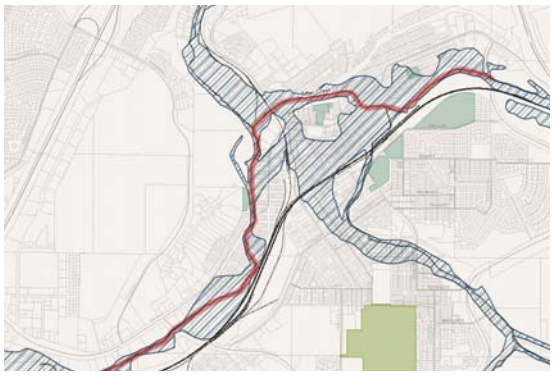
Amended Final Environmental Assessment

Rock Springs Bitter Creek Clean-Up Project

Rock Springs, Sweetwater County, Wyoming



This document provides an amendment and update to the Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project dated September 28, 2009.

Prepared by:
City of Rock Springs
Landmark Design Inc.

In Cooperation with U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

January 2011

Amended Final Environmental Assessment

Rock Springs Bitter Creek Clean-Up Project

Rock Springs, Sweetwater County, Wyoming

Contents

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Introduction

This document, in total, presents both the original "Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project"[1] (Final EA), and an Addendum that completes outstanding items for the National Environmental Policy Act (NEPA) review of this project. Upon review of the "Final EA" (ca. 2009), it was determined that the original document contained insufficient data to verify that wetlands and cultural resources would not sustain *significant impacts* from the proposed action. Both OSM and COE must determine that there will be no significant adverse environmental impacts resulting from the proposed action before they can authorize this action to proceed. Therefore additional information and analysis was requested.

While the COE was reviewing the wetland permit application, they requested a more detailed review of additional alternatives that had initially been considered and rejected by the City during its early planning. These findings are also discussed in this Addendum.

During the intervening period between 2009 and the present, the Federal Emergency Management Agency (FEMA) determined that it would require rehabilitation and extension of old flood control levees along Dead Horse Canyon Creek to attain the goals of this project. The affected area for this new portion of the project had not been previously identified, and therefore resource evaluations and impact analyses were required for the newly identified affected area. This Addendum document also discusses the findings from the additional environmental evaluation on the proposed Dead Horse Canyon Creek levee rehabilitation as an "Additional Proposed Action".

A copy of the "Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project", in its entirety, as well as the Addendum to that document follow.

[1] Landmark Design Inc., "Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project," Rock Springs, Sweetwater County, Wyoming, September 28, 2009.

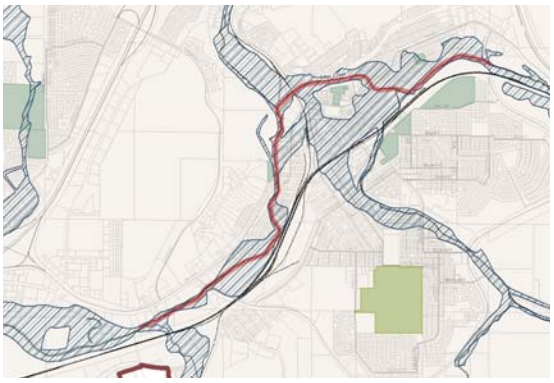
Final Environmental Assessment
Rock Springs Bitter Creek Clean-Up Project

(September 2009)

Final Environmental Assessment

Rock Springs Bitter Creek Clean-Up Project

Rock Springs, Sweetwater County, Wyoming



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Final Environmental Assessment

Rock Springs Bitter Creek Clean-Up Project

Rock Springs, Sweetwater County, Wyoming

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Appendix 2: Levee Accreditation Feasibility Assessment

"Levee Accreditation Feasibility Assessment", Greg Poole, Hansen Allen & Luce, March 3, 2009.

Appendix 3: Wetland Assessment Reports & Correspondence

"2009 Wetland Assessment for City of Rock Springs Bitter Creek," July 2, 2009.

Letter from Matthew A. Bilodeau, USACE, Omaha District, Wyoming Regulatory Office, September 16, 2009.

"2008 Wetland Assessment for City of Rock Springs Bitter Creek," March 19, 2009.

Response letter from Cindy Adams, BKS Environmental Associates, Inc. to Mike Burgan, USACE, January 20, 2009.

Letter from Mike Burgan, USACE, Omaha District, Wyoming Regulatory Office, February 24, 2009.

"2008 Wetland Assessment for City of Rock Springs Dead Horse Canyon-Bitter Creek Detention Basins," October 20, 2008.

Letter from Mike Burgan, USACE, Omaha District, Wyoming Regulatory Office, December 12, 2008.

Appendix 4: Wildlife Survey Data & Correspondence

2008 Wildlife Survey Data Sheets

Letter from John Emmerich, Deputy Director, WGFD, July 8, 2008.

Letter from Brian T. Kelly, Field Supervisor, Wyoming Field Office, U.S. Department of Interior, Fish and Wildlife Service, referencing phone conversation on December 2, 2008.

Letter from Bobby Crompton and Kevin Spence, Wyoming Fish and Game Department, February 23, 2009.

Appendix 5: Soil Sample Summary

"Soil Sample Summary for Bitter Creek Enhancement Project," JFC Engineers and Surveyors, December 2008.

Appendix 6: Urban Renewal Agency Letter
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Email communication from Jeromy Caldwell, Supervisory Wildlife Biologist, Department of Interior, Bureau of Land Management, Rock Springs Field Office, March 9, 2009.

Letter from Patricia Hamilton, Lead Realty Specialist, Department of Interior, Bureau of Land Management, Rock Springs Field Office, February 25, 2009.

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Appendix 11: DEQ Air Quality Division Letter
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Appendix 12: State Historic Preservation Office (SHPO) Letter
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Appendix 13: Draft Final Environmental Assessment Comments & Responses
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A. Description of Proposed Action

The Proposed Action involves channel improvements to Bitter Creek as it flows through the City of Rock Springs, Wyoming, and the construction of two detention basins associated with Dead Horse Canyon Creek.[1] Dead Horse Canyon Creek is a tributary of Bitter Creek with the confluence occurring within the City; ultimately Bitter Creek flows into the Green River. Rock Springs is located in southwestern Wyoming in Sweetwater County adjacent to Interstate 80—a major east-west transportation corridor across the United States that is enhanced further by the large presence of Union Pacific Railroad Company in the City. The City is situated in the semi-arid, relatively low-lying desert, where its ample natural resources gave rise to a vital railroad and mining industry that has been the center of its economy since the City was established in 1888.

Bitter Creek is part of a larger Green River drainage where snowmelt and occasional, intense rainstorms often fill otherwise intermittent or ephemeral drainages and creeks causing intense flooding and erosion. In response to these conditions, the early mining town in collaboration with Union Pacific Coal Company and Union Pacific Railroad, modified bank and channel conditions on Bitter Creek and Dead Horse Canyon Creek to control flooding and protect areas where railroad employees and miners settled, where mining activities took place, where downtown Rock Springs developed, where routes of commerce passed, and where railroads, which took advantage of the local coal deposits, expanded and prospered.

The Proposed Action includes channel improvements to approximately 3.5 miles of Bitter Creek corridor from the South Side Belt Route roadway bridge on the east side of Rock Springs to the confluence of Sweetwater Creek just west of Plaza Mall. Improvements along the 3.5-mile corridor will include efforts to naturalize the channel and add-back sinuosity where space is available. Where space is constrained, armored banks and other protective features are planned. Additional improvements include refuse and debris removal, road crossing improvements, wetland enhancements, wildlife habitat improvements, access for maintenance, and potentially, trails and other aesthetic improvements.

The channel will be reconstructed to provide a low-flow channel, as well as capacity for a 100-year flood. The channel will carry floodwaters safely through the City, and result in about 360-acres in downtown Rock Springs being removed from the FEMA floodplain. The Proposed Action also includes construction of two storm water detention basins on Dead Horse Canyon Creek which enters the City from the southeast. Waters flowing from Dead Horse Canyon Creek into Bitter Creek contribute to the flooding in downtown Rock Springs.

[1] Location of Bitter Creek drainage through Rock Springs, Wyoming: West end, SE1/4 SE1/4 NW1/4 NW1/4 NE1/4 of Section 3, T18N, R105W; East end, NE1/4 SE1/4 NE1/4 NE1/4 SW1/4 of Section 25, T19N, R105W Sweetwater County, Wyoming.
Dead Horse Canyon Creek Detention Basin #2: NE 1/4 NW ¼; NW1/4 NE1/4; NW1/4 NW1/4 SW1/4 NE1/4 of Section 6, T18N, R104W, Sweetwater County, Wyoming.
Dead Horse Canyon Creek Detention Basin #3: SE1/4 NW1/4; SW1/4 NE1/4; N1/2 NW1/4 SE1/4; N1//2 SW1/4 SE1/4; NE1/4 NE1/4 SE1/4 SW1/4; NE1/4 SW1/4 of Section 1, T18N, R105W, Sweetwater County, Wyoming.

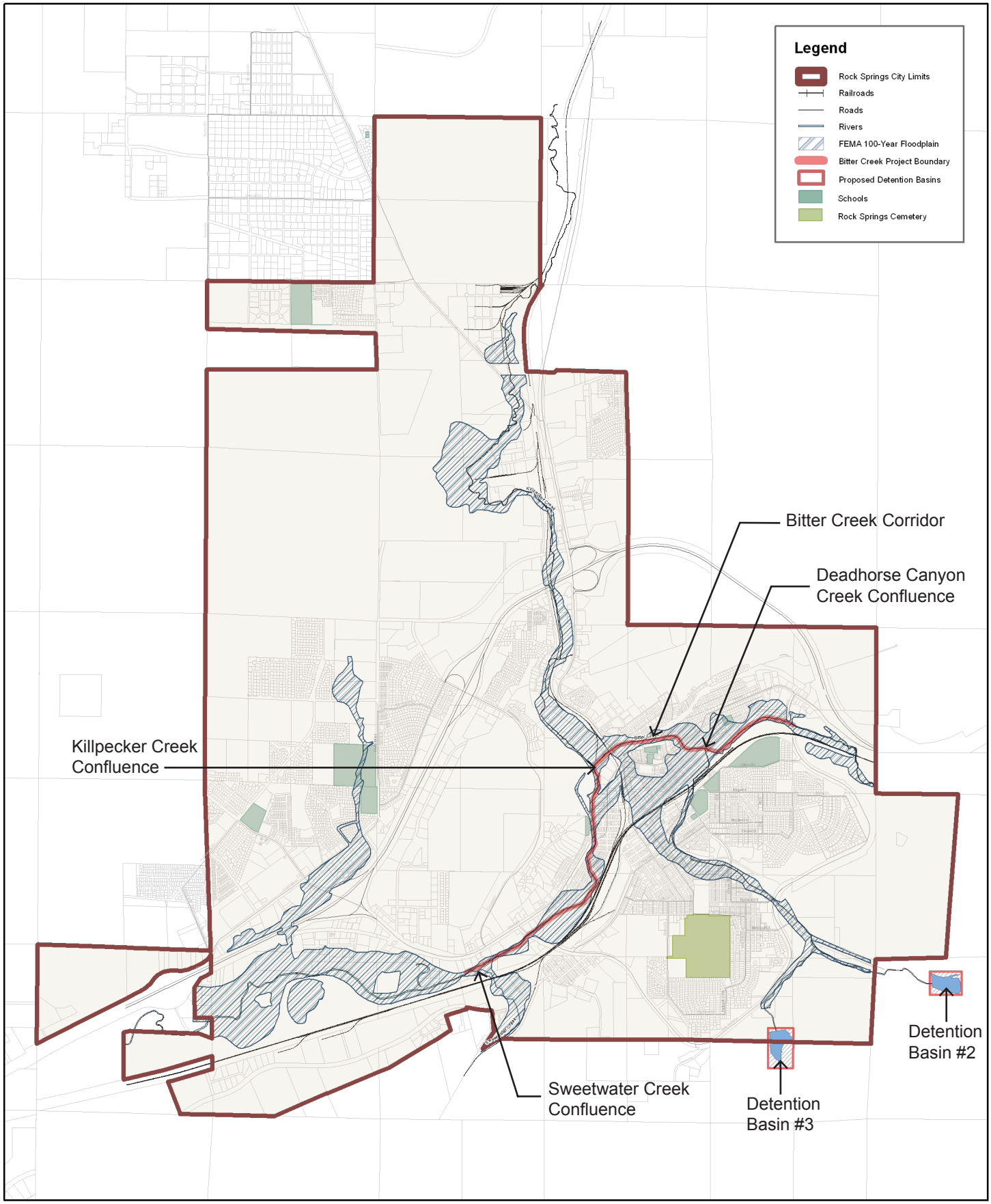


Figure 1: Vicinity Map with Study Area

Rock Springs Bitter Creek Clean-Up Project
Draft Enviromental Assessment

Rock Springs, Sweetwater County, Wyoming
September 28, 2009

Figure 1 illustrates the corridor length, the confluence points within the City of Rock Springs, and the location of the two detention basins. The Proposed Action also includes designated access areas that will be used for maintenance of the channel and may provide opportunity for future urban trails along the corridor.

B. Need for the Proposed Action

The Bitter Creek drainage has been the source of flooding in the City of Rock Springs throughout its history. Hydrologic conditions in the large drainage basin—about 4,060 square miles—create an environment where Bitter Creek and its tributaries contribute massive flows which continue to plague the City. In response, the City and its partners initiated a series of flood control and creek diversion projects, starting in 1916 when the Dead Horse Canyon Creek channel was constructed to control storm water into Bitter Creek. The first major diversion of the Bitter Creek channel occurred in 1925-26 following a disastrous flood in 1924. In collaboration with the Union Pacific Railroad Company (UPRR) and support from the Union Pacific Coal Company (UPCC), UPRR surveyed the location for the new channel location, and submitted design plans to the City of Rock Springs City Council.[2] At the same time, UPCC deeded land that it owned along the creek to the City of Rock Springs at no cost so that it could either sell the land to the squatters living along the banks or use it for other purposes.[3] The diversion project benefited the growing city as well as the railroad and coal companies by controlling some flooding, though it did not effectively control 100-year floods.

Flood conditions on Bitter Creek continue to cause residential neighborhoods and commercial/retail areas to be designated as Special Flood Hazard Areas (SFHA) within the Federal Emergency Management Agency (FEMA) 100-year floodplain. This designation puts severe restrictions on development opportunities, requires property owners to pay costly flood insurance premiums, and restricts the community's opportunities for economic development and growth. These impacts cause hardship to individual property owners within the designated floodplain, and effectively constrain development or rejuvenation of the Historic Downtown District and associated residential neighborhoods.

The Proposed Action is needed to provide flood protection for a significant portion of modern-day central Rock Springs, and to provide the basis for FEMA to revise the existing Flood Insurance Rate Map (FIRM). The intent of the Proposed Action is to control flooding, and eliminate the potential for further damage to vulnerable residential and commercial/retail areas, remove barriers to economic development and property improvements, enhance living conditions in the City of Rock Springs, and create a stable, aesthetically pleasing stream system through town. The Proposed Action will make channel improvements to Bitter Creek, detain floodwaters in Dead Horse Canyon Creek, and control flood events in the City of Rock

[2] Johnson, David and Kautzman, Matt, "Class III Cultural Resource Inventory for the City of Rock Springs Bitter Creek Clean-up Killpecker Creek Detention Pond (Dam Site 1) Bitter Creek Dead Horse Canyon Detention Pond (Dam Site 2 and 3) Sweetwater County, Wyoming:", Western Archaeological Services, Rock Springs, Wyoming, January 15, 2009.

[3] Gardner, Dudley "Description of Union Pacific Coal Companies Involvement in the New Bitter Creek Channel through Rock Springs Wyoming", prepared for Landmark Design Inc. Manuscript on file at Western Wyoming Community College, January 19, 2009.

Springs so that properties now shown in the 100-year floodplain will no longer be constrained by FEMA floodplain designation.

The Proposed Action is thoroughly described in the *Bitter Creek Reconstruction Plan and Design: A Master plan for the Reclamation and Development of the Bitter Creek Drainage through Downtown Rock Springs, Wyoming (December 14, 2007)* found in Appendix 1. This effort was undertaken and funded by the City of Rock Springs. The purpose of this Environmental Assessment (EA) is to provide sufficient data to allow analysis of the impacts of the project, and strategies to limit adverse impacts caused by the Proposed Action. Provided there will be no significant adverse environmental impacts, the project may move forward with the first phase of improvements and subsequent phases will occur as funds are available.

The Proposed Action is needed to alleviate economic impacts from the impairment of the Bitter Creek drainage, and the attendant flooding. Inclusion of a large portion of the City within the FEMA 100-year floodplain designation causes undue economic impact and hardship to local residents and businesses. The Wyoming State Legislature recognized the need for a new flood control plan that would relieve the hardships on the community of Rock Springs, and appropriated federally-derived Abandoned Mine Land (AML) Program funds to provide for the initial work on this project, such as completion of the Environmental Assessment and initiating construction on proposed improvements. In so doing, the Legislature recognized the critical role the City has played in the development of the State's oil, gas, mineral, and coal resources, and the direct and indirect impacts the City and its residents have sustained throughout the history of mining in southwestern Wyoming. To allow the City to continue its leadership role in the State, it is necessary to foster a healthy economic environment that provides for managed growth and redevelopment rather than internal decay.

The proposed project will remove approximately 360 acres of developed land in downtown Rock Springs from the FEMA 100-year floodplain designation, will eliminate this major barrier to the City's economic development plans, will improve living conditions for hundreds of residents and property owners, will mitigate impacts caused by past mining activities, urban and industrial/commercial development, and stream channel modifications that have impacted the community over time, and will enhance the stream corridor aesthetically and biologically.

C. Alternatives Considered

The project will be built on the basis of planning and design recommendations in the *Bitter Creek Reconstruction Plan and Design: A Master Plan for the Reclamation and Development of the Bitter Creek Drainage through Downtown Rock Springs, Wyoming (December 14, 2007).* The Master Plan presents results of a study undertaken by the City of Rock Springs in 2007 to investigate creek channel modifications that would control storm water flood events on Bitter Creek and thus remove a large portion (approximately 360 acres) of downtown Rock Springs from the FEMA floodplain and the Flood Insurance Rate Map (FIRM). To summarize, the City proposes to alter, enlarge, and enhance the Bitter Creek channel where it

passes through the City of Rock Springs, and to improve flood flow management in a manner that is protective of the residents in the City and the improved properties that are presently within the floodplain. This effort will include improved water conveyance structures, cleanup of refuse and debris from the channel, installation of upstream detention structures, the addition of maintenance access, and improvement of the aesthetics of the presently degraded and unattractive watercourse. The Master Plan presented two concepts for channel improvements which vary slightly. Both concepts are feasible, however Concept 2 – Limited Cooperation was selected by the City as the Proposed Action.

The two concepts presented in the master plan differ primarily in the amount of land needed for implementation. They represent two possible development solutions with many opportunities for variation in between. In many areas the creek channel is narrow, with existing development on either side of the creek and little opportunity to create more space for channel improvements. In other areas there is ample room for broadening the channel, reintroducing meanders into the creek, and creating a more natural creek condition. In each concept, the floodplain associated with Bitter Creek would be significantly reduced. The Master Plan is included in Appendix 1.

Concept 1 would require negotiation with private property owners or agreements with adjacent public and quasi-public property owners to create greenways and community parks along the corridor, to link to existing pathways, and to give Bitter Creek more space during flood conditions. The implementation of Concept 1 would incorporate a larger area, assuming that negotiated agreements or easements could be obtained, and would build on greenway improvements already occurring within the City. Concept 1 would include the creation of a pond at the confluence of Bitter Creek and Dead Horse Creek. Due to the complicated nature and expense of Concept 1, the City has selected Concept 2.

Concept 2 would not require acquisition of private property, but would still require negotiated agreements with adjacent public and quasi-public property owners in order to implement the required channel improvements. In this alternative, improvements would remain within the existing creek corridor, though it would be enlarged where possible. Concept 2 also suggests potential improvements to, and expansion of Pearl Park onto existing City-owned land. The reduced riparian area of this alternative would provide less opportunity for aesthetic and urban design improvements.

While the City has selected Concept 2 as its preferred alternative, the discussion in the Master Plan acknowledged that the two concepts were not entirely independent, and in fact might be merged, depending on future funding and cooperation of adjacent property owners.

Proposed Action Alternative

Concept 2, the alternative that requires the least property acquisition, is the selected alternative from the Master Plan. This Proposed Action includes a variety of channel improvements that are discussed in greater detail in the Master Plan (see Appendix 1). The key objective of the Bitter Creek Clean-Up Project is to alter the current hydrologic regime such that residential and commercial properties in the affected area are no longer at risk from flooding, and are no longer in an area classified as the 100-year floodplain on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM).

Development of the Master Plan included utilization of a "HecRAS" model developed by the U.S. Department of Defense, Army Corps of Engineers (USACE) to identify areas of opportunity for channel improvements. This program models the hydraulics of water flow through natural rivers and other channels. The process followed for this modeling is described in detail in the Master Plan. The identified channel improvements were implemented into a water surface profile hydraulic model. Review of the model results identified required bridge improvements. Additional modeling results indicated the need for other channel improvements. Where feasible, channel improvements would utilize several techniques described briefly below.

Channel meanders would be restored to the extent practicable. The constructed channel would include three elements: 1) a low-flow channel with capacity of about 3 cubic-feet-per-second (cfs), 2) a normal flood flow channel with capacity equivalent to approximately the 2-year flood event, and 3) a flood channel with capacity for the 100-year event. This would include the construction of a maintenance access road above the normal (2-year) flood flow channel.

Gabion-naturalized areas would require the use of a retaining structure on one side of the channel where available space is limited. Though a gabion system is discussed, alternative retaining systems may be included in the final designs, depending on site-specific conditions. A gabion retaining system includes a series of stacked wire baskets filled with rock. Alternative retaining systems may include slope soil nailing, mechanically stabilized earth walls (such as Keystone walls), and concrete retaining walls. Some reaches may require retaining structures on both sides of the channel, and in some locations, an armored channel bottom may also be required. Alterations to bridges and other tributary storm water conveyances will be implemented as required. It may also be necessary to improve restricted and limited accesses in some areas.

Potential greenway improvements could vary from a narrowly defined, but much improved creek channel that handles the flood waters, to enhancements such as a trail system requiring pedestrian crossings; five new pedestrian bridges are proposed. Other improvements would include planting areas for trees and adapted plant materials, benches and playgrounds, and other public facilities. The creek channel itself would ultimately be vegetated with native plant materials adapted to local soil and climatic conditions.

The Proposed Action would also include construction of two storm water detention basins on Dead Horse Canyon Creek, a tributary to Bitter Creek. These are needed to effectively control flooding in downtown Rock Springs. No channel improvements are proposed or needed for Dead Horse Canyon Creek. (Johnson-Fermelia Co. Inc. (JFCo), 1989).

No Action Alternative

This alternative provides for no alleviation of the flooding in downtown Rock Springs, and no relief from the economic and other impacts associated with flood events. It would continue to place an unnecessary burden on the City and on property owners seeking to remove their properties from the 100-year floodplain designation.

Alternative Considered But Not Advanced

Certification of the Existing Levee: In 1924 a diversion channel around the north end of town which included a levee across Bitter Creek near the site of the Pilot Butte Avenue Bridge was constructed. At the same time, a channel was excavated to the confluence of Killpecker Creek, a levee to protect the western part of town was built along the east bank of Bitter Creek, and the storm ditch constructed in 1916 was relocated and extended. These improvements, completed by the City of Rock Springs and the Union Pacific Railroad Company were never certified by the Corp of Engineers and are not reflected in the current FEMA and FIRM documents. Certification of these improvements alone does not entirely achieve the important objective of removing a major portion of downtown Rock Springs from the FEMA 100-year floodplain designation, nor are the economic development and redevelopment barriers, and social impacts to property and property owners removed, or the biological benefits of an improved channel environment achieved.

The feasibility of certifying the existing levee was evaluated in a *Levee Accreditation Feasibility Assessment* prepared by Hansen Allen & Luce, Inc. (March 3, 2009). The existing levee does not currently meet FEMA requirements for three feet of freeboard (additional height) above the base flood elevation. Certification would require raising the height of the structure by a minimum of 3-feet and a maximum of 9-feet; the levee would need to be extended 900 feet requiring the removal and/or relocation of homes and Front Street; it could impact Pearl Park which would trigger 4(f) considerations (special protections for park lands); and the structural stability of the existing levee would need to be critically analyzed requiring extensive excavation and disruption. The evaluation assessment is found in Appendix 2.

D. Affected Environment

1. General Setting

The project is located within the Greater Green River Basin, of which Bitter Creek is a major tributary. "The Bitter Creek drainage area is a bowl-like basin encircled by broad escarpments that rise to between 7,000 and 9,000 feet, NGVD (National Geodetic Vertical Datum). Physiographically, the basin is divided into distinct plateau and foothill regions. The plateau region, which is flat or gently rolling country studded with buttes and knolls, comprises the central part of the Bitter Creek Drainage. The foothill region includes the Bitter Creek headwaters and the drainage areas of Dead Horse Canyon, Killpecker, and Sweetwater Creeks ..." (Federal Emergency Management Agency, 1998).

"The Bitter Creek valley floor has been extensively modified by 19th and 20th Century urban development…Aerial photographs of Bitter Creek around Rock Springs show the extent of modifications to the creek channel. To the west and east of the City, Bitter Creek exhibits signs of a natural creek channel. In those areas, the stream follows a winding and meandering path with numerous oxbows and abandoned channels. Within Rock Springs, the channel is markedly different. The channel is relatively straight with no meanders or signs of abandoned channels. The entire length of the creek in Rock Springs shows signs of modification to the channel in the form of dredging and straightening. No portion of Bitter Creek in the study area

remains a natural channel" (Class III Cultural Resource Inventory, Western Archaeological Services, 2009).

Geology

"The Bitter Creek Sub-basin lies entirely within sedimentary basin geology, composed of mostly fine grained sedimentary rocks containing salts and other evaporite minerals. Because of the arid climate and relatively low elevation and basin terrain, most reaches in this drainage are non-perennial. Snowmelt and occasional rainstorm events often transport high loads of sediment and dissolved salts. Land uses include grazing, coal mining, phosphate mining, uranium exploration, and oil and gas development. Bitter Creek, a tributary to the Green River, drains a large arid area (an outlying part of the Red Desert) … including a western fringe area of the Red Desert basin" (Wyoming Department of Environmental Quality, 2006).

Climate

"The climatic conditions alternate on an annual basis between having cold winter temperatures, which prevent substantial plant growth, and having summer water deficits. The Green River weather station averaged a short 103-day annual frost-free period from 1915-2004, and monthly station records of precipitation and temperature (30-year mean from 1971-2000) indicate water stress through much of the frost-free period" (Mason and Miller, 2005). May is the wettest month averaging 1.36 inches, while February is the driest averaging 0.52 inches of moisture (EDE Consultants, 2006). In Rock Springs, the average annual precipitation is almost 9 inches with an average yearly snowfall of about 35 inches. At elevation 6,271, Rock Springs experiences generally clear skies, low humidity, and extreme temperature ranges varying from a low of -40 degrees Fahrenheit in winter to highs of over 100 degrees Fahrenheit in summer; the mean annual temperature is about 44 degrees Fahrenheit (Federal Emergency Management Agency, 1998).

1.1 Bitter Creek Corridor

Bitter Creek flows through the City of Rock Springs from east to west, and functions as a tributary drainage to the Green River. The setting is within the arid eastern portion of the Great Basin Desert where sparse vegetation, multi-colored soil strata, and eroded "knobs and knees" form the landscape. The City's historic downtown and residential neighborhoods developed along the low-lying areas where Bitter Creek flows, where extensive coal deposits were mined, and where the railroad found suitable topography to develop tracks. Over the years, the City has grown up the slopes and escarpments where new neighborhoods and schools have expanded the City, and where Western Wyoming Community College has developed.

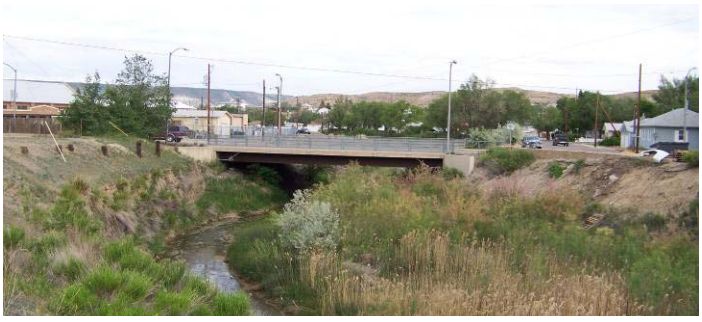
Through Rock Springs, Bitter Creek is a highly modified creek channel with deeply cut side-slopes and a narrow channel. Constructed levees have been installed to help control flooding and contain the creek. Some sections of the channel are stable and others are not. Some have been armed with stone to control erosion and to protect the banks from the torrents of water that occur when intense rainstorms occur in the summer months, and most are well vegetated where recent disturbance has not occurred. Many of the old stone embankments have historic relevance and are important relics telling the story of a community and its struggle to control Bitter Creek.

Toward the eastern stretch, the corridor is open and the creek flows between railroad tracks and railroad appurtenances, with some residential and commercial areas. Toward the middle, it flows between constructed embankments to control flooding, older residential neighborhoods that sit in the 100-year floodplain, and the historic downtown areas of the City. On the western end, it flows through residential neighborhoods, commercial/industrial areas, and ultimately past the south side of Plaza Mall.

Bitter Creek runs intermittently, filling and overflowing only when major storm events occur in the broader Green River watershed. Its current appearance is not aesthetically appealing, nor has adjacent development attempted to engage the creek in any way. Wherever Bitter Creek flows through Rock Springs, it is a neglected, modified, abandoned creek, littered with debris and trash.

Images from the eastern end of the creek corridor.

Project Start: Southside Belt Route (East)



Bridge at "N" Street

Through railroad property

Images through the center portion of the creek corridor.

Through residential areas and commercial/industrial areas, between "N" Street Bridge and the South Side Belt Route (West)

Images through the western portion of the creek corridor

In Back of Plaza Mall

Project End: Sweetwater Creek

1.2 Dead Horse Canyon Creek Detention Basins

Both of the basin sites are south and east of Rock Springs, and are natural, deeply cut drainage channels flowing into Dead Horse Canyon Creek. Detention Basin #2 is adjacent to State Highway 430, outside of the City limits in Sweetwater County, and on Bureau of Land Management (BLM) land. It is a natural basin that appears to have been previously disturbed as there is evidence of grading and contour manipulation. It is in an undeveloped area with vegetation typical of the region—sagebrush and junipers.

Looking southeast to a small drainage into the basin

Looking northeast across the basin

Detention Basin #3 is also a natural appearing basin, and is located on land owned by the Anadarko Petroleum Company, a large mining and mineral extraction company. The northern portion of the basin site is within the corporate limits of Rock Springs; the southern portion is in Sweetwater County. It is located immediately south of a new manufactured home park in Rock Springs which has channelized the drainage channel as it passes through the development.

Looking north to the subdivision and Rock Springs in the background

The dominant vegetation in both basins is a sagebrush community with scattered junipers located on the tops of ridges and the surrounding hills, and both include deeply incised seasonal tributaries that contribute to the drainage. Both detention basin sites have evidence of modern impacts including the manufactured home development, two-track and off-road vehicle tracks, and trash and debris. When the basins are complete, it will be important to keep off-road vehicle use out of the basins so that they retain their functionality and can be revegetated successfully.

Eroded channel within the basin site

2. Affected Resources of the Proposed Action and No Action Alternatives

2.1 Cultural Resources

Cultural resources on public lands, including archaeological sites and historic properties are protected by various laws and regulations such as the National Historic Preservation Act of 1966 (NHPA), Governing Regulations, and 36 CFR Part 800. The specific directives can be found in *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (Federal Register 1983). Laws and regulations concerning cultural resources stipulate that a proposed federal undertaking consider the effects of the action on cultural resources. This requires that cultural resources within the proposed area of potential effect be identified and evaluated. Measures will be taken to mitigate or minimize any adverse effects to those historic properties included in, or eligible for, the National Register of Historic Places (NRHP).

A file search was conducted through the Cultural Records Office of the Wyoming State Historic Preservation Office. This file search included all of the sections of land encompassing the proposed project area. The Union Pacific Railroad, Western Wyoming Community College, and Western Archaeological Services records were researched, and the proposed project area was the subject to an intensive Class III Cultural Resource Inventory, which involves on-the-ground investigation and documentation.

In determining eligibility, the criteria for evaluating cultural resource significance is as described in the Code of Federal Regulations (36CFR60.4).

Prehistoric Resources

The prehistoric period extends from approximately 12,000 years before present time (B.P.) through 350 B.P. when European cultural items began to arrive in the region. The area was inhabited by small, mobile groups of hunters and gatherers. Prehistoric cultural remains in southwest Wyoming usually include scattered lithic debris, stone tools, grinding slabs,

evidence of camp sites, and occasional burials and house pits. Only one prehistoric site has been documented in the general study area which is roughly defined as within one-mile of the project area, but not in the immediate project area. This is a lithic scatter consisting of a diffuse scatter of chipped stone debris and is considered not eligible for nomination to the NRHP.

Historic Resources in the General Study Area

Historic use of the Rock Springs area was mainly tied to construction of the Union Pacific Railroad and mineral extraction. The overall lack of water limited the development of homesteads or ranching; however, wool production added to the Rock Springs economy and evidence of sheep herding is scattered across the landscape.

Previously conducted Class III inventories have covered 1,297 acres of the general study area. The previous inventories were conducted as part of nine AML projects, five fiber optic lines, five highway projects, three gas pipelines, two water lines, two miscellaneous block inventories, one sewer line, one cell tower, one viaduct replacement, two Certified Local Government (CLG) historic district assessments, and one historic building assessment and restoration.

From those inventories, the following resources were documented. Many of the resources were determined to be not eligible for nomination to the NRHP, and will require no special protection. Historic sites consist of three not eligible historic dump and debris sites, three not eligible bridges, four not eligible coal mines, three eligible coal mines, seven unevaluated coal mines, and the Blair Station (destroyed). The linear resources include the eligible Lincoln Highway, Overland Trail, and the Rock Springs to Browns Park and Rock Springs to Lander Wagon roads, and the not eligible Rock Springs to Hiawatha Freight Road. These resources are within the general study area, but are not in the current project area.

Numerous evaluations of buildings have been completed in the City of Rock Springs, mostly in conjunction with CLG projects. The Downtown Historic District consists of 28 contributing and 19 non-contributing buildings, all of which are eligible for listing on the NRHP. The Wardell Court Historic District is eligible in its entirety. Outside of the historic districts, there are 119 not eligible and 12 eligible buildings or houses. The properties listed on the National Register of Historic Places include the Elks Club, Masonic Temple, Our Lady of Sorrows Catholic Church, Gras House, Slovenski Dom, Taliaferro House, Old Post Office, First Security Bank Building, and Wardell Court.

Additionally, the Rock Springs to Browns Park Road (48SW3865) was in use by the mid-1880s and was utilized to ship freight, passengers and mail south to Browns Park. The road is considered eligible for nomination to the NRHP. The 1909 General Land Office (GLO) shows the road in Section 35, T19N, R105W, heading southwest along the current Highway 430. This linear property is south of the current project area and has been impacted by the development of Rock Springs.

Historic Resources in the Current Project Area

Bitter Creek Corridor

A major flood in 1924 and unsanitary conditions spurred the City of Rock Springs and its railroad and mining partners to re-channel Bitter Creek from a point on "Rainbow Avenue (currently Pilot Butte) to a point west of Elk Street, where it again joins the original Bitter Creek channel" (*Employees' Magazine*, *1926*). The old channel was filled in and named Channel Street. The new channel was dug with a dragline and three new bridges were built. The channel was 3,580 feet long with a bottom width of 36 feet and an average depth of 8 feet. A reinforced concrete box culvert was placed under the railroad tracks (*Employees' Magazine*, *1926)*.

At least three re-channel projects have taken place since the original project. In 1938, a bond issue was passed and the creek was widened and straightened. A 1948 Rock Springs map shows that Bitter Creek was moved along Dewar Drive to behind the current strip mall (Plaza Mall). In the late 1970s the creek was also moved parallel to Clark Street. Other moves may have occurred but are not well documented.

Four previously recorded sites are located in the project area of the re-channeled Bitter Creek. An additional two sites were recorded during the Class III Cultural Resource Inventory for the current project. The four previously located sites include:

- Chinatown (48SW3999) is considered eligible for nomination to the NRHP and was located on the north side of the old channel of Bitter Creek in the area around the present-day Washington School. In 1885, the Chinese were attacked and Chinatown was burned and later rebuilt. It continued to be used into the 1920s and eventually became a modern housing development. Chinese artifacts may be found buried along the south side of re-channeled Bitter Creek north of Washington School, however, photographs taken during construction of re-channeled Bitter Creek show that the area has been heavily disturbed with no standing structures.

- The Rock Springs to Lander Wagon Road (48SW4163) was established in 1868 to ship freight, passengers and mail north and is considered eligible for nomination to the NRHP. The 1909 GLO map shows the freight road crossing the re-channeled Bitter Creek in Section 26, T19N, R105W. In this area, the freight road has been completely subsumed by Elk Street and other modern developments and no longer contributes to the NRHP eligibility.

- The NRHP eligible Overland Trail (48SW1226) is one of two major east-west oriented 19th century transcontinental wagon roads across Wyoming. The 1876 GLO map shows the trail crossing Bitter Creek in two places. The first is north of the intersection of Elk Street and Bridger Avenue and the second is near the Pilot Butte Bridge. Both of these areas are within the project area, but have been completely industrialized and no Overland Trail remnants remain.

- The Lincoln Highway (48SW1834) is the earliest 20th century automobile road to cross Wyoming. The Lincoln Highway went through the town of Rock Springs and later

was superseded by U.S. 30. The Lincoln Highway through the current project area has been previously determined to no longer contribute to the NRHP eligibility and the State Historic Preservation Office has concurred with that determination.

The two new sites in the current project area are described below.

- The re-channeled Bitter Creek crosses under the Union Pacific Railroad South Pass Branch on the west side of Elk Street, north of the Elk and Center Streets interchange. This site was recorded as part of the Class III Cultural Resource Inventory for the current project. The site was determined not eligible for nomination to the NRHP because it is a typical early 20th Century deck plate girder bridge. The design is standard and was widely used across the Union Pacific system.

- In 1937, the Bitter Creek witnessed a significant flood in which more than 2,000 people had to be evacuated. In response to this flood, various ideas were proposed and finally, in 1941 as part of a Works Progress Administration (WPA) project, a series of stone walls were constructed to try and contain flood water. The stone walls (48SW17183) were recorded during the Class III inventory of the project area and are recommended eligible for nomination to the NRHP with contributing and non-contributing portions. These stone walls will be incorporated into the proposed project as much as possible; however mitigation such as Historic American Buildings Survey (HABS) and/or Historic American Engineering Record (HAER) documentation may be required.

Dead Horse Canyon Creek Detention Basins

No cultural resources were identified as a result of the Class III inventory for the Bitter Creek Dead Horse Canyon Creek detention basins.

2.2 Water Resources

Bitter Creek Watershed

The mouth of Bitter Creek is located on the Green River near the City of Green River, Wyoming about 15 miles downstream from Rock Springs. The Bitter Creek Watershed has over 2,200 square miles of tributary area (See Figure 2). The majority of the watershed is owned and managed by the Bureau of Land Management. The majority of the remaining portions of the watershed are privately owned, mixed with a small portion of State land.

Available stream flow gauging records for Bitter Creek are very sparse. The only continuous stream flow gauging records available for Bitter Creek are from a gauging station maintained from 1976 through 1981 on Bitter Creek above Salt Wells Creek (see Figure 3). The Bitter Creek tributary area to this gauging station is about 830 square miles. As shown on Figure 3, the stream flow is intermittent with short sharp peaks in response to runoff events and extended periods of no flow. Bitter Creek below the Rock Springs mine discharge (a flowing well located upstream of Center Street Bridge) is considered perennial. The middle reaches of Bitter Creek are intermittent, and the upper reaches above the confluence with Tenmile Draw and Deadman Wash are ephemeral.

Figure 2. Bitter Creek Watershed Land Ownership

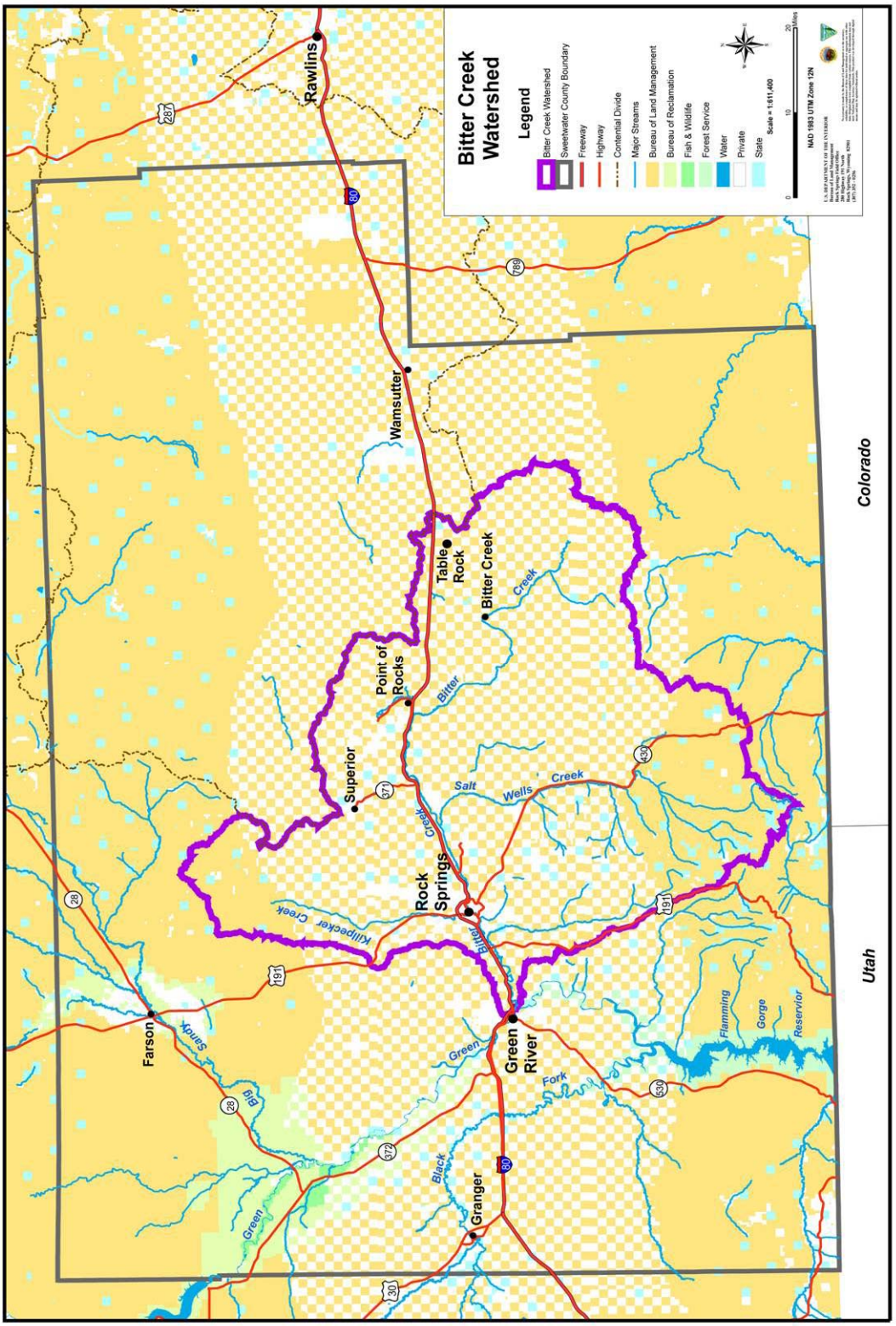
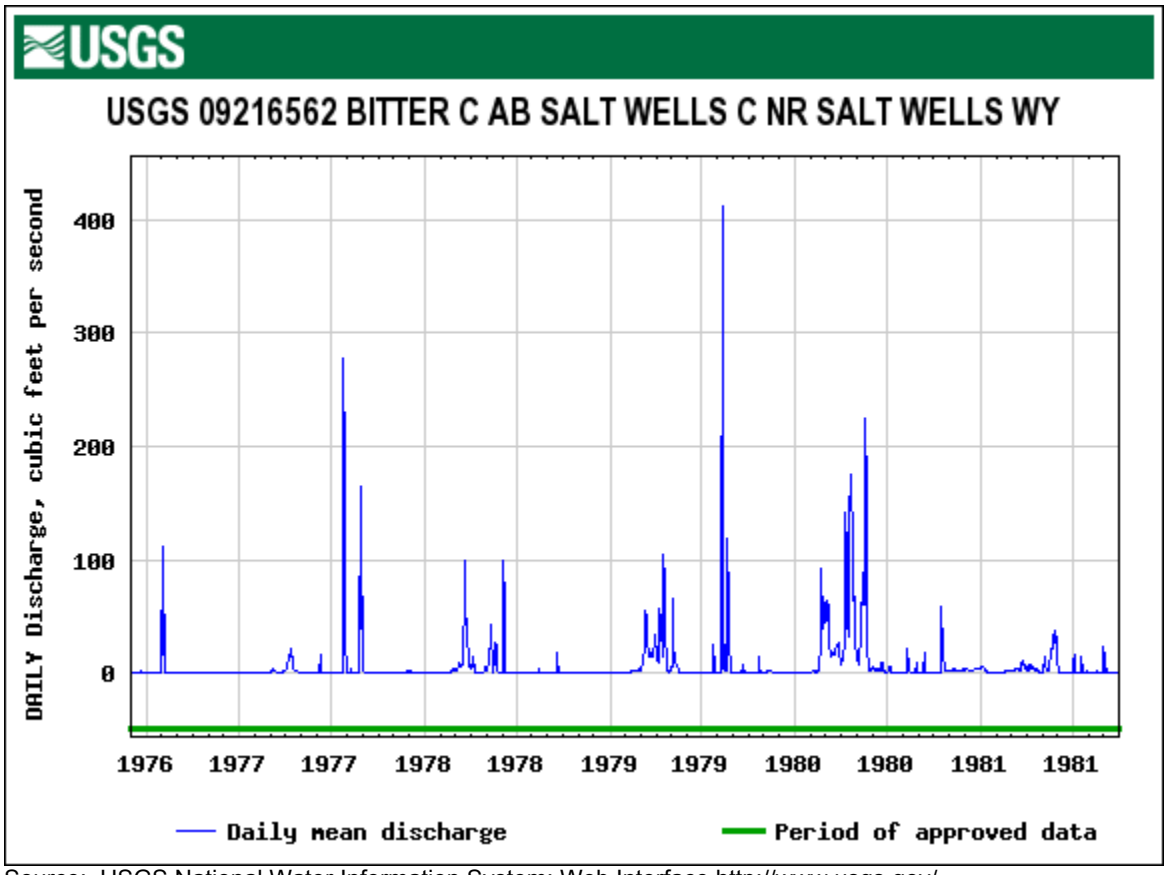


Figure 3. Stream Flow Gauging on Bitter Creek Above Salt Wells Creek

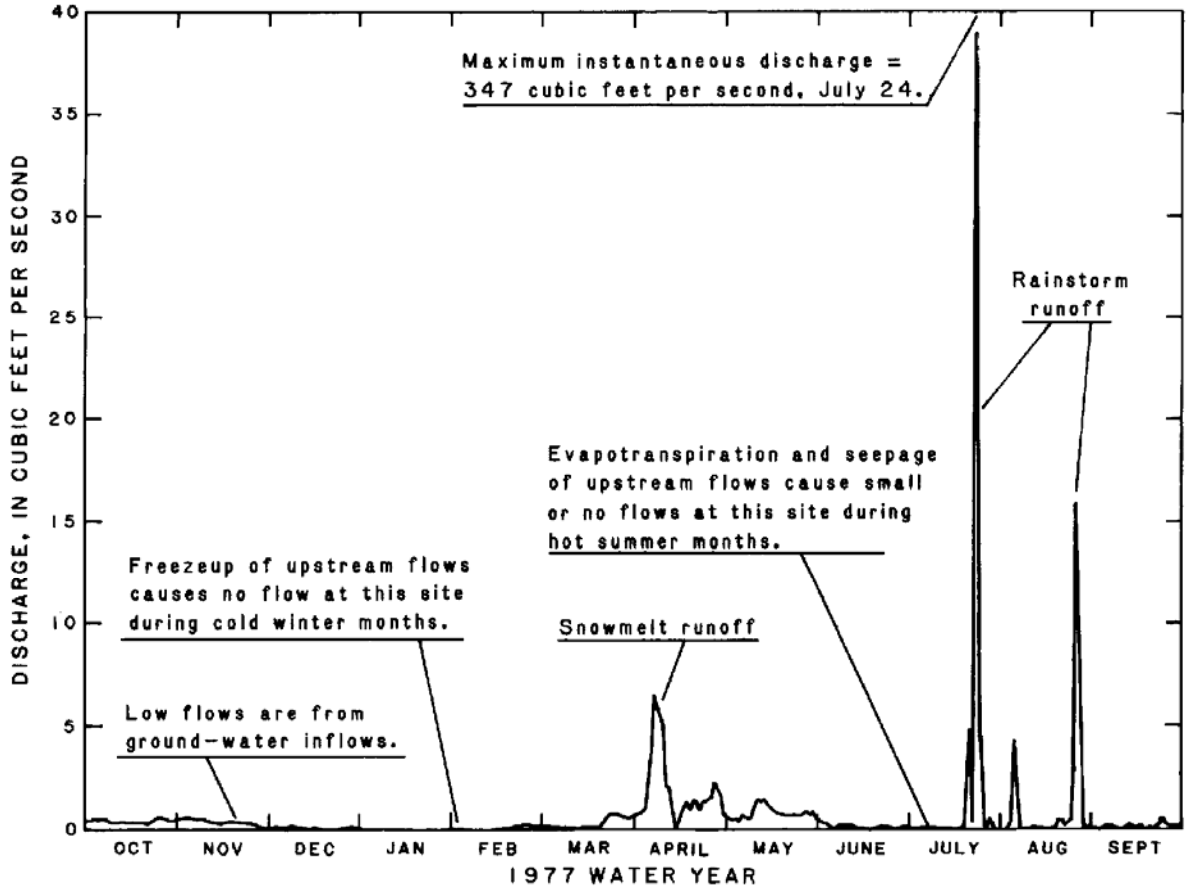


Source: USGS National Water Information System: Web Interface http://www.usgs.gov/

Peak stream flow records are available for Salt Wells Creek for 1959 through 1976. Salt Wells Creek is a major tributary to Bitter Creek (confluence located about 11 miles northeast of Rock Springs). A hydrologic study of Salt Wells Creek was made during 1975 through 1978 (Lowham and others, 1982). The daily discharge plot (Figure 6 from the 1982 study report) is reproduced here as Figure 4. The relationship between snowmelt runoff and rainstorm runoff events are shown on the figure. Snow melt runoff events produce longer durations of stream flows compared to the short sharp runoff peaks from rainfall events.

The Salt Wells Creek study (Lowham and others, 1982) estimated the average annual runoff from the Salt Wells Creek to be about 2,000 to 3,000 acre-feet for the 515 square mile drainage area. The average annual runoff in inches is less than 0.11 inches per year. Extrapolating this runoff estimate to the Bitter Creek watershed (2,200 square miles) results in an estimate of between 8,000 to 13,000 acre feet per year. Comparing this to the mean annual flow of the Green River below Flaming Gorge Reservoir (about 1.4 million acre-feet per year with a drainage area of about 15,390 square miles) yields that the Bitter Creek runoff volume is less than 1% of the Green River runoff volume and that the average annual runoff per square mile from the Bitter Creek watershed is less than 10% of the average annual runoff per square mile from the Green River watershed.

Figure 4. Daily Discharge on Salt Wells Creek Near South Baxter, Wyoming



Source: Reproduced from *Hydrology of Salt Wells Creek – A Plains Stream in Southwestern Wyoming*: U.S. (Lowham and others, 1982.

Bitter Creek Morphology

The morphology of Bitter Creek (its planform, bed topography, and bed sediment) are formed and modified by the process of erosion, transport, and bed sediment composition. Bitter Creek morphology is the result of the geology of the watershed, the climate, and past human-caused impacts. A brief description of the geology and climate of the Bitter Creek watershed was presented earlier in section 1.0 – General Setting. A more detailed watershed geology description can be found in *Water Resources of Sweetwater County, Wyoming* (Mason and Miller, 2005).

"Bitter Creek is a typical, semi-arid, meandering alluvial stream, entrenched to varying depths with vertical banks and wide sandy bottoms. Bitter Creek . . . can be classified as largely ephemeral, indicating flow only in direct response to snowmelt and rainfall runoff events . . . Runoff in Bitter Creek and its tributaries is flashy and typically turbid with high total suspended solids" (Lowham and others, 1982). "The amount of sediment available for transport and deposition greatly exceeds that actually transported, resulting in temporary

instream storage of sediment. During medium and high discharges, sediment is either flushed from the basin or mobilized and deposited further down the system" (JFCo. Inc.,1991).

"The intermittent nature of the stream flow has a significant effect on water quality. "Flushing" of accumulated salts and sediment occurs during the first flows following rainfall or snowmelt. This flushing follows dry periods when salts and loose sediment accumulate on the basin surface and in the stream channels. The first flows during runoff transport these materials as dissolved and suspended loads. After this initial flushing of the basin surface and channels, concentrations decrease" (Lowham and others, 1982).

Much of Bitter Creek has been impacted by past human activities. These activities have included encroachments, channel realignment, straightening, and changes in base flows. "Channelization of Bitter Creek was done to accommodate construction of the highway and railroad" (Lowham and others, 1982). These activities are believed to have contributed to stream bed and bank instability resulting in incised channels with active bank erosion.

Bitter Creek Water Quality

The Wyoming Department of Environmental Quality currently classifies Bitter Creek as Class 2C (Wyoming Water Quality Rules and Regulations, Wyoming Surface Water Classification List), and states: "Class 2C waters are those known to support or have the potential to support only non-game fish populations or spawning and nursery areas at least seasonally including their perennial tributaries and adjacent wetlands. Class 2C waters include all permanent and seasonal non-game fisheries and are considered "warm water". Uses designated on Class 2C waters include non-game fisheries, fish consumption, aquatic life (other than fish), recreation, wildlife, industry, agriculture, and scenic value." Based on the Class 2C designation, Bitter Creek has been identified as impaired in its lower reaches due to fecal coliform and is impaired due to chloride throughout most of the creek length.

Fecal Coliform

Water quality monitoring performed in 2004 and 2005 as part of a 319 watershed assessment (EDE Consultants, 2006) found that Bitter Creek from the confluence with the Green River, upstream to where Bitter Creek enters the urbanized area of Rock Springs exceeds the Class 2C standards for fecal coliform and *E. coli.* The exact sources of the contamination have not been identified. *The Bitter Creek and Killpecker Creek Watershed Management Plan* (Bitter Creek and Killpecker Creek Watershed Advisory Group and the Sweetwater County Conservation District, June 2006) states, "The longevity, degree, and persistence of this bacteriological contamination may pose a health threat and it is recommended that within the impaired reaches, these streams be posted with signage warning of potential health risks from contact. It is recommended that specific and selective sampling be conducted to attempt to identify the sources."

Chloride

"The 2004 and 2005 sampling and analysis confirmed that Bitter Creek and Killpecker Creek are impaired with respect to chloride throughout most of the stream length, and with respect to acute toxicity (non-game fish) standards in the lower reaches of both streams. It appears that this impairment may be naturally occurring as a result of the surrounding geology and soils" (EDE Consultants, 2006). *The Bitter Creek and Killpecker Creek Watershed Management*

Plan (Bitter Creek and Killpecker Creek Watershed Advisory Group and the Sweetwater County Conservation District, June 2006) recommends that a Use Attainability Analysis be pursued to assure that the creek classifications are appropriate and that the creeks can actually support the use designations.

The 2006, 319 Watershed Study (EDE Consultants) found "that Bitter Creek and Killpecker Creek are apparently naturally under high biological stress conditions as a result of the flow regimes, the moveable bed sedimentology, fine grained substrate, the natural riparian composition and the natural water quality."

Bitter Creek Flooding

"Rock Springs is on the edge of the normal path of storms that cross the upper Colorado River region and is subject to severe storm sequences occurring as a series over a period of 2 to 3 days" (FEMA, 1998).

The City of Rock Springs has been historically affected by flood events on Bitter Creek. Historic flood event dates and discharges are summarized on Table 1. Historic flood control works constructed in Rock Springs are summarized on Table 2.

The current FEMA Flood Insurance Rate Map (FIRM) for Rock Springs is shown on Figure 5 (FEMA, 1998). The major sources of flooding to Rock Springs are from Bitter Creek, Dead Horse Canyon Creek and Killpecker Creek. The downtown area is affected by flooding from both Bitter Creek and Dead Horse Canyon Creek. FEMA mapping and hydraulic models indicate that during a 100-year flood event the levee upstream of Pilot Butte Avenue Bridge will overtop and that Bitter Creek would flood a portion of the downtown Rock Springs area before re-entering the channel below its confluence with Killpecker Creek. Dead Horse Canyon Creek would also flood a portion of downtown Rock Springs during a 100-year flood event.

Table 1. Rock Springs Bitter Creek Historical Flood Events

DATE	DISCHARGE (cfs)
April 1924	6,000
July 1926	7,000
August 1930	6,000
July 1937 (upstream of Kilpecker Creek)	9,700
February and March 1962	4,600
June 1965	4,500
August 1976	4,000 - 6,000

"Bitter Creek Channel Improvement Study", JFCo. Inc., 1991, Draft Report

Table 2. Rock Springs Historic Flood Control Works

DATE	DESCRIPTION
1916	Construction of a storm ditch from Dead Horse Canyon Creek to Bitter Creek to protect the southern portion of town.
1924	Construction of a diversion channel around the north end of town including diking across the creek near the site of the Pilot Butte Avenue bridge and excavating a channel to the confluence with Killpecker Creek. Dikes to protect the western part of town were built along the east bank of Bitter Creek downstream from the mouth of Killpecker Creek, and the storm ditch built in 1916 was relocated and extended to a new outlet in Bitter Creek upstream from the head of the bypass channel.
1940s	Construction of stone walls to protect stream banks (see photo below).
1970s	Construction of a channel diversion project for a commercial development to create building lots, and filling of the original creek bed.

Construction of stone wall (1941) upstream of Pilot Butte Bridge

Source: Rock Springs Historical Museum

An understanding of the limitations of the prior flood control projects helps to better understand the current FIRM. Because the levee associated with the diversion channel constructed in the 1920s (see Table 2) is not certified in accordance with the current FEMA guidelines, the 100-year floodplain mapping (Figure 5) was prepared showing the worst-case flooding assuming two conditions; that the levee holds increasing flood potential upstream and on the north side of the levee, and that the levee fails causing flooding through the East Flat area (old downtown). The levee was evaluated and it is determined that it is not certifiable without major impacts to the community and costly modifications (see Appendix 2).

A summary of flood peak discharges for Bitter Creek, Dead Horse Canyon Creek, and Killpecker Creek is provided on Table 3. The return period is defined as the reciprocal of the

Figure 5. Rock Springs Flood Insurance Rate Map

probability of the event being equaled or exceeded in any given year, thus a 100-year flood event has a 1% chance of being equaled or exceeded during a given year.

Table 3. Flood Peak Discharges by Return Period

STREAM/LOCATION	TRIBUTARY AREA (square miles)	PEAK DISCHARGE (cfs) BY RETURN PERIOD		
		10-YEAR	100-YEAR	500-YEAR
BITTER CREEK at East City Limit	1,700	1,700	7,800	19,000
Bitter Creek Below Killpecker Creek	2,032	4,000	9,800	22,000
Dead Horse Canyon Creek at Mouth	7.2	200	2,300	4,400
Killpecker Creek at Mouth	320	2,500	6,300	14,500

2.3 Vegetation and Wetland Resources

Wetland Resources

Wetlands are protected under Section 404 of the Clean Water Act and regulated by the Environmental Protection Agency (EPA) and the United States Army Corp of Engineers (USACE). Wetlands are defined as, "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USACE 1987). The federal government may require mitigation or replacement of wetlands impacted by development projects.

Wetland delineations were conducted on June 9, 2008 for the Dead Horse Canyon Creek detention basins and on September 9 and 10, 2008 and May 26-28, 2009 for Bitter Creek. The plants were identifiable during all surveys. The Arid West Supplement to the USACE manual was referenced to delineate the wetlands.
Watershed-wide, land uses including grazing, phosphate mining, coal mining, uranium exploration, and oil and gas development affect wetlands. Regional industry is a major player that discharges into the creeks, causing an increased amount of wetlands or new wetlands to develop. These industries may discharge into Bitter Creek; however, they should have the appropriate discharge permit, Wyoming Pollutant Discharge Elimination System (WYPDES) issued by the Wyoming Department of Environmental Quality, Water Quality Division.

Bitter Creek Wetlands

The Bitter Creek channel is approximately 3.5 miles long and has four types of wetlands present- Palustrine Emergent (PEM) at 2.89 acres (vegetation that is actively growing in water within the channel) and Riverine Intermittent Aquatic Bed (R4AB) at 1.50 acres (vegetation

that is submerged and growing under the water in the channel). Palustrine Unconsolidated Bottom (PUB) at 0.54 acres (vegetation not present, but hydric soils and hydrology are present). The PUB wetlands are found between the water's edge and the PEM boundary. Scrub/Shrub Wetland at 0.04 acres (found on small sections of the tamarisk terraces when influenced by stormwater run-off). The total is 4.97 acres. Since the total acreage of wetlands within the project boundary is greater than 0.50 acres, the wetlands do not fall under a nationwide permit and the City of Rock Springs will likely need to apply for an individual wetland permit from the United States Army Corp of Engineers. (See Appendix 3.)[4]

The dominant wetland plant species identified in the Bitter Creek channel were *Schoenoplextus maritimus* (cosmopolitan bulrush), *Lepidium latifolium* (broadleaved pepperweed), *Potamogeton foliosus* (leafy pondweed), and *Puccinellia nuttalliana* (Nuttall's alkaligrass). There were also some occurrences of *Schoenoplectus pungens* (common threesquare).

The dominant vegetation found on the lower banks were *Puccinellia nuttalliana* (Nuttall's alkaligrass), *Juncus balticus* (baltic rush), *Tamarix ramosissima* (tamarisk), *Schoenoplectus pungen*s (common threesquare), broadleaved pepperweed, *Atriplex horteniss* (garden orache), and *Atriplex heterosperma* (shadscale saltbush). These species were the dominant species for the PEM wetlands. The dominant vegetation found on the scrub shrub tamarisk terraces are tamarisk and *Sarcobatus vermiculatus* (greasewood).

The dominant upland vegetation found on the terraces within Bitter Creek was tamarisk, *Chyrothamnus nauseosus* (rubber rabbitbrush), greasewood, broadleaved pepperweed, *Bromus tectorum* (cheatgrass), *Solidago* species (goldenrod) and *Elymus hispidus* (intermediate wheatgrass). There was also *Elaeagnus angustifolia* (Russian olive) present in some parts of the channel.

The dominant upland species identified at the detention basins on Dead Horse Canyon Creek were shrubs, grasses, and forbs. The shrubs identified were *Chrysothamnus viscidiflorus* (yellow rabbitbrush), *Artemisia tridenta* (big sagebrush), *Sarcobatus vermiculatus* (greasewood), *Atriplex gardneri* (gardner's saltbrush), and *Grayia spinosa* (spiny hopsage). The grasses identified were *Agropyron cristatum* (crested wheatgrass), *Bromus tectorum* (cheatgrass) and *Elymus lanceolatus* (thickspike wheatgrass). The forbs were *Lesquerella ludoviciana* (foothill bladderpod), *Halogeton glomeratus* (halogeton), *Descurainia pinnata* (pinnate tansymustard), *Descurainia sophia* (flixweed tansymustard), and *Alyssum desertorum* (desert madwort).

Dead Horse Canyon Creek Detention Basins

No wetlands were identified on the sites of Detention Basins #2 or #3 (see Appendix 4).[5]

[4] "2008 Wetland Assessment for City of Rock Springs Bitter Creek," BKS Environmental Associates, Inc., March 19, 2009; BKS Environmental Associates, Inc. response letter dated January 20, 2009; and letter from Mike Burgan, USACE, Omaha District, Wyoming Regulatory Office, February 24, 2009.

[5] "2008 Wetland Assessment for City of Rock Springs Bitter Creek – Bitter Creek Detention Basins," BKS Environmental Associates, Inc., October 20, 2008; and letter from Matthew A. Bilodeau, USACE, Omaha District, Wyoming Regulatory Office, December 12, 2008.

Threatened and Endangered Plant Species

Threatened and endangered plant species are managed under the authority of the Endangered Species Act of 1973 (ESA), as amended, (50 CFR §402.13). The Endangered Species Act requires Federal agencies to ensure that all actions which they authorize, fund, or carry out are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of their critical habitat. There is one potentially endangered and two potentially threatened plant species in the area, *Penstemon haydenii* (blowout penstemon), *Sprinthes diluvialis* (Ute Ladies' tresses orchid), and *Gaura neomexicana* spp. *Coloradensis* (Colorado Butterfly plant) respectively; however, as described below habitat conditions are generally not conducive to their presence either. No individuals or populations were identified during field work. (See Appendix 3.)

The Colorado butterfly plant's habitat is in drainage bottoms along bends of grassy stream channels and along moist floodplains. The Colorado butterfly plant is currently found in Laramie and Platte Counties in Wyoming and Weld County in Colorado. The Bitter Creek project area had no habitat due to the topography of the channel and often steep banks. No individuals or populations of the species were identified along the creek or in the Dead Horse Canyon Creek detention basins during field work.

The Ute Ladies' Tresses orchid requires a late season water source that potentially has a seed source, sandy or loamy textured soils that are not clayey, the presence of hydrophytic edge vegetation and low vegetation competition, and absence of excess salt accumulation. There is no existing habitat at the Dead Horse Canyon Creek detention basin sites as there was no late season water source present. The project area within the Bitter Creek channel had poor to non-existent habitat as the soil was generally clayey on the east half of the project area and sandy loam on the west half of the project area. There was a marginally dense vegetation cover, presence of salt accumulation and alkalinity within the project area. Also, many of the banks were steep. No species of Ute Ladies Tresses was identified along the creek. The nearest known population of Ute Ladies Tresses' is on the Green River south of the Flaming Gorge Reservoir, which is downstream of the project area; there are currently no known populations in Sweetwater County, Wyoming.

In Wyoming, Blowout penstemon species is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than five percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25-40 percent vegetative cover (USFWS, 2008). This species is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. The project area along Bitter Creek and at the Dead Horse Canyon Creek Detention basins provides non-existent habitat. No individuals or populations of either species were identified within the project area.

2.4 Fish and Wildlife Resources

Threatened and endangered fish and wildlife species are managed under the authority of the Endangered Species Act of 1973 (ESA), as amended, (50 CFR §402.13). The Endangered Species Act requires Federal agencies to ensure that all actions which they authorize, fund, or carry out are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of their critical habitat.

Formal raptor and mountain plover surveys were conducted on June 26, 2008. Passerine surveys were conducted during the breeding season and fall migration. While conducting surveys, observers were attentive for the presence of multiple species of concern, these species including bald eagle, yellow-billed cuckoo, and trumpeter swans. No bald eagles, yellow-billed cuckoos, trumpeter swans or mountain plovers were found during the survey efforts. Results of the passerine and raptor surveys appear in Appendix 4.

Wildlife Habitat

Consultation with Wyoming Game and Fish Department (WGFD) personnel in Cheyenne established that the project area does not occur in sensitive wildlife habitats. WGFD states that: "Although not residents, bald eagles and trumpeter swans may use the area on a seasonal basis. We do not expect significant impacts to these species, or to wildlife in general, from this project" (See Appendix 4). Trumpeter swans, though not a listed species, were included in the evaluation as a result of this statement.

The Green River system supports various game and non-game fish species including the roundtail chub, bluehead sucker, and flannelmouth sucker. These species are categorized as Status 1 Species by the WGFD. Status 1 Species "are physically isolated and/or exist at extremely low densities throughout their range, and habitat conditions are declining or vulnerable." Therefore, it is imperative that loss of habitat important to these species should not occur, and that the existing barrier (drop structure) which is isolating flannelmounth suckers upstream of Rock Springs be mitigated.

The U.S. Fish and Wildlife Service (Service) expressed concern about potential waterborne selenium concentrations accumulating in the detention basins on Dead Horse Canyon Creek (Pedro "Pete" Ramirez, Ecological Contaminants Specialist for the Service, 2008, personal communications). Selenium toxicity can have adverse effects on sensitive species of fish and aquatic migratory birds. In order to directly address this possible issue soil samples were taken from sediment deposits in the channel of Dead Horse Canyon Creek at two locations where water velocity slows and sediment loads could be deposited. The samples were collected by JFC Engineers and Surveyors, and analyzed by Wyoming Analytical Laboratories, Inc. Particulars and results of the sampling are presented in "*Soil Sample Summary for Bitter Creek Enhancement Project"*, JFC Project No. 7987-07E, December 2008 (see Appendix 5). The amount of selenium in the samples collected from alluvial deposits in the existing channel is described in the report from Wyoming Analytical Laboratories as "Below Reporting Limit" and of no measurable concern in either of the two sample sites. Based on the parameters provided by the Service, it is expected that the proposed project will have no negative impacts on fish or wildlife and associated habitats.

Threatened and Endangered Species Evaluated

Consultation with the United States Fish and Wildlife Service, (see Appendix 4) has determined that no wildlife listed under the Endangered Species Act as proposed, threatened, endangered, experimental, candidate or declining are likely to occur within the project area.

2.5 Socio-Economics

Demographics

The City of Rock Springs has experienced tremendous growth in recent years. In 2000, the City of Rock Springs included 18,708 residents (U.S. Census), which at the time represented about half of the residents of Sweetwater County (37,613 county-wide). More recent estimates from Pacific Power/Rocky Mountain Power indicate that in December 2007 the population in Rock Springs was 28,306 (Sweetwater County Economic Development Association, 2008). This estimate is derived from the number of residential electrical hookups (11,057) multiplied by the average household size (2.56 persons). The City of Rock Springs also reports a 71-percent increase in building permits between 2003 and 2007, which represents even more evidence that the community is experiencing rapid growth and development.

For purposes of comparison, the City of Rock Springs is compared to Sweetwater County and the State of Wyoming in Table 4. Since 2000 Census data is the only official data available, it is used to make these general comparisons.

Table 4. 2000 Census Data Demographic Comparisons

	Rock Springs	Sweetwater County	State of Wyoming
Population	18,708	37,613	493,782
Median Age	34.5 years	34.2 years	36.2 years
65 years and over	9.9 percent	8 percent	11.7 percent
Housing Units	8,359	15,921	223,854
Average Household Size	2.6 persons	2.74 persons	2.58 persons
Household Income less than $24,999	27.4 percent	23.9 percent	31.6 percent
Household Income $25,000 - $74,999	53.9 percent	55.4 percent	42.8 percent
Household Income above $75,000	18.5 percent	20.8 percent	15.8 percent

Downtown Development and Redevelopment

The once-thriving downtown Rock Springs is similar to other smaller communities where new growth and development moves to the edges of town creating commercial/retail areas and neighborhoods that no longer rely on downtown for family shopping and entertainment. Those factors combined with little reinvestment and redevelopment in the downtown continue to contribute to its compromised status. *The Rock Springs Downtown Redevelopment Plan (2000)* states that "….local banks have not provided loans for redevelopment in the downtown business area. The reasons are numerous and diverse. The area has been plagued by subsidence problems; it lies within a flood zone; the utilities, streets, and sidewalks are aging and subject to neglect."

The subsidence problems are caused by past coal mining activities directly under downtown Rock Springs. The City has sought and received funding from the Abandoned Mine Lands Division (AML) to address this barrier to redevelopment in downtown and will continue to do

so. The designation of much of downtown as being in a FEMA 100-year floodplain is the principal reason for this Proposed Action. Revision of this status is critical to the future redevelopment and vitality of downtown Rock Springs (Rock Springs Downtown Redevelopment Plan, 2000).

While other areas of Rock Springs have grown rapidly over the years, development and redevelopment in downtown have been stagnating. According to the Director of the City of Rock Springs Urban Renewal Agency, "In the last nine months, I have been able to track an adverse economic impact of over 5 million dollars related to over 20 building improvement projects in downtown that have failed due to the FEMA 100-year floodplain issue" (Lisa Mueller, Director, Urban Renewal Agency, Rock Springs, Wyoming, letter dated October 13, 2008, see Appendix 6).

Commercial Property Values and Financing

Property values in downtown, when compared to other areas of Rock Springs, are also depressed. Commercial properties in the portion of downtown that is in the 100-year floodplain are worth about half what comparable properties are worth in areas not in the 100-year floodplain. Downtown properties with buildings that are not in the 100-year floodplain have been selling for $200,000 to $300,000; however, those in the 100-year floodplain are selling for $100,000 to $150,000 – if financing can be obtained (Dennis Carlson, Brokerage Southwest, Rock Springs, Wyoming, personal conversation, October 23, 2008, see Appendix 7). Mr. Carlson reports that larger commercial properties in other areas of the City sell for as much as $16.00 to $20.00 per square foot when they are located on high-traffic streets like Dewar and Gateway, while properties in downtown are selling for $2.00 to $3.00 per square foot.

The Commercial Loan Officer at Rock Springs National Bank confirms there are problems financing projects in 100-year floodplain areas of downtown. She reports that acquiring property is not necessarily a problem; all that is required is that the new owner purchase flood insurance as an additional cost. The primary problem comes when the new owner or existing owner wishes to renovate, upgrade, or remodel existing buildings, or to construct new buildings on the property. The financial institution will not lend money on those kinds of projects until the property is essentially removed from the 100-year floodplain. While FEMA floodplain development regulations do allow for commercial properties to be floodproofed rather than elevated, the zero lot line construction of most downtown properties prohibits construction of inexpensive floodproofing measures, such as floodwalls. Other floodproofing measures are expensive, and therefore, often not feasible (Heather Anderson, Commercial Loan Officer, Rock Springs National Bank, personal conversation October 27, 2008, Appendix 8).

Residential Property Values and Financing

Similarly, single-family residential property values are also depressed. A multiple listing search for single-family residential properties in the $50,000 to $200,000 price range yielded 52 properties on October 23, 2008. Of those, 11 properties were located in downtown Rock Springs representing a price range from $59,000 to $188,490 with an average price of $115,763. The remaining 41 properties located throughout the City of Rock Springs ranged in price from $69,900 to $199,900 with an average price of $165,688. The 11 residential

properties in downtown Rock Spring have been on the market for over 1155 days in total; about 105 days or approximately 3.5 months each. The range in time on the market was 13 to 337 days (over 11 months).

The Residential Loan Officer at Rock Springs National Bank states that in order for a homeowner or landowner to receive financing for renovations or remodels, or to build a new residential structure, they must first mitigate the impacts of being located in a designated 100-year floodplain. The City allows floodplain development if the structure can be elevated without filling and a FEMA Letter of Map Revision (LOMR) is not required. However, a LOMR is required to officially remove property from the floodplain. This requires a topographic survey, raising the ground level to remove the property from the 100-year floodplain, and ultimately filing the LOMR with FEMA -- an extensive and expensive process that often renders the project not financially feasible (Linda McGovern, Residential Loan Officer, Rock Springs National Bank, personal conversation October 27, 2008, Appendix 9).

Affected Historic Properties

"The Downtown Rock Springs Historic District is comprised of portions of eight blocks of the central business district in the original townsite plat of Rock Springs, Wyoming. The District contains forty-five buildings, twenty-seven of which are considered to be contributing elements to the District. Buildings include structures built for commercial, financial, governmental, social, recreational, and transportational purposes" (United States Department of Interior, National Park Service, National Registry of Historic Places, 1994). All of these properties are located within the FEMA 100-year floodplain and are subject to the development restrictions and regulatory requirements imposed by FEMA. The Wardell Court Historic District is also located in the 100-year floodplain and includes 21 residential structures and one multi-family structure (See Figure 6– Land Use). While FEMA regulations do allow for local communities to exempt historic structures meeting certain criteria from floodplain development requirements, exempted structures must still pay flood insurance and lending institutions may still require floodproofing or elevation to protect their investments.

Other Affected Properties

Eight public parks: Pearl, Bunning, Washington, O'Ferrell, Stevens, Railroad, Rahonce Park (undeveloped), and Rock Springs Dog Park are located in the 100-year floodplain. Lowell Elementary School, the Rock Springs Civic Center, and numerous churches and religiously-affiliated institutions are also within the 100-year floodplain.

Property Ownership

The major property owners along the Bitter Creek Corridor affected by the Proposed Action include the Union Pacific Railroad and the City of Rock Springs. Creek channel improvements will require construction activity on these properties, and will result in removing them from the 100-year floodplain. Communications with UPRR are underway to secure the lease needed to allow construction to proceed.

Private properties affected by the Proposed Action include those for which changes are required due to reconstruction of the Pilot Butte Bridge, and the possible reconstruction of the N Street Bridge. Construction activities may raise the level of the bridge(s), thus requiring

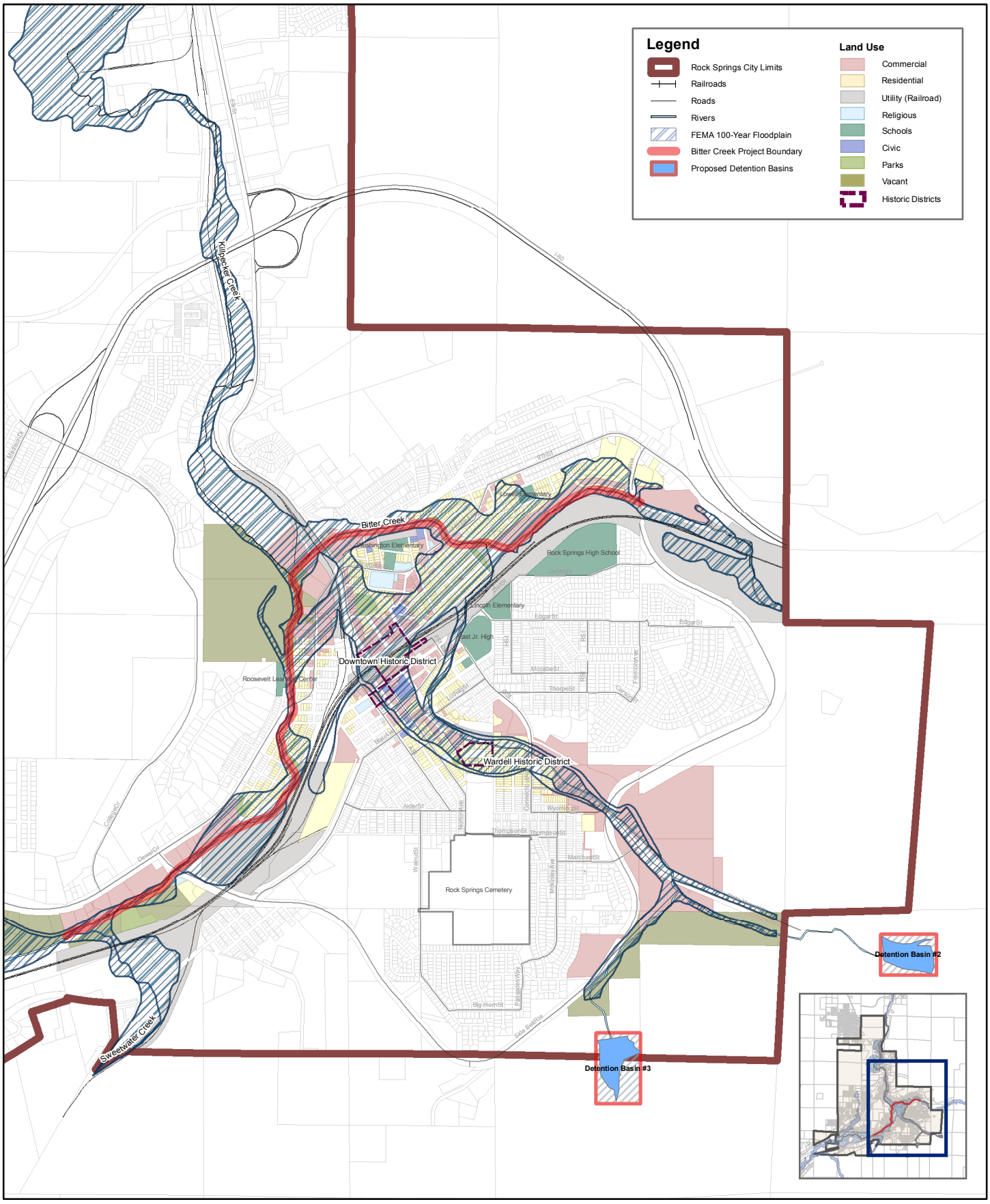


Figure 6: Land Use with Historic Districts

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realignment of access to adjacent businesses. It is the intent of this Proposed Action to mitigate any impacts to businesses during construction and to restore access. (See Figure 7-Land Ownership).

Any excess fill due to channel improvements and/or dredging will be disposed of appropriately and according to applicable rules and regulations. The City of Rock Springs has need of fill materials in several areas of the City, and has agreed to utilize any excess fill. The nutrient rich soil from the bottom of the creek, while somewhat saline, could be used to improve adjacent soils.

One of the two detention basins on Dead Horse Canyon Creek (Detention Basin #2) is located on BLM land; the other is located on land owned by Anadarko Petroleum Company (Detention Basin #3). Construction of Detention Basin #2 requires coordination with BLM, conformance to BLM environmental regulations, and a letter of agreement. This process is underway and is expected to proceed to a successful conclusion. Construction of Detention Basin #3 requires coordination and agreement with Anadarko Petroleum; this process is nearing completion (see Appendix 10).

2.6 Recreation Resources

City Parks

Three small parks—O'Farrell, Stevens, and Pearl—are located immediately adjacent to Bitter Creek within the historic downtown segment of the project area. All are under an acre in size and have basic park services and structures such as pavilions, restrooms, and play structures. The largest of the three is Pearl Park. City parks will not be affected by construction of the Proposed Action; however, all three are located within the designated FEMA 100-year floodplain.

Several other larger parks lie within the 100-year floodplain—Bunning (Downtown area), Washington Park (along Dead Horse Canyon Creek), the recently completed Dog Park (located on city-owned property directly south of the Plaza Mall), and Railroad Park, a linear park located adjacent to the Historic Train Depot (Main Street). This park is in the heart of the historic district, and hosts the City's historic *Rock Springs Coal* sign along with a small playground and seating areas. A new park—Rahonce Park—on Muir Avenue connecting to the Dewar Drive Parkway is planned. None of these parks is affected by construction of the Proposed Action; however, during flood events, the parks could be damaged and become unsafe, requiring costly repairs and possible replacement of facilities (see Figure 8 – Parks and Recreation Resources).

Recreation Facilities

The City's Civic Center (See Figure 8) is also located adjacent to the Bitter Creek within the project area. The Civic Center houses an indoor pool, racquetball courts, climbing wall, basketball court, and other fitness equipment and offers a variety of fitness classes. The Civic Center will not be impacted by construction of the Proposed Action; however, a portion of the Civic Center site is located in the FEMA 100-year floodplain.

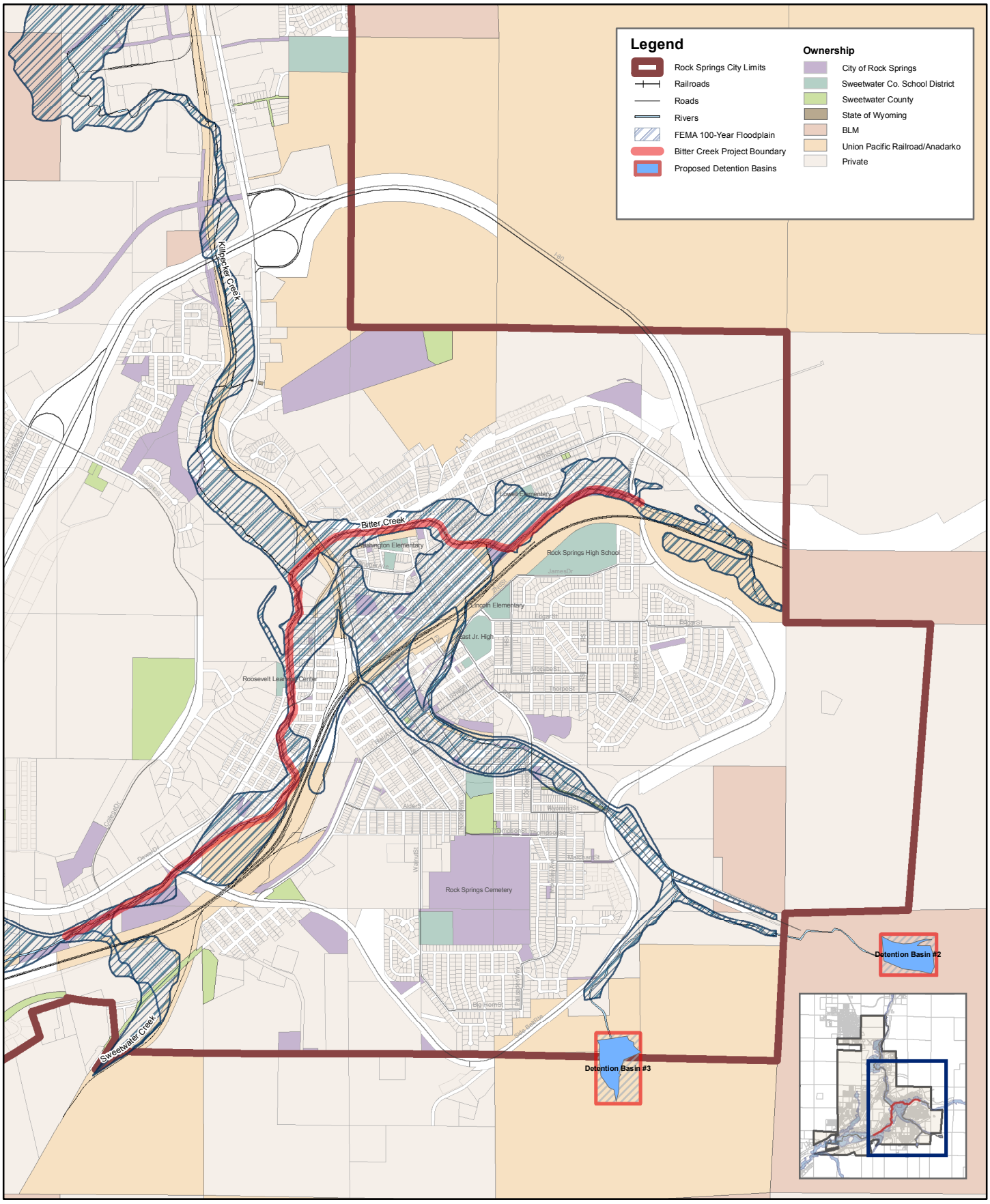

Figure 7: Land Ownership

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Trails

According the *Rock Springs Trail System Plan* (1994), on-street bike lanes exist along Elk Street/A Street into the Downtown area and along 2nd Street (Figure 8). The Trail System Plan includes a network of proposed on-street and off-street bike lanes and paths. Although the

Trail System Plan focuses on providing an alternative form of transportation (i.e. bicycle routes), off-street trails are intended for bicycles as well as a variety of other users. Several of the proposed on-street bike lanes in the Trail Master Plan would also intersect or connect to the proposed off-street trail system along Bitter Creek.

The *Bitter Creek Reconstruction Plan and Design* (2007) and the Proposed Action are consistent with the City's Trail Master Plan, which proposed off-street trails along the Bitter Creek corridor throughout the entire project area. These trails will often remain in the designated 100-year floodplain even after construction of the Proposed Action; and some would be constructed with the proposed channel improvements that would provide access to the creek channel for maintenance.

Public Lands

Any public lands managed by the Bureau of Land Management (BLM) are managed under the BLM's *Green River Resource Management Plan* (1997). Detention Basin #2 on Dead Horse Canyon Creek is located on BLM property. According to this Resource Management Plan (RMP), there are no developed recreation sites within the proposed detention basin area, nor does the area fall within any special recreation management areas (SRMA). According to the RMP, such undeveloped recreation areas will be "managed with priority consideration for air quality, cultural resources, watershed protection, wildlife values, and public health and safety" (Green River RMP, pg. 16).

The RMP also states that "most public lands in the planning area are open to consideration of all individual, commercial, and competitive outdoor recreation uses" (Green River RMP, pg. 16). Dispersed camping is allowed on BLM lands within the RMP's planning area if not within 200 feet of water and for up to 14-days in one area.

Off-road vehicle use is evident throughout this area; however, it will need to be managed when the detention basin in constructed in order to maintain its functionality and to assure successful revegetation.

Visual Resources

The BLM's *Green River Resource Management Plan* (1997) assigns all BLM owned lands within the RMP's planning area into several Visual Resource Management (VRM) classifications. The BLM-owned land where proposed Detention Basin #2 is located is in a Class III VRM management area. Projects located in Class III VRM areas should "partially retain existing character of the landscape" (Green River RMP, 1997, pg. 21). "All surface disturbing actions, regardless of the visual resource management class, are required to be mitigated to reduce visual impacts. This will be achieved by designing and locating the disturbance in a manner that most closely meets the minimum degree of contrast acceptable for the visual resource management class" (Green River RMP, 1997, pg. 21). To comply with BLM Visual Resource Management requirements, the area needed to construct Detention

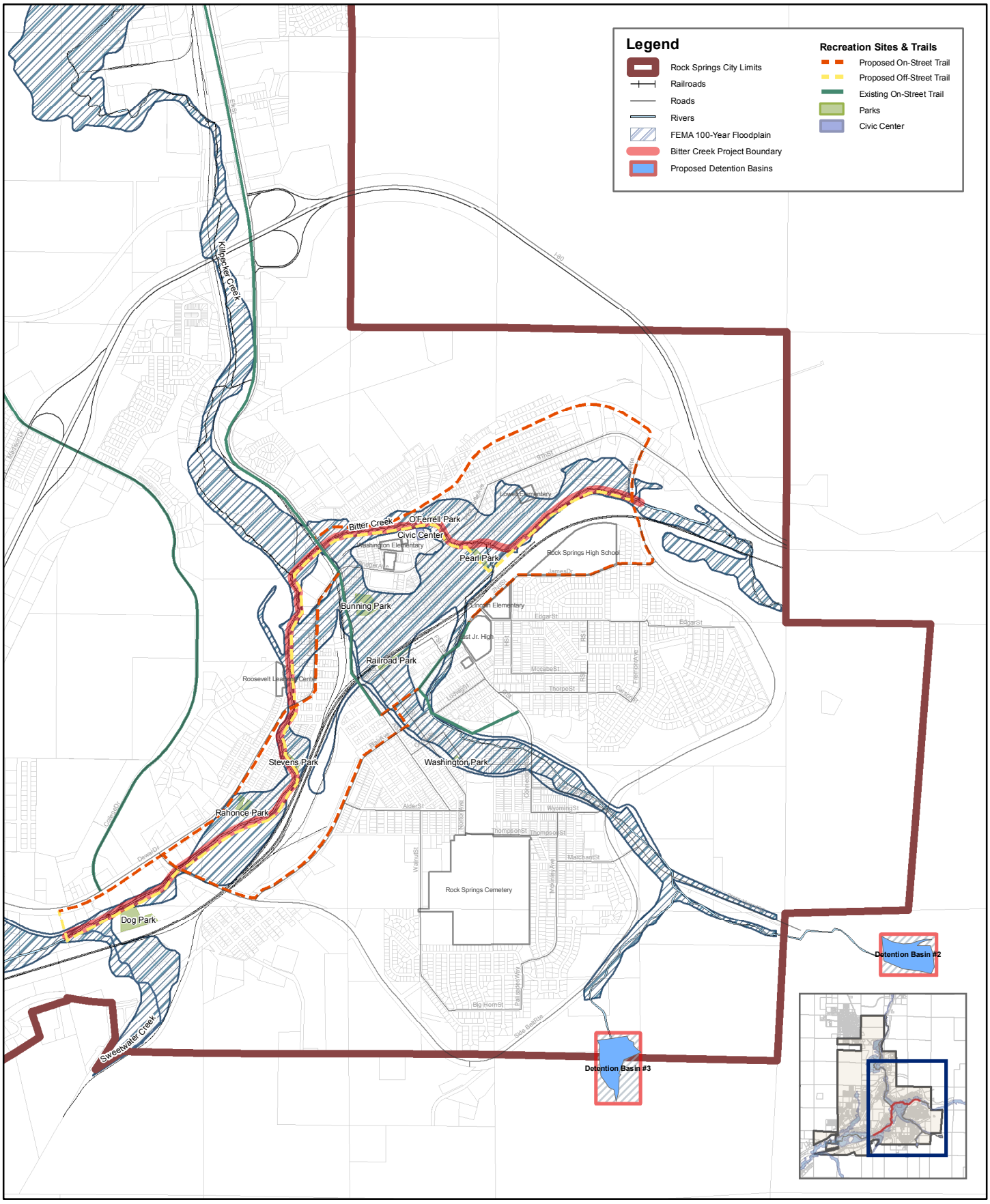

Figure 8: Park and Recreation Resources

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Basin #2 will need to be graded for a natural appearance and seeded with native species replicating what is currently in the area. Again, management to control off-road vehicles will be necessary for successful revegetation.

2.7 Soil and Farmlands

Farmlands

There are no prime or State unique farmlands associated with the Bitter Creek study area (NRCS, 2008).

Soil Description

Geotechnical investigations (JFC Engineers, October 2008) found that the upper soil zones in the Bitter Creek project area are generally comprised of fine grain sands and silts underlain by layers of clay. The upper layers are especially susceptible to erosion. The lower clay layers are generally thick, plastic, and cohesive and are more resistant to erosion. The creek has generally established a flow line (creek bottom) on the clay by eroding through the upper layers. However, during large flood events, the tractive force of the channel may become greater than the resisting force of the clay and further erosion can occur. The project would consider the erosive nature of the natural creek banks and provide protection and stabilization as required.

2.8 Air Quality

Air quality will not be affected long-term by the Proposed Action, with the possible exception of short-term increases in dust during construction. Effective dust control procedures will be incorporated into the project to comply fully with the Wyoming Air Quality Standards and Regulations (letter from Marty Hamilton, Air Quality Engineer, Department of Environmental Quality, Air Quality Division, October 29, 2008, Appendix 11).

2.9 Noise

The Proposed Action will not cause an increase in noise, with the possible exception of construction-related noise. Adherence to the City of Rock Springs Noise Ordinance will be required during construction.

2.10 Special Areas of Concern

There are no special areas of concern within the study area.

3. Environmental Impacts of the Proposed Action and No Action Alternatives

3.1 Cultural Resource Effects

Direct and Indirect Effects

Proposed Action

Direct impacts of the Proposed Action would primarily result from construction related activities in the areas where the stone walls and Chinatown are located along the Bitter Creek corridor. It is likely that the stone walls will be impacted by modification or removal which would be considered an adverse effect. The Wyoming State Historic Preservation Office (SHPO) has concurred on the eligibility determinations of the cultural evaluation for this project, and has requested that it be involved with further consultation on this adverse impact to the old flood walls before the project proceeds. Activities considered to have the greatest potential effect on cultural resources include blading and trenching; however, every effort will be made to protect the walls and incorporate them into the final design. A beneficial effect from the Proposed Action would be the protection of portions of these historic walls from future flood damage.

No Action Alternative

No additional effects on cultural resources would be expected to occur beyond the current situation. Existing historic properties would remain in the 100-year floodplain.

Mitigation

Adverse effects to historic properties may occur. They would first be mitigated by avoidance, then by other measures as determined in consultation with the SHPO. Monitoring of surface disturbance activity by a professional archaeologist may be required in some areas to reduce the potential damage to cultural resources. Application of the mitigation measures identified below would minimize potential impacts to cultural resources.

- If at any time during construction, maintenance, or use of the project area, previously unanticipated or unknown cultural resources are discovered, all activities would be suspended in the area of discovery until the discovery can be evaluated and protected as recommended by SHPO. Continued operation would be conducted in such a fashion as to permit no further damage to the discovered cultural resource.
- Protective measures could be implemented in consultation with the SHPO. Mitigation of effects to cultural resources would be determined through consultation with SHPO, aided by AML if necessary. Adverse effects are anticipated to 48SW17183 (stone walls). The City of Rock Springs has committed to incorporating the stone walls as much as possible into the project design. A Memorandum of Understanding (MOU) will be formulated between the City of Rock Springs and the SHPO outlining the mitigation measures to protect the stone structures, and potentially a procedure to follow should unanticipated cultural materials be discovered during construction. Mitigation will be determined during further consultation with SHPO (see Appendix 12.).

Cumulative Effects

If actions were to adversely affect a National Register eligible property such as the stone walls and could not be mitigated resulting in an adverse effect determination, the impact could be unavoidable and cumulative resulting in the loss of historic resources. The intent is to incorporate the walls as much as possible into the Proposed Action, resulting in unearthing them, incorporating them into the flood control design, and making them more visible and integrated into the community. This could be very positive to the City of Rock Springs and the region.

3.2 Water Resource Effects

Direct and Indirect Effects

Proposed Action

Water Quality: The Proposed Action will not adversely affect water quality. The Bitter Creek fecal coliform water quality impairment could improve due to the current interest in contamination source identification and elimination. Bitter Creek chloride concentrations are not expected to change and are believed to be naturally occurring as a result of the surrounding geology and soils. Signing indicating water quality concerns to the general public could be posted until the contamination is safely controlled.

Increased wetlands could have a positive effect through filtering water and by providing for nutrient trapping and uptake. Long term sediment generation in the Bitter Creek study reach could be reduced due to the creation of a stable channel section with stable side slopes and bed protection. The creek side slopes would be laid back where possible and protected with erosion control matting and vegetation.

The creek bed longitudinal profile would remain essentially the same as existing except for a reduced gradient between the Elk Street Bridge and the confluence with Dead Horse Canyon Creek (see Table 5).

Table 5 – Average Existing and Proposed Channel Bed Slope

REACH	AVERAGE EXISTING CHANNEL BED SLOPE	AVERAGE PROPOSED CHANNEL BED SLOPE
Confluence with Dead Horse Creek downstream to Elk Street	0.27%	0.19%
Confluence with Killpecker Creek downstream to the east South Belt Route bridge	0.15%	0.15% no change

The proposed average channel slope upstream of the Elk Street Bridge is less than the existing slope for this same reach, but is still slightly greater than the existing slope in the downstream channel between the confluence with Killpecker Creek and the South Side Belt Route Bridge.

Therefore, there should be no significant changes in the overall sediment conveyance capacity through the study area.

There is a potential for a short term increase in erosion in Bitter Creek during construction. This potential increase in erosion could be mitigated using best management practices for erosion control on the channel side slopes and the bed. Best management practices include the following.

- Temporary conveyance for creek low flows around the project site will be provided. The 2-year return period peak creek flow should be considered for the design of the temporary bypass conveyance system.
- Construction in the winter (during periods of low channel flow) will be encouraged to reduce risk from major storm runoff events.
- Disturbed areas will be protected by erosion control blankets and revegetation as quickly as practical.
- The length of unprotected disturbed creek bed and banks will be limited to reduce exposure.

A Wyoming Pollution Discharge Elimination System (WYPDES) permit will be required for construction and will limit and control sedimentation during and following construction.

The proposed detention basins in the Dead Horse Canyon Creek will not impact normal sediment transportation in the creek system. The detention basins are planned to have outlets sized such that the 10-year storm runoff flows will be conveyed through the facilities without ponding. There will likely be some deposition in the basins during larger (rarer) storm runoff events; but these rare events will have little long term effect on the stream morphology.

Erosion in the Dead Horse Canyon Creek detention basins will be controlled through revegetation of all areas disturbed during construction of the basins. Signing and enforcement will be required to protect the re-vegetated slopes from off road vehicle disturbances.

Water Quantity: The proposed Dead Horse Canyon Creek flood detention basins will not adversely impact the mean annual discharge of Dead Horse Canyon Creek to Bitter Creek. The intent of the facilities is to detain large flood events by reducing the peak flood flow rate. The basins will not have a permanent pool and will empty out quickly (within one to two days) after a major storm runoff event. Evaporation losses due to the detention basins are expected to be negligible.

Water depletions to the Colorado River system will come in the form of additional evapotranspiration of plants associated with wetlands. The proposed plan includes the removal of less than 2-acres of existing wetlands during construction, with a mitigation plan to replace the removed wetland, as well as expand the wetlands for a total of 8-acres of wetland. Based on this increase the expected depletion from the final, fully functioning wetland will be less than 20 acre-feet per year.[6]

[6] This is based on an estimated difference in consumptive use between the existing vegetation and the proposed vegetation of 2.3 acre-feet per year.

The Service Biological Opinion on *Elimination of Fees for Water Depletions of 100 Acre-Feet or Less from the Upper Colorado River Basin* (USFWS 1997, amended 2000), states that impacts on endangered fish due to project depletions of less than 100 acre-feet/year are offset by recovery actions that are accomplished by the Upper Colorado River Basin Endangered Fish Recovery Implementation Program and do not require the project proponent to pay a depletion charge. The Proposed Action would be considered to be new depletions but will not deplete more than 100 acre-feet per year. Upon implementation of the project, before removal or creation of wetlands, a letter requesting formal consultation will be sent to the Service to review. The Service can then provide a project number and add the depletion to the "Section 7 Consultations for Water Depletions in the Upper Colorado River, After Recovery Implementation Program" list for depletions less than 100 acre-feet. The proposed project will not have negative impacts on Colorado River Endangered fish and associated habitats, based upon the Colorado River Basin Endangered Fish Recovery Implementation Program administered by the Service (see Appendix 4).

The Bitter Creek channel improvements and Dead Horse Canyon Creek flood control detention facilities will have a negligible effect on normal annual discharge of the Bitter Creek to the Green River.

Flooding: A primary objective of the Proposed Action is to remove about 360-acres of property developed in Rock Springs from the FEMA designated 100-year floodplain by improving conveyance capacity and lowering the flood elevation such that the area is protected from flooding from Bitter Creek and Dead Horse Canyon Creek flood events up to a 100-year flood event. This objective will be achieved with the Proposed Action. With the improvements, the historic downtown area should be protected from flooding for events less than a 100-year flood (less than a 1% chance of being flooded in any given year). This should allow for the financing process to be unencumbered by the requirement to obtain flood insurance, will greatly reduce the annual cost of flood insurance, and will remove barriers to redevelopment and new construction.

Downstream, long term sediment generation in the Bitter Creek study reach could be reduced due to the creation of a stable channel section with stable side slopes and bed protection. This would result in a long term decrease in the sediment loading to the channel below the project area, however, this positive effect may be insignificant due to the naturally erosive environment of the watershed and the high sediment loads which are conveyed by Bitter Creek above the project area.

Upstream, the channel has been impacted in the past due to human activities (Lowham and others, 1982). A key goal of the proposed channel improvements is long-term stability of the channel bed through the proposed project reach. The proposed project will control the bed elevation at the head of the project reach and hence will not have an impact on the upstream channel.

No Action Alternative

Water Quality: The water quality of portions of Bitter Creek has been identified as impaired due to fecal coliform and chloride. The Bitter Creek fecal coliform water quality impairment is expected to improve due to the current interest in identifying and eliminating the sources of

contamination. The existing chloride concentrations which cause the water quality impairment (based on a Class 2C water) are not expected to change. Bitter Creek chloride concentrations are believed to be naturally occurring as a result of the surrounding geology and soils.

Sediment generation and transport through the Bitter Creek study reach would remain unaffected: "The amount of sediment available for transport and deposition greatly exceeds that actually transported, resulting in temporary in-stream storage of sediment. During medium and high discharges, sediment is either flushed from the basin or mobilized and deposited further down the system" (JFCo. Inc., 1991).

The channel banks can be expected to continue to erode until either the adjacent property owners stabilize the channel bank or a stable channel side slope is achieved through long term erosion of the banks.

Water Quantity: The quantity of the mean annual discharge through Bitter Creek is not changed.

Flooding: The potential for flooding remains unchanged, and about 360 acres of developed property in Rock Springs (including the historic downtown area) remain in the FEMA designated 100-year floodplain, and are susceptible to damage.

Cumulative Effects

Proposed Action
The proposed channel rehabilitation project may increase the public awareness of the natural resources of Bitter Creek. The heightened awareness and the example of the Bitter Creek rehabilitation effort may lead to additional rehabilitation projects, which may lead to improved water quality in addition to the expected improvements due to compliance with the Clean Water Act (see No Action Alternative description following). This could result in improvements to water quality generally in the Green River watershed.

No Action Alternative
With current regulations under the Clean Water Act, Bitter Creek water quality could improve slightly with time due to identification and elimination of contamination sources. If these improvements are implemented, water quality could improve generally in the Green River watershed. However, it has been found that Bitter Creek has naturally "high biological stress conditions resulting from flow regimes, the moveable bed sedimentology, fine grained substrate . . . and natural water quality" (EDE Consultants, 2006).

3.3 Vegetation and Wetland Resource Effects

Direct and Indirect Effects

Proposed Action
There were no wetlands or threatened and endangered species identified in the Dead Horse Canyon Creek detention basins and therefore there are no direct or indirect impacts to wetlands and vegetation in that portion of the project area.

There were no threatened and endangered species identified in the affected portion of the Bitter Creek corridor, therefore there are no direct or indirect impacts to threatened and endangered plant species in the project area.

The Proposed Action requires the Bitter Creek channel to be disturbed, and 4.97 acres of wetlands will be removed due to construction activities along the creek. The contractor should be required to construct a temporary diversion so the water in the channel can flow around the construction activities unimpeded. It is recommended that construction occur during the late fall and winter months when there is typically less water in the creek.

Improvements to the channel include widening the channel in areas where there is room to do so, and installing a variety of gabion sections or other bank stabilization methods to prevent erosion. Gabions are composed of a series of stacked wire baskets filled with rock. Gabions or some other structural bank stabilization method will be necessary in the narrowest portions of the channel. Bank stabilization will be constructed to achieve a 1 to 3 slope. The 2-year channel varies between three-fourths to one-foot higher than the bottom of the low flow channel, thus it is planned that this area will be re-vegetated to wetlands. The narrowest sections, primarily around bridges measure approximately 400 feet in total length, and will require placement of a concrete slope-structure or erosion protection mat. This may permanently remove all types of wetlands (PEM, R4AB) from that section of the channel, particularly if the concrete mat is determined to be most appropriate.

It is recommended that topsoil from inside the drainage, including the bottom of the drainage and the banks be salvaged and replaced inside the drainage where appropriate to aid in future plant growth and wetland establishment.

The removal of wetlands on Bitter Creek may result in short-term increases in sediment loads as the vegetation will not be present to stabilize the lower banks; the use of erosion control blankets or mats, and vegetation will help control sediments and restore wetlands and their

functions. The Proposed Action will include re-seeding and mitigating the wetlands that are removed during the project.

No Action Alternative

If the reconstruction of Bitter Creek did not take place the wetlands would remain as they currently exist.

Mitigation

Wetlands will first be avoided, if possible. Where wetlands are impacted, mitigation measures include best management practices such as temporary bypass conveyance systems to maintain wetland conditions during construction; construction in fall and winter when the presence of water is at its lowest volume; installation of erosion control blankets and revegtation as quickly as possible; salvaging and replacing topsoil in the creek to aid in growth of new vegetation; removal of weeds and invasive species; and restoration of wetlands according to USACE requirements.

Cumulative Effects

Proposed Action

Generally, wetlands can aid in flood control, improve water quality, and provide wildlife habitat. Water quality in Bitter Creek is currently impaired due to the presence of fecal coliform and chloride. The wetlands on Bitter Creek may improve water quality by filtering the fecal coliform, but will have no effect on chloride. There have been no studies on Bitter Creek that identify the benefits of wetlands reducing pollutants within the channel; however, the Sweetwater Conservation District and Advisory Group are working toward achieving regulatory compliance while educating the community and using a locally-led process to develop a plan to maintain and/or improve watershed health (Bitter Creek Bitter and Killpecker Creeks Watershed Management Plan 2006).

The Proposed Action should not impact the wetlands upstream of the project area; however, it could impact wetlands downstream due to the loss of wetland seed sources that will be temporarily removed until construction is complete and the wetlands are restored. The Bitter Creek project is estimated to take approximately 5-10 years to complete. Construction will occur in phases and the wetlands will be restored soon after construction is completed for each phase. During that time construction activities planned by the City of Rock Springs include the Grant Avenue Bridge, which is not a part of the Proposed Action. This bridge construction will likely disturb the areas around the crossing and eliminate wetlands due to constructed concrete erosion control structures below the bridge. Industry outside the project area but within the confines of the watershed will likely continue to discharge water as they have in the past and influence the water level and quality in Bitter Creek.

The future impacts to the Bitter Creek watershed include the continuation of existing land uses including industry, agriculture, and urban and suburban uses. The impaired water quality, due to fecal coliform is likely to continue until cleanup occurs. Other water quality contributors, many of which occur upstream of Rock Springs include aging septic systems, animal waste from hobby farming, vehicle storage, fuels and hazardous materials storage, and the City's aging sewer system may continue to impact the creek. The Sweetwater Conservation District and Advisory Group for Killpecker and Bitter Creeks are working on a plan to restore cleaner water to these creeks; if they are successful, the cumulative effect could be positive for the region and the Green River watershed.

No Action Alternative

The wetland cumulative impact boundary is the Bitter Creek watershed. Under the No Action Alternative no improvements and disturbances to the Bitter Creek channel would occur. The City of Rock Springs Grant Avenue Extension Project would still occur and a new bridge across Bitter Creek would be built. This construction activity would likely disturb that section of Bitter Creek.

3.4 Fish and Wildlife Resource Effects

Direct and Indirect Effects

Proposed Action

Some wildlife habitat will be temporarily lost due to construction activities and while new vegetation becomes established. This short-term habitat loss may disrupt the feeding, resting and breeding of some individuals of wildlife species, principally songbirds which use the project area. Since the affected area does not contain particularly unique wildlife habitat within the region, the impacts to the viability of wildlife populations in the area will be minimal. No significant changes in abundance or breeding status of any vertebrate wildlife species in the area are expected as a result of this project. Revegetation along the corridor and in the detention basins should replicate existing vegetation and wetlands, and result in the restoration of existing habitat conditions.

Wyoming Status 1 Species, particularly the flannelmouth sucker, may be locally impacted by short-term channel disruption during the project, but in the long-term may directly benefit from the project due to the removal of a barrier to movement upstream. An existing drop structure of more than three feet currently exists where a sewer line crosses Bitter Creek. This structure has essentially genetically isolated the population of this fish upstream of Rock Springs. This drop structure will be removed and replaced with an engineered grade which will accommodate the migration passage requirements of the flannelmouth sucker, as well as other fish species, and thus potentially increasing their range and numbers (see Appendix 4).

No Action Alternative

Wildlife will not be affected with this alternative. The flannelmouth suckers will continue to be isolated upstream of Rock Springs.

Mitigation

Restoration of the Bitter Creek channel is the central goal of this project. Commitments in place for planned revegetation utilizing plants common to the area and the various habitat types will replace habitats lost during construction along the creek corridor and in the two detention basins. Restoration of the disturbed areas should ensure only temporary impacts to migratory birds by replacing cover, food resources, and supporting insect populations.

Cumulative Effects

Realignment and stabilization of the stream channel, as well as stream banks, should increase the wildlife and fisheries values of the area. Vegetative structure, stability, and diversity will be increased.

3.5 Socio-Economic Effects

Direct and Indirect Effects

Proposed Action

While construction activities may temporarily impact traffic and access to businesses, and may withdraw segments of the creek from use temporarily, there are no long-term

adverse socio-economic impacts of the Proposed Action. Only immediate, positive, direct and indirect impacts will occur. Properties will be removed from the 100-year floodplain, financing for development and redevelopment will be easier to obtain, and the financial and the other disincentives to develop and redevelop will be removed. There are no unavoidable adverse socio-economic impacts which would result from the Proposed Action; however, the equity created by removal of the floodplain, could increase competition for properties and development opportunities.

No Action

Adverse socio-economic impacts will continue to plague property owners in downtown Rock Springs, economic development goals will be unachievable, and the City will continue to suffer the consequences of the FEMA 100-year floodplain designation.

Mitigation

Impacts to adjacent properties during construction will be avoided, if possible. Access to businesses will be maintained during construction. Any minor impacts to properties resulting from construction will be mitigated by restoring the properties to the current level of development or better.

Cumulative Effects

The benefits from the Proposed Action would be to increase the economic vitality of one of the most important communities in southwestern Wyoming well into the future, and to have a positive, long-term effect on the economy of southwestern Wyoming. In addition to the financial and economic benefits of removal of a large developed area from the FIRM floodplain classification, improvements to the aesthetics of the creek's riparian corridor would provide an added resource to the community and enhance certain recreational values within the City limits. The potential improvements in water quality might also improve conditions downstream on Bitter Creek as far as the Green River, thereby providing secondary benefit to the surrounding area.

3.6 Recreation Resource Effects

Direct and Indirect Effects

Proposed Action

There are no adverse impacts to recreation resources resulting from the Proposed Action. Only immediate, long-term, and positive effects will result from removal of the 100-year floodplain designation. Existing parks will be connected with trails, and the City's master planned trail system will grow, providing important bicycle and pedestrian facilities to enhance mobility within the City, reduce automobile use, and potentially benefit air quality in the long-term.

No Action

City parks and the recreation/civic center will continue to be located in the FEMA 100-year floodplain. They would continue to be at risk for damage or loss to City property, the people who live nearby, and those who use the recreation facilities. The cost of repairs and/or replacement would be large.

Mitigation

Construction impacts to adjacent parks and recreation/civic center facilities should be avoided as the first option for mitigation. Any minor impacts to properties should be mitigated by restoring the properties to the current level of development or better. Final finishing and revegetation of the improved channel will eventually provide additional recreation opportunities along the creek. Landscape disturbance caused by construction of the detention basins should be mitigated by sensitive contouring and revegetation.

Cumulative Effects

Regionally, the action will increase access to trails, parks, and other recreation opportunities within Rock Springs and will add to the variety and diversity of recreational opportunities in the southwestern Wyoming.

3.7 Soils and Farmland Effects

There are no impacts to farmlands or soils with either the Proposed Action or the No-Action Alternative. Improvements to the creek channel will mitigate erosion potential.

3.8 Air Quality Effects

There are no long-term impacts to air quality with either the Proposed Action or the No Action Alternative. Measures will be used during construction to mitigate dust.

3.9 Noise Effects

There are no long-term noise impacts with either the Proposed Action or the No Action Alternative. Measures will be used during construction to mitigate noise.

E. Summary of Effects

Table 6 summarizes the effects related to the No Action Alternative and the Proposed Action.

Table 6 – Summary of Effects: No Action and Proposed Action

No Action Alternative	Proposed Action	Mitigation
Cultural Resources		
• No anticipated change. • Existing historic properties would remain in the 100-year floodplain.	**Creek Corridor:** • Six sites within the project area have been evaluated for eligibility by the NRHP—four previously recorded, two newly submitted. • Two eligible—Chinatown and the WPA-constructed stone walls—sites may be impacted by construction-related activities. **Detention Basin Sites:** No cultural resources were identified.	• Avoidance of historic properties is preferable. • If avoidance is not possible, measures minimizing potential impacts to cultural resources and mitigation of those resources will be determined between the SHPO and the City of Rock Springs. This may include monitoring of surface disturbances by a professional archeologist and determining how cultural resources, such as WPA stone walls, will be incorporated into the project design. • Discovery of unanticipated cultural resources would require suspension of activities. Activity, when resumed, should provide no further damage to the discovered cultural resource. • An MOU between the City and SHPO outlining mitigation is required.
Water Resources—Water Quality		
• If the current interest in identifying and eliminating the fecal coliform sources of contamination occur, water quality could improve. • Existing chloride concentrations are not expected to change.	**Creek Corridor:** • Water quality will not be adversely affected. • Increased wetlands could improve water quality. • Fecal coliform and existing chloride concentrations will remain unaffected by construction activities/measures. If the current interest in identifying and eliminating the fecal coliform sources of contamination occur, water quality could improve. Existing chloride concentrations are not expected to change. • Changes to the creek bed longitudinal profile will have little effect on the overall sediment conveyance capacity.	• Signage indicating water quality concerns to the general public should be posted until the contamination is safely controlled. • Creek side slopes should be laid back where possible and protected with erosion control matting and vegetation. • Signing and enforcements should be implemented to control ORV use in the detention basins and along the creek. • Compliance with a WYPDES stormwater permit. • Best management practices for erosion control should be implemented, including: ▪ A temporary bypass conveyance system.

No Action Alternative	Proposed Action	Mitigation
		▪ Construction in the winter. ▪ Use of erosion control blankets and revegetation as quickly as practical. ▪ Limiting the length of disturbance/reducing exposed banks.
Water Resources—Water Quantity		
No anticipated change.	**Creek Corridor:** • An increase in riparian wetlands could result in an increase in water consumption by wetland plant species, and potentially less water flowing in the creek. **Detention Basin Sites:** • Detention basins will detain large flood events reducing the peak flood flow rate and will not adversely impact the mean annual discharge of Dead Horse Canyon Creek to Bitter Creek.	• Less than 20 acre free/year of water are anticipated to be depleted due to evapotransporation. Depletions of less than 100 acre feet/year of water are offset by recovery actions that are accomplished by the Upper Colorado River Basin Endangered Fish Recovery Implementation Program. • A formal consultation with the Service must be requested prior to wetland removal and/or creation.
Water Resources—Flooding		
• The potential for flooding remains unchanged. • 360 acres of developed land remain in the FEMA designated 100-year floodplain.	**Creek Corridor:** • Improved conveyance capacity and lowering the flood elevation will remove 360 acres of developed land from the FEMA designated 100-year floodplain. **Detention Basin Sites:** • Detention basins will detain large flood events reducing the peak flood flow rate.	
Vegetation and Wetlands		
No anticipated change.	**Creek Corridor:** • 4.97 acres of wetlands may need to be removed due to construction activities and may result in a short-term increase in sediment loads. • 6.4 acres of new wetlands will be added. • Wetland removal may cause the loss of wetland seed sources to wetlands downstream temporarily. • Re-seeding and mitigating the wetlands removed during the project will occur within the 2-year channel area of the proposed	• Avoid wetlands, where possible, using temporary bypass conveyance systems to maintain wetland conditions during construction • Salvage and replace topsoil from inside the drainage to aid future plant growth and wetland establishment. • Erosion control blankets or mats, and vegetation should be used to stabilize lower banks and control sediments. This will help restore wetlands and their functions.

No Action Alternative	Proposed Action	Mitigation
	channel design. • Increased wetlands may improve flood control, water quality, and provide wildlife habitat. **Detention Basin Sites:** No wetlands were identified at these sites.	• Restoration of wetlands as required by USACE. • Any minimal depletion of water resources caused by increased wetlands will be report to the U.S. Fish and Wildlife Service as require, and will not exceed the 100-acre feet limit.
Fish & Wildlife		
• Obstructions/sewer lines remain. The Flannelmouth sucker may continue to remain a genetically isolated population.	**Creek Corridor:** • Short-term habitat loss (during construction and while new vegetation becomes established) may temporarily disrupt the feeding, resting and breeding of some wildlife species. • Impacts to the viability of wildlife populations in the area will be minimal. • No significant changes in abundance or breeding status of any vertebrate wildlife species in the area are expected. • Flannelmouth sucker may directly benefit as obstructions (sewer lines) are removed and redesigned. **Detention Basin Sites:** • Same as points 1-3 above. • Realignment and stabilization of the stream channel, as well as stream banks, should increase the wildlife and fisheries values of the area as vegetative structure, stability and, therefore, increase diversity are improved.	• Revegetation should replace habitats lost during construction by replicating existing habitats. Such restoration should provide beneficial impacts to migratory birds by providing cover, food. and supporting insect populations. • Replacement of the drop structure which restricts fish migration with a sloped channel will improve fish migration in both the short-term and long-term.
Socio-Economics		
• FEMA designation remains. Adverse socio-economic impacts will continue making economic development goals difficult to attain.	• Properties will be removed from the 100-year floodplain making financing for development and redevelopment easier and removing financial and other disincentives and burdens.	• Impacts to adjacent properties during construction should first be avoided. • Any minor impacts to properties resulting from construction will be mitigated by restoring the properties to the current level of development or better.

No Action Alternative	Proposed Action	Mitigation
Recreation		
• Adverse impacts will continue as City parks and the recreation/civic center will continue to be located in the FEMA 100-year floodplain.	• Existing parks will be connected with trails, and the City's master planned trail system will grow providing important bicycle and pedestrian facilities to enhance mobility within the City.	
Soils & Farmland		
No prime or state unique farmlands		
Air Quality		
No anticipated change.	Dust during construction only.	Effective dust control procedures should be incorporated into the project to comply fully with the Wyoming Air Quality Standards and Regulations.
Noise		
No anticipated change.	Noise during construction only.	Construction-related noise should adhere to the City of Rock Springs Noise Ordinance.
Special Areas of Concern		
No special areas of concern		

F. Persons and Agencies Contacted to Assist in the Preparation of the Environmental Assessment

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Final Environmental Assessment

Rock Springs Bitter Creek Clean-Up Project

Rock Springs, Sweetwater County, Wyoming

Appendices

Appendices

Appendix 1: Bitter Creek Reconstruction Plan & Design

"Bitter Creek Reconstruction Plan and Design: A Master Plan for the Reclamation and Development of the Bitter Creek Drainage through Downtown Rock Springs, Wyoming", December 14, 2007.

Appendix 2: Levee Accreditation Feasibility Assessment

"Levee Accreditation Feasibility Assessment", Greg Poole, Hansen Allen & Luce, March 3, 2009.

Appendix 3: Wetland Assessment Reports & Correspondence

"2009 Wetland Assessment for City of Rock Springs Bitter Creek," July 2, 2009.

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Letter from Mike Burgan, USACE, Omaha District, Wyoming Regulatory Office, December 12, 2008.

Appendix 4: Wildlife Survey Data & Correspondence

2008 Wildlife Survey Data Sheets

Letter from John Emmerich, Deputy Director, WGFD, July 8, 2008.

Letter from Brian T. Kelly, Field Supervisor, Wyoming Field Office, U.S. Department of Interior, Fish and Wildlife Service, referencing phone conversation on December 2, 2008.

Letter from Bobby Crompton and Kevin Spence, Wyoming Fish and Game Department, February 23, 2009.

Appendix 5: Soil Sample Summary

"Soil Sample Summary for Bitter Creek Enhancement Project," JFC Engineers and Surveyors, December 2008.

Appendix 6: Urban Renewal Agency Letter
Letter from Lisa Mueller, Director, Urban Renewal Agency, Rock Springs, Wyoming, October 13, 2008.

Appendix 7: Brokerage Southwest Telephone Conversation
Log of telephone conversation with Dennis Carlson, Brokerage Southwest, Rock Springs, Wyoming, October 23, 2008.

Appendix 8: Rock Springs National Bank Telephone Conversation (Heather Anderson)
Log of telephone conversation with Heather Anderson, Commercial Loan Officer, Rock Springs National Bank, Rock Springs, Wyoming, October 27, 2008.

Appendix 9: Rock Springs National Bank Telephone Conversation (Linda McGovern)
Log of telephone conversation with Linda McGovern, Residential Loan Officer, Rock Springs National Bank, Rock Springs, Wyoming, October 27, 2008.

Appendix 10: BLM and Anadarko Correspondence
Letter from Bernard Weynand, Assistant Field Manager, Resources, U.S. Department of Interior, Bureau of Land Management, Rock Springs Field Office, February 26, 2009.

Email communication from Jeromy Caldwell, Supervisory Wildlife Biologist, Department of Interior, Bureau of Land Management, Rock Springs Field Office, March 9, 2009.

Letter from Patricia Hamilton, Lead Realty Specialist, Department of Interior, Bureau of Land Management, Rock Springs Field Office, February 25, 2009.

Lease Agreement between Anadarko Petroleum Company and the City of Rock Springs for Detention Basin #3.

Appendix 11: DEQ Air Quality Division Letter
Letter from Marty Hamilton, Air Quality Engineer, Department of Environmental Quality, Air Quality Division, October 29, 2008.

Appendix 12: State Historic Preservation Office (SHPO) Letter
Letter from Kara Hahn, Historian, Wyoming State Parks and Cultural Resources, State Historic Preservation Office, February 23, 2009.

Appendix 13: Draft Final Environmental Assessment Comments & Responses
Summary of Comments Received for the Draft Final Environmental Assessment Rock Springs Bitter Creek Clean-Up Project (April 25, 2009 through May 31, 2009).

Appendix 1

Bitter Creek Reconstruction Plan & Design

Bitter Creek
Reconstruction Plan & Design

A Master Plan for the
Reclamation and Development
of the Bitter Creek Drainage
through Downtown Rock Springs, Wyoming

The City of Rock Springs, Wyoming — A Great Place to Work and Play!

December 14, 2007

Hansen Allen & Luce Inc Engineers

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8. Opinion of Probable Cost – Concept 1
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I. Introduction

Purpose of the Plan

The Master Plan has two purposes – one functional and engineering-based, and another that focuses on aesthetics and urban design. Both purposes will provide guidance to the reconstruction and design of Bitter Creek as it flows through the City of Rock Springs, Wyoming.

Bitter Creek currently causes residential neighborhoods and commercial/retail areas to be designated within the Federal Emergency Management Agency (FEMA) flood plain. This designation puts severe restrictions on development opportunities, requires property owners to pay additional, sometimes costly flood insurance premiums, and negatively affects community image. A primary purpose of the plan is to reconstruct the creek channel to contain flood events so that properties now shown in the flood plain can be removed from the Flood Insurance Rate Map (FIRM) and the restrictions attached.

The Plan will also set a framework for transforming the long-neglected eyesore into a green corridor that links neighborhoods with each other and downtown, and provides a pleasant and inviting pathway system accented with gathering places, seating places, and plazas. The creek corridor will be cleaned, planted with native riparian and upland vegetation, and over time will establish Bitter Creek as a community asset and positive reflection on the community.

Planning Process

The Plan was completed by a consultant team with guidance from a Steering Committee. Throughout the process, several opportunities for community involvement and public participation were provided.

Steering Committee

The Steering Committee was made up of fourteen (14) individuals representing the Urban Renewal Agency, the Rock Springs Planning and Zoning Commission and City Council, Sweetwater County, city staff, and local businesses and residents. The committee met three times: (1) to identify issues to be addressed in the plan, (2) to review alternatives and concepts, and (3) to make comment on the draft plan. The assistance and insight of the Steering Committee was invaluable in developing the Master Plan. It is anticipated that the Committee will remain intact and continue to work toward implementing the Plan.

Public Involvement

Residents of Rock Springs attended a Public Scoping Meeting on July 16, 2007. Twenty individuals signed-in at the meeting, and identified concerns and conditions along Bitter Creek that should be addressed in the Plan. Three comment forms were also returned with comments regarding Bitter Creek issues. On August 27, 16 individuals attended a Draft Plan Open House, where two development concepts were presented. In each instance, comments were collected, documented, and submitted to the Steering

Committee for review. Comments received at both public meetings are summarized and included in the Appendix.

Study Area

The master plan area includes the Bitter Creek corridor from the South Side Belt Route roadway bridge on the east side of Rock Springs to the confluence of Sweetwater Creek just west of Plaza Mall. The length if approximately three miles and includes several roadway bridge crossings and pipe crossings, as well as a variety of conditions within the channel and adjacent to it. Figure 1 shows the location of the corridor, its context within the City of Rock Springs, and the limits of the study area.

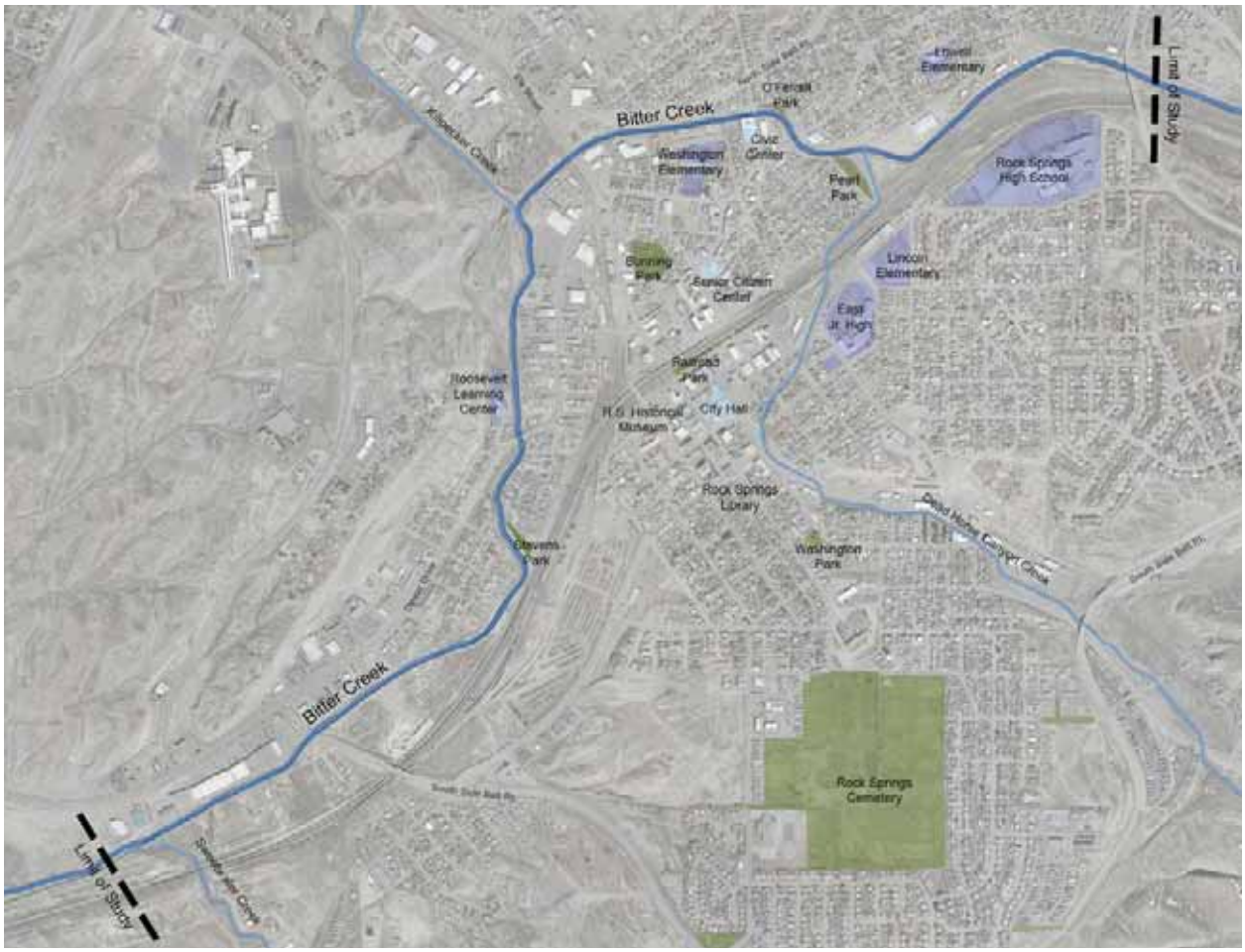


Figure 1 – Vicinity Map and Study Area Limits

Organization of the document

The document is organized in sections, beginning with this introduction, and proceeding through background information on the creek and watershed, followed by a discussion of existing conditions in the channel and on adjacent lands, a description of master plan concepts and options for design and development, and ending with phasing and implementation strategies, including funding opportunities. Reference materials are cited, and appendices are included with supporting and supplemental information.

2. Background

The Bitter Creek Watershed

Bitter Creek is part of a much larger watershed that ultimately drains to the Green River, passing through Rock Springs on its way. Thus, the larger issues about the health of the watershed, the tributaries flowing into Bitter Creek, and the land uses that take place along the creek all affect water quality, stream conditions, erosion and sedimentation. This master plan looks specifically at the 3-mile section within Rock Springs, and acknowledges that all watershed issues cannot be solved here; rather this effort is viewed as a beginning, resolving the most critical issues now and providing a catalyst and inspiration for future needs.

The broader watershed issues are critical and need to be addressed by a consortium of land owners, interest groups, municipalities, and local and federal government agencies. A majority of the watershed is managed by the Bureau of Land Management (see Figure 2). The remaining portions of the watershed are privately owned with a smaller portion of State land. The City of Rock Springs has publicly stated that it is most willing to participate and collaborate with others toward improving conditions in Bitter Creek farther upstream, and in the watershed in general.

"The Wyoming Department of Environmental Quality 2006 State Water Quality Assessment Report provides the following description of the Bitter Creek watershed.

> "The Bitter Creek Sub-basin lies entirely within sedimentary basin geology, composed of mostly fine grained sedimentary rocks containing salts and other evaporite minerals. Because of the arid climate and relatively low elevation and basin terrain, most reaches in this drainage are non-perennial. Snowmelt and occasional rainstorm events often transport high loads of sediment and dissolved salts. Land uses include grazing, coal mining, phosphate mining, uranium exploration, and oil and gas development. Bitter Creek, a tributary to the Green River, drains a large arid area (an outlying part of the Red Desert) … including a western fringe area of the Red Desert basin."

The Bitter Creek watershed is shown on Figure 2 on the following page. It was provided by Mr. Dennis Doncaster serving in the capacity of an interested resident of Rock Springs, Wyoming, and also an employee of the Bureau of Land Management (BLM).

The following watershed descriptions are taken from the 1989 Flood Insurance Study Report (Federal Emergency Management Agency - FEMA).

> "Rock Springs is on the edge of the normal path of storms that cross the upper Colorado River region and is subject to severe storm sequences occurring as a series over a period of 2 to 3 days. The average annual precipitation is almost 9 inches with a yearly snowfall that averages about 35 inches."
>
> "The Bitter Creek drainage area is a bowl-like basin encircled by broad escarpments that rise to between 7,000 and 9,000 feet, NGVD. Physiographically, the basin is

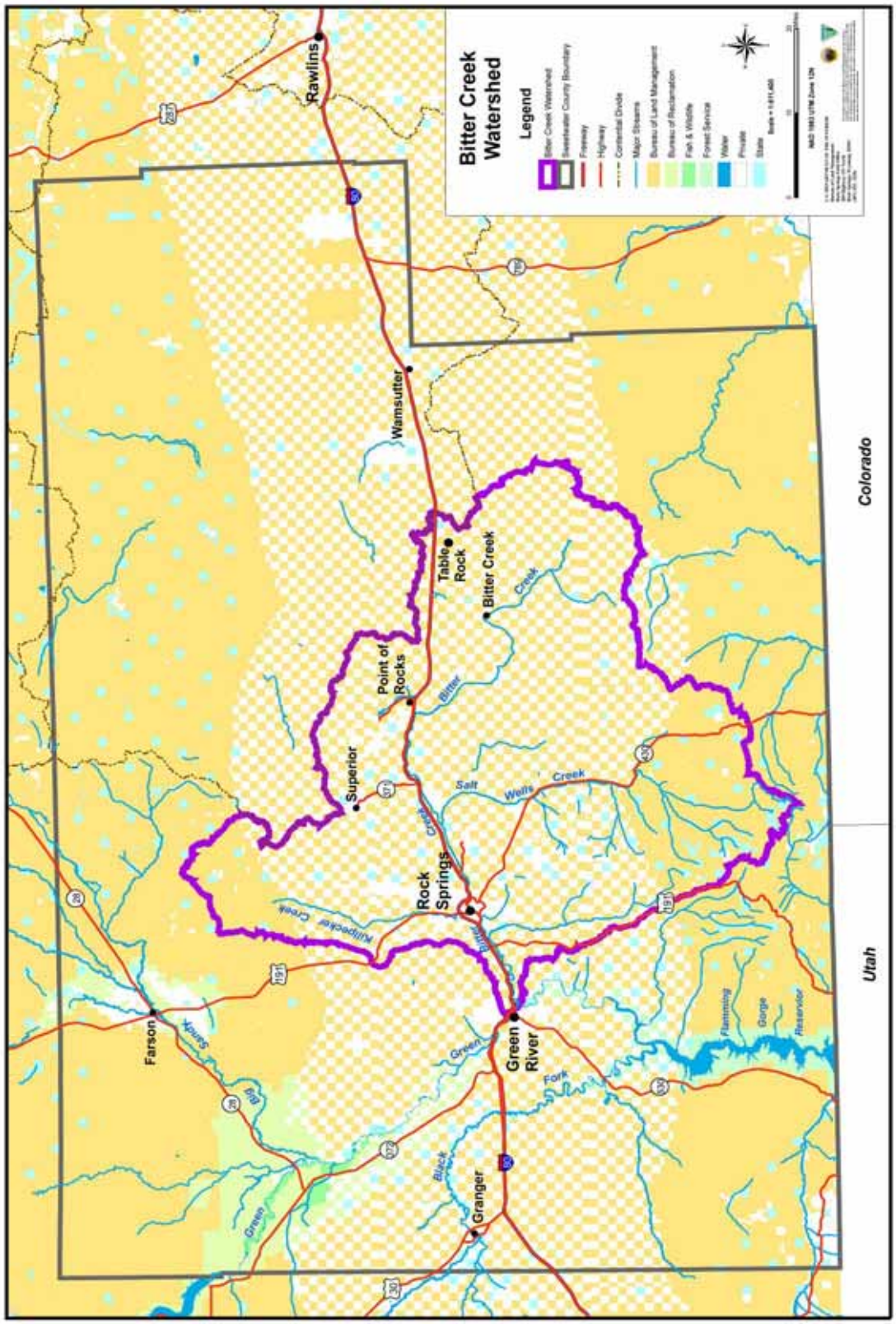


Figure 2 – Bitter Creek Watershed

divided into distinct plateau and foothill regions. The plateau region, which is flat or gently rolling country studded with buttes and knolls, comprises the central part of the Bitter Creek Drainage. The foothill region includes the Bitter Creek headwaters and the drainage areas of Dead Horse Canyon, Killpecker, and Sweetwater Creeks ..."

Historic Bitter Creek Flooding

The City of Rock Springs has been historically affected by flood events on Bitter Creek. Historic flood event dates and discharges are summarized on Table 1. Historic flood control works constructed in Rock Springs are summarized on Table 2. An understanding of the limitations of these prior flood control projects helps to better understand the current Flood Insurance Rate Map (FEMA, July 20, 1998).

Table 1 – Rock Springs Bitter Creek Historical Flood Events

DATE	DISCHARGE (cfs)
April 1924	6,000
July 1926	7,000
August 1930	6,000
July 1937 (upstream of Killpecker Creek)	9,700
Feb/Mar 1962	4,600
June 1965	4,500
August 1976	4,000 - 6,000

(Reference: "Bitter Creek Channel Improvement Study", JFCo. Inc., 1991, Draft Report)

Table 2 – Rock Springs Historic Flood Control Works

DATE	DESCRIPTION
1916	Construction of a storm ditch from Dead Horse Canyon Creek to Bitter Creek to protect the southern portion of town.
1924	Construction of a diversion channel around the north end of town including diking across the creek near the site of the Pilot Butte Avenue bridge and excavating a channel to the confluence with Killpecker Creek. Dikes to protect the western part of town were built along the east bank of Bitter Creek downstream from the mouth of Killpecker Creek, and the storm ditch built in 1916 was relocated and extended to a new outlet in Bitter Creek upstream from the head of the bypass channel.

Dead Horse Canyon Creek and Killpecker Creek

Flood events on Dead Horse Canyon Creek and Killpecker Creek impact portions of the Rock Springs Bitter Creek study area. Improvements to Bitter Creek alone are insufficient to eliminate 100-year flooding in the study area, particularly in downtown Rock Springs. Flood control improvements are needed to both Dead Horse Canyon Creek and Killpecker Creek to meet the study objective of removing properties from the FIRM map.

A flood control study of Bitter Creek tributaries in Rock Springs was completed in 1989 ("Level II - Feasibility Study Phase IA Report - Rock Springs, Wyoming Flood Control Project Bitter Creek Tributaries" by Johnson-Fermelia Co. Inc. in association with Western Water Consultants, Inc. and Western Research Corporation, February 1989) (hereinafter referred to as the 1989 Flood Control Study). The 1989 Flood Control Study investigated several different alternatives for flood control on Dead Horse Canyon Creek and Killpecker Creek. The study concluded that "an economically feasible flood control project could be constructed to control floodwater in excess of the safe carrying capacity of the existing stream channels." A summary of the preferred alternative for Dead Horse Canyon Creek and Killpecker Creek is provided below.

Dead Horse Canyon Creek

The preferred alternative selected in the 1989 Flood Control Study included construction of two detention ponds (a 64 acre-foot pond and a 39 acre-foot pond) upstream of Highway 430 (see Figure 3, copy of Figure No. 32 from the 1989 Flood Control Study). The ponds are to be sized such that the sum of the pond outflow peaks and the local runoff peak from those areas below the ponds, will not exceed 1,100 cfs. The flood control project cost for Dead Horse Canyon Creek was estimated to be $644,000 in 1988; inflating costs to 2007 using the historical cost indexes of the 2007 RSMeans Heavy Construction Cost Data (2007 Means) results in a 2007 project cost estimate of $1,193,000.

Killpecker Creek

The 1989 Flood Control Study found that Killpecker Creek channel capacity is about 1,000 cfs below I-80 and about 3,500 cfs above I-80 (compared to a 100-year flood flow of 6,300 cfs). The preferred alternative includes construction of two detention ponds (a 3,000 acre-foot pond and a 650 acre-foot pond) and construction of channel improvements. The larger detention pond (3,000 acre-feet) would be constructed above Yellowstone Road and the smaller detention pond (650 acre-feet) would be constructed above I-80 (see Figure 4, copy of Figure No. 15 from the 1989 Flood Control Study). The channel improvements include improving channel capacity on Killpecker Creek below I-80 to increase the safe carrying capacity to 2,000 cfs. The flood control project cost for Killpecker Creek was estimated to be $2,290,308 in 1988; inflating costs to 2007 using the historical cost indexes of the 2007 Means results in a 2007 project cost estimate of $4,241,000.

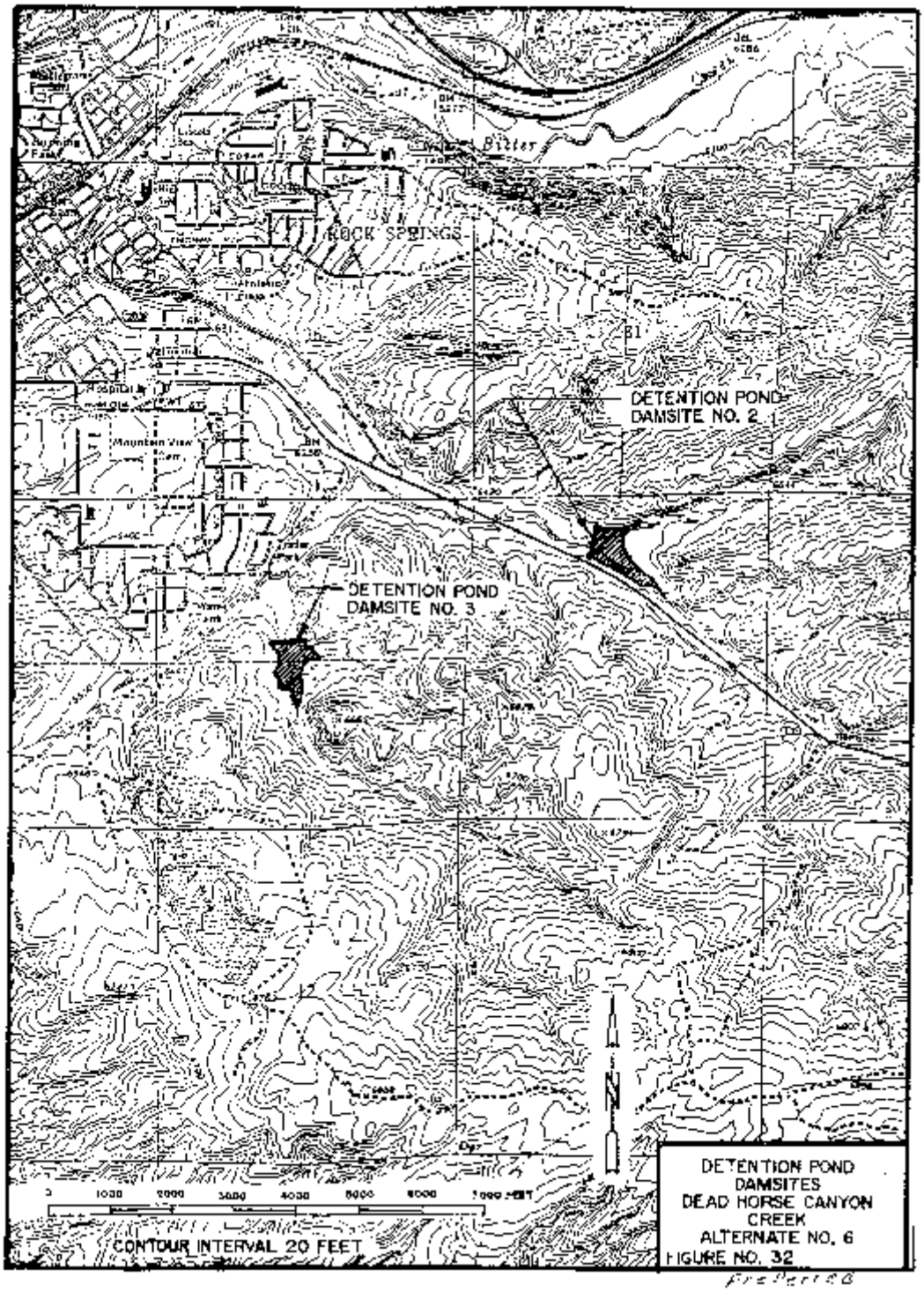


Figure 3 - Dead Horse Canyon Creek Detention Pond Locations from the 1989 Flood Control Study

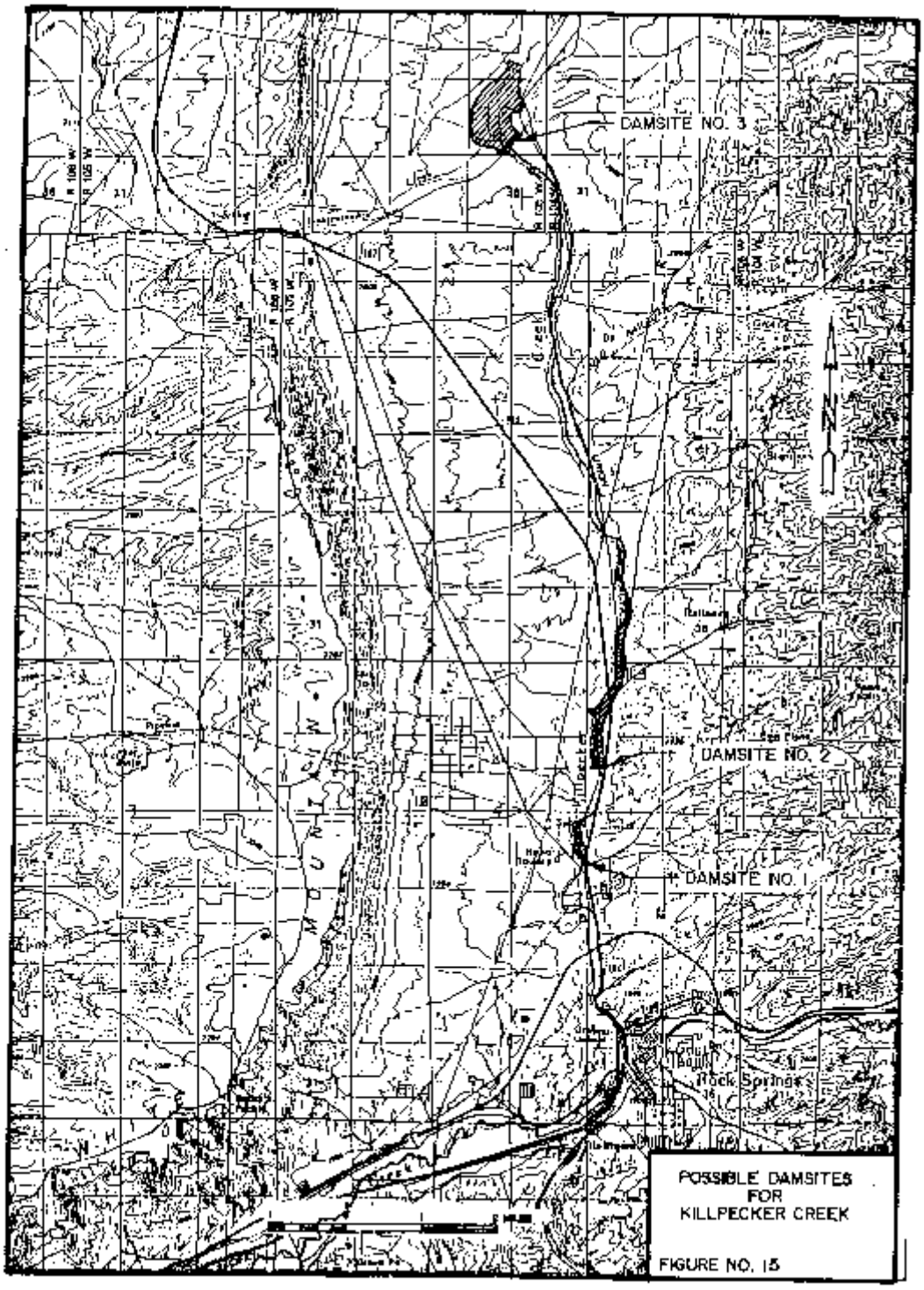


Figure 4 - Killpecker Creek Detention Pond Locations from the 1989 Flood Control Study

3. Existing Conditions

The extent of this project, as shown in Figure 1, begins at the South Belt Route bridge over Bitter Creek on the east side of Rock Springs – the upstream end of the project, and ends at the confluence of Sweetwater Creek just west of the Plaza Mall (see Figure 1). The length of the project is approximately three miles. Maps (Figures 6-9) at the end of this section of the document provide detailed information about conditions in the creek channel as of July 2007. Members of the consultant team walked the length of the corridor, noting and photographing the condition of the channel including pipe crossings, storm drain and other pipe drainages into the channel, bridge crossings, vegetation types, areas where large debris piles were located, piling and other slope/bank stabilization features, land use adjacent to the creek, and other information relevant to existing conditions in the corridor.

Source of Flooding

The current FEMA Flood Insurance Rate Map (FIRM) for Rock Springs is shown on Figure 5. The major sources of flooding to Rock Springs are from Bitter Creek, Dead Horse Canyon Creek and Killpecker Creek. The downtown area is affected by flooding from both Bitter Creek and Dead Horse Canyon Creek.

During a 100-year flood event the FEMA mapping and hydraulic models represent that the dike upstream of Pilot Butte Avenue Bridge will overtop and a portion of the Bitter Creek flood flows would leave the current channel and flood through a portion of the downtown area before rejoining with the current Bitter Creek channel below the confluence with Killpecker Creek. The downtown Rock Springs Area is also affected by flooding from Dead Horse Canyon Creek which, during a 100-year flood event, spills from the current channel and flows through a portion of the downtown area. A summary of peak flood discharges for Bitter Creek, Dead Horse Canyon Creek, and Killpecker Creek is provided on Table 3. Return period is defined as the reciprocal of the probability of the event being equaled or exceeded in any given year, thus a 100-year flood event has a 1% chance of being equaled or exceeded during a given year.

Table 3 – Flood Peak Discharges by Return Period

STREAM/LOCATION	TRIBUTARY AREA (square miles)	PEAK DISCHARGE (cfs)		
		10-YEAR	100-YEAR	500-YEAR
Bitter Creek at East City Limit	1,700.0	1,700	7,800	19,000
Bitter Creek Below Killpecker Creek	2,032.0	4,000	9,800	22,000
Dead Horse Canyon Creek at Mouth	7.2	200	2,300	4,400
Killpecker Creek at Mouth	320.0	2,500	6,300	14,500

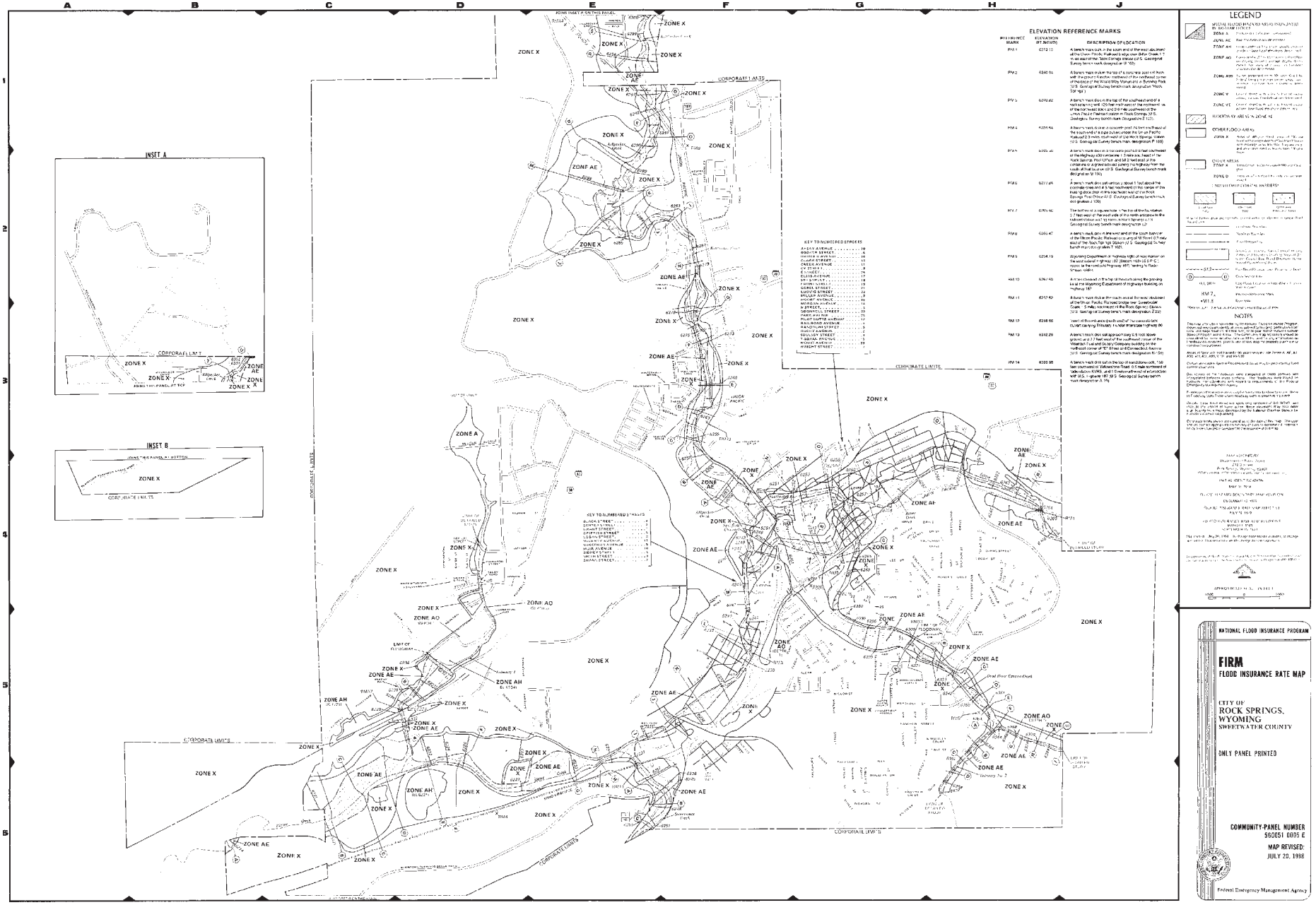


Figure 5 - FEMA Flood Insurance Rate Map

Water Quality

Bitter Creek is classified as use classification Class 2C (Wyoming Water Quality Rules and Regulations), which states:

> "Segments of Bitter Creek and Killpecker Creek are listed as water quality impaired for fecal coliform bacteria and chloride. … "The longevity, degree, and persistence of this bacteriological contamination may pose a health threat and it is recommended that within the impaired reaches, these streams be posted with signage warning of potential health risks from contact. It is recommended that specific and selective sampling be conducted to attempt to identify the sources." (Bitter Creek and Killpecker Creek Watershed Management Plan, Bitter Creek and Killpecker Creek Watershed Advisory Group and the Sweetwater County Conservation District, June 2006).

Sediment

As stated in the "Bitter Creek Channel Improvement Study", JFCo. Inc., 1991, Draft Report:

> "Bitter Creek is a typical, semi-arid, meandering alluvial stream, entrenched to varying depths with vertical banks and wide sandy bottoms. Bitter Creek ... can be classified as largely ephemeral, indicating flow only in direct response to snowmelt and rainfall runoff events. ... Runoff in Bitter Creek and its tributaries is flashy and typically turbid with high total suspended solids (Lowham and others, 1982: Lowham, H.W., De Long, L.L., Collier, K.R., and Zimmerman, E.A., 1982, Hydrology of Salt Wells Creek – A Plains Stream in Southwestern Wyoming: U.S. Geological Survey Water Resources Investigation 81-62, 52 p.). The amount of sediment available for transport and deposition greatly exceeds that actually transported, resulting in temporary in-stream storage of sediment. During medium and high discharges, sediment is either flushed from the basin or mobilized and deposited further down the system."

Sediment deposits below the South Belt Bridge (East)

Impacts to Land Development

Those parcels that are within the current 100-year flood plain and that are required to purchase flood insurance occupy about 580-acres in the City of Rock Springs. The creek bed itself occupies about 73 acres. By removing the majority of the 580 acres from the flood plain, several hundred property owners can be relieved of the cost of flood insurance, the depressed land values and the restrictions on development, and the stigma of living and working in a part of the city that has little to look forward to in the future.

Lands that are within the flood plain are also ineligible for other sources of funding and programs that could help to improve image and raise the economic expectations of

property owners. Once the lands are removed from the flood plain, the City, the Urban Renewal Agency (URA), and others can identify funding and programs for economic development, property renovations, and utility and infrastructure upgrades.

Slopes and Channel

Side-slopes and banks in the creek channel are generally steep and the channel bed is narrow. Constructed dikes have been installed to help control flooding and contain the creek. Some sections of the channel are stable and others are not. Some have been armed with stone to control erosion and to protect the banks from the torrents of water that occur when intense rainstorms occur in the summer months, and most are well vegetated where recent disturbance has not occurred. Many of the old stone embankments have historic relevance and are important relics telling the story of a community and its struggle to control Bitter Creek.

Bank armed for erosion control and bank stabilization

Steep, disturbed slopes

Debris and Trash

Most of the length of the channel is littered with debris and trash. It ranges from litter such as can, bottles, paper, old tires, and auto parts which can be relatively easily removed, to large concrete chunks, construction debris, and metal objects that will need to be removed and disposed-of appropriately. Removal of the larger objects will require equipment, while smaller objects and trash could be removed by volunteer groups and interested citizens.

Large concrete chunks block channel

Vegetation

Vegetation along the slopes is fairly consistent throughout the corridor. The dominant species are Sarcobatus vermiculatus (Greasewood), Atriplex canescens (Four-wing Saltbush), Artemesia tridentate wyomingensis (Wyoming Sage) which are typically found in the upper banks, while sedges, grasses, Salix exigua (Coyote Willow) and other willow species are found in the lower banks and bottom of the channel. Occasional trees are also found on the creek banks, primarily Acer negundo (Box Elder), Ulnus chinensis

Four-wing Saltbush

(Chinese Elm), Eleagnus angustifolia (Russian Olive), and Fraxinus sp. (Ash). These tree species were probably introduced into the corridor from adjacent plantings.

Invasive species such as Tamarix sp. (Tamarisk or Saltcedar) have invaded the banks of Bitter Creek; however, it is not the dominant species at this time. It occurs along the entire corridor, but is more concentrated in certain sections. Even though a vegetation analysis on Bitter Creek through Rock Springs appears not to have been completed, the species noted are typical of these Great Basin environmental conditions. Other invasive and noxious weed species may also occur.

Adjacent Land Uses

On the Existing Conditions Maps (Figures 6-9) that follow, land ownership is shown in shades of color. The blue shading is property owned by the City of Rock Springs, Sweetwater County, or the State of Wyoming. Property owned by quasi-public groups such as the railroad and utility companies are shown in pink on the maps. Public parks are shown in green, and all other land not shaded is in private ownership.

South Side Belt Route (East) to N Street - Figure 6: Between the eastern upstream start of the study area at the South Side Belt downstream to the confluence of Dead Horse Creek, land is either City-owned or owned by the railroad. In this area, there is much open land between the creek and the railroad tracks on the south side of the creek. The corridor itself is primarily City-owned, and private property to the north is primarily industrial and commercial. Between Pilot Butte Bridge and N Street Bridge, the north side of the creek flows along Pearl Street and Pearl Park; the south side of the creek flows along Creek Avenue containing industrial/utility uses.

Open land between the creek and railroad tracks

Pearl Park

Pilot Butte Bridge

N Street to Dewar Drive - Figure 7: From N Street to Elk Street, land uses on the south side of the creek are primarily civic, railroad, utility, and commercial uses. The north side of the creek includes some residential at N Street and Lyle Street, and small commercial uses at Elk Street. Frontage along Center Street includes some streetscape improvements and undeveloped land to the edge of the creek. This area has the strongest visual connection to Historic Downtown Rock Springs (Front Street) and the adjacent residential neighborhoods, and includes the only formalized pedestrian bridge across the creek.

Pedestrian bridge near Soulsby Street

Just downstream of Elk Street and the railroad bridge, Bitter Creek turns south where commercial and light industrial uses occur between the creek and Center Street. The north and west side of the creek include Pacific Steel and Recycling (adjacent to the railroad), the confluence of Killpecker Creek, a section of undeveloped land, and then Roosevelt Learning Center. Between Grant Street and Dewar Drive, the residential neighborhood including Grant Street, Sherman Street, Sheridan Street, Thomas Street, and Logan Street line the eastern edge of the creek. Several reaches in this section are narrow and confined.

Pacific Steel and Recycling

Side road connecting residential neighborhoods

Residences backing onto a narrow reach of the creek

Dewar Drive Bridge

Dewar Drive to South Side Belt (West) - Figure 8: From Dewar Drive south to Stevens Park, the creek corridor is fairly narrow with residential and park uses on the east side, and residential uses and the Dewar Drive parkway on the west. The parkway includes a meandering pathway, landscaping, and a pedestrian underpass that could be connected to new trails along the creek. Just downstream of Stevens Park, the creek turns abruptly to the southwest. The southern side of the creek is once again very open and broad, and owned by the railroad and the State of Wyoming. The northern side includes areas of residential and commercial development that backs-up to the creek. Rock Springs owns much of the land within the creek corridor on the northern bank. This section terminates at the South Side Belt route bridge.

Residences (left) back onto the creek corridor

Informal pedestrian crossing between a residential area and railroad-owned land

Densely vegetated bank within the open stretch of railroad-owned land

Commercial uses (right) and broad, open railroad-owned land (left) are typical in this segment

Dewar Drive Bridge

South Side Belt (West) to Sweetwater Creek - Figure 9: To the west of the South Side Belt, the creek once again enters a narrow section which includes a berm/dike on the south side for the entire length until reaching the confluence of Sweetwater Creek. Much of the adjacent land is owned by the City of Rock Springs, and a Dog Park is currently being designed for a portion of the property. The north side of the creek is characterized with steep slopes/banks and flows immediately behind the Plaza Mall. Some local developments have encroached on the creek through the placement of fill material. Some of these fill areas are unprotected and are eroding. Ongoing erosion will continue to create unsafe conditions as floodwaters eat away at these unprotected banks.

Steep, eroding slopes behind commercial development

The confluence of Bitter and Sweetwater Creek

Social and Cultural Context

Bitter Creek has historically been a problem for Rock Springs residents. The creek has been channelized and re-routed in some locations, and continues to be an area that is ignored and often considered a dumping ground. Furthermore, its floods are also unpredictable and notably large and furious when they occur. Such issues have prevented the area from being embraced by the community. Yet at the same time, the community recognizes the potential of incorporating Bitter Creek into the community and making it an asset and focus point.

Many of the previous flood control devices, such as the reinforced walls, berms, and pilings are assumed to have some importance historically, and certainly as reminders of the struggles the community has faced with Bitter Creek. To the extent that it is possible, and where they are stable, it is hoped that some of those structures can remain in place and be incorporated into an improved channel design.

Remnants of previous flood control efforts along the creek

Bitter Creek

Reconstruction Plan & Design

Existing Conditions

Hydrology
- 100-year floodplain (FEMA/AE category)

Utility pipelines
- pipe entering creek
- utility pipeline (above ground)

Crossings
- informal pedestrian creek crossing
- formal creek crossing (bridge)

Existing bank stabilization
- gabioned
- embedded rock wall

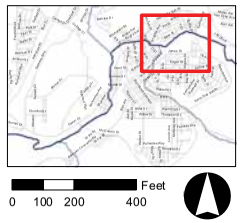
Restricted Access
- fence to bank edge
- land use to bank edge
- retaining wall; grade changes
- low fence

Potential Access
- access down to creek shelf

Potential Hazards
- ridgeline (steep drop-off)
- unstable/sliding bank

Land Use/Ownership
- public parks
- public ownership (city, county, and state)
- quasi-public ownership (railroad and power)

Figure 6: So. Side Belt (East) to N Street



Bitter Creek

Reconstruction Plan & Design

Existing Conditions

Hydrology
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Utility pipelines
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Restricted Access
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- land use to bank edge
- retaining wall; grade changes
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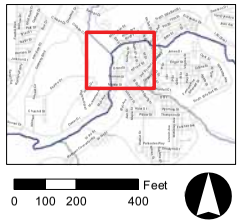
Potential Access
- access down to creek shelf

Potential Hazards
- ridgeline (steep drop-off)
- unstable/sliding bank

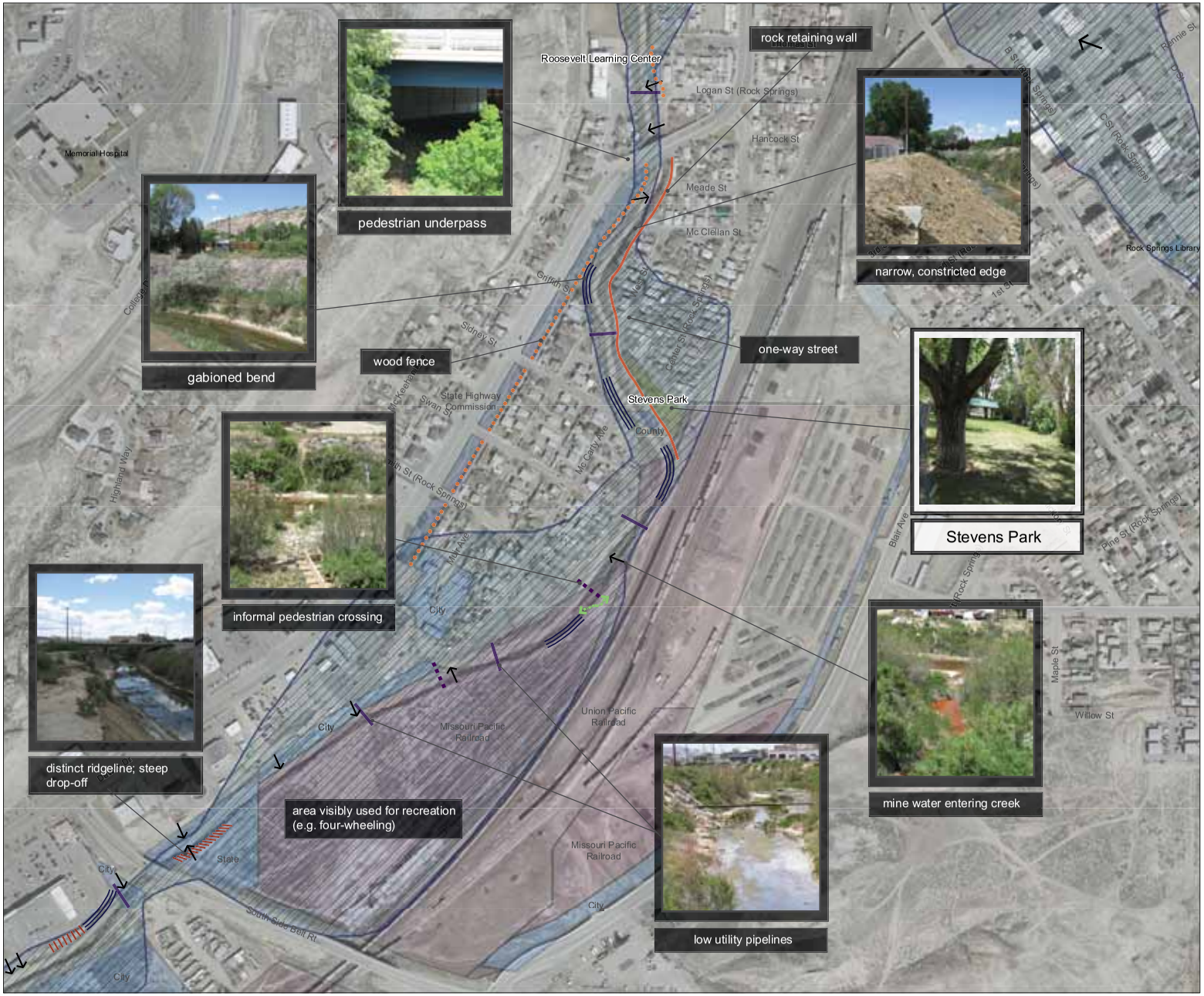
Land Use/Ownership
- public parks
- public ownership (city, county, and state)
- quasi-public ownership (railroad and power)

Figure 7: N Street to Dewar Drive



ROCK SPRINGS

HANSEN ALLEN & LUCE



Bitter Creek

Reconstruction Plan & Design

Existing Conditions

Hydrology
- 100-year floodplain (FEMA/AE category)

Utility pipelines
- pipe entering creek
- utility pipeline (above ground)

Crossings
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- formal creek crossing (bridge)

Existing bank stabilization
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- embedded rock wall

Restricted Access
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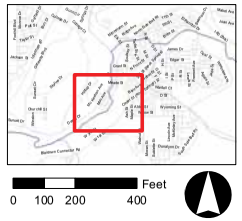
- land use to bank edge
- retaining wall; grade changes
- low fence

Potential Access
- access down to creek shelf

Potential Hazards
- ridgeline (steep drop-off)
- unstable/sliding bank

Land Use/Ownership
- public parks
- public ownership (city, county, and state)
- quasi-public ownership (railroad and power)

Figure 8: Dewar to So. Side Belt (West)



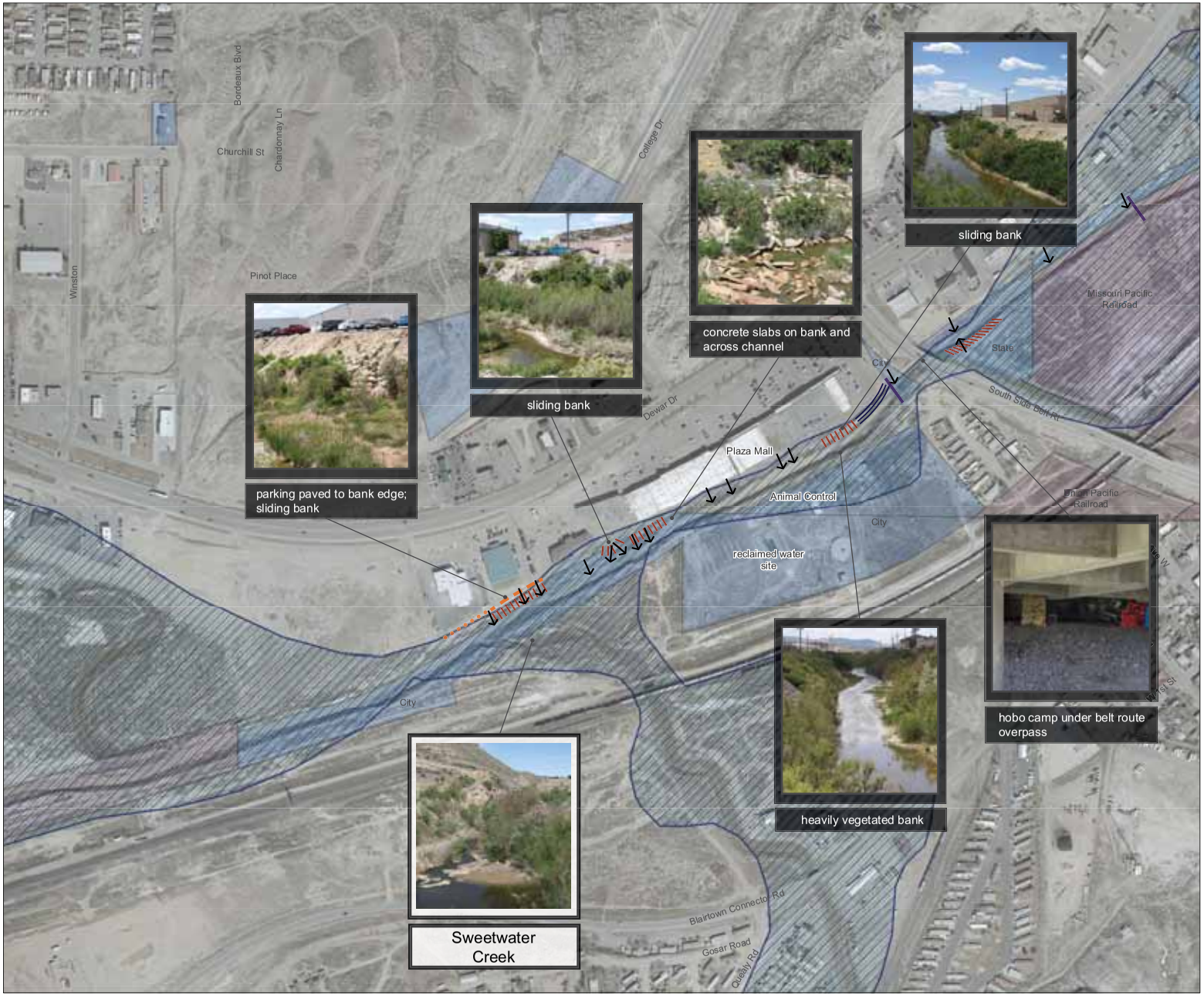
ROCK SPRINGS

HANSEN ALLEN & LUCE

Bitter Creek

Reconstruction Plan & Design

Existing Conditions



Hydrology
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Utility pipelines
- pipe entering creek
- utility pipeline (above ground)

Crossings
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Existing bank stabilization
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Potential Hazards
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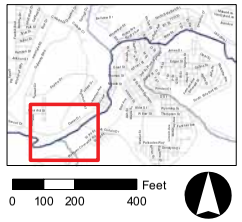
- unstable/sliding bank

Land Use/Ownership
- public parks
- public ownership (city, county, and state)
- quasi-public ownership (railroad and power)

Figure 9: So. Side Belt to Sweetwater Creek



ROCK SPRINGS

HANSEN ALLEN & LUCE

4. Bitter Creek Reconstruction and Design Master Plan

Description of Plan Concepts

The two concepts presented in this master plan differ primarily in the amount of land needed for implementation, and represent two possible development solutions with many opportunities for variation in between. In many areas the creek channel is narrow, with development on either side of the creek and little opportunity to create more space for channel improvements. In other areas there is ample room for broadening the channel, reintroducing meanders into the creek, and creating a more natural appearing creek condition. In each concept, the flood plain associated with Bitter Creek is significantly reduced as shown on the maps found at the end of the description of each concept.

Each concept also includes an opinion of probable cost which takes into account the extent of improvements. These costs are very preliminary and must be refined as more detailed design is initiated; however, they are a good starting point for budgeting and project phasing.

It is important to point out that while each concept is discussed and described separately, they are not entirely independent. In fact, portions of each concept can be mixed and blended. The degree to which blending will occur depends on circumstances, the willingness of property owners to cooperate, and the amount of funding available.

Concept 1: Full Cooperation requires negotiation with private property owners or agreements with adjacent public and quasi-public property owners to create greenways and community parks along the corridor, to link to existing pathways, and to give Bitter Creek more space during flood conditions. In Concept 1, improvements take place over a larger area assuming that negotiated agreements or easements can be obtained, and builds on greenway improvements already occurring within the City.

Concept 1 also includes the creation of a pond at the confluence of Bitter Creek and Dead Horse Creek, and adjacent to Pearl Park. The pond could be filled utilizing water that is currently pumped from the water treatment facility to the City Cemetery for irrigation. This water could also be used to produce a seasonal, though very low, high quality source of water in the creek bed. This water is available during the irrigation season to supplement natural flows.

Concept 2: Limited Cooperation does not require acquisition of private property, but will require negotiated agreements with adjacent public and quasi-public property owners in order to implement the required channel improvements. In this concept, improvements take place within the existing creek corridor, though it is enlarged where possible.

This concept also includes improvements to and expansion of Pearl Park onto existing city-owned land, but it does not include the addition of a pond fed with effluent water as described in Concept 1. Because of the reduced amount of space available for improvements to the creek channel, there is a corresponding smaller amount of space available for aesthetic and urban design improvements.

Flood Conveyance System Improvements

A key objective of the Bitter Creek Master Plan is to provide a plan that if implemented will result in the removal of residential and commercial properties in the study area from the 100-year flood plain shown on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map. Master plan improvements for Bitter Creek were identified through use of a HecRAS Bitter Creek water surface profile model developed based on the FEMA existing effective hydraulics model. The following steps have been implemented in the development of the proposed Bitter Creek improvements.

- Hydraulically equivalent master plan cross sections (see Figures 10-13) which are capable of conveying the Bitter Creek 100-year flood flows were developed assuming uniform flow conditions with the Mannings Equation. Bitter Creek was divided into reaches and the channel friction slope and 100-year flow rate were identified for each reach.
- The FEMA existing effective water surface profile hydraulic model was prepared in HecRAS version 4.0 by using the HEC-2 model input data (see disk with model data in the Appendix).
- The master plan channel improvements were then implemented into a water surface profile hydraulic model.
- The model results were reviewed and required bridge improvements were identified and implemented

The Bitter Creek Master Plan channel improvement alternatives are described as follows. Channel dimensions and design slope are summarized by Bitter Creek channel reach for each channel section alternative in Table 4, Table 5, Table 6, and Table 7.

Meander-Naturalized Section

The Bitter Creek channel meander is restored as much a practical and the constructed channel includes three elements: 1) a low flow channel with capacity of about 3 cfs, 2) a normal flood flow channel with capacity equivalent to approximately the 2-year flood event, and 3) a flood channel with capacity for the 100-year event. This section includes the construction of a maintenance access road above the normal (2-year) flood flow channel to reduce maintenance costs.

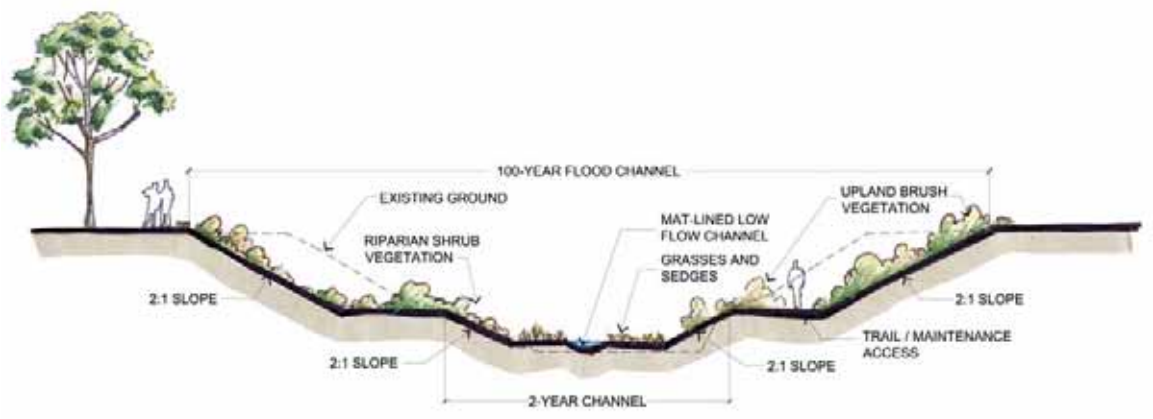


Figure 10 – Meander-Naturalized Section

Table 4 – Meander - Naturalized Section Dimensions

REACH	100-Year Flowrate (cfs)	Design Slope[1] (feet/feet)	Low Flow Bottom Width (feet)	2-year Channel Bottom Width (feet)	100-year Flood Channel Bottom Width (feet)	Vegetated Side Slopes (horizontal : vertical)
Downstream of Killpecker Creek	9,800	0.0013	1	40	102	2 H : 1 V
Between Killpecker Creek and Dead Horse Canyon Creek	7,800	0.0022 and 0.0015	1	20	62	2 H : 1 V
Upstream of Dead Horse Canyon Creek	7,800	0.0016	1	24	74	2 H : 1 V

Gabion-Naturalized Section

The Gabion-Naturalized Section includes use of a retaining structure on one side of the section for use in areas where the available space is limited. The retaining structure is represented with a gabion system, however, there are several alternative retaining systems which may be included during the preliminary design effort dependent upon specific site needs. The gabion retaining system includes a series of stacked wire baskets filled with rock. The wire should be coated to provide an increased service life. This system has been used effectively on streams with similar conditions to Bitter Creek. Alternative retaining systems for consideration during preliminary design include slope soil nailing, mechanically stabilized earth walls (such as Keystone walls), and concrete retaining walls.

[1] Design Slope is the existing average reach slope except between the Soulsby Street Footbridge and the confluence with Dead Horse Canyon Creek where the slope is flattened to 0.0015 feet per foot.

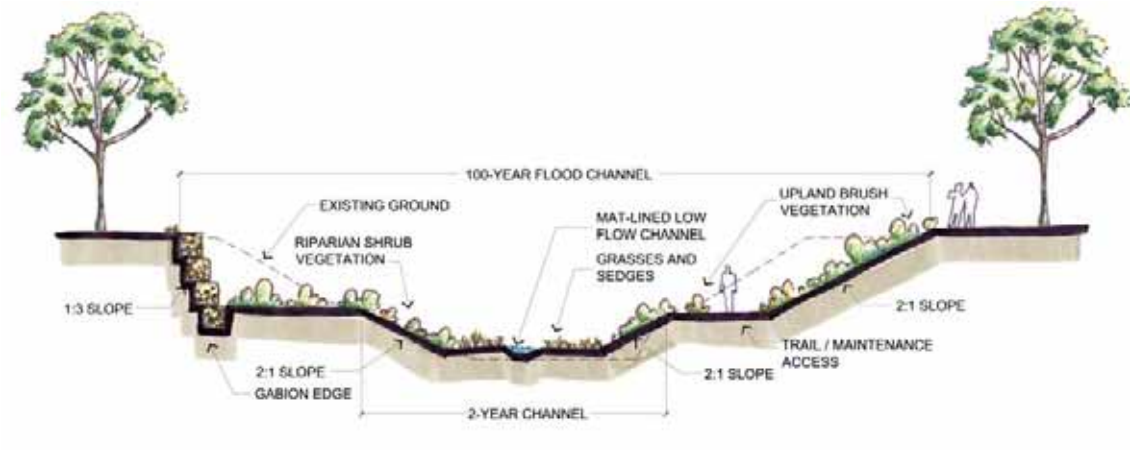


Figure 11 – Gabion-Naturalized Section

Table 5 – Gabion - Naturalized Section Dimensions (Gabion on one side)

REACH	100-Year Flowrate (cfs)	Design Slope[2] (feet/feet)	2-year Channel Bottom Width (feet)	100-year Flood Channel Bottom Width (feet)	Vegetated Side Slopes H : 1 V	Gabion Side Slopes[3] H : 1 V
Downstream of Killpecker Creek	9,800	0.0013	40	107	2	0.33
Between Killpecker Creek and Dead Horse Canyon Creek	7,800	0.0022 and 0.0015	20	68	2	0.33
Upstream of Dead Horse Canyon Creek	7,800	0.0016	24	80	2	0.33

[2] Design Slope is the existing average reach slope except between the Soulsby Street Footbridge and the confluence with Dead Horse Canyon Creek where the slope is flattened to 0.0015 feet per foot.
[3] The low flow channel bottom width is one feet with 3 horizontal to 1 vertical side slopes.

Gabion Section

The Gabion Section uses a retaining structure on both sides of the channel for areas of more restricted available space.

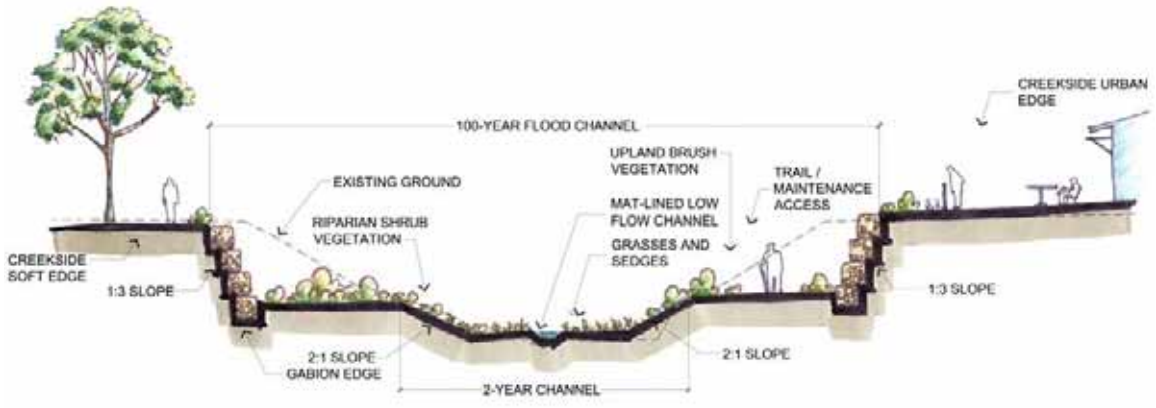


Figure 12 – Gabion Section

Table 6 – Gabion Section Dimensions

REACH	100-Year Flowrate (cfs)	Design Slope[4] (feet/feet)	2-year Channel Bottom Width (feet)	100-year Flood Channel Bottom Width (feet)	Vegetated Side Slopes H : 1 V	Gabion Side Slopes[5] H : 1 V
Downstream of Killpecker Creek	9,800	0.0013	40	112	2	0.33
Between Killpecker Creek and Dead Horse Canyon Creek	7,800	0.0022 and 0.0015	20	74	2	0.33
Upstream of Dead Horse Canyon Creek	7,800	0.0016	24	86	2	0.33

[4] Design Slope is the existing average reach slope except between the Soulsby Street Footbridge and the confluence with Dead Horse Canyon Creek where the slope is flattened to 0.0015 feet per foot.

[5] The low flow channel bottom width is one feet with 3 horizontal to 1 vertical side slopes.

Restricted Gabion Section

The Restricted Gabion Section uses a retaining structure on both side of the channel and does not have the normal (2-year) flood flow channel. This section is for areas of very limited space such as at bridge crossings. The floor can either be lined with concrete or with erosion protection matting.

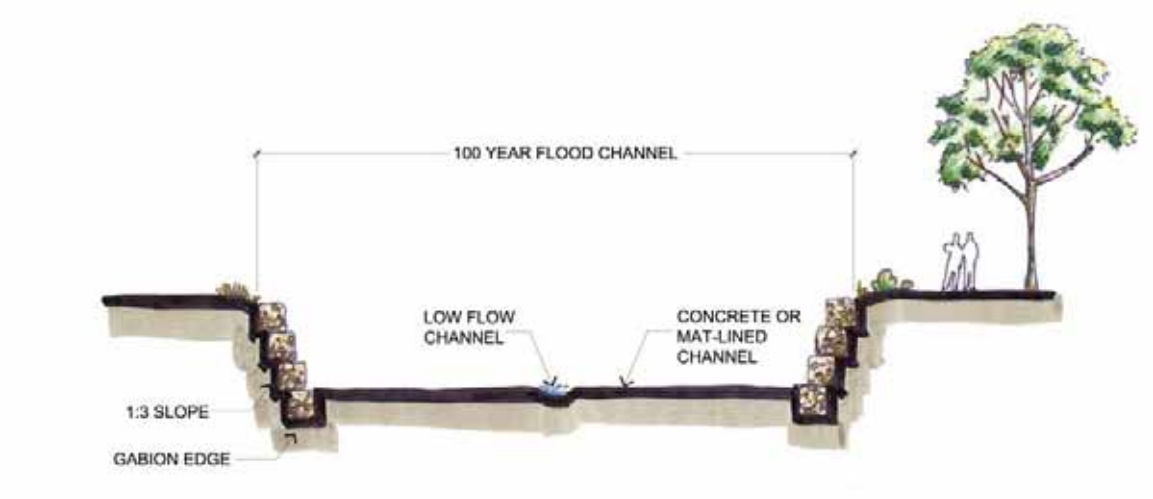


Figure 13 – Restricted Gabion Section

Table 7 – Restriction Gabion Section (No 2-year Channel)

REACH	100-Year Flowrate (cfs)	Design Slope[6] (feet/feet)	100-year Flood Channel Bottom Width (feet)	Gabion Side Slopes[7] H : 1 V
Downstream of Killpecker Creek	9,800	0.0013	82	0.33
Between Killpecker Creek and Dead Horse Canyon Creek	7,800	0.0022 and 0.0015	52	0.33
Upstream of Dead Horse Canyon Creek	7,800	0.0016	60	0.33

[6] Design Slope is the existing average reach slope except between the Soulsby Street Footbridge and the confluence with Dead Horse Canyon Creek where the slope is flattened to 0.0015 feet per foot.
[7] The low flow channel bottom width is one feet.

Master Plan improvements include the following elements.

- Bitter Creek channel improvements from below the mall to above the east South Belt Route bridge (see master plan maps for identification of channel improvements by reach).
- Adjust the Bitter Creek channel flowline by extending a channel flow line slope of 0.15% starting downstream of the Soulsby Street footbridge to just above the confluence with Dead Horse Canyon Creek (just below the sewer drop structure).
- Change the pipe crossing adjacent to the Elk Street Railroad Crossing Bridge by either raising the pipe or installing a siphon beneath the creek.
- Raise the Elk Street Bridge and the Pilot Butte Avenue Bridge low chord elevations. It may also be necessary to modify/replace the N Street Bridge depending upon the effects of the lowered channel on the bridge footings.

Greenway Improvements

Depending on the combination of options and ideas presented in Concepts 1 and 2, the extent of greenway improvements can vary from a narrowly defined, but much improved creek channel that handles the flood waters, to an enhancement that creates "sense of place" and establishes a community focus. Regardless of the exact extent of aesthetic improvements, such improvements provide opportunity for the community to embrace the creek.

The creek is a natural trail corridor which can play a major role in connecting neighborhoods and business areas throughout Rock Springs. An expanded trail system requires pedestrian crossings; thus five new pedestrian bridges are proposed. The greenway improvements inherent in Concept 1 provide opportunities to create pleasant walkways and gathering areas, planting areas for trees and adapted plant materials, benches and playgrounds, and other public facilities.

The creek channel itself should be vegetated with native plant materials adapted to local soil and climatic conditions. Using plant materials already present in the channel is a good first step in putting together a plant list of likely species that will be successful both functionally and aesthetically.

Adjacent properties will also benefit from the channel improvements and the other improvements needed to bridges and roads. Restricted and limited accesses may be improved, properties may be upgraded and renovated, visibility may be enhance to some businesses along the corridor, and new opportunities for development and redevelopment will likely begin occurring. Where new development and redevelopment occur, the creek edge can be transformed into an urban-like edge with lighting, plazas, and other public spaces.

This master plan presents broad concepts and vision; the detailed design that will follow this effort will clarify the vision and set the urban design standards that should be adhered to throughout the projects development. In the following, the concepts are described,

followed by maps which illustrate the ideas and concepts, and an opinion of probable cost.

Concept 1: Full Cooperation

South Side Belt (East) To N Street - Figure 14

The area between South Side Belt and Dead Horse Creek is either city-owned or railroad-owned, allowing between 200 feet and 400 feet of space between the existing channel and the railroad tracks. Assuming there can be agreement with the railroad, there is room to allow the creek to meander in a naturalized channel section using the Meander-Naturalized Section described earlier.

As the creek approaches Dead Horse Canyon Creek, there is an opportunity on city-owned land to realign the confluence with Dead Horse Canyon Creek and Bitter Creek to the east so that city-owned land can be incorporated into an expanded Pearl Park, including a pond fed with treated effluent currently pumped to irrigate the City Cemetery. A trail follows the channel improvements on the south side, links to Pearl Park with a pedestrian bridge over Dead Horse Canyon Creek, and continues on toward Pilot Butte Bridge and N Street.

Just east of the Dead Horse Canyon Creek realignment, a gabion or other steep slope design is needed on both sides of the channel to control flood flows. This condition persists to Pilot Butte Bridge, where it narrows, requiring the Restricted Gabion Section, and continues to N Street.

Improvements could be made to expand Pearl Street Park, add walkways and other amenities, and increase access to the trail system along Bitter Creek. Additionally, there is an opportunity to acquire property bounded by Ruby Place, Pearl Street, and Railroad Avenue to expand O'Ferrell Park. Combined these features could be beginning of a parkway along Railroad Avenue which could continue up to Elk Street.

N Street to Dewar Drive - Figure 15

At N Street, the pedestrian trail crosses the creek as part of the bridge replacement project, and meanders through the parkway along Center Street. Full parkway development requires the acquisition of private property adjacent to N Street and Elk Street. (See Appendix for detail of these areas.) The creek channel takes the form of the Gabion – Naturalized Section, which includes gabions to the south, and a graded, naturalized slope to the north.

This concept identifies the area between N Street and Elk Street as a potential redevelopment area, which could include mixed uses such as retail, housing, and expanded civic uses incorporating the existing Civic Center. Plazas, walkways, and other creek-side improvements could provide gathering and public spaces for community events and activities, and link to redevelopment along Front Street.

From Elk Street past the recycling business, the channel cross section again narrows to the Gabion Section, before opening up to the Meander – Naturalized section just past the Killpecker Creek confluence. The private property on the west side of the creek could be identified as a future park to be negotiated during the development approval process for future residential or commercial development in that area. Property acquisition will allow space for the park as well as space for the creek to meander and naturalize. (See Appendix for details of these areas.) Just after Grant Street, the Gabion – Naturalized Section is needed to transition into the Restricted Gabion Section prior to reaching Dewar Drive.

From Elk Street to Dewar, the primary trail is on the north and west sides of the creek, passing through the proposed park and the Roosevelt Learning Center. A new pedestrian bridge will be required over Killpecker Creek.

Dewar to South Side Belt (West) - Figure 16

The channel cross section remains restricted from Dewar Drive to just before Stevens Park, where it transitions into the Gabion Section which continues past the tight curve in the creek as it approaches railroad tracks just past Stevens Park. Here, there is another large section under railroad ownership that could allow the channel to meander and naturalize until it reaches the South Side Belt.

The existing sidewalk and trail in the parkway along Dewar Drive should connect to the Bitter Creek trail using a new pedestrian bridge just south of Dewar Street. The Bitter Creek trail continues on the east and south side of the river, connecting to sidewalks along South Side Belt and forming a loop at Dewar Street. Periodically, in these wider channel sections it is possible for the trail to follow the slope down to provide close interaction with the creek. The trail also passes under the South Side Belt.

South Side Belt to Sweetwater Creek - Figure 17

From South Side Belt to the confluence of Sweetwater Creek, the channel section is Gabion – Naturalized, with the gabion side protecting the bank behind Plaza Mall, and the naturalized side meandering onto city-owned property were the Dog Park is planned. This will require relocating the existing roadway serving the animal shelter to allow space for the creek channel to widen.

The trail continues on the south side of the creek, but a pedestrian bridge is proposed at the east end of Plaza Mall. It would pass through a potential park on city-owned property between the mall and South Side Belt.

Concept 1 Costs

Implementation of Concept 1 is estimated in 2007 dollars to be approximately $60 million. The costs do not include piping treated effluent water to the pond. While not included in the Opinion of Probable Cost (Table 8) for this concept, estimates for improvements to Dead Horse Canyon Creek and Killpecker Creek are recommended and have been included in the footnote on the bottom of page 30. A generous contingency is shown, as well as an estimate of cost for design and engineering.

Table 8 - Opinion of Probable Cost – Concept l

DESCRIPTION	QUANTITY	UNIT	COST	TOTAL
Channel Cross Sections (including trails)				
Meander-Naturalized Section	6,100	L.F.	$656	$4,001,600
Gabion-Naturalized Section	4,750	L.F.	$1,876	$8,911,000
Gabion Section	4,000	L.F.	$3,042	$12,168,000
Restricted Gabion Section	2,050	L.F.	$3,806	$7,802,300
Total l.f.	*16,900*			
New Pedestrian Bridges	5	Each	$81,120	$405,600
Vehicular Bridge Replacements	3	Each	$2,200,000	$6,600,000
Additional Trails	1,500	L.F.	$30	$45,000
Pipe Crossings - up to 12" Dia.	8	Each	$30,000	$240,000
Pipe Crossings - 20" water with 30" casing	1	Each	$50,000	$50,000
Culverts into channel-reconstruct pipe drop	39	Each	$3,000	$117,000
Pond	140,000	S.F.	$15	$2,100,000
Clean-up	16,900	L.F.	$100	$1,690,000
Property Acquisition	13	AC.	$100,000	$1,300,000
Property Development - Parkway	13	AC.	$80,000	$1,040,000
Road Relocation	1,000	L.F.	$150	$150,000
Total				$46,620,500
Contingency at 20%				$9,324,100
Design and Engineering at 8%				$3,729,640
TOTAL ESTIMATED COST[8]				$59,674,240

[8] The total estimated cost does not include the cost of bringing effluent water to the pond. The addition of 2007 project cost estimates for the recommended improvements to Dead Horse Canyon Creek ($1,193,000) and Killpecker Creek ($4,241,000) bring the total estimated cost to $65,108,240. See page 6 for additional information.

Bitter Creek

Reconstruction Plan & Design

Concept 1: Full Cooperation

Reconstruction Features

- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

1. Meander-Naturalized Section

3. Gabion Section

4. Restricted Gabion Section

Figure 14: So. Side Belt (East) to N Street

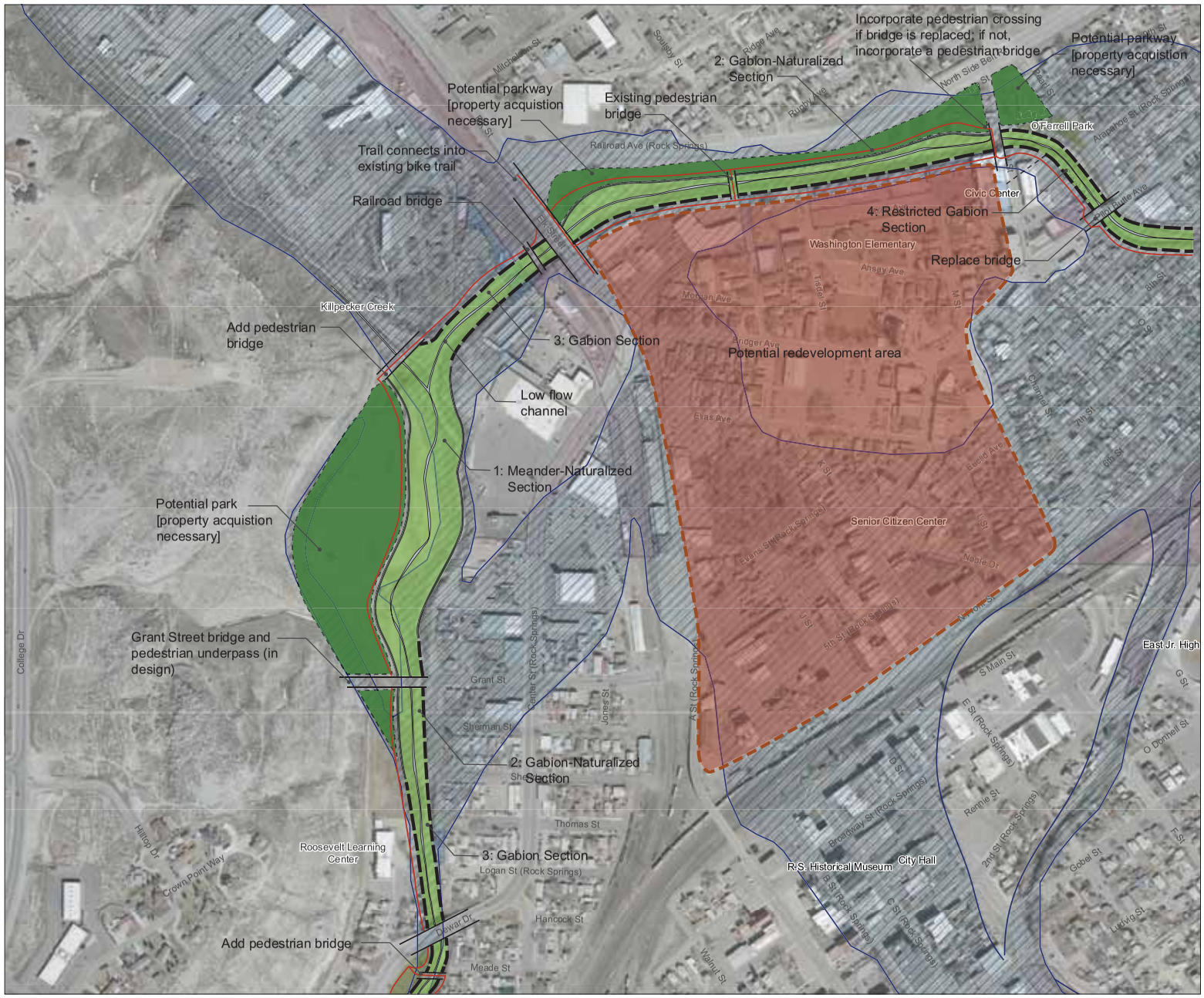
ROCK SPRINGS

HANSEN ALLEN & LUCE

Bitter Creek

Reconstruction Plan & Design

Concept 1: Full Cooperation


Incorporate pedestrian crossing if bridge is replaced; if not, incorporate a pedestrian bridge
Potential parkway [property acquistion necessary]
2: Gabion-Naturalized Section
Potential parkway [property acquistion necessary]
Existing pedestrian bridge
Trail connects into existing bike trail
Railroad bridge
Railroad Ave (Rock Springs)
O'Ferrell Park
Civic Center
4: Restricted Gabion Section
Washington Elementary
Replace bridge
Potential redevelopment area
Add pedestrian bridge
Killpecker Creek
3: Gabion Section
Low flow channel
1: Meander-Naturalized Section
Potential park [property acquistion necessary]
Senior Citizen Center
Grant Street bridge and pedestrian underpass (in design)
East Jr. High
2: Gabion-Naturalized Section
Roosevelt Learning Center
3: Gabion Section
Logan St (Rock Springs)
R-S Historical Museum
City Hall
Add pedestrian bridge
Dewar Dr
Meade St
Hancock St
Thomas St
Sherman St
Grant St
College Dr
Crown Point Way
Hilltop Dr
Walnut St
Gobel St
Rennie St
S Main St
O Donnell St
Elk Street
Morgan Ave
Ansay Ave
Elias Ave
Bridger Ave
Eberd Ave
Nolte Dr
Trudel St
Jones St
Center St (Rock Springs)
A St (Rock Springs)
B St (Rock Springs)
C St (Rock Springs)
D St
E St
F St (Rock Springs)
G St
K St
M St
O St
Broadway St (Rock Springs)
2nd St (Rock Springs)
6th St (Rock Springs)
Evans St (Rock Springs)
Alcova Ave
Alcova Blvd
Alcova Pl
Alcova Ct
Alcova Cir
Alcova Way
Alcova Ln
Alcova Trl
Alcova Pkwy
Alcova Sq
Alcova Plz
Alcova Ter
Alcova Aly
Alcova Rd
Alcova Dr

Bitter Creek

Reconstruction Plan & Design

Concept 1: Full Cooperation

Reconstruction Features

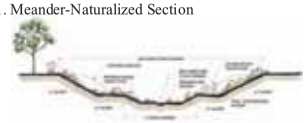
- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

1. Meander-Naturalized Section



3. Gabion Section

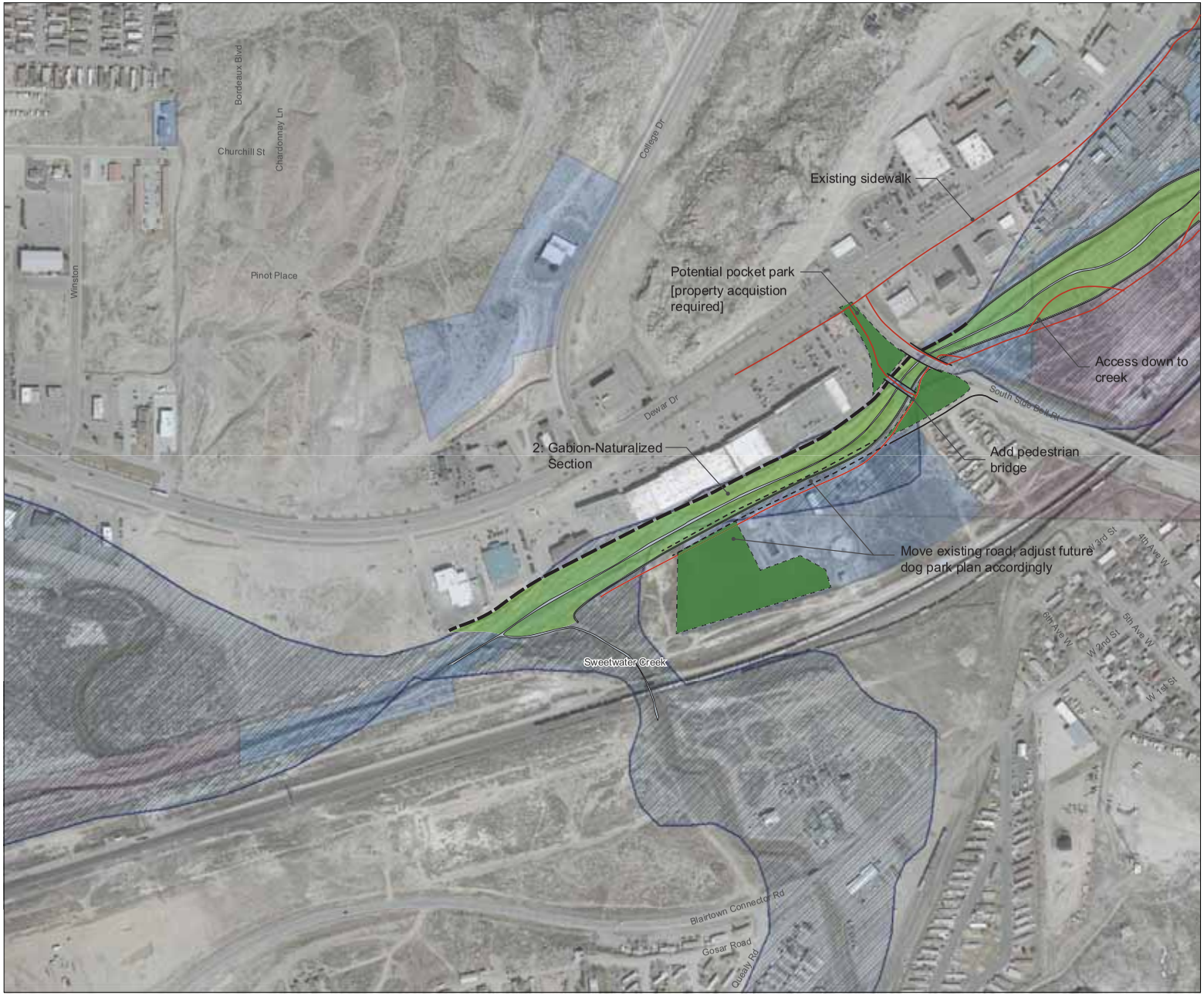
4. Restricted Gabion Section

Figure 16: Dewar to So. Side Belt (West)

Bitter Creek

Reconstruction Plan & Design

Concept 1: Full Cooperation



Reconstruction Features

- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

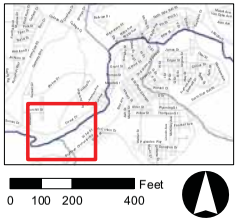
Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

2. Gabion-Naturalized Section

Figure 17: So. Side Belt to Sweetwater Creek



ROCK SPRINGS

HANSEN ALLEN & LUCE

Concept 2: Limited Cooperation

South Side Belt (East) to N Street - Figure 18
This section is the same as Concept 1 except that the creek channel does not meander through the railroad-owned property; rather, it maintains a naturalized section but does so in a much narrower space. This option is available if it is not possible to negotiate an agreement with the railroad to utilize more of their property to accommodate meandering the creek.

Additionally, there is no pond in this concept; rather the property is used to make other improvements to Pearl Park including open play fields, picnic areas, and other park elements.

N Street to Dewar Drive - Figure 19
This concept assumes that the Center Street parkway remains as it is without expansion onto private property between N Street and Elk Street. It will be necessary to install more gabions in this section to protect private property, thus the channel section through this area is narrower than in Concept 1. Though the redevelopment area is not indicated in this concept, it is still a possibility.

The park south of the Killpecker Creek confluence suggested in Concept 1 is not included in Concept 2. Rather, this concept requires gabions on the east side of the creek and shows a narrower channel section. Trails are the same as those discussed in Concept 1.

Dewar to South Side Belt (West) - Figure 20
This concept is the same as Concept 1, except that the meandering channel section is not shown and a more confined, though still naturalized section, is substituted. Again, this assumes that agreement cannot be reached with the railroad to accommodate the space needed to allow the creek a meandering cross section.

South Side Belt to Sweetwater Creek – Figure 21
In this concept, the Gabion Section is utilized so there are gabions on both side of the creek to protect development at Plaza Mall, to eliminate the removal of the berm/dike, and to relocate the existing roadway serving the animal shelter and new Dog Park. The small park between the mall and South Side Belt is also not included.

Concept 2 Costs
Implementation of Concept 2 is estimated in 2007 dollars to be approximately $64 million. While not included in the Opinion of Probable Cost (Table 8) for this concept, estimates for improvements to Dead Horse Canyon Creek and Killpecker Creek are recommended and have been included in the footnote on the bottom of page 36. A generous contingency is shown, as well as an estimate of cost for design and engineering.

For purposes of budgeting improvements to Bitter Creek at this point in the process, and until more detailed design is completed, a figure between $60 and $65 million dollars is recommended.

Table 9 - Opinion of Probable Costs – Concept 2

DESCRIPTION	QUANTITY	UNIT	COST	TOTAL
Channel Cross Sections (including trails)				
Meander-Naturalized Section	4350	L.F.	$656	$2,853,600
Gabion-Naturalized Section	3550	L.F.	$1,876	$6,659,800
Gabion Section	5600	L.F.	$3,042	$17,035,200
Restricted Gabion Section	4200	L.F.	$3,806	$15,985,200
Total L.F.	*17700*			
New Pedestrian Bridges	5	Each	$81,120	$405,600
Vehicular Bridge Replacements	3	Each	$2,200,000	$6,600,000
Additional Trails	1500	L.F.	$30	$45,000
Pipe Crossings - up to 12" Dia.	8	Each	$30,000	$240,000
Pipe Crossings - 20" water with 30" casing	1	Each	$50,000	$50,000
Culverts into channel-reconstruct pipe drop	39	Each	$3,000	$117,000
				$0
Park Improvements	140000	S.F.	$5	$700,000
Clean-up	16900	L.F.	$100	$1,690,000
Total				$49,527,800
Contingency at 20%				$9,905,560
Design and Engineering at 8%				$3,962,224
TOTAL ESTIMATED COST[9]				$63,395,584

[9] The addition of 2007 project cost estimates for the recommended improvements to Dead Horse Canyon Creek ($1,193,000) and Killpecker Creek ($4,241,000) bring the total estimated cost to $68,829,584. See page 6 for additional information.

Bitter Creek

Reconstruction Plan & Design

Concept 2: Limited Cooperation

Reconstruction Features

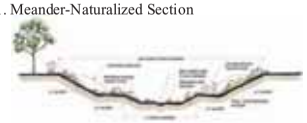
- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

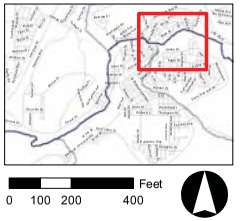
1. Meander-Naturalized Section



3. Gabion Section

4. Restricted Gabion Section

Figure 18: So. Side Belt (East) to N Street



Bitter Creek

Reconstruction Plan & Design

Concept 2: Limited Cooperation

Reconstruction Features

- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

2. Gabion-Naturalized Section

3. Gabion Section

4. Restricted Gabion Section

Figure 19: N Street to Dewar Drive

Bitter Creek

Reconstruction Plan & Design

Concept 2: Limited Cooperation

Reconstruction Features

- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

1. Meander-Naturalized Section

4. Restricted Gabion Section

Figure 20: Dewar to So. Side Belt (West)

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Bitter Creek

Reconstruction Plan & Design

Concept 2: Limited Cooperation

Reconstruction Features

- Low flow channel
- Proposed trail
- Gabion wall
- Naturalized channel edge
- Proposed green space
- Floodplain after reconstruction

Existing Conditions

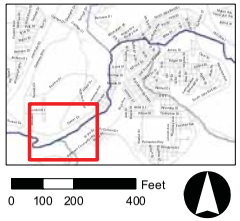
- Existing green space
- 100-year floodplain (FEMA/AE category)
- Public ownership
- Quasi-public ownership

Channel Alternatives:

2. Gabion-Naturalized Section

3. Gabion Section

Figure 21: So. Side Belt to Sweetwater Creek



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5. Proposed Phasing

Currently the existing effective FEMA water surface profile hydraulic model includes a significant spill due to overtopping the dike upstream of Pilot Butte Avenue Bridge resulting in flooding of the historic downtown area. Flood waters would rejoin with Bitter Creek below the confluence with Killpecker Creek. The priority of construction should proceed such that areas downstream or upstream of the creek reconstruction are not adversely affected. For example, if channel and bridge improvements are made in the vicinity of the Pilot Butte Avenue Bridge before improvements are made to the Elk Street Bridge, then there is a risk of increased flooding upstream of the Elk Street Bridge. Following is a suggested schedule for design and construction.

1. Survey existing channel conditions and channel flow line throughout the study reach. Provide survey of channel cross sections at hydraulic modeling sections. Complete a soils and geotechnical investigation. The soils investigation should include identification of re-vegetation limitations and soils suitability for topsoil. The geotechnical investigation should include an assessment of the stability of the existing channel side slopes and recommendations for stable sections.
2. Prepare a preliminary plan and Conditional Letter of Map Revision submittal to FEMA for the study area. Receiving a conditional letter of map revision from FEMA will help assure that when the project is completed the primary goal of removing developed areas in the study area from the 100-year flood plain is achieved.
3. Design and construct the channel improvements in the lower reach adjacent to the Plaza Mall up to the west South Side Belt Bridge. If need be, improvements to this reach may be delayed and completed at anytime during the Rock Springs Bitter Creek channel modification efforts.
4. Change the pipe crossing adjacent to the Elk Street Railroad Crossing Bridge by either raising the pipe or installing a siphon beneath the creek.
5. Replace the Elk Street Bridge.
6. Replace the Pilot Butte Avenue Bridge.
7. Improve the channel from Grant Street Bridge to just below the Soulsby Street footbridge.
8. Improve the channel from Soulsby Street footbridge to below the sewer drop above the confluence with Dead Horse Creek. This will include re-grading the channel flow line to about a 0.15 % grade resulting in lowering the channel nearly two feet above Pilot Butte Street Bridge. Construct a grade control structure downstream of the existing sewer crossing (located just upstream of the confluence with Dead Horse Canyon Creek).
9. Construct the park improvements and the pond, and realign the confluence of Dead Horse Canyon Creek and Bitter Creek.
10. Improve the channel between the west South Side Belt Bridge and Dewar Street. If desired, these improvements could be completed anytime after the completion of the channel improvements below the west South Side Belt (item 3 above).
11. Construct the channel improvements between the east South Side Belt Bridge and the confluence with Dead Horse Canyon Creek.

12. Document the construction and submit record drawings and Letter of Map Revision submittal to FEMA for approval to remove the developments in the study area from the 100-year floodplain.

Channel improvements and access ramps should be designed and constructed in such a manner as to minimize maintenance costs. Most of the proposed channel cross sections include a trail system which should be designed to carry heavy equipment on occasion during maintenance efforts. It is further recommended that the City participate in regional planning and watershed improvement efforts.

Phasing Improvements to Dead Horse Canyon Creek and Killpecker Creek

The proposed improvements to Bitter Creek include capacity for flood flows from Dead Horse Canyon Creek and Killpecker Creek. However, as mentioned previously, flood control improvements are needed to Dead Horse Canyon Creek and to Killpecker Creek in order to remove areas of the City flooded by these creeks from the regulated flood plain. In particular, a large portion of downtown Rock Springs is affected by flooding from Dead Horse Canyon Creek (see Figure 5, City of Rock Springs Flood Insurance Rate Map).

The flood control improvements to Dead Horse Canyon Creek and Killpecker Creek may be completed independently from the Bitter Creek improvements. However, the full benefits of the improvements to the creek flood control systems will not be realized until the improvements are completed to all three creeks.

6. Implementation Strategies

Development Review Process

When new development or redevelopment is proposed, trails and other improvements to Bitter Creek that are shown in the master plan may be negotiated with developers and land owners. As part of the development approval process, trail easements, easements associated with desired improvements to channel conditions, and other desired improvements should be shown on documents submitted for development approval. As a condition of approval, some improvements could be required rather than simply accommodated for as with an easement. Trails in particular are a frequent public improvement required by municipalities as part of the approval process.

The dedication of land for parks has long been an accepted development requirement and is another valuable tool for implementing parks and greenways. The City can require the dedication of park land and/or park development.

Easements or Acquisition

As mentioned above, easement may be required for development approval. Easements simply allow the space needed to make improvements and does not require the exchange of property. Easements are recorded on the property deed and would remain so if the property were sold.

Acquiring property is another means of assuring that public improvements are accommodated; however, the purchase of land is often costly. In some instances, it may not be possible to acquire easements, and property acquisition is the only means of implementing the project.

Urban Renewal Agency

The existing designated Urban Renewal District boundary encompasses nearly all of the area of focus and enables the specific powers of the Urban Renewal Agency to be applied to projects within the boundary. These include the ability to acquire, hold and transfer property, as well as the ability to initiate powers of eminent domain. The City of Rock Springs has the final decision regarding eminent domain and is strongly committed to using a willing buyer/willing seller approach. The Urban Renewal Agency has a policy to work with land owners.

7. Funding Opportunities

Aside from raising taxes or some sort of special assessment, there are a range of funding options and opportunities to be explored. Public funding is much more difficult to obtain in 2007, and many programs are either not being funded or have been substantially reduced by either Federal or State agencies. Money from foundations and other philanthropic organizations and groups is also difficult to acquire, in part because available funds are highly sought-after and very competitive. Nevertheless, there are sources and they should be explored to the fullest.

State and Federal Programs

The availability of these funds may change annually depending on budget allocations at the state of federal level. It is important to check with local representatives and administering agencies to find out the current status of funding. Many of these programs are funded by the Federal government and administered by local State agencies.

SAFETEA-LU – Transportation Enhancement Grants
In 2005, Congress passed and the President signed the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). SAFETEA-LU establishes federal transportation policy and funding for five years. It continues programs, including transportation enhancements and recreation trails, and creates new ones, such as Safe Routes to Schools.

Recreation Trails were funded at $70 million in 2006, rising to $85 million in 2009. Transportation Enhancements are funded at 3.5 billion over five years beginning in 2005. Three eligible activities include bicycle, pedestrian or shared use physical facilities; conversion of abandoned railroad corridors for trails; and safety and education programs for pedestrians and bicyclists.

Wyoming generally receives about $3 million to use for TEAL and TEAS projects. A local match is required to use Wyoming's TEAL or TEAS funds.

- TEAL (Transportation Enhancement Activities – Local) funds are used for project that are sponsored by local entities and generally located off or away from the State Highway System. The application process is administered through the Wyoming Department of Transportation (WYDOT) and funds are awarded annually. The application is generally available in April-May and is due the end of June from the WYDOT Local Government Coordinator.

- TEAS (Transportation Enhancement Activities – State) funds are used for projects located on or adjacent to the State Highway System. It includes pathways that are along state highways or on city streets that are under WYDOT administration. These funds are administered through the local WYDOT District Engineer and can be applied for at any time of the year through a Letter of Project Request to the district office.

- Safe Routes To School is funded nationally at $100 million in 2006, rising to $183 million in 2009. Wyoming typically receives about $800,000. These funds are available for planning, design, and construction of infrastructure related to projects that improve bicycle and pedestrian safety between residential neighborhoods and elementary and middle schools. Funds may also be used for public education programs, bicycle safety classes, and other programs that encourage bicycling and walking to middle and elementary schools.

Abandoned Mine Lands (AML) Funds

In 2006 President Bush signed an amendment to the Surface Mining Control and Reclamation Act of 1977 (SMCRA) which extended the AML program for 15 years, and also provides for Wyoming to receive funds collected but not returned to the state since enactment of SMCRA. A total of $518 million will be disbursed to Wyoming in seven equal annual payments beginning in federal fiscal year 2008 ($74 million per year). The law states that the funds are to be used for "purposes established by the state legislature with priority given to addressing the impacts of mineral development."

In addition to the prior balance funds mentioned above, the law requires payments to Wyoming equivalent to 50 percent of reclamation fees collected from future coal production. These future "in lieu" payments are estimated to be $109 million in 2008, decreasing to about $69 million in 2015. The AML Program is one of five divisions of the Wyoming Department of Environmental Quality, whose mission is to eliminate safety hazards and repair environmental damage from past mining activities, and to assist communities impacted by mining. The Wyoming State Legislature will decide how disbursements are used.

Wyoming Water Development Commission (WWDC)

The Commission administers programs that provide financial and technical assistance to

municipalities, irrigation districts, or other approved assessment districts. Funding is in the form of grants and low-interest loans or a combination of both (67 percent grant, 33 percent loan), and can be used to develop basin-wide plans and specific master plans, to prepare the necessary documents to acquire federal funding, and for groundwater programs. Their highest priority project are multi-purpose, where several functions may be provided such as agriculture, municipal, industrial, rural domestic, recreation, environmental, flood control, erosion control, and hydropower. Funds are allocated annually following review of applications that are due on August 15th of each year. Recommended projects must be approved by the Legislature and the Governor.

Urban Parks and Recreation Recovery Program (UPARR)

This program, administered by the National Park Service, provides grants for the rehabilitation and enhancement of existing parks and recreation areas in communities. The program provides matching funds and technical assistance to economically distressed urban communities for the rehabilitation of critically needed recreation facilities. Although economically distressed communities are targeted, funds have been used in local communities that do not necessary meet the criteria. It is important to check with the agency and determine eligibility and funding levels.

It also encourages local funding and commitment to the operations and maintenance of recreation programs, sites, and facilities. Three types of programs are available. Rehabilitation Grants are used for remodeling, rebuilding, or expanding existing outdoor or indoor recreation areas. Innovation Grants are for projects that demonstrate innovative and cost-effective ways to enhance park and recreation opportunities. Planning Grants provide funds for the development of a Recovery Action Plan, which must be on file with the National Park Service in order to receive funds.

Land and Water Conservation Fund

This Federal money is administered by the National Park Service and is made available to States; in Wyoming the program is administered by Wyoming State Parks and Cultural Resources. Funds are matched with local funds for acquisition of park and recreation lands, redevelopment of older recreation facilities, trails, improvements to accessibility, and other recreation programs and facilities that provide close-to-home recreation opportunities for youth, adults, senior citizens, and persons with physical and mental disabilities. Grant applications are due on January 30 of each year, with final approval by May 1 of each year.

Federal Recreational Trails Program

The Wyoming Department of State Parks and Cultural Resources – Division of State Parks, and Historic Sites/Trails Program (SPCR/TP) administers these Federal Highway Administration funds. The funds are available for motorized and non-motorized trail development and maintenance projects, educational programs to promote trail safety, and trail related environmental protection projects. A 20 percent local match is required. In 2007 the allocation for Wyoming was just over $1 million; the 2008 allocation is expected to be slightly higher. The minimum grant amount is $2,500 for trails development; maximum for non-motorized trails is $50,000.

Wyoming Wildlife and Natural Resource Trust
Funds are available for projects that preserve and enhance Wyoming's wildlife and natural resources. Eligible projects include those that enhance wildlife habitat, preserve open space, maintain and improve aquatic habitats and watershed enhancements, and mitigation of impacts detrimental to wildlife. Applications are due March 31 and September 30 annually, and projects are approved in July and January.

Local and Private Funds
These are less likely to be used for large-scale projects, but can be very helpful for smaller, specific and targeted projects. These sources are most-likely appropriate for the development of the trail along Bitter Creek and improvements to parks and greenways adjacent to the creek corridor.

Private and Public Partnerships
Partnering with a private developer or other government or quasi-government agency may often result in projects that service the public, yet are also attractive to an entrepreneur or another partner. These partnerships can be effective funding opportunities for special use sports facilities like baseball complexes or soccer complexes; however, they generally are not feasible when the objective is to develop neighborhood and community parks that provide facilities such as playgrounds, informal playing fields, and other recreational opportunities that are generally available to the public free of charge. A recreation center, community center, or swimming/water park is also potentially attractive as a private or public partnership.

Private Fundraising
While not addressed as a specific strategy for individual facilities, it is not uncommon for public monies to be leveraged with private donations. Private funds will most likely be attracted to high-profile facilities such as a swimming complex or sports complex, and generally require aggressive promotion and management on behalf of the park and recreation department or city administration.

Service Organization Partners
Many service organizations and corporations have funds available for park and recreation facilities. Local Rotary Clubs, Lions Clubs, Kiwanis Clubs, and other service organization often combine resources to develop park and recreation facilities. Other for-profit organizations such as Home Depot and Lowes are often willing to partner with local communities in the development of playground and other park and recreation equipment and facilities. Again, the key is a motivated individual or group who can garner the support and funding desired.

Joint Development Partnerships
Joint development opportunities may also occur between municipalities and among agencies or departments within a municipality. Cooperative relationships between cities and counties are not uncommon, nor are partnerships between cities and school districts. Often, small cities in a region are able to cooperative and pool resources for recreation projects.

There may be other opportunities as well which should be explored whenever possible in order to maximize recreation opportunities and minimize costs. In order to make these kinds of opportunities happen, there must be on-going and constant communication between people, governments, business interests, and others.

Park and Recreation Impact Fees

Impact fees can be used by communities to offset the cost of public parks and facilities needed to serve future residents and new development. Impact fees are especially useful in areas of rapid growth. They help the community to maintain a specified level of service as new development puts strain on existing facilities. It assures that new development pays its fair share to maintain quality of life expectations for its residents.

City Funding - General Fund or Bonding

The City can fund parks directly from its general fund or can bond for park development and spread the cost over many years. Bonding is a very common approach, where repayment of the bonds comes from general city revenue sources such as property and sales tax, or other earmarked tax revenue. Bonding associated with plan implementation should be kept as low as possible; however, for large developments such as sports complexes, swimming/water park complexes, large land acquisition priorities, or the one-time creation of multiple park projects, bonding is likely to be the best option.

Special Taxes

Tax revenue collected for special purposes may be earmarked for park development. There are examples of cities that have acted to earmark room taxes applied to hotel and motel rooms in the city for parks, recreation, and trails development. And, examples of counties that have initiated **Z**oo **A**rts and **P**arks (ZAP) taxes or **R**ecreation **A**rts and **P**arks (RAP) taxes that are voted and approved by residents and earmarked.

Community Development Block Grants

Community Development Block Grants (CDBG) can be used for park development in areas of the City that qualify as low and moderate income areas. CDBG funds may be used to upgrade parks, purchase new park equipment, and improve accessibility (Americans With Disabilities Act). Additionally, CDBG funds may be used for projects that remove barriers to access for the elderly and for persons with severe disabilities.

Urban Renewal Agency Funds

The URA has ongoing fundraising options and community partnerships available to this effort ranging from working with the economic development agencies to foundations to raise money targeted to specific projects. The URA Board of Directors is fully committed to this project and to incorporating elements of the Bitter Creek Master Plan into redevelopment projects undertaken downtown, including Rock Springs Main Street program activities as well as ongoing branding efforts being driven by the Destination Development, Inc. master plan completed in late 2007.

In-Kind and Donated Services or Funds

Several options for local initiatives are possible to further the implementation of the parks, recreation, and trails plan. These kinds of programs would require the City to implement a proactive recruiting initiative to generate interest and sponsorship, and may include:

- Adopt a park or trail, whereby a service organization or group either raises funds or constructs a given facility with in-kind services;
- Corporate sponsorships, whereby businesses or large corporations provide funding for a particular facility, similar to adopt-a–trail or adopt-a-park;
- Public trail and park facility construction programs, in which local citizens donate their time and effort to trail and park

Appendix

A. Summary of Public Scoping Meeting Comment

B. Summary of Draft Plan Open House Comments

C. Alternative 2 – Property Acquisition Detailed Area Maps

D. Hydrologic Data (CD provided)

A.

Rock Springs Bitter Creek Reclamation Planning and Design
Public Scoping Meeting Notes

Held: 6:30 p.m. July 16, 2007
Western Wyoming Community College
Attending: 20 persons signed-in.

Notes recorded on flip-chart.

- Pilot Butte Bridge is a problem and needs to be raised.
- Preserve the vegetation; it helps control flood waters.
- The creek through Rock Springs is a small segment of a larger watershed – work needs to be done at the watershed level to prevent increased flow/sediment.
- The creek is on the 303D list of impaired waters; it's undesirable for people to come into contact with it.
- Money would be better spent on connecting bike paths in the city.
- Solving the broader problems will need partnerships, such as the Water Conservancy group.
- Bridges are pinch-points.
- Important to address flooding in the plan.
- Important to have a constant flow in the creek.
- Will ponds/lakes be included as an aesthetic element?
- Need to address East Flat storm drainage issues.
- There will be continued maintenance – cleaning out storm event sediments.
- Use vegetation as buffering; slowing water, etc. See the Salt Wells Creek plan as an example.
- A variety of low-flow channel materials will be investigated.
- Beavers create dams and they take out trees. Should they be allowed to remain?
- The channel cross-sections shown could be modified to include an armed slope on one side and a natural slope/meander on the others.
- Wherever it is possible to meander, it should.

Comments submitted on comment forms (three submitted).

1. **a.** Remove it from the 303D list. Stabilize the drop below Perotto ditch. Build the riparian sponge. Use the entire length of the channel, not just the portion through town.
b. Fix the creek before you invest money on a green belt. Beaver – what will happen when they move in?
c. Short term goal, consider connecting the bike paths to make a safe loop. The creek will take long enough to heal that people will forget. The bike path will be used all this time.

2. My concern is the flood plain. Widen the bridge at Pilot Butte.

3. It would be important to look at entire watershed or anything done within the city will repeatedly be destroyed by flood events.
a. First, deal with the fecal coliform issue.
b. Consider existing studies and plans, and coordinate with conservation district advisory group for Bitter Creek/Killpecker Creek.

B.

Rock Springs Bitter Creek Reclamation Planning and Design

Draft Plan Open House **6:00 p.m. August 27, 2007**
White Mountain Library

10 persons signed-in, plus Steering Committee Members in attendance.

Comments made during the meeting and recorded on charts.

- Improve Billy Drive at the same time the parkway is developed.
- There is much distrust of FEMA and COE. Too much bad history, and where will the money come from to make the improvements?
- Put concrete in the low flow channel to make it easier to clean.
- All vegetation is good to have, so protect what can be protected and revegetated.
- How will hazardous waste be addressed?
- There is money available from AML (Abandoned Mines and Lands) and from the Water Commission.
- Maintenance is a major concern and needs to be addressed in the plan.

Notes received on Comment Forms

- Save money, save effort – consider the entire watershed.
  This plan lack sufficient teeth. You have the "lets put this stuff in the creek option", but you lack the "look at the watershed option" or the "look at the watershed and put this stuff in the creek option".

  To reduce the impacts to the floodplain and make things better looking, work with the flow by reducing the high flows and prolonging the low flows you are making the creek more livable and easier to maintain.

  Lowering the main channel will change the contributing channels.

  Changing the flow channel flows will change the flood plain.

  Prolonging the low flow will reduce the amount of water that needs to be pumped.

- I think Dennis is correct about the sediment upstream. If that is not addressed now…the rest of this plan is purely cosmetic.

  I think the watershed issue needs to be addressed now.

  The project for Bitter Creek now is nice, I don't feel it's enough to solve the flooding problem however,

  Thank you for your hard work on this project. Good luck.

- Because of the great amount of sediment, it might be most practical to widen and deepen the creek bed with gabions on the sides and matting along the bottom for the whole length of the channel. Then any trails, parks, trees, or other aesthetic improvements

could be above the 100 year flood level and thus never be damaged. The creek channel itself would have natural vegetation on its bottom growing through the matting, thus adding some aesthetic value, but the key thing is that it could be easily dredged.

- Partnerships to address upstream flow and sediment are vital to the success of the product.

  Great planning! I am so excited about the project. Should have been done years ago.

C.

Parkway East Properties

Parkway West Properties

Large Park Properties

Appendix 2

Levee Accreditation Feasibility Assessment

HANSEN ALLEN & LUCE inc
ENGINEERS

Memorandum

DATE: March 3, 2009
TO: Jan Striefel, FASLA, AICP, LLA; Landmark Design
FROM: Greg Poole, P.E.
PROJECT: Rock Springs - Bitter Creek
TOPIC: **LEVEE ACCREDITATION FEASIBILITY ASSESSMENT**
PROJECT NO.: 344.02.200

The levee located along the south side of Bitter Creek between Pilot Butte Bridge and the confluence with Dead Horse Canyon Creek is not accredited and as a result is not recognized by FEMA as reducing the flood hazard.

FEMA's levee accreditation requirements are found in 44 CFR Section 65.10. The requirements are also summarized in "Meeting the Criteria for Accrediting Levee Systems on NFIP Flood Maps How-to-Guide for Floodplain Managers and Engineers" (FEMA, November 2008).

ANALYSIS

It is assumed with the levee alternative that channel conveyance improvements would not be performed and that the additional flood protection needed to protect the east flat area (the area south of Bitter Creek and west of Dead Horse Canyon Creek) from flooding from Bitter Creek would be provided by a levee along the south side of Bitter Creek. Flooding on the north side of Bitter Creek is not addressed.

The accreditation requirements are presented as summarized in the FEMA publication (italicized) followed by assessment comments related to implementation.

1. ***Freeboard.*** *Minimum freeboard required 3 feet above the Base Flood Elevation (BFE) all along length, and an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted. Additional 0.5 foot at the upstream end of a levee.*

    a. Using the existing effective flood profile model, the predicted 100-year flood elevation (the BFE) between Pilot Butte Bridge and the confluence with Dead Horse Canyon Creek varies from 6257 feet to about 6257.4 feet. The existing levee elevation varies between about 6256 feet and 6257 feet. Therefore the existing levee

would need to be raised a minimum of three feet too accomodate the required freeboard.

b. The upstream end of the levee would need to be extended following the west bank of Dead Horse Canyon Creek until the existing ground elevation is 3.5 feet above the BFE. This would require the levee to be extended about 900 feet along what is presently Front Street. Front Street and homes fronting on Front Street in this area would likely need to be moved to allow construction of the dike.

c. The Pilot Butte Bridge, road approaches, and the levee for 100 feet each side of the bridge would also need to be raised about five feet in order to provide the required freeboard (4 feet above BFE).

d. A levee would need to be constructed between N Street Bridge and Pilot Butte Bridge with a top of the levee about 6259 (about six feet higher than the existing top of bank).

e. N Street Bridge, road approaches, and the levee for 100 feet each side of the bridge would need to be raised to 6260 upstream of the bridge and 6259 downstream of the bridge (about four to six feet higher than existing conditions).

f. A levee would need to be constructed between N Street Bridge and the Soulsby Street Foot Bridge with the top of the levee about 6257 (about seven feet higher than the existing top of bank elevation).

g. Soulsby Street Foot Bridge and the levee for 100 feet each side of the bridge would need to be raised to about 6258 (about eight feet higher than existing conditions).

h. A levee would need to be constructed between the Soulsby Street Foot Bridge and Elk Street Bridge with the top of the levee about 6257 (about nine feet higher than existing top of bank elevation).

2. ***Closures.*** *All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.*

   a. The storm drainage system serving the area protected by the levee will need to be designed to provide for drainage to Bitter Creek through closure devices (gates) which provide protection from Bitter Creek flooding.

3. ***Embankment Protection****. Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.*

a. The levee will require engineering analysis and design to provide erosion protection. The existing levee toe upstream of Pilot Butte Bridge appears to be well protected with the rock wall. However, the existing channel downstream of Pilot Butte Bridge is not consistently protected and will likely require construction of toe protection as part of the re-construction of the levee (see Item 1 d through h above).

4. ***Embankment and Foundation Stability Analyses.*** *Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (USACE) Engineer Manual 1110–2–1913, Design and Construction of Levees, (Chapter 6, Section II), may be used*.

a. Analysis of the levee stability must be performed and submitted. This analysis will have to include seepage analysis.
b. Collection of adequate geotechnical information for the analysis is hampered by the existing old levee which appears to be made of various materials (block, treated timbers, cable, etc.). Perhaps, what will be required is the excavation of the levee and foundation with a large track hoe at key locations.
c. Experience with other similar levees has found that it is often impractical to get accreditation for an existing levee where existing foundation and embankment materials are not documented. Often the solution has been to construct a new levee behind the existing levee. Whether or not the levee can be constructed in the same place as the existing levee, the new levee would likely encroach on the existing park which affects federal funding (4F issue).

5. ***Settlement Analyses.*** *Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110–1–1904, Soil Mechanics Design— Settlement Analysis, must be submitted.*

a. Geotechincal analysis of the foundation will have to be performed to predict future settlement with the higher levee.

6. ***Interior Drainage.*** *An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than 1 foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.*

   a. The probability of local storm drainage flooding occurring concurrently with high Bitter Creek flood elevations will need to be evaluated and it is possible storm drainage pump stations will be needed to assure that the protected area is not flooded from within.
   b. Flooding of this area from Dead Horse Canyon Creek would also need to be addressed (either through detention upstream reducing peak flows to less than the existing channel conveyance system capacity or through increasing the Dead Horse Creek conveyance system capacity).

CONCLUSIONS

Accreditation of the existing levee is problematic and would require extensive additional construction. It appears that about 900 feet of Front Street and adjacent homes would need to be removed to construct the levee extension. And the new levee would likely encroach on the existing park.

The gathering of sufficient geotechnical information to perform the required analyses of the existing portions of the levee would likely require excavation of the existing levee and foundations at selected locations.

cc: file

Appendix 3

Wetland Assessment Reports & Correspondence

2009 WETLAND ASSESSMENT
FOR
CITY OF ROCK SPRINGS
BITTER CREEK

Prepared for:

City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Landmark Design Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Prepared by:

BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

Detailed Wetland Delineation: July 2, 2009
Original Report: October 20, 2008/ Updated March 19, 2009

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INTRODUCTION

The following report is for detailed wetland delineation on the City of Rock Springs Bitter Creek Project in Rock Springs, Wyoming. Mr. Mike Burgan from the U.S. Corp of Engineers (USACOE) requested on February 19, 2009 that BKS Environmental Associates, Inc. (BKS) conduct a more detailed wetland delineation for the project area.

In 2008, BKS conducted a wetland delineation for Landmark Design Inc. (LDI) for part of the Bitter Creek Project. The 2008 wetland delineation found 1.34 acres of Palustrine Emergent (PEM) wetlands along the banks of the stream channel, 0.27 acres of Riverine Intermittent Aquatic Bed (R4AB) and 2.36 acres of Other Waters of the United States (OWUS). On February 19, 2009, Cindy Adams and Katie (Halvorson) Wilson of BKS, Jan Striefel of LDI, Greg Poole of Hansen Allen and Luce, and Mike Burgan of the USACOE met in Rock Springs for a site visit of selected wetland areas. Upon completion of the site visit, Mr. Burgan believed an individual permit and detailed delineation would be required for the project. Mr. Burgan requested a detailed delineation be conducted based on the purpose of the project and because the acreage of wetlands determined in the original 2008 delineation exceeded the 0.50 acre limit covered under most nationwide permits, preventing the project from coverage under a Nationwide Permit 43. Mr. Burgan requested a detailed delineation be conducted whereby the survey team would attempt to walk around each wetland feature in order to obtain a more exact estimation of the wetlands present in the project area along Bitter Creek. Authorization for the Bitter Creek Project lies under the jurisdiction and decision making of the USACOE in Wyoming.

On April 14, 2009, BKS received approval from the City of Rock Springs and LDI to conduct a detailed wetland delineation for the Bitter Creek Project. BKS conducted the detailed wetland delineation for Bitter Creek on the 26th-28th of May 2009. The analysis for the wetland report will be incorporated into the Environmental Assessment (EA) that LDI composed for the City of Rock Springs Bitter Creek Project EA as required by the Wyoming Department of Environmental Quality (WDEQ)/ Abandoned Mine Land (AML).

METHODOLOGY

The wetland survey was conducted in accordance with the 1987 USACOE Wetland Delineation Manual and the Arid West Supplement. OWUS were also assessed during the survey. The plot

method of assessing wetlands was utilized as well as pedestrian reconnaissance. The PEM boundary of the wetlands was walked and the width of the drainage was conservatively estimated because walking within the unconsolidated bottom of the channel was deemed unsafe. Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of hydric soil indicators. Arid West Supplement, Version September 2008, Wetland Determination Data Forms were utilized for each observation point. Vegetation, soils, and hydrology were evaluated throughout the drainage to determine the PEM boundary and assess the wetland status of the tamarisk community. GPS points were also taken whenever a different plant community met hydrophytic vegetation parameters based on the 50/20 Rule (as defined by the USACOE), or whenever indicators suggested the potential presence of a seasonal wetland under normal circumstances. Appendix D includes the wetland data forms.

Soils information for the project area was unavailable for Sweetwater County, Wyoming on the NRCS website. The majority of the soils for Sweetwater County have not yet been mapped (NRCS 2008). The soils within the drainage were alkaline.

The 2008 wetland delineation data forms and maps were utilized for the current delineation as well as a 2-foot contour map of the project area.

Wetland indicator categories were identified for each dominant plant species observed using the National List of Plant Species that Occur in Wetlands, 1988 National Summary. Region 9 indicator categories were utilized for the project area. Appendix C provides a table of all species observed in the project area and associated indicator status.

Field sample locations were recorded with a hand-held Garmin GPSmap 60CSx Global Positioning System (GPS) unit in UTM NAD 1983, Zone 12 and the PEM boundary was defined using a GeoXH Trimble GPS unit with sub-foot accuracy. BKS provided drafting services for the project.

RESULTS

The project area for the delineations was located along Bitter Creek as it runs through the center of Rock Springs and extends the length of 3.72 miles. The project area contained PEM

communities, palustrine unconsolidated bottom (PUB) communities, and R4AB community, as well as a small scrub-shrub tamarisk community near the west end of the project area. However, the majority of the tamarisk terraces were determined to be upland.

Palustrine Emergent Wetland (PEM)

The PEM community along the Bitter Creek Project was 2.88 acres. PEM had wetland vegetation, hydrology and hydric soils present. The PEM boundary mainly followed the visual salt line along the channel; the salt line has formed due to salt wicking from the soil. The dominant hydrophytic vegetation species present were *Puccinella nuttalliana* (Nuttall's alkaligrass), *Schoenoplectus pungens* (common threesquare), *Phalaris arundinacea* (reed canarygrass), and *Schoenoplectus maritimus* (cosmopolitan bulrush). Hydric soils were present and had hydric soil indicators of sandy redox, depleted matrix, or loamy gleyed matrix. The hydrology present was either due to surface water, saturation, surface soil cracks, salt crusts, or saturation visible on aerial imagery.

Riverine Intermittent Aquatic Bed (R4AB)

The R4AB wetland community within the Bitter Creek channel in the project area consisted of 1.50 acres. The R4AB consisted of *Potamogeton foliosus* (leafy pondweed) growing under the water within the width of the channel. Hydric depleted matrix soils were present as well as surface water hydrology.

Palustrine Unconsolidated Bottom (PUB)

The PUB wetland was located between the water's edge and the PEM boundary. The PUB had no vegetation present but had hydric soils and hydrology indicators, primarily salt crusts or surface soil cracks. During peak flows PUB is likely covered by OWUS and would be classified as such.

Upland Boundaries (Non-wetland)

The upland boundaries were dominated by the upland species *Sarcobatus vermiculatus* (greasewood), *Ericameria nauseosa* (rubber rabbitbrush), and *Elymus hispidus* (intermediate wheatgrass). Other dominant species were *Tamarix ramosissima* (saltcedar), which has the designation of facultative wet. There were no hydric soils or hydrology present.

Small wetland Tamarisk Terrace

On the west side of the project area, near WET5 and WET 6 there were two large pipes (likely stormwater) that drain water from above the drainage onto the tamarisk terrace. WET5 and WET6, were determined to be a wetland, dominated by tamarisk and greasewood and was located within the 4-6 foot contour. The soils were hydric, as they had 20% or more redox features and had problematic alkaline soils.

Non-wetland Tamarisk Terraces

Salt cedar is a designated noxious weed on the Wyoming Weed and Pest Control Act Designated List. The roots of salt cedar can grow to a depth of 30 meters or more and generally increase the salinity of the surface soil (Colorado State Parks 2005). Much of the saltcedar terraces were located about 4-8 feet above the surface water. There was encroachment of tamarisk on the upland plant species, primarily greasewood and rubber rabbitbrush within the shrub stratum. The herb stratum dominant species were intermediate wheatgrass, salt grass, broadleaved pepperweed, *Bromus tectorum* (cheatgrass), and *Solidago* species (goldenrod). There were no hydrology indicators present as the terraces were a higher elevation above the water in the creek and were located several feet from the water's edge. The alkaline soils had high chroma and value colors and 0-5 percent redox features; therefore, the soils on the tamarisk terraces were non-hydric.

TABLE 1: SUMMARY OF WETLANDS WITHIN THE PROJECT AREA

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	Delineation Designation	Cowardin Classification	Total Acreage of Cowardin Classification	Geomorphic Setting	Location along Bitter Creek	Jurisdictional Recommendation
WET1	T18N R105W Sec. 3	08 P56, P57	Wetland	PEM	2.89 acres total	Stream edge	South Side Belt to Sweetwater Creek	Jurisdictional
WET2	T18N R105W Sec. 3	--	Non-wetland	--	--	Hillslope	South Side Belt to Sweetwater Creek	--
WET3	T18N R105W Sec. 3	P4	Non-wetland	--	--	Terrace	South Side Belt to Sweetwater Creek	--
WET4	T18N R105W Sec. 3	--	Non-wetland Tamarisk Terrace	--	--	Terrace	South Side Belt to Sweetwater Creek	--
WET5	T18N R105W Sec. 3	P6, P7	Wetland	Scrub Shrub	0.04 acres total	Terrace	South Side Belt to Sweetwater Creek	Jurisdictional
WET6	T18N R105W Sec. 3	P8, P9, P10	Wetland	Scrub Shrub	0.04 acres total	Terrace	South Side Belt to Sweetwater Creek	Jurisdictional
WET7	T19N R105W Sec. 34	--	Non-wetland	--	--	Hillslope	South Side Belt to Sweetwater Creek	--
WET8	T19N R105W Sec. 34	P14, P15, P16, P17	Wetland	PEM	2.89 acres total	Terrace	South Side Belt to Sweetwater Creek	Jurisdictional

WET9	T19N R105W Sec. 35	P20, P21	Wetland	PEM	2.89 acres total	Terrace	Dewar to South Side Belt (West)	Jurisdictional
WET9.5	T19N R105W Sec. 35	P20, P21	Non-wetland	--	--	Terrace slope	Dewar to South Side Belt (West)	--
WET10	T19N R105W Sec. 35	P24, P25, P26, P27	Non-wetland Tamarisk Terrace	--	--	Terrace	Dewar to South Side Belt (West)	--
WET11	T19N R105W Sec. 26	P40, P41, P42	Wetland	PEM	2.89 acres total	Terrace	N Street to Dewar Street	Jurisdictional
WET12	T19N R105W Sec. 26	--	Non-wetland Tamarisk Terrace	--	--	Terrace	N Street to Dewar Street	--
WET13	T19N R105W Sec. 26	P43, P44, P45	Non-wetland	--	--	Terrace	N Street to Dewar Street	--
WET14	T19N R105W Sec. 26	P47, P48, P49	Non-wetland	--	--	Terrace	N Street to Dewar Street	--
WET15	T19N R105W Sec. 26	P51, P52, P53, P54	Non-wetland Tamarisk Terrace	--	--	Terrace	N Street to Dewar Street	--
WET16	T19N R105W Sec. 26	P55, P57, P58	Wetland	PEM	2.89 acres total	Terrace	N Street to Dewar Street	Jurisdictional
WET17	T19N R105W Sec. 26	P56, P59, P60	Non-wetland	--	--	Terrace	N Street to Dewar Street	--
WET18	T19N R105W Sec. 26	P57, P58	Wetland	R4AB	1.50 acres total	Within stream channel	N Street to Dewar Street	Jurisdictional
WET19	T19N R105W Sec. 25	P63, P64, P65	Non-wetland Tamarisk Terrace	--	--	Terrace	N Street to Dewar Street	--

WET20	T19N R105W Sec. 25	P73, P74, P75	Wetland	PEM	2.89 acres total	Bank of channel	South Side Belt (East) to N Street	Jurisdictional
WET21	T19N R105W Sec. 25	P76, P77, P78	Non-wetland	--	--	Terrace	South Side Belt (East) to N Street	--
2008 Wetland Delineation Points								
08Wet1	T19N R104W Sec 30	P1, P2	Wetland	PEM	0.25	Drainage	South Side Belt (East) to N Street	Jurisdictional
08Wet2	T19N R104W Sec 30	P5, P6	Non-wetland	--	--	Drainage	South Side Belt (East) to N Street	--
08Wet3	T19N R104W Sec 30	P7, P8, P9	Wetland	PEM	--	Drainage	South Side Belt (East) to N Street	
08Wet4	T19N R104W Sec 30	P20, P21, P22	Wetland	PEM	1.08	Drainage	South Side Belt (East) to N Street	Jurisdictional
08Wet5	T19N R105W Sec. 25	P32, P33	Wetland	PEM	0.25	Drainage	South Side Belt (East) to N Street	Jurisdictional
08Wet6	T18N R105W Sec. 3	P56, P57	Wetland	PEM	1.08	Drainage	South Side Belt to Sweetwater Creek	Jurisdictional
08Wet7	T19N R105W Sec. 34	P67, P68	Wetland	R4AB	0.27	Drainage	Dewar to South Side Belt (West)	Jurisdictional
08Wet8	T19N R105W Sec. 35	P80, P81	Wetland	PEM	1.08	Drainage	Dewar to South Side Belt (West)	Jurisdictional
08Wet9	T19N R105W Sec.35	P92, P93	Wetland	PEM	1.08	Drainage	N Street to Dewar Street	Jurisdictional

TABLE 2: SUMMARY OF WETLAND DELINEATION RESULTS

Wetland Type	2009 Acres in Project Area	2008 Acres in Project Area
OWUS (Other Waters of the United States, Open Water)	7.14 acres	2.36 acres
PEM (Palustrine Emergent)	2.89 acres	1.08 acres
PUB (Palustrine Unconsolidated Bottom)	0.54 acres	0 acres
R4AB (Riverine Intermittent Aquatic Bed)	1.50 acres	0.51 acres
Scrub/Shrub (Scrub/Shrub Wetland)	0.04 acres	0 acres
Disturbed Channel	0.11 acres	0 acres

DISCUSSION

BKS conducted the 2009 Bitter Creek detailed delineation at the request of Mike Burgan from the USACOE to determine the exact wetland acreage. BKS used a sub-foot accurate GPS unit to map the PEM boundary. The R4AB, PUB, and OWUS boundaries were estimated based on field notes and the PEM boundary, due to safety concerns of walking near the water's edge.

On the first two days of the wetland delineation, the water within the drainage was relatively clear and the observer could see the *Potamogeton foliosus* under the water. On the 3rd day, there was more water present in the drainage and the water was muddied due to discharge from an unknown source.

Also, there were several areas of recent man-made disturbance present in the project area. Bank erosion was present from waypoints 28 – 29 and 151 – 152. Also, at waypoints 95 to 97 there were no PEM wetlands present on the west side of the creek due to other construction not affiliated with the Bitter Creek Project. BKS observed a trackhoe pulling dirt from the bottom of the drainage, along the bank slope to a pile at the top of the hill.

The OWUS acreage increased the most from 2008 to 2009 and that was due to two factors. The 2008 delineation estimated the acreage conservatively, and the 2009 delineation occurred after a wet spring.

The 2009 delineation showed that *Potamogeton foliosus* was present within the drainage for more than half of the distance of the drainage surveyed, it started at the west side of the project

area and ended in the North Street to Dewar Street section of the drainage. Thus the R4AB acreage tripled from 2008.

The PUB wetlands found within the drainage were present between the water's edge and the PEM wetland boundary. The area had been recently inundated by water as there were surface soil cracks present indicating that hydrology was present. Hydric soils were also likely present based on the hydric soils on the PEM. There was no vegetation growing between the water's edge and the PEM boundary, thus BKS determined the area to be PUB. When the water level increases due to discharge from an unknown source, the PUB area would likely become OWUS, as no vegetation was present.

The PEM boundary increased in size from 1.08 acres to 2.89 acres of wetland as a more accurate GPS unit was utilized. There were more PEM wetlands present on the west side of the drainage where the banks are less incised.

The tamarisk shrub community on the terraces within the creek channel was determined not to be wetlands, except when influenced by stormwater drainage pipes flowing into Bitter Creek. There was a small area of scrub-shrub wetlands at WET5 and WET6, whereby it was determined that this point was a wetland point because the run-off from the drainage pipes or runoff above were creating hydric soil conditions and hydrology. The area was also dominated by greasewood which has a wetland indicator status of facultative upland and is typically an upland plant species. The remaining tamarisk communities were determined not to have sufficient wetland characteristics. Some points within the community had hydrophytic vegetation present but not soils or hydrology. The soils had less than 5% mottling and the mottles were often concentrations in the root channels. There was no hydrology present and the communities were at a higher elevation than the water within the creek.

CONCLUSION

Overall, the 2009 wetland delineation determined that more wetlands were present within the drainage primarily due to the more accurate GPS unit and the conservative estimates of the 2008 wetland delineation. The PEM and PUB wetland communities often fell on or below the first terrace within the drainage. The second and third terraces were dominated with tamarisk and greasewood and determined not to be wetlands. The R4AB extended from the west end of

the project area to roughly half way through the project area. There were also smaller R4AB communities in the eastern half of the project area.

Construction activities on Bitter Creek to widen the channel or construction of bridges will likely affect wetlands; these effects will be short-term during construction. Construction done in the winter, when flows in Bitter Creek historically decrease, may cause less harm to the wetlands present within the channel; re-seeding of wetland species along the fringe of the channel would also help re-establishment of the wetlands. Additionally, the proposed channel improvements will avoid wetlands and upland bank vegetation whenever possible.

Final authority of wetland jurisdiction lies with the USACOE. The USACOE will also determine if an individual wetland permit will be required or if it will fall within Nationwide Permit 27.

REFERENCES

BKS Environmental. 2008. Bitter Creek Detention Basins- Wetland Assessment. Prepared for the City of Rock Springs and Landmark Designs. Rock Springs, Wyoming.

BKS Environmental. 2008. Bitter Creek - Wetland Assessment. Prepared for the City of Rock Springs and Landmark Designs. Rock Springs, Wyoming.

Colorado State Parks. 2005. Best Management Practices Weed Profile – Saltcedar (Tamarisk) *Tamarix ramossissima.* Revised: April 1, 2005. Online: http://parks.state.co.us/NR/rdonlyres/912EFB06-E646-40C9-A4CF-DA5020797639/0/Tamarisk.pdf

Dorn, R.D. 2001. Vascular Plants of Wyoming. 3rd Edition. Mountain West Publishing, Cheyenne, Wyoming. 289 pp.

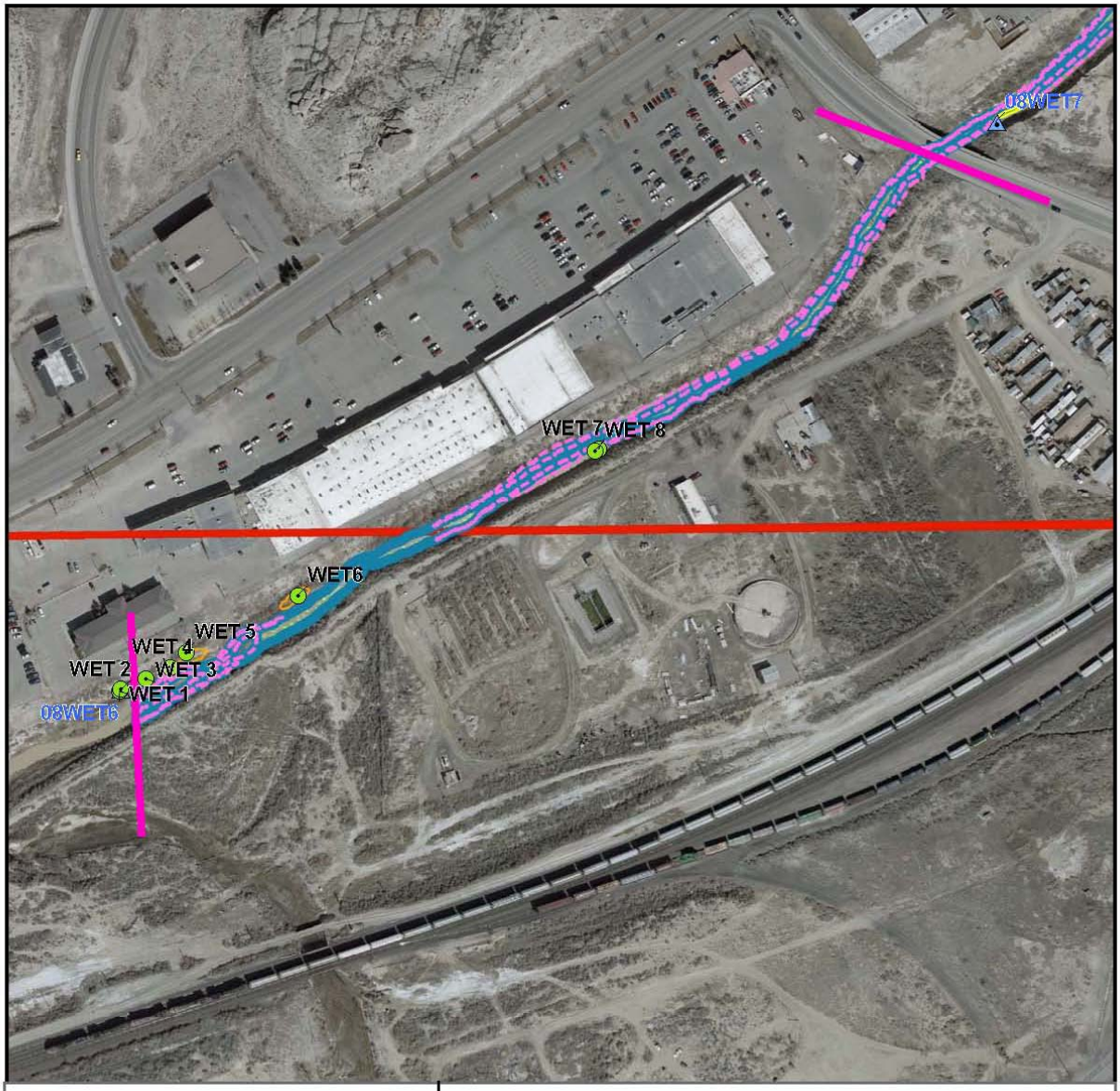
U.S. Army Corps of Engineers. (2006). “Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. Final Report.

Natural Resource Conservation Service. 2008. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/

Appendix A

MAPS

Figure 1: South Side Belt to Sweetwater Creek
Figure 2: Dewar to South Side Belt (West)
Figure 3: N Street to Dewar Street
Figure 4: South Side Belt (East) to N Street



Landmark Designs Inc &
The City of Rock Springs
Bitter Creek Wetland

Figure 1:
South Side Belth to Sweetwater Creek

Created by: BKS- Tracy Spelts
Created on: July 1, 2009
Projection: NAD 83 UTM Z12

N

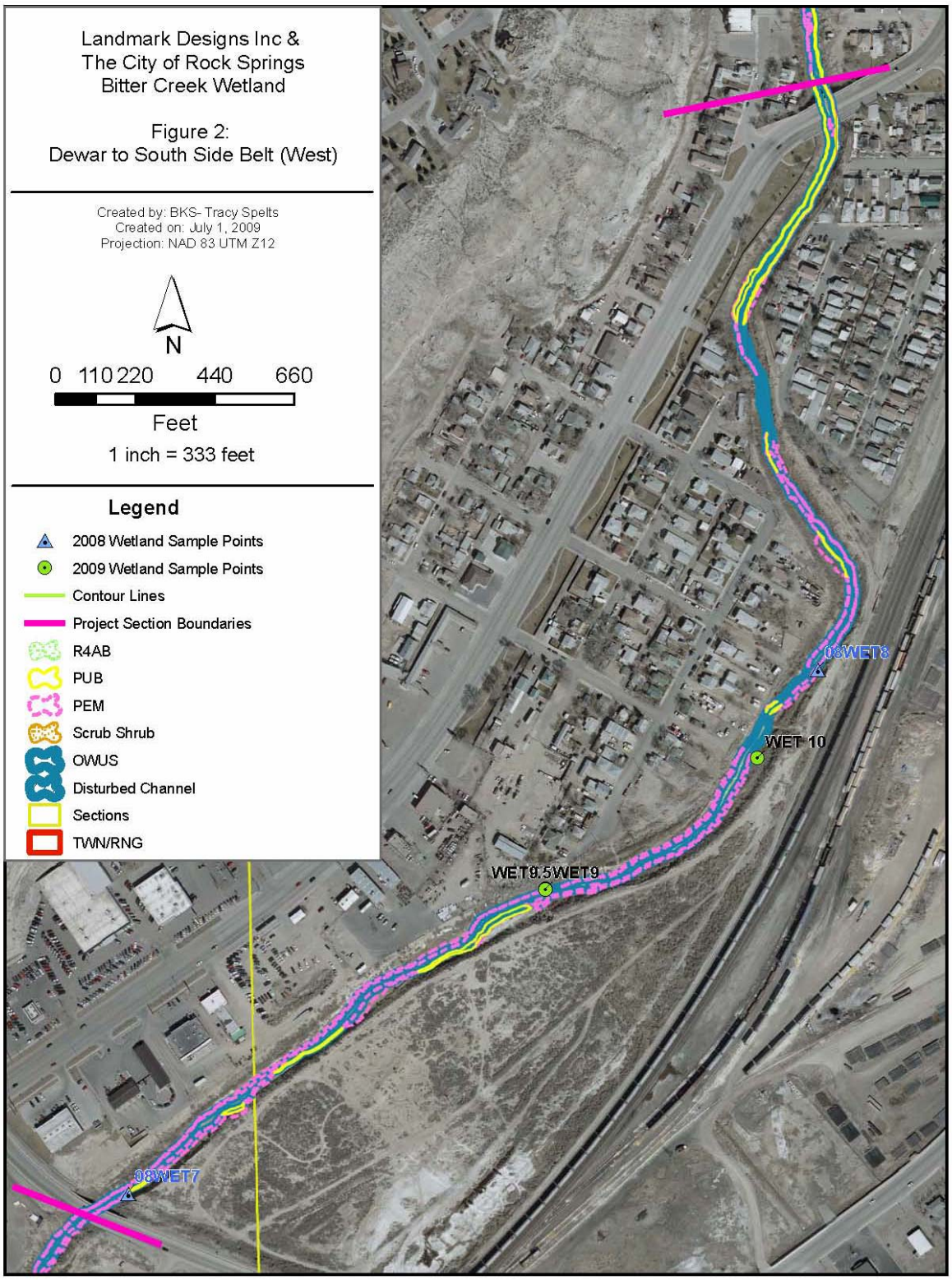
0 85 170 340 510

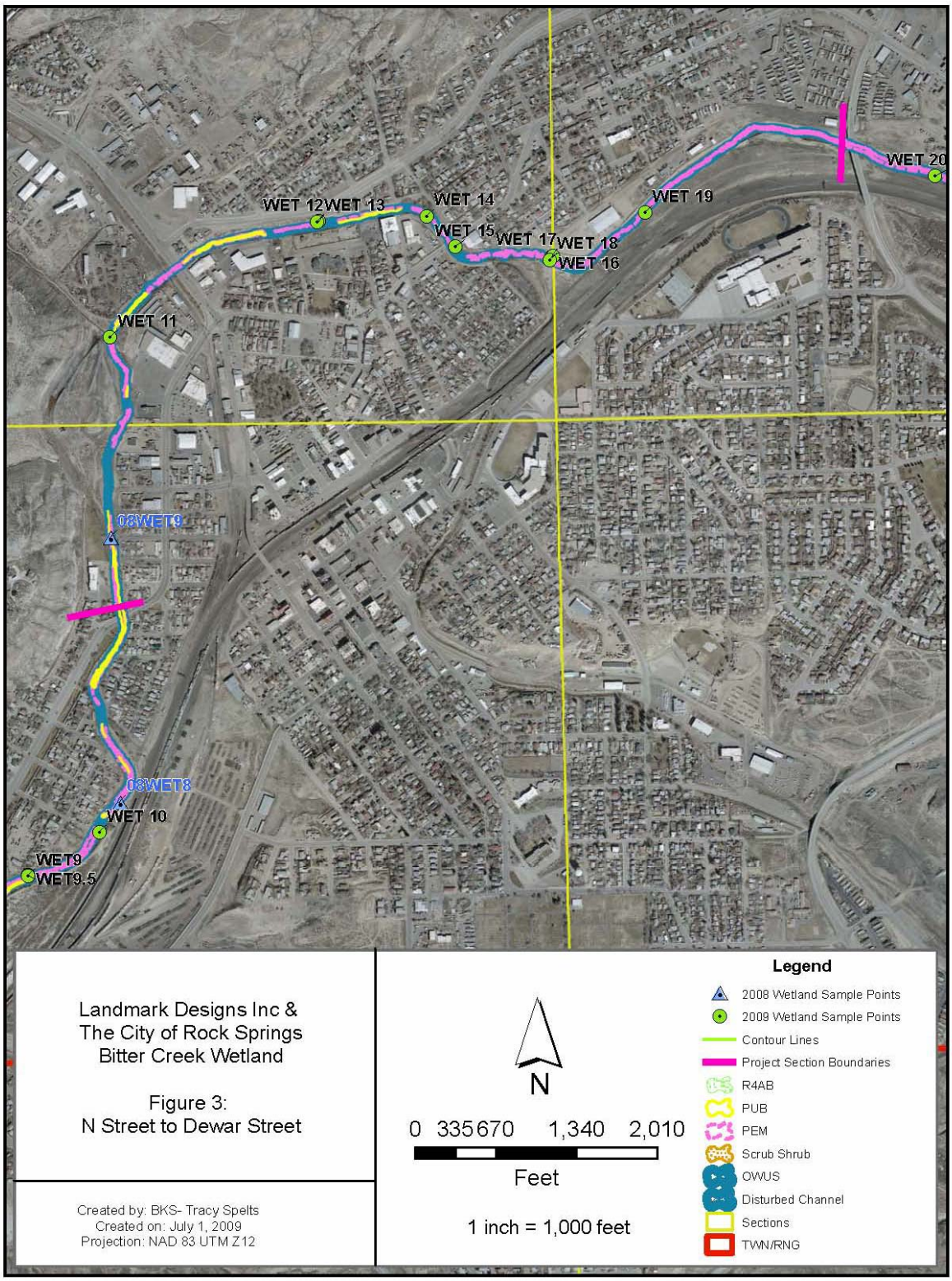
Feet

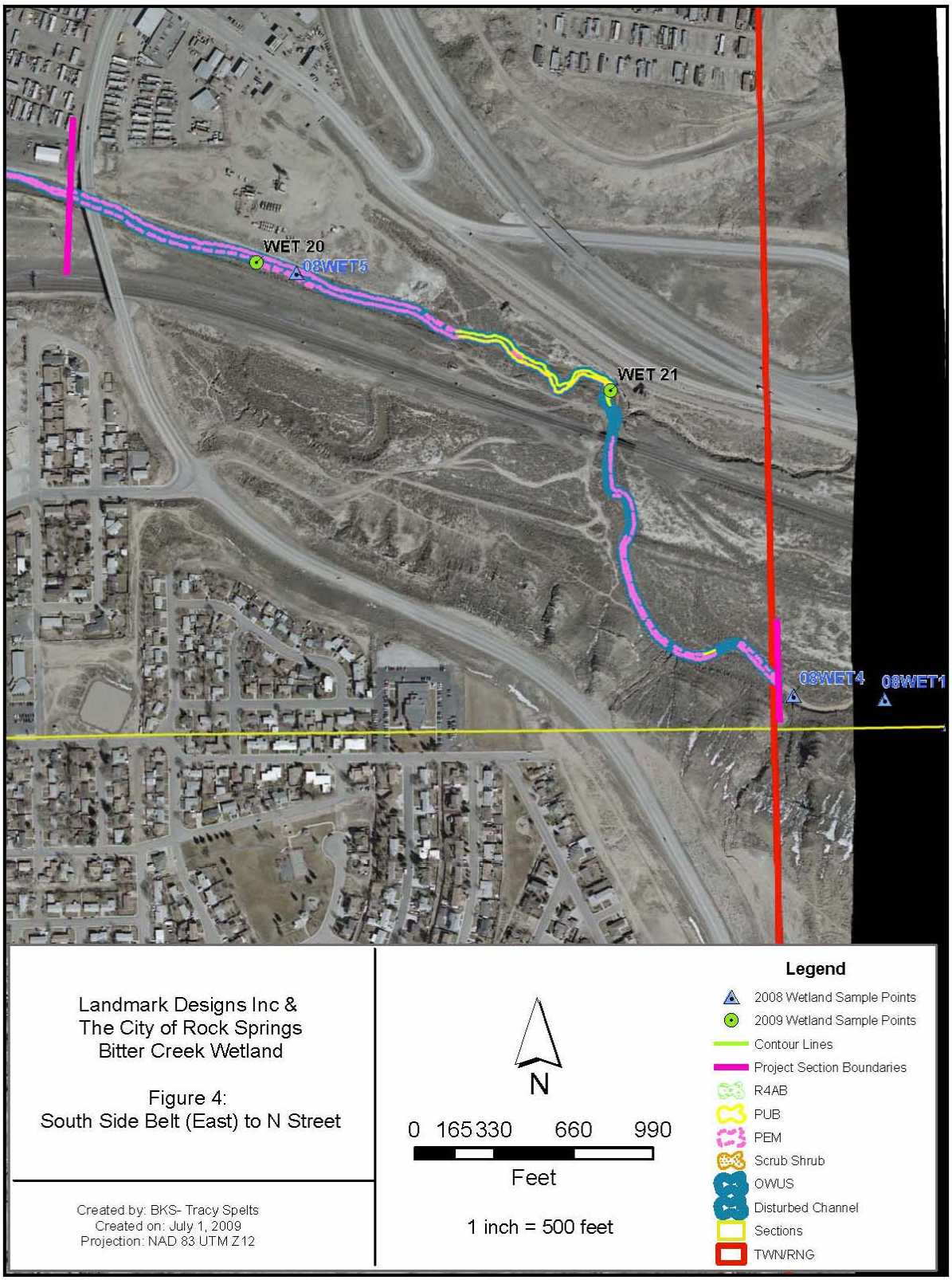
1 inch = 250 feet

Legend

- 2008 Wetland Sample Points
- 2009 Wetland Sample Points
- Contour Lines
- Project Section Boundaries
- R4AB
- PUB
- PEM
- Scrub Shrub
- OWUS
- Disturbed Channel
- Sections
- TWN/RNG


Landmark Designs Inc &
The City of Rock Springs
Bitter Creek Wetland
Figure 2:
Dewar to South Side Belt (West)
Created by: BKS- Tracy Spelts
Created on: July 1, 2009
Projection: NAD 83 UTM Z12
N
0 110 220 440 660
Feet
1 inch = 333 feet
Legend
2008 Wetland Sample Points
2009 Wetland Sample Points
Contour Lines
Project Section Boundaries
R4AB
PUB
PEM
Scrub Shrub
OWUS
Disturbed Channel
Sections
TWN/RNG
08WET8
WET 10
WET9.5
WET9
08WET7


WET 20
WET 19
WET 14
WET 12
WET 13
WET 15
WET 17
WET 18
WET 16
WET 11
08WET9
08WET8
WET 10
WET9
WET9.5
Landmark Designs Inc &
The City of Rock Springs
Bitter Creek Wetland
Figure 3:
N Street to Dewar Street
Created by: BKS- Tracy Spelts
Created on: July 1, 2009
Projection: NAD 83 UTM Z12
N
0 335670 1,340 2,010
Feet
1 inch = 1,000 feet
Legend
2008 Wetland Sample Points
2009 Wetland Sample Points
Contour Lines
Project Section Boundaries
R4AB
PUB
PEM
Scrub Shrub
OWUS
Disturbed Channel
Sections
TWN/RNG


WET 20
08WET5
WET 21
08WET4
08WET1
Landmark Designs Inc &
The City of Rock Springs
Bitter Creek Wetland
Figure 4:
South Side Belt (East) to N Street
Created by: BKS- Tracy Spelts
Created on: July 1, 2009
Projection: NAD 83 UTM Z12
N
0 165 330 660 990
Feet
1 inch = 500 feet
Legend
2008 Wetland Sample Points
2009 Wetland Sample Points
Contour Lines
Project Section Boundaries
R4AB
PUB
PEM
Scrub Shrub
OWUS
Disturbed Channel
Sections
TWN/RNG

Appendix B

PHOTOS

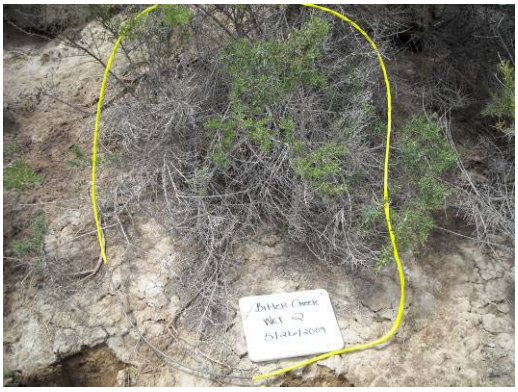


Photo 3: WET 2, Upstream to the south

Photo 4 : Wet3, Upstream to the southeast

Photo 6: WET5, Upstream

Photo 7: WET5, Downstream

Photo 8: WET6, Of Plot

Photo 9: WET6, Upstream

Photo 10: WET6, downstream

Space intentionally left blank

P14: WET8, Upstream

P15: WET8, Of Surface Soil Cracks

P16: WET7, Downstream

P17: WET8, Of plot

P20: WET9, Upstream

P21: WET9, Downstream

P24: WET10, Of plot

P27: WET 10 of plot area

P25: WET10, Upstream

P26: WET10, Downstream

P30: Disturbance

P31: Disturbance

P30: Disturbance by new road, the bucket scraped soil from bottom of drainage upward, and disturbed the PEM fringe along the side of the creek. Area at Disturbed area.

P40: WET11, of plot

P41: WET11, Upstream

P42: WET11, Downstream

P43: WET13, of Plot

P44: WET13, Upstream

P45: WET13, Downstream

P47: WET14, of Plot

P48: WET14, Upstream

P49: WET14, Downstream

P51: WET15, Of Plot

P52: WET15, of Soil

P53: WET15 Upstream

P54: WET15, Downstream

P55: WET16, of Plot

P57: WET16 and 18, Upstream

P58: WET16 and 18, Downstream

P56: WET17, of Plot

P60: WET17, Upstream

P61: WET17, Downstream

P63: WET19, of Plot

P64: WET19, Upstream

P65: WET19, Downstream

P73: WET20, of plot

P74: WET20, Upstream

P75: WET20, Downstream

P76: WET 21, of plot

P77: WET21, Upstream

P78: WET21, Downstream

APPENDIX C

PLANT LIST FOR PROJECT AREA

Bitter Creek

Species Code	*Common Name*	Scientific Name	Wetland Code
AGRCRI	*Agropyron cristatum*	Creasted wheatgrass	UPL
ARTTRI	*Artemisia tridentata*	big sagebrush	UPL
ATRCON	*Atriplex confertifolia*	shadscale saltbush	NI
ATRHOR	*Atriplex hortensis*	garden orache	FAC
ATRHET	*Atriplex heterosperma*	twoscale saltbush	UPL
BASHYS	*Bassia hyssopifolia*	fivehorn smotherweed	FACW
BASSIE	*Bassia scoparia*	burningbush	FAC
BROTEC	*Bromus tectorum*	cheatgrass	UPL
CHE Spp.	*Chenopodium species*	goosefoot	-
DESPIN	*Descurainia pinnata*	western tansymustard	UPL
DESSOP	*Descurainia sophia*	flixweed tansymustard	UPL
DISSPI	*Distichlis spicata*	saltgrass	FACW
ELAANG	*Elaeagnus angustifolia*	Russian olive	FAC
ELYHIS	*Elymus hispidus*	Intermediate wheatgrass	UPL
ELYJUN	*Elymus junceus*	Russian wildrye	FAC
ELYSMI	*Elymus smithii*	western wheatgrass	UPL
ERINAU	*Ericameria nauseosa*	rubber rabbitbrush	UPL
GLAMAR	*Glaux maritima*	sea milkwort	FACW+
HALGLO	*Halogeton glomeratus*	halogeton	UPL
HORBRA	*Hordeum brachyantherum*	meadow barley	FACW-
HORJUB	*Hordeum jubatum*	foxtail barley	FAC-
IVAAXI	*Iva axillaris*	povertyweed	FAC
JUNBAL	*Juncus balticus*	baltic rush	FACW+
LEPLAT	*Lepidium latifolium*	broadleaved pepperweed	FAC
LYCBAR	*Lycium barbarum*	matrimony vine	UPL
PHAARU	*Phalaris arundinacea*	reed canarygrass	FACW
PHRAUS	*Phragmites australis*	common reed	FACW+
PHLPRA	*Phleum pratense*	Timothy	FACU
POASEC	*Poa secunda*	sandberg bluegrass	FACU
POTFOL	*Potamogeton foliosus*	leafy pondweed	OBL
PUCNUT	*Puccinellia nuttalliana*	Nuttall's alkaligrass	OBL
SAL spp	*Salix* species	willow	
SALEXI	*Salix exigua*	narrowleaf willow	OBL
SARVER	*Sarcobatus vermiculatus*	greasewood	FACU+
SCHMAR	*Schoenoplectus maritimus*	cosmopolitan bulrush	OBL
SCHPUN	*Schoenoplectus pungens*	common threesquare	OBL

SISALT	*Sisymbrium altissimum*	tall tumblemustard	UPL
SOL spp.	*Solidago* species	goldentop	UPL
SYMCIL	*Symphyotrichum ciliatum*	rayless alkali aster	FACW
TAMRAM	*Tamarix ramosissima*	tamrisk / saltcedar	FACW
TRIMAR	*Triglochin maritima*	seaside arrowgrass	OBL
TRIPAL	*Triglochin palustris*	marsh arrowgrass	OBL

Appendix D

Wetland Determination Data Forms
Arid West Region

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET1

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Stream Edge Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 646755 Long: 4603953 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks: P56 – upstream; P57 – downstream; 6' water; 20' on each side of water lowland/wetland species present; The sides of the channel are very steep with greater than 45% slope

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Puccinella nuttalliana*	60	X	OBL
2. *Schoenoplextus pungens*	20	X	OBL
3. *Lepidium latifolium*	1		FAC
4. *Phleum pratense*	1		FACU
5. *Symphyotrichum ciliatum*	2		FACW
6. *Schoenoplectus maritimus*	5		FACW
7. *Triglochin maritime*	1		OBL
8.			
9.			
10.			
Total Cover:	90		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	81	x1=	81
FACW species	7	x2=	14
FAC species	1	x3=	3
FACU species	1	x4=	4
UPL species	0	x5=	0
Column Totals:	90 (A)		102 (B)

Prevalence Index = B/A = 1.13

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Some bars present covered with vegetation.

SOIL Sampling Point WET1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 1	10YR 4/2	100					C	
2 -10	Gley1 3/10Y	95	Gley2 2.5/10B	5	D	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)		Depleted Matirx (F3)	X	Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)		Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

Indicators for Problematic Hydric Soils[3]:

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
Though the value is not 4 or more, the soil was saturated during the time of survey and had all characteristics similar to a gleyed soil.
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X	Surface Water (A1)		Salt Crusts (B11)		Water Marks (B1) (Riverine)
X	High Water Table (A2)		Biotic Crust (B12)		Sediment Deposits (B2) (Riverine)
X	Saturation (A3)		Aquatic Invertebrates (B13)		Drift Deposits (B3) (Riverine)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)		Drainage Patterns (B10)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)		Dry-Season Water Table (C2)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)		Thin Muck Surface (C7)
	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)		Crayfish Burrows (C8)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)		Saturation Visible on Aerial Imagery (C9)
	Water Stained Leaves (B9)				Shallow Aquitard (D3)
					FAC-Neutral Test (D5)

Secondary Indicators (2 or more required)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches):	12
Water Table Present?	Yes	X	No		Depth (inches):	7
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):	

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Water was present in the soil hole: Soil was saturated through the entire profile

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET2

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none): Sloped Slope (%): 30

Subregion (LRP): Interior Deserts (LRR D) Lat: 646755.75 Long: 4603953.6 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks: outside of WET1

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Sarcobatus vermiculatus*	50	X	UPL
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species	50	x5=	250
Column Totals:	50	(A)	250 (B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators

Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:

SOIL Sampling Point WET2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 4/4	100					SC	
3-12	10YR 4/3	99	10YR 4/6	1	C	RC	siCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5) (LRR C)
- ____ 1 cm Muck (A9) (LRR D)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matirx (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)
- ____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ____ 1 cm Muck (A9) (LRR C)
- ____ 2 cm Muck (A10) (LRR B)
- ____ Reduced Vertic (F18)
- ____ Red Parent Material (TF2)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ____

Depth (inches): ____

Hydric Soils Present? Yes: ____ No: X

Remarks:

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1) (Nonriverine)
- ____ Sediment Deposits (B2) (Nonriverine)
- ____ Drift Deposits (B3) (Nonriverine)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water Stained Leaves (B9)
- ____ Salt Crusts (B11)
- ____ Biotic Crust (B12)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Oder (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Plowed Soil (C6)
- ____ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ____ Water Marks (B1) (Riverine)
- ____ Sediment Deposits (B2) (Riverine)
- ____ Drift Deposits (B3) (Riverine)
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Thin Muck Surface (C7)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? Yes ____ No ____ Depth (inches): ____

(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

Water table is about 2 inches below the point

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET3

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 646769.11 Long: 4603959.5 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks: 3' of slope to water about 80%, Photo 4: of Hoop

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Sarcobatus vermiculatus*	80	X	UPL
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Distichlis spicata*	60	X	FACW
2. *Lepidium latifolium*	3		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species	60	x2=	120	
FAC species	3	x3=	9	
FACU species		x4=		
UPL species	80	x5=	400	
Column Totals:	143	(A)	529	(B)

Prevalence Index = B/A = 3.70

Hydrophytic Vegetation Indicators

_____ Dominance Test is > 50%

_____ Prevalence Index is $\leq$ 3.0[1]

_____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

_____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:
Distichlis spicata dominated in surrounding area with *Sarcobatus vermiculatus* present

SOIL Sampling Point WET3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	95	10YR 4/6	5	C	RC	SC	
2-12	10YR 4/3	100					siCL	
12-18	10YR 4/4	80	10YR 4/6	10	C	RC	siCL	
				10				Sedimentary layers

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

X ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Many concentrated root channels present
Soils are alkaline

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ___	Depth (inches): ___		
Water Table Present?	Yes ___	No ___	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___	Wetland Hydrology Present?	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Upper terrace about 4 feet above channel.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET4

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): None Slope (%): 3

Subregion (LRP): Interior Deserts (LRR D) Lat: 646781.97 Long: 4603965.32 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	3	X	FACW
2. *Ericameria nauseosa*	3	X	UPL
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Distichlis spicata*	45	X	FACW
2. *Salix* species	2		-
3. *Elymus hispidus*	20	X	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 15 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species	48	x2=	96	
FAC species		x3=		
FACU species		x4=		
UPL species	23	x5=	115	
Column Totals:	71	(A)	211	(B)

Prevalence Index = B/A = 2.97

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
The hydrophytic vegetation is on its way out.

SOIL Sampling Point WET4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 4/3	100					L	
5-16	10YR 5/4	95	10YR 4/6	5	C	RC	LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Alkaline Soils

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET5

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 10

Subregion (LRP): Interior Deserts (LRR D) Lat: 646790.26 Long: 4603973.45 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Scrub-shrub wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks: salt deposits present on terrace
P 6 of plot, P 7 downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Sarcobatus vermiculatus*	25	X	FACU+
2. *Tamarix ramosissima*	10	X	FACW
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Lepidium latifolium*	25	X	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.66 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species	10	x2=	20
FAC species	25	x3=	75
FACU species	25	x4=	100
UPL species		x5=	
Column Totals:	60 (A)		195 (B)

Prevalence Index = B/A = 3.25

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:
Salt crusts present

SOIL Sampling Point WET5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 5/4	100					LS	
2-20	10YR 5/4	50	10YR 5/6	50	C	M	LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Histosol (A1)	Sandy Redox (S5)	Indicators for Problematic Hydric Soils[3]:
Histic Epipedon (A2)	Stripped Matrix (S6)	1 cm Muck (A9) (LRR C)
Black Histic (A3)	Loamy Mucky Mineral (F1)	2 cm Muck (A10) (LRR B)
Hydrogen Sulfide (A4)	Loamy Gleyed Matrix (F2)	Reduced Vertic (F18)
Stratified Layers (A5) (LRR C)	Depleted Matirx (F3)	Red Parent Material (TF2)
1 cm Muck (A9) (LRR D)	Redox Dark Surface (F6)	X Other (Explain in Remarks)
Depleted Below Dark Surface (A11)	Depleted Dark Surface (F7)	
Thick Dark Surface (A12)	Redox Depressions (F8)	
Sandy Mucky Mineral (S1)	Vernal Pools (F9)	
Sandy Gleyed Matrix (S4)		

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
Soils are alkaline. The soil closely matches sandy redox

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

Surface Water (A1)	X Salt Crusts (B11)	Water Marks (B1) (Riverine)
High Water Table (A2)	Biotic Crust (B12)	Sediment Deposits (B2) (Riverine)
Saturation (A3)	Aquatic Invertebrates (B13)	Drift Deposits (B3) (Riverine)
Water Marks (B1) (Nonriverine)	Hydrogen Sulfide Oder (C1)	Drainage Patterns (B10)
Sediment Deposits (B2) (Nonriverine)	Oxidized Rhizospheres along Living Roots (C3)	Dry-Season Water Table (C2)
Drift Deposits (B3) (Nonriverine)	Presence of Reduced Iron (C4)	Thin Muck Surface (C7)
Surface Soil Cracks (B6)	Recent Iron Reduction in Plowed Soil (C6)	Crayfish Burrows (C8)
Inundation Visible on Aerial Imagery (B7)	Other (Explain in Remark)	Saturation Visible on Aerial Imagery (C9)
Water Stained Leaves (B9)		Shallow Aquitard (D3)
		FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No	Depth (inches):		
Water Table Present?	Yes	No	Depth (inches):		
Saturation Present? (includes capillary fringe)	Yes	No	Depth (inches):		

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/26/09

Applicant/Owner: Landmark State: WY Sampling Point: WET6

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRP): Interior Deserts (LRR D) Lat: 646850 Long: 4604003 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Scrub-Shrub

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present	Yes		No	X	

Remarks:
P8 of Plot, P9 Upstream, P10 Downstream.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	5	X	FACW
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Lepidium latifolium*	1		FAC
2. *Phragmites australis*	10	X	FACW+
3. *Distichlis spicata*	39	X	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	50		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species	54	x2=	108
FAC species	1	x3=	3
FACU species		x4=	
UPL species		x5=	
Column Totals:	55 (A)		111 (B)
Prevalence Index = B/A =	2.02		

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is $\leq 3.0^1$

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL Sampling Point WET6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/3	100					SC	
10-14	10YR 4/4	80	10YR 2/1	5	D	M	Clayey	
			10YR 5/8	10	C	M		
			7.5YR 5/4	5	C	RC		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:
Soils are alkaline

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
There are two large pipes that may be stormwater discharge points and may be hydrating the soil, rather than from the ground water.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/27/09

Applicant/Owner: Landmark State: WY Sampling Point: WET7

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 34, T19N R105W

Landform (hillslope, terrace, etc.) Hillslope Local relief (concave, convex, none): Hillslope Slope (%): 45

Subregion (LRP): Interior Deserts (LRR D) Lat: 647012 Long: 460483 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks: The waypoint is above the salt line.
The hole in the salt line the soil is more moist and had defined mottling and depletions. The closer the salt line is to the bottom of the slope the more defined and an increased density of mottling and depletions.
P14: Downstream and of the salt line P15: Upstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Sarcobatus vermiculatus*	3	X	UPL
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Lepidium latifolium*	2	X	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 95 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species	2	x3=	6
FACU species		x4=	
UPL species	3	x5=	15
Column Totals:	5	(A)	21 (B)

Prevalence Index = B/A = 4.2

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5 Y 5/4	99	10YR 5/8	1	C	M	CL	
6-14	10YR 4/4	99	10YR 5/8	1	C	M	siCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (LRR C)
- 1 cm Muck (A9) (LRR D)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matirx (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (LRR C)
- 2 cm Muck (A10) (LRR B)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: No: X

Remarks:
The soil is alkaline.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1) (Nonriverine)
- Sediment Deposits (B2) (Nonriverine)
- Drift Deposits (B3) (Nonriverine)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Water Stained Leaves (B9)
- Salt Crusts (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Oder (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Plowed Soil (C6)
- Other (Explain in Remark)

Secondary Indicators (2 or more required)

- Water Marks (B1) (Riverine)
- Sediment Deposits (B2) (Riverine)
- Drift Deposits (B3) (Riverine)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)
- Thin Muck Surface (C7)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes No Depth (inches):

Water Table Present? Yes No Depth (inches):

Saturation Present? Yes No Depth (inches):
(includes capillary fringe)

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/27/09

Applicant/Owner: Landmark State: WY Sampling Point: WET8

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 34, T19N R 105W

Landform (hillslope, terrace, etc.) 1st terrace Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 647010 Long: 4604082 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks: P14: Downstream, P15: Upstream, P17: of plot

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Phragmites australis*	15	X	FACW+
2. *Puccinella nuttalliana*	30	X	OBL
3. *Chenopodium* species	1		UPL
4. *Schoenoplectus maritimus*	2		OBL
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	48		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 55 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species	x5=	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL Sampling Point WET8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	2.5Y 5/3	40	Gley1 2.5/N	25	RM	M	Clay	
			Gley1 2.5/5G	35	RM	M	Clay	
3-3.5								Herbaceous layer
3.5-16	2.5Y 5/3	10	Gley2 3/5B	90	RM	M	Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)	X	Depleted Matirx (F3)	X	Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)		Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

Indicators for Problematic Hydric Soils[3]:

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
The soil is alkaline. 3-3.5" of decaying root zone visable.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

	Surface Water (A1)		Salt Crusts (B11)		Water Marks (B1) (Riverine)
X	High Water Table (A2)		Biotic Crust (B12)		Sediment Deposits (B2) (Riverine)
X	Saturation (A3)		Aquatic Invertebrates (B13)		Drift Deposits (B3) (Riverine)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)		Drainage Patterns (B10)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)		Dry-Season Water Table (C2)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)		Thin Muck Surface (C7)
	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)		Crayfish Burrows (C8)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)		Saturation Visible on Aerial Imagery (C9)
	Water Stained Leaves (B9)				Shallow Aquitard (D3)
					FAC-Neutral Test (D5)

Secondary Indicators (2 or more required)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	10
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):	

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Point is 1' from water's edge

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/27/09

Applicant/Owner: Landmark State: WY Sampling Point: WET9

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 35, T19N R105W

Landform (hillslope, terrace, etc.) Hillslope and terrace Local relief (concave, convex, none): Convex Slope (%): 0-10%

Subregion (LRP): Interior Deserts (LRR D) Lat: 647577 Long: 4604512 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks:
P 20: Upstream, P21 Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	45	X	FACW
2. *Sarcobatus vermiculatus*	30	X	FACU+
3.			
4.			
5.			
Total Cover:	75		
Herb Stratum			
1. *Lepidium latifolium*	60	X	FACW+
2. *Puccinella nuttalliana*	10		OBL
3. *Elymus hispidus*	5		UPL
4. *Glaux maritima*	3		FACW+
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	48		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.67 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x1=	10
FACW species	47	x2=	94
FAC species	60	x3=	180
FACU species	30	x4=	120
UPL species	5	x5=	25
Column Totals:	152 (A)		429 (B)

Prevalence Index = B/A = 2.82

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Half is dominated by the herb stratum.

SOIL Sampling Point WET9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 5/4	100						
18-22	10YR 5/2	97	10YR 4/6	3	C	RC	LS	Saturated

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:
Soil is saturated at 18-22 inches. Soil is alkaline, and fits closest to sandy redox.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	___	Depth (inches):	___
Water Table Present?	Yes	___	No	___	Depth (inches):	___
Saturation Present? (includes capillary fringe)	Yes	X	No	___	Depth (inches):	18

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Saturated soil slope 18-22” no water present in hole

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/27/09

Applicant/Owner: Landmark State: WY Sampling Point: WET9.5

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 35, T19N R105W

Landform (hillslope, terrace, etc.) Hillslope and terrace Local relief (concave, convex, none): Convex Slope (%): 0-10%

Subregion (LRP): Interior Deserts (LRR D) Lat: 647577 Long: 4604513 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P 20: Upstream, P21 Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	45	X	FACW
2. *Sarcobatus vermiculatus*	30	X	FACU+
3.			
4.			
5.			
Total Cover:	75		
Herb Stratum			
1. *Lepidium latifolium*	60	X	FAC
2. *Elymus hispidus*	5		UPL
3. *Glaux maritima*	3		FACW+
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	48		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.67 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	10	x1=	10
FACW species	48	x2=	96
FAC species	60	x3=	180
FACU species	30	x4=	120
UPL species		x5=	
Column Totals:	148 (A)		496 (B)

Prevalence Index = B/A = 3.35

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Half is dominated by the herb stratum.

SOIL Sampling Point WET9.5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR5/4	100					LS	
4-12	10YR 4/4	99	10YR 4/6	1	C	RC	LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Soils are alkaline

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/27/09

Applicant/Owner: Landmark State: WY Sampling Point: WET10

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 35, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 647756 Long: 4604624 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P 24: area sampled, P25: upstream, P26: downstream, P27: tamrisk terrace

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	2	X	FACW
2. *Ericameria nauseosa*	1	X	UPL
3.			
4.			
5.			
Total Cover:	3		
Herb Stratum			
1. *Elymus hispidus*	30	X	UPL
2. *Juncus balticus*	7		FACW+
3. *Descurainia pinnata*	5		UPL
4. *Distichlis spicata*	24	X	FACW
5. *Lepidium latifolium*	1		FAC
6.			
7.			
8.			
9.			
10.			
Total Cover:	67		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 30 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species	33	x2=	66
FAC species	1	x3=	3
FACU species		x4=	
UPL species	36	x5=	180
Column Totals:	70	(A)	249 (B)

Prevalence Index = B/A = 3.55

Hydrophytic Vegetation Indicators

Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:
Tamrisk dominant on surround because it is about 8' wide. Opposite bank has about 2-3' of PUB.

SOIL Sampling Point WET10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 5/4	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ___	Depth (inches): ___		
Water Table Present?	Yes ___	No ___	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___	Wetland Hydrology Present?	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek | City/County: Rock Springs, Sweetwater County | Sampling Date: 5/27/09

Applicant/Owner: Landmark | State: WY | Sampling Point: WET11

Investigator(s): D. Gardner and C. Adams | Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) 1st terrace | Local relief (concave, convex, none): Convex | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: 647784 | Long: 4605872 | Datum: NAD83 UTM12

Soil Map Unit Name: | NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present	Yes		No	X	

Remarks:
P27 of plot

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	35	X	FACW
2. *Sarcobatus vermiculatus*	5		FACU+
3.			
4.			
5.			
Total Cover:	40		
Herb Stratum			
1. *Halogeton glomeratus*	2		UPL
2. *Phragmites australis*	10	X	FACW+
3. *Glaux maritima*	2		FACW+
4. *Bromus tectorum*	2		UPL
5. *Puccinella nuttalliana*	5		OBL
6. *Agropyron cristatum*	5		UPL
7.			
8.			
9.			
10.			
Total Cover:	26		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 40 | % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species	x5=	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 5/4	100					LS	
4-12	2.5Y 5/4	70	10YR 5/8	20	C	RC/M	LS	
			10YR 3/1	10	D	M	C	Stratified layer

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

				Indicators for Problematic Hydric Soils[3]:	
	Histosol (A1)	X	Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)		Depleted Matirx (F3)	X	Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)		Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
Soils are alkaline and most like sandy redox hydric indicator.
Depletions area are stratified

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

				Secondary Indicators (2 or more required)	
	Surface Water (A1)		Salt Crusts (B11)		Water Marks (B1) (Riverine)
	High Water Table (A2)		Biotic Crust (B12)		Sediment Deposits (B2) (Riverine)
	Saturation (A3)		Aquatic Invertebrates (B13)		Drift Deposits (B3) (Riverine)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)		Drainage Patterns (B10)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)		Dry-Season Water Table (C2)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)		Thin Muck Surface (C7)
	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)		Crayfish Burrows (C8)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)		Saturation Visible on Aerial Imagery (C9)
	Water Stained Leaves (B9)				Shallow Aquitard (D3)
					FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):
Water Table Present?	Yes		No		Depth (inches):
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET12

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 3

Subregion (LRP): Interior Deserts (LRR D) Lat: 648311 Long: 4606164 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P40: Plot, P41: Upstream; P42: Downstream
Creek is about 12' wide, opposite bank has 4' of disturbance.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	2		UPL
2. *Tamarix ramosissima*	20	X	FACW
3.			
4.			
5.			
Total Cover:	22		
Herb Stratum			
1. *Lepidium latifolium*	40	X	FAC
2. *Bassia sieversiana*	5		UPL
3. *Distichlis spicata*	35	X	FACW
4. *Bassia hyssopifolia*	5		FACW
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	85		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 35 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species	x5=	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is $\leq 3.0^1$

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL Sampling Point WET12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/4	99	10YR 3/2	1	D	M/RC	LS	Redox in the stratified layer, looks like decomposing plant material
4-16	10YR 5/4	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Alkaline soils.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ___	Depth (inches): ___		
Water Table Present?	Yes ___	No ___	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches): ___	Wetland Hydrology Present?	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Bank at this point is no longer disturbed (cut by machinery)

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET13

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 648306 Long: 4606163 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P 43: Plot
The 4' contour is in this area on both sides of the channel.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			

Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			

Herb Stratum				
1.	*Lepidium latifolium*	40	X	FAC
2.	*Phragmites australis*	30	X	FACW+
3.	*Distichlis spicata*	10		FACW+
4.	*Poa secunda*	20	X	FACU
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover:		100		

Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.67 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species		x5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL Sampling Point WET13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 5/4	98	7.5YR 5/6	2	C	RC	Sand	
7-16	10YR 5/4	97	7.5YR 5/6	3	C	RC/M	LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5) (LRR C)
- ____ 1 cm Muck (A9) (LRR D)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matirx (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)
- ____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ____ 1 cm Muck (A9) (LRR C)
- ____ 2 cm Muck (A10) (LRR B)
- ____ Reduced Vertic (F18)
- ____ Red Parent Material (TF2)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? Yes: ____ No: X

Remarks:
This hole is 8' downstream from WET12, the soil is soft when you walk on it.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1) (Nonriverine)
- ____ Sediment Deposits (B2) (Nonriverine)
- ____ Drift Deposits (B3) (Nonriverine)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water Stained Leaves (B9)
- ____ Salt Crusts (B11)
- ____ Biotic Crust (B12)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Oder (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Plowed Soil (C6)
- ____ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ____ Water Marks (B1) (Riverine)
- ____ Sediment Deposits (B2) (Riverine)
- ____ Drift Deposits (B3) (Riverine)
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Thin Muck Surface (C7)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____		
Water Table Present?	Yes ____	No ____	Depth (inches): ____		
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____	Wetland Hydrology Present?	Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET14

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 5

Subregion (LRP): Interior Deserts (LRR D) Lat: 648583 Long: 4606177 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes No
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P 47: plot; P48: upstream; P49: downstream
Russian olive and willow roots likely reach the ground water.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Elaeagnus angustifolia*	5		FAC
2. *Salix exigua*	25	X	OBL
3.			
4.			
Total Cover:	30		
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	20	X	UPL
2.			
3.			
4.			
5.			
Total Cover:	20		
Herb Stratum			
1. *Elymus hispidus*	75	X	UPL
2. *Lepidium latifolium*	2		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	77		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	25	x1=	25
FACW species		x2=	
FAC species	7	x3=	21
FACU species		x4=	
UPL species	95	x5=	475
Column Totals:	127 (A)		521 (B)

Prevalence Index = B/A = 4.10

Hydrophytic Vegetation Indicators

Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:

SOIL Sampling Point WET14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 5/3	99	10YR 5/8	1	C	RC	SC	
7-14	10YR 5/3	100					LS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5) (LRR C)
- ____ 1 cm Muck (A9) (LRR D)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matirx (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)
- ____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ____ 1 cm Muck (A9) (LRR C)
- ____ 2 cm Muck (A10) (LRR B)
- ____ Reduced Vertic (F18)
- ____ Red Parent Material (TF2)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? Yes: ____ No: X

Remarks:
Soil surface creaks visible near water's edge

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1) (Nonriverine)
- ____ Sediment Deposits (B2) (Nonriverine)
- ____ Drift Deposits (B3) (Nonriverine)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water Stained Leaves (B9)
- ____ Salt Crusts (B11)
- ____ Biotic Crust (B12)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Oder (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Plowed Soil (C6)
- ____ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ____ Water Marks (B1) (Riverine)
- ____ Sediment Deposits (B2) (Riverine)
- ____ Drift Deposits (B3) (Riverine)
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Thin Muck Surface (C7)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? Yes ____ No ____ Depth (inches): ____
(includes capillary fringe)

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET15

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRP): Interior Deserts (LRR D) Lat: 648654 Long: 4606100 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil , or Hydrology Significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P51: plot; P52: Soil; P53: upstream; P54: downstream
In the tamrisk terrace above the PEM level. Channel is 8-10' wide

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	5	X	UPL
2. *Tamarix ramosissima*	20	X	FACW
3.			
4.			
5.			
Total Cover:	25		
Herb Stratum			
1. *Elymus hispidus*	70	X	UPL
2. *Lepidium latifolium*	5		FAC
3. *Descurainia pinnata*	2		UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	77		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 2 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33.33% (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species	20	x2=	40
FAC species	5	x3=	15
FACU species		x4=	
UPL species	77	x5=	385
Column Totals:	102	(A)	440 (B)

Prevalence Index = B/A = 4.31

Hydrophytic Vegetation Indicators

- Dominance Test is > 50%
- Prevalence Index is ≤ 3.0[1]
- Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
- Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes No X

Remarks:

SOIL Sampling Point WET15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/4	100					S and C	Sandy with layers of clay
4-14	10YR 5/4	100					LS	There are black strips about 1mm thick, not depleted but part of the matrix at 10YR 2/1

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Soil surface creaks visible near water's edge

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
No water in hole, 4' contour level. About 15-20' from water's edge.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET16

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave slight Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 648898 Long: 4606075 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present	Yes		No	X	

Remarks:
P55: plot; P7: upstream; P58: downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Phalaris arundinacea*	100	X	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 2 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species		x5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:

SOIL Sampling Point WET16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 5/4	100					SL	
2-12	10YR 5/2	88	7.5 YR 4/6	10	C	RC	SC	
			10YR 3/1	2	D	RC		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)	X	Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)		Depleted Matirx (F3)		Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)		Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

Indicators for Problematic Hydric Soils[3]:

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
Soil strongly effervecent

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

	Surface Water (A1)		Salt Crusts (B11)
	High Water Table (A2)		Biotic Crust (B12)
	Saturation (A3)		Aquatic Invertebrates (B13)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)
	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)
	Water Stained Leaves (B9)		

Secondary Indicators (2 or more required)

	Water Marks (B1) (Riverine)
	Sediment Deposits (B2) (Riverine)
X	Drift Deposits (B3) (Riverine)
	Drainage Patterns (B10)
	Dry-Season Water Table (C2)
	Thin Muck Surface (C7)
	Crayfish Burrows (C8)
	Saturation Visible on Aerial Imagery (C9)
	Shallow Aquitard (D3)
	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):
Water Table Present?	Yes		No		Depth (inches):
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET17

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): None Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 648901 Long: 4606077 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P56: plot; P60: upstream; P59: downstream
Approximately 16' from creek on upper shelf.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	20	X	UPL
2.			
3.			
4.			
5.			
Total Cover:	20		
Herb Stratum			
1. *Phragmites australis*	75	X	FACW+
2. *Lepidium latifolium*	2		FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	77		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species	75	x2=	150	
FAC species	2	x3=	6	
FACU species		x4=		
UPL species	20	x5=	100	
Column Totals:	97	(A)	256	(B)
Prevalence Index = B/A =	2.64			

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL Sampling Point WET17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 5/4	100					SL	
4-10	10YR 5/3	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
Soil strongly alkaline.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? Yes ___ No ___ Depth (inches): ___
(includes capillary fringe)

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET18

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 26, T19N R105W

Landform (hillslope, terrace, etc.) In channel Local relief (concave, convex, none): _____ Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 648894 Long: 4606067 Datum: NAD83 UTM12

Soil Map Unit Name: _____ NWI Classification: R4AB

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks:
P57: upstream; P58: downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Potamogeton foliosus*	35	X	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	35		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 70 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species		x5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

___ Prevalence Index is ≤ 3.0[1]

___ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No _____

Remarks:

SOIL Sampling Point WET18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	2.5Y 5/2	100					C	
2-6	2.5Y 5/2	60	Gley2 4/5BG	40	D	M	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- X Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 2.5'

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? Yes ___ No ___ Depth (inches): ___

(includes capillary fringe)

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET19

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 25, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave slight Slope (%): 1

Subregion (LRP): Interior Deserts (LRR D) Lat: 649134 Long: 4606186 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P63: plot; P64: upstream; P65: downstream
Upland terrace

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	50	X	UPL
2. *Tamarix ramosissima*	10		FACW
3.			
4.			
5.			
Total Cover:	60		
Herb Stratum			
1. *Lepidium latifolium*	2		FAC
2. *Bromus tectorum*	15	X	UPL
3. *Solidago* species	10	X	UPL
4. *Iva axillaris*	1		FAC
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	28		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 25 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species	10	x2=	20	
FAC species	3	x3=	9	
FACU species		x4=		
UPL species	75	x5=	375	
Column Totals:	88	(A)	404	(B)

Prevalence Index = B/A = 4.59

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is $\leq 3.0^1$
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: There was one *Opuntia polyacantha* about 3' above the water on the terrace.

SOIL Sampling Point WET19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	2.5Y 5/4	100					S	
1-18	10YR 5/3	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? Yes: ___ No: X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

Salt crusts end at about the 2'contour. Point is about 6' above the channel.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET20

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 25, T19N R105W

Landform (hillslope, terrace, etc.) Bank Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 649867 Long: 4606278 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks:
P73: Plot; P74: Upstream; P75: Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species	x5=	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Herb Stratum			
1. *Schoenoplectus pungens* (the majority of the species was dead but there were about 1cm tall plants coming up)	15	X	OBL
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	15		

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

___ Prevalence Index is ≤ 3.0[1]

___ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

Hydrophytic Vegetation Present? Yes X No

% Bare Ground in Herb Stratum 85 % Cover of Biotic Crust 0

Remarks:

SOIL Sampling Point WET20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 4/2	95	10YR 2/1	5	D	M	siC	Stratified depletions
2-12	2.5Y 5/1	90	10YR 5/6	10	C	M	siC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)	X	Depleted Matirx (F3)		Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)		Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

Indicators for Problematic Hydric Soils[3]:

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
Soil strongly effervecent

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

	Surface Water (A1)	X	Salt Crusts (B11)
	High Water Table (A2)		Biotic Crust (B12)
	Saturation (A3)		Aquatic Invertebrates (B13)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)
X	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)
	Water Stained Leaves (B9)		

Secondary Indicators (2 or more required)

	Water Marks (B1) (Riverine)
	Sediment Deposits (B2) (Riverine)
	Drift Deposits (B3) (Riverine)
	Drainage Patterns (B10)
	Dry-Season Water Table (C2)
	Thin Muck Surface (C7)
	Crayfish Burrows (C8)
	Saturation Visible on Aerial Imagery (C9)
	Shallow Aquitard (D3)
	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes		No		Depth (inches):
Water Table Present?	Yes		No		Depth (inches):
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 5/28/09

Applicant/Owner: Landmark State: WY Sampling Point: WET21

Investigator(s): D. Gardner and C. Adams Section, Township, Range: Sec. 25, T19N R105W

Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 650314 Long: 4606117 Datum: NAD83 UTM12

Soil Map Unit Name: NWI Classification: Non-wetland (problematic)

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes		No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Wetland Hydrology Present	Yes		No	X	

P76: Of plot, P77: Upstream, P78: Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	5	X	FACW
2. *Artemisia tridentata*	1		UPL
3.			
4.			
5.			
Total Cover:	6		
Herb Stratum			
1. *Bassia sieversiana*	1		UPL
2. *Juncus balticus*	40	X	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	41		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 60 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species	x5=	
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks: The *Juncus balticus* species was very young and last year's growth was present but dead. The point was designated as a non-wetland, as the wetland species appear to be moving out of the area.

SOIL Sampling Point WET21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 5/3	100					C	
3-5	2.5Y 5/3	100					LS	
5-10	10YR 5/3	99	10YR 5/8	1	C	RC	siC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Histosol (A1)	Sandy Redox (S5)	Indicators for Problematic Hydric Soils[3]:
Histic Epipedon (A2)	Stripped Matrix (S6)	1 cm Muck (A9) (LRR C)
Black Histic (A3)	Loamy Mucky Mineral (F1)	2 cm Muck (A10) (LRR B)
Hydrogen Sulfide (A4)	Loamy Gleyed Matrix (F2)	Reduced Vertic (F18)
Stratified Layers (A5) (LRR C)	Depleted Matirx (F3)	Red Parent Material (TF2)
1 cm Muck (A9) (LRR D)	Redox Dark Surface (F6)	X Other (Explain in Remarks)
Depleted Below Dark Surface (A11)	Depleted Dark Surface (F7)	
Thick Dark Surface (A12)	Redox Depressions (F8)	
Sandy Mucky Mineral (S1)	Vernal Pools (F9)	
Sandy Gleyed Matrix (S4)		

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: No: X

Remarks:
Soil is alkaline

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

Surface Water (A1)	Salt Crusts (B11)	Secondary Indicators (2 or more required)
High Water Table (A2)	Biotic Crust (B12)	Water Marks (B1) (Riverine)
Saturation (A3)	Aquatic Invertebrates (B13)	Sediment Deposits (B2) (Riverine)
Water Marks (B1) (Nonriverine)	Hydrogen Sulfide Oder (C1)	Drift Deposits (B3) (Riverine)
Sediment Deposits (B2) (Nonriverine)	Oxidized Rhizospheres along Living Roots (C3)	Drainage Patterns (B10)
Drift Deposits (B3) (Nonriverine)	Presence of Reduced Iron (C4)	Dry-Season Water Table (C2)
Surface Soil Cracks (B6)	Recent Iron Reduction in Plowed Soil (C6)	Thin Muck Surface (C7)
Inundation Visible on Aerial Imagery (B7)	Other (Explain in Remark)	Crayfish Burrows (C8)
Water Stained Leaves (B9)		Saturation Visible on Aerial Imagery (C9)
		Shallow Aquitard (D3)
		FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes No Depth (inches):

Water Table Present? Yes No Depth (inches):

Saturation Present? Yes No Depth (inches):
(includes capillary fringe)

Wetland Hydrology Present? Yes No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
4' terrace, point is located about 8' from channel. The 2' terrace had salt crust present and no vegetation, it was 6' wide.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

REPLY TO
ATTENTION OF

September 16, 2009

Wyoming Regulatory Office

Honorable Timothy Kaumo
Mayor, City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Dear Mr. Kaumo:

This letter is in response to a request we received on July 20, 2009, from Ms. Cindy Adams of BKS Environmental Associates, Inc. for a jurisdictional determination based upon a wetland delineation conducted along a portion of Bitter Creek within the city limits of the City of Rock Springs. The study area described in the delineation report begins in the southwest quarter of the southwest quarter of Section 30, Township 19 North, Range 104 West, and ends in the northwest quarter of the northeast quarter of Section 3, Township 18 North, Range 105 West, Sweetwater County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations are published in the Code of Federal Regulation at 33 CFR Parts 320 through 331. Information on Section 404 program requirements in Wyoming can be obtained from our web site at https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm.

We have reviewed the report prepared by Ms. Adams entitled *2009 Wetland Assessment for City of Rock Springs Bitter Creek* updated March 19, 2009. Mr. Michael Burgan from our office also visited the site on February 19, 2009, with Ms. Adams and Ms. Katie Wilson of BKS Environmental, Ms Jan Striefel of Landmark Design, Inc., and Mr. Greg Poole of Hansen, Allen & Luce, Inc. Based upon documentation in the report and Mr. Burgan's site visit, we have determined that the methods used to identify wetlands on the property are consistent with the *Corps of Engineers Wetland Delineation Manual* dated January 1987. Therefore, the three maps entitled *Landmark Designs Inc & The City of Rock Springs Bitter Creek Wetland, Project Area Maps 1 of 3, 2 of 3, and 3 of 3,* dated June 29, 2009, in the report accurately depict the locations and boundaries for wetlands and other waters on the property defined above.

The wetland delineation results indicate that there are approximately 4.97 acres of wetland abutting Bitter Creek and 7.25 acres of other waters (Bitter Creek) within the acre study. **Therefore, all wetlands and other waters within the study area meet the definition of waters of the United States as defined at 33 CFR Part 328.3(a)(5) and (7).**

In the March 28, 2000, edition of the *Federal Register* (Vol. 65, No. 60), the Corps implemented an administrative appeals process for jurisdictional determinations. This letter serves as an approved jurisdictional determination. The City of Rock Springs may appeal any determination to the Division Engineer's appeal officer, Mr. David Gesl, by obtaining a Notification of Administrative Appeal Options and Process (NAO) form at our web site. Section "D" of the NAO explains the procedures for appeal. The NAO form must be submitted to Mr. Gesl at the address shown on the form prior to **November 16, 2009**, or forfeit the right to an administrative appeal.

Please be aware that the landowner is responsible for obtaining authorization prior to commencing with any activities that include a discharge of dredged or fill material in waters of the United States. Many activities with minor impacts are authorized by general permits known as nationwide permits. On March 19, 2007, our office issued a public notice describing all of the nationwide permits currently in effect in Wyoming based upon information contained in Part II of the *Federal Register* published on March 12, 2007 (Volume 72, No. 47). A copy of the public notice is available from our web site. A standard (individual) permit would be required if a project's total impacts on waters of the U.S. exceeds the nationwide permit criteria. A permit application (ENG Form 4345) is also available from our web site.

This verification is valid for a period of five years, until **September 16, 2014**, unless new information warrants a modification. If you have any questions, please contact Mr. Michael Burgan at (307) 772-2300 and reference file No. NWO-2008-2869.

Sincerely,

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

Copies Furnished:

Cindy Adams
BKS Environmental Associates, Inc.
P.O. Box 3017
Denver, Colorado 80203-1256

Jan Striefel
Landmark Design, Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

The Omaha District, Regulatory Branch, Wyoming Regulatory Office is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete a Customer Service Survey found on our web site at https://www.nwo.usace.army.mil/html/od-rwy/survey.htm Paper copies of the survey are also available upon request for those without Internet access.

2008 WETLAND ASSESSMENT
FOR
CITY OF ROCK SPRINGS
BITTER CREEK

Prepared for:

City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Landmark Designs Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Prepared by:

BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

October 20, 2008/ Updated March 19, 2009

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INTRODUCTION

The following report is based upon an April 7, 2008 request by Landmark Design Inc. (LDI), of Salt Lake City, Utah, to provide technical consulting services in the form of a wetland assessment for the City of Rock Springs Bitter Creek Project. The Bitter Creek Project's objective is to reconstruct the creek channel to aid in flood control, and to improve the creek's aesthetics and community value by stabilizing the creek banks and planting appropriate wetland and upland species. The flood control is needed so properties now shown in the flood plain can be removed from the Flood Insurance Rate Map (FIRM) and the attached restrictions. The Bitter Creek Project includes the modification of the Bitter Creek stream channel and construction of two detention basins to aid in flood control. The proposed basins are to be constructed on Dead Horse Canyon Creek, a tributary of Bitter Creek. A report exploring the wetlands associated with the proposed detention basins was composed separately and titled "Bitter Creek Detention Basins" (BKS 2008). The analysis for the wetland report required by the United States Army Corp of Engineers (USACE) will be included in the Bitter Creek Project Environmental Assessment (EA) as required by the Wyoming Department of Environmental Quality (WDEQ)/ Abandoned Mine Land (AML).

BKS Environmental Associates, Inc. (BKS) of Rock Springs, Wyoming conducted a field survey on September 9 and 10, 2008. Bitter Creek is located in Sweetwater County in:

- NE1/4 of Section 3, T18N R105W
- T19N R105W
    - SE 1/4 of Section 34
    - W1/2 of Section 35
    - S1/2 Section 25 and 26

Appendix A: Figure 1 identifies the project area; Figures 2 - 5 identify segments of Bitter Creek and the associated wetlands.

Authorization for the proposed project will need to be considered under an individual permit as the project exceeds the maximum loss of 0.5 acres of Waters of the United States (WOUS) and 300 feet of linear feet of stream bed, as stated in Nationwide Permit 43 (NWP43)- Stormwater Management Facility.

METHODOLOGY

The wetland survey was conducted in accordance with the 1987 USACE Wetland Delineation Manual and the Arid West Supplement. Other Waters of the United States (OWUS) were also assessed during the survey. The routine wetland delineation method with onsite inspection was utilized, and the survey was conducted by pedestrian reconnaissance. Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of wetland criteria indicators. Arid West Version 11-1-06 Wetland Determination Data Forms were utilized for each observation point. Hydrology and soils were evaluated whenever a different plant community met hydrophytic vegetation

parameters based on the 50/20 Rule (as defined by the USACE), or whenever indicators suggested the potential presence of a seasonal wetland under normal circumstances.

Soils information for the project area was unavailable for Sweetwater County, Wyoming on the NRCS website. Soils for Sweetwater County have not yet been mapped.

Potential wetlands, WoUS and OWUS were initially identified via review of the following quadrangle maps:

USGS 1997 Color Infrared (CIR) imagery for Rock Springs, Wyoming Quadrangle Map
USGS 1997 CIR imagery for Reliance, Wyoming Quadrangle Map

Wetland indicator categories were identified for each dominant plant species observed using the National List of Plant Species that Occur in Wetlands, 1988 and 1996 National Summary. Region 9 indicator categories were utilized for the project area. Appendix C provides a table of all species observed in the project area and associated indicator status.

Field sample locations and resulting wetland boundaries were recorded with a hand-held Garmin III Plus Global Positioning System (GPS) unit in UTM NAD 1983, Zone 12. BKS provided drafting services for the project.

RESULTS

Bitter Creek runs through the center of Rock Springs and extends the length of 3.72 miles. The project area is split into the following four segments based on the Master Plan for the Reclamation and Development of the Bitter Creek Drainage through Downtown Rock Springs, Wyoming (2007):

- South Side Belt (East) to N Street
- N Street to Dewar Street
- Dewar to South Side Belt (West)
- South Side Belt to Sweetwater Creek

During the time of the survey, water was flowing in Bitter Creek throughout the project area. There was trash present in and around the creek channel in the N Street to Dewar and South Side Belt to Sweetwater Creek section. One vehicle was in the middle of the channel in the South Side Belt (East) to N street section. The water was primarily murky, but submergent vegetation, *Potamogeton foliosus* (leafy pondweed), was present in the Dewar to South Side Belt (West) section and southwest.

There were approximately one foot wide Palustrine Emergent (PEM) wetlands on either side of Bitter Creek channel from the South Side Belt (East) to Dewar Street sections. Further southwest in the project area the PEM increased and averaged five to ten feet wide. The PEM wetlands were characterized by hydrophytic vegetation and hydrology, and in some areas hydric soils were also present. The PEM wetlands were wider from

the Dewar to South Side Belt (West) section to the South Side Belt to Sweetwater Creek section.

South Side Belt (East) to N Street

The South Side Belt (East) to N Street section is in the northeast portion of the project area and extends along 0.77 miles of the Bitter Creek stream channel. Two wetland datasheets were completed for this section of stream channel, WET 4 and WET 5, as well as three datasheets to the east of this section, WET 1, WET 2, and WET 3. The datasheets completed outside of the project area were utilized as wetland type points and referenced to document areas within the project boundaries that had similar characteristics. The beginning of the project area up to WET 5 was found to be OWUS and PEM wetlands along the lower bank of the channel. The OWUS totaled 0.35 acres and PEM totaled 0.20 acres. The portion of the creek between WET 5 and the N Street to Dewar Street section was found to be also PEM wetlands, with *Schoenoplextus maritimus* (cosmopolitan bulrush) emerging from the channel bottom. Total PEM was 0.33 acres.

N Street to Dewar Street

The N Street to Dewar Street section is in the north-central portion of the project area and extends along 1.77 miles of the Bitter Creek stream channel. One wetland datasheet was filled out along this section of Bitter Creek, WET 9; however, the area was compared to several other datasheets previously completed. This portion of the creek had intermittent PEM wetlands totaling 0.12 acres, characterized by emergent vegetation, cosmopolitan bulrush, growing in the middle of the creek channel. Near the end of this section and the beginning of the Dewar to South Side Belt (West) section there was a small area, 0.01 acres, of Riverine Intermittent Aquatic Bed (R4AB) wetland with submergent vegetation, leafy pondweed, present. The remaining area of channel was characterized by OWUS and PEM wetlands along the lower bank of the channel. The PEM wetlands were on average one to two feet wide on either side of the bank. The PEM had a high percentage of hydrophytic vegetation, soils with redox features and gley colors, and a high water table present.

Dewar to South Side Belt (West)

The Dewar to South Side Belt (West) section is in the south-central portion of the project area and extends along 0.84 miles of the Bitter Creek stream channel. Two wetland datasheets were filled out along this section of Bitter Creek, WET 7 and WET 8. WET 7, determined the area was R4AB; this area extended the entire 0.84 miles of creek channel within this section. The area had submergent vegetation, hydric soils, and hydrology present. The vegetation along the lower banks was predominantly *Lepidium latifolium* (broadleaved pepperweed)*, Puccinellia nuttalliana* (Nuttall's alkaligrass)*,* and cosmopolitan bulrush*;* this area was designated PEM. Slopes ranged from 5% in the drainage bottom to 80% on the upper banks. Vegetation on the upper bank was predominantly *Tamarix ramosissima* (salt cedar) and *Ericameria nauseosa* (rubber rabbitbrush). At waypoint 33, a pipe entered the channel and a visible iron stain was present within the channel bottom. From waypoint 35 to the end of the project area sediment control structures were present.

WET 8 had submergent vegetation, leafy pondweed, present in the channel. WET 8, however, was sampled on the channel bank and was determined to be PEM. Hydrophytic vegetation and hydrology were present; however, the soils did not meet the hydric criteria as the value was greater than 2, but all other characteristics were present including redox features. The lowland area and associated PEM was approximately 25 feet wide throughout this area and the R4AB wetland channel was approximately 10 feet wide.

South Side Belt to Sweetwater Creek

The South Side Belt to Sweetwater Creek section is in the southwest portion of the project area and extends along 0.29 miles of the Bitter Creek stream channel. There was one wetland datasheet filled out for this section, WET6. WET 6 was determined to be a PEM wetland based on hydrophytic vegetation and hydrology. At WET 6 and waypoint 27 the channel contained submergent vegetation, leafy pondweed, and resembled WET 7, which was designated as a R4AB wetland. However the waypoints between WET 6 and waypoint 7 did not have submergent vegetation documented, but water was present within the channel.

TABLE 1: SUMMARY OF WETLANDS WITHIN THE PROJECT AREA

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	2008 Delineation Designation	Cowardin Classification	Total Acreage of Cowardin Classification	Geomorphic Setting	Location along Bitter Creek	Jurisdictional Recommendation
Wet1	T19N R104W Sec 30	P1, P2	Wetland	PEM	0.25	Drainage	South Side Belt (East) to N Street	Jurisdictional
Wet2	T19N R104W Sec 30	P5, P6	Non-wetland	--	--	Drainage	South Side Belt (East) to N Street	--
Wet3	T19N R104W Sec 30	P7, P8, P9	Wetland	PEM	--	Drainage	South Side Belt (East) to N Street	
Wet4	T19N R104W Sec 30	P20, P21, P22	Wetland	PEM	1.08	Drainage	South Side Belt (East) to N Street	Jurisdictional
Wet5	T19N R105W Sec. 25	P32, P33	Wetland	PEM	0.25	Drainage	South Side Belt (East) to N Street	Jurisdictional
Wet6	T18N R105W Sec. 3	P56, P57	Wetland	PEM	1.08	Drainage	South Side Belt to Sweetwater Creek	Jurisdictional
Wet7	T19N R105W Sec. 34	P67, P68	Wetland	R4AB	0.27	Drainage	Dewar to South Side Belt (West)	Jurisdictional
Wet8	T19N R105W Sec. 35	P80, P81	Wetland	PEM	1.08	Drainage	Dewar to South Side Belt (West)	Jurisdictional

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	2008 Delineation Designation	Cowardin Classification	Total Acreage of Cowardin Classification	Geomorphic Setting	Location along Bitter Creek	Jurisdictional Recommendation
Wet9	T19N R105W Sec.35	P92, P93	Wetland	PEM	1.08	Drainage	N Street to Dewar Street	Jurisdictional

TABLE 2: SUMMARY OF WETLAND DELINEATION RESULTS

Name	Acres of Wetland in Channel	Acres of PEM along Channel	Acres of OWUS	Length of Stream Channel to be Affected (miles)
South Side Belt (East) to N Street	0.13	0.20	0.33	0.77
N Street to Dewar Street	0.14	0.57	0.95	1.77
Dewar to South Side Belt (West)	0.23	0.15	0.35	0.84
South Side Belt to Sweetwater Creek	0.03	0.16	0.72	0.34
Total	**0.51**	**1.08**	**2.36**	**3.72**

DISCUSSION

Bitter Creek has wetlands present throughout the project area. The wetlands are sparser at the South Side Belt (East) to N Street end and increases as the channel moves towards the South Side Belt to Sweetwater Creek. The channel also increases in size as the channel moves West through town, starting with a width of approximately five feet and ending with a width of approximately 10 feet.

There were intermittent areas of PEM and PAB wetlands within the channel at waypoints 5, 13, 15, 18, 22, 23, WET 1, WET 5 and 27, 29, 31, 32, 37, and WET 7 respectively. The South Side Belt (East) to N Street had 0.13 acres of PEM wetlands and the N Street to Dewar Street had 0.12 acres of PEM and 0.01 acres of R4AB wetlands. The Dewar to South Side Belt (West) and South Side Belt to Sweetwater Creek had 0.23 acres and 0.03 acres of R4AB wetlands, respectively. The remaining areas of the channel included OWUS within the channel and PEM wetlands on the fringe of the channel, on average one to two feet wide. There were a total of 1.08 acres of PEM wetland fringe along Bitter Creek, and 2.36 acres of OWUS with a length of stream channel at 3.72 miles.

CONCLUSION

Construction activities on Bitter Creek to widen the channel or construction of bridges will likely affect wetlands; these affects will be short-term during the construction. Construction done in the winter, when flows in Bitter Creek decrease, may cause less harm to the wetlands present within the channel, re-seeding of wetland species along the fringe of the channel would also help re-establishment of the wetlands.

Final authority of wetland jurisdiction lies with the U.S. Army Corp of Engineers.

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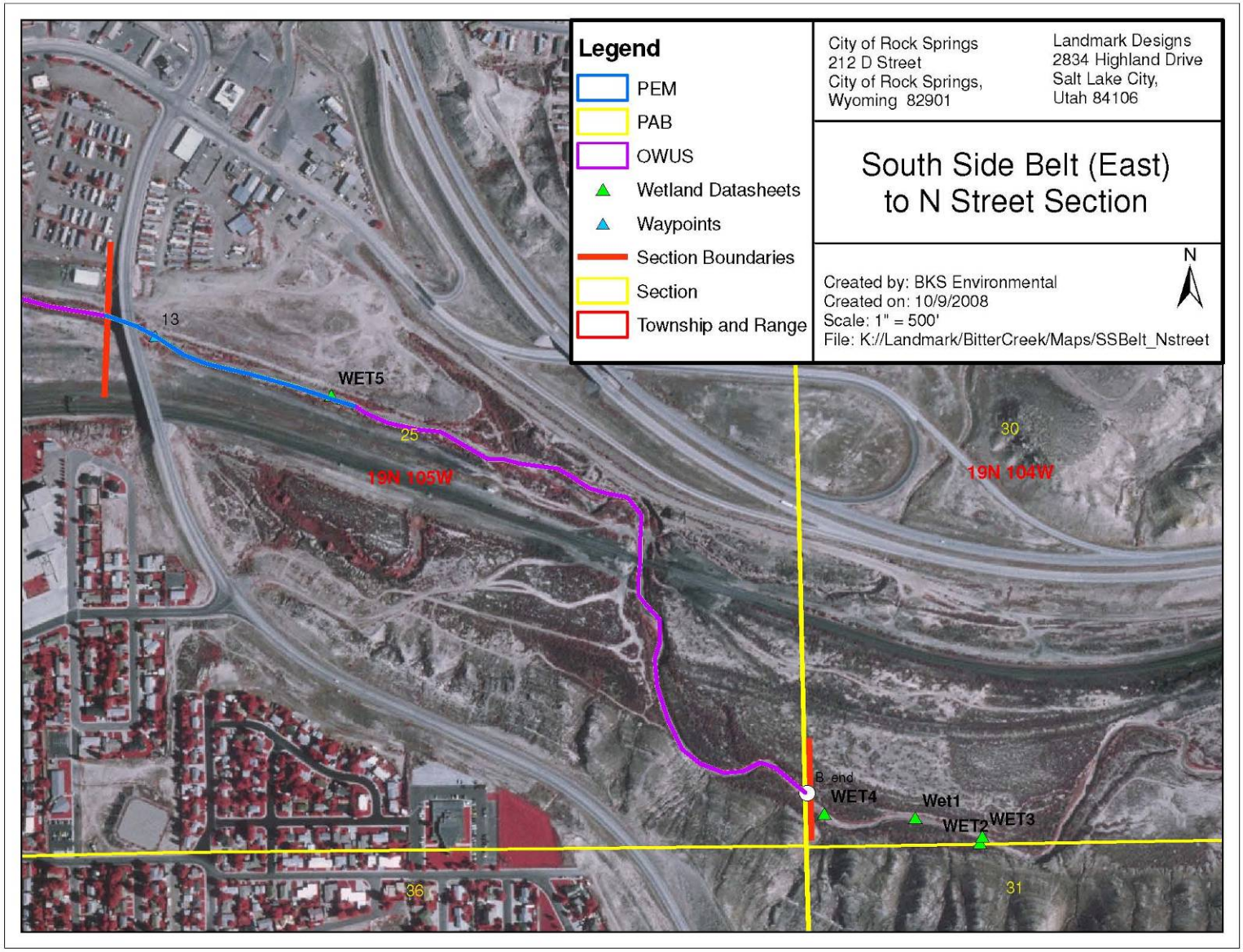
U.S. Fish and Wildlife Service. 1997. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary.
Wyoming Game and Fish. 2008. National Wetlands Inventory Mapping from 1976.

APPENDIX A

MAPS

Figure 1: Map of the Project Area Including all Proposed Detention Basins
Figure 2: South Side Belt (East) to N Street
Figure 3: N Street to Dewar Street
Figure 4: Dewar to South Side Belt (West)
Figure 5: South Side Belt to Sweetwater Creek

Insert Figure 1
Project Areas (Large Map)


Legend
PEM
PAB
OWUS
Wetland Datasheets
Waypoints
Section Boundaries
Section
Township and Range
City of Rock Springs
212 D Street
City of Rock Springs,
Wyoming 82901
Landmark Designs
2834 Highland Drive
Salt Lake City,
Utah 84106
South Side Belt (East)
to N Street Section
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Created on: 10/9/2008
Scale: 1" = 500'
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Wet1
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WET3
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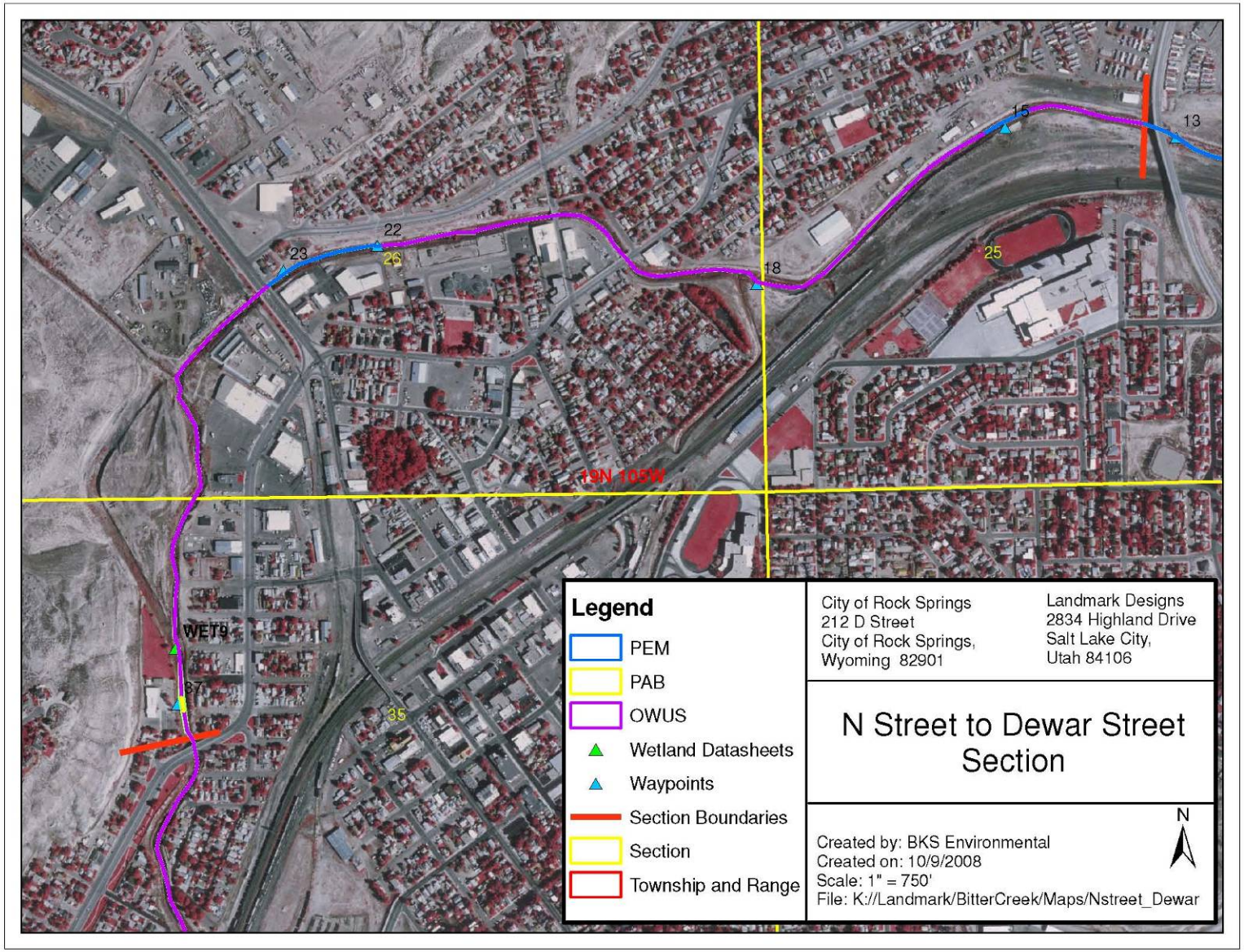
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WET9
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Wetland Datasheets
Waypoints
Section Boundaries
Section
Township and Range
City of Rock Springs
212 D Street
City of Rock Springs,
Wyoming 82901
Landmark Designs
2834 Highland Drive
Salt Lake City,
Utah 84106
N Street to Dewar Street Section
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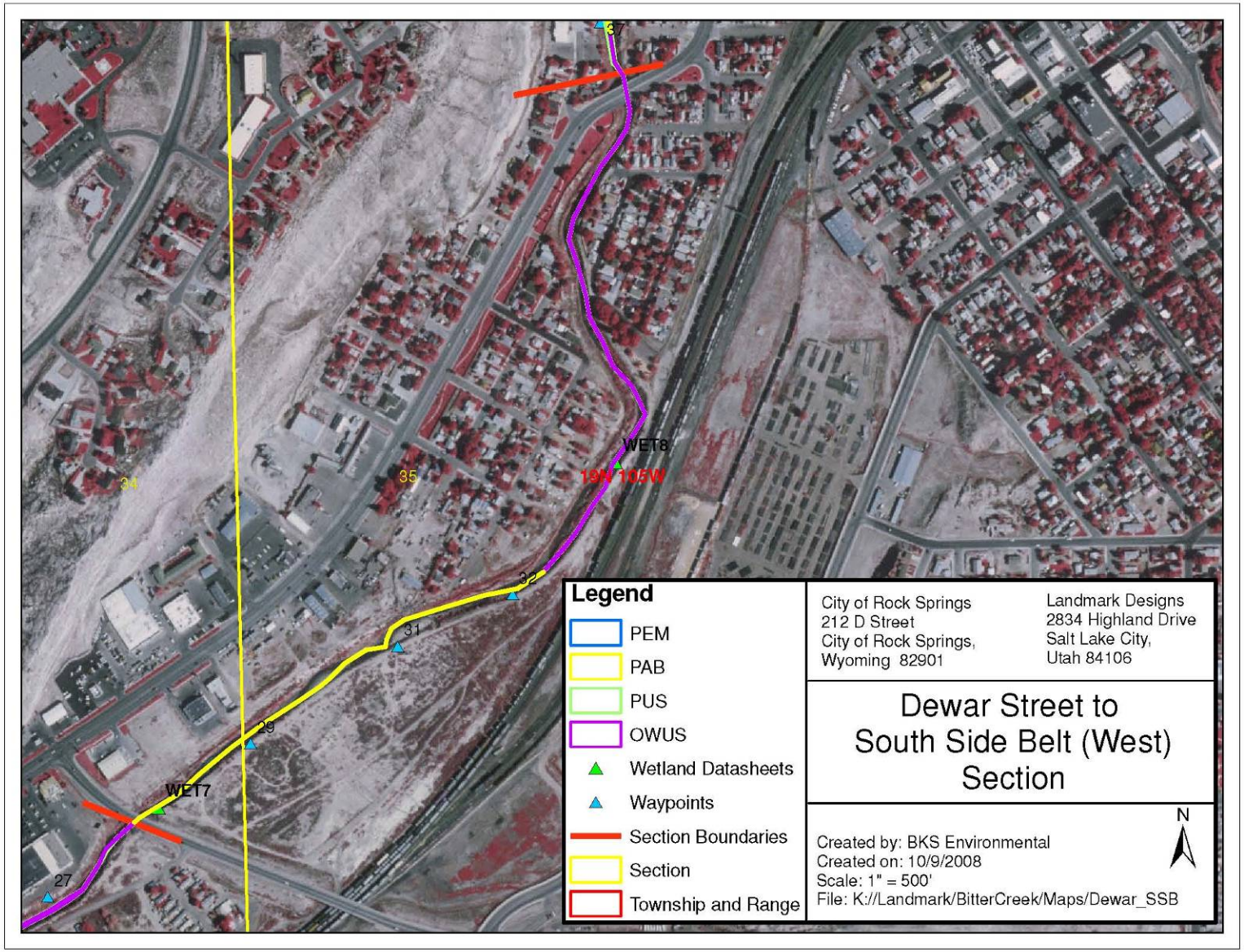
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Waypoints
Section Boundaries
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Township and Range
City of Rock Springs
212 D Street
City of Rock Springs,
Wyoming 82901
Landmark Designs
2834 Highland Drive
Salt Lake City,
Utah 84106
Dewar Street to
South Side Belt (West)
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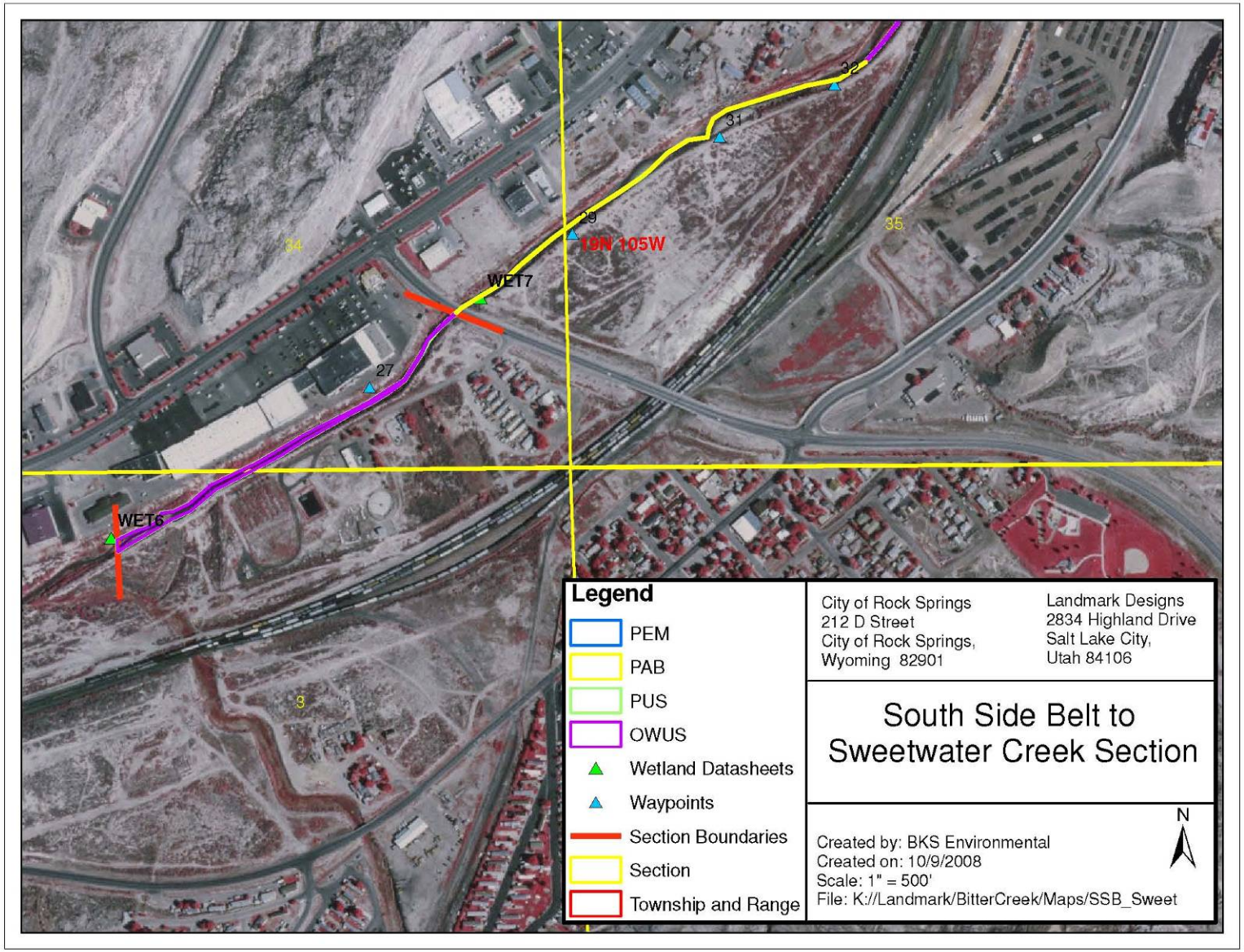
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WET7
WET6
Legend
PEM
PAB
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Wetland Datasheets
Waypoints
Section Boundaries
Section
Township and Range
City of Rock Springs
212 D Street
City of Rock Springs,
Wyoming 82901
Landmark Designs
2834 Highland Drive
Salt Lake City,
Utah 84106
South Side Belt to
Sweetwater Creek Section
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Created by: BKS Environmental
Created on: 10/9/2008
Scale: 1" = 500'
File: K://Landmark/BitterCreek/Maps/SSB_Sweet

APPENDIX B

PHOTOS

WET 1: Upstream

WET1: Downstream

WET2: Upstream

WET2: Downstream

WET3: Photo of hole, upstream and downstream same as WET2

WET4: Photo of hole and surrounding vegetation

WET4: Upstream

WET4: Downstream

WET5: Upstream

WET5: Downstream

WET6: Upstream

WET6: Downstream

WET7: Upstream

WET7: Downstream

WET8: Upstream

WET8: Downstream

WET9: Upstream

WET9: Downstream

APPENDIX C

PLANT LIST FOR PROJECT AREA

Species Code	***Common Name***	**Scientific Name**	**Wetland Code**
ARTTRI	*Artemisia tridentata*	big sagebrush	UPL
ATRCON	*Atriplex confertifolia*	shadscale saltbush	NI
ATRHOR	*Atriplex hortensis*	garden orache	FAC
ATRHET	*Atriplex heterosperma*	twoscale saltbush	UPL
BROTEC	*Bromus tectorum*	cheatgrass	UPL
DESSOP	*Descurainia sophia*	flixweed tansymustard	UPL
DISSPI	*Distichlis spicata*	saltgrass	FACW
ELAANG	*Elaeagnus angustifolia*	Russian olive	FAC
ELYSMI	*Elymus smithii*	western wheatgrass	UPL
ERINAU	*Ericameria nauseosa*	rubber rabbitbrush	UPL
HALGLO	*Halogeton glomeratus*	halogeton	UPL
HORJUB	*Hordeum jubatum*	foxtail barley	FAC-
JUNBAL	*Juncus balticus*	baltic rush	FACW+
LEPLAT	*Lepidium latifolium*	broadleaved pepperweed	FAC
LYCBAR	*Lycium barbarum*	matrimony vine	UPL
PHRAUS	*Phragmites australis*	common reed	FACW+
POASEC	*Poa secunda*	sandberg bluegrass	FACU
POTFOL	*Potamogeton foliosus*	leafy pondweed	OBL
PUCNUT	*Puccinellia nuttalliana*	Nuttall's alkaligrass	OBL
SAL spp	*Salix* species	willow	
SARVER	*Sarcobatus vermiculatus*	greesewood	FACU+
SCHMAR	*Schoenoplectus maritimus*	cosmopolitan bulrush	OBL
SCHPUN	*Schoenoplectus pungens*	common threesquare	OBL
SISALT	*Sisymbrium altissimum*	tall tumblemustard	UPL
SYMCIL	*Symphyotrichum ciliatum*	rayless alkali aster	FACW
TAMRAM	*Tamarix ramosissima*	tamrisk / saltcedar	FACW

APPENDIX D

WETLAND DETERMINATION DATA FORMS:
Arid West Region

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek | City/County: Rock Springs, Sweetwater County | Sampling Date: 9/9/2008
Applicant/Owner: Landmark | State: WY | Sampling Point: WET1
Investigator(s): C. Adams and D. Gardner | Section, Township, Range: Sec. 30, T19N R104W
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope (%): 5
Subregion (LRP): Interior Deserts (LRR D) | Lat: 650659 | Long: 4605727 | Datum: NAD83 UTM12
Soil Map Unit Name: | NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation ____, Soil ____, or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes	X	No	
Wetland Hydrology Present	Yes	X	No	

Is the Sampled Area Within a Wetland: Yes X No

Remarks:
P1 – Upstream; P2 – Downstream; 4' on left, 3' on right facing up; Upland vegetation is dominated by SARVER and salt cedar on opposite bank

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Lepidium latifolium*	75%	X	FAC
2. *Puccinellia nuttalliana*	5%		OBL
3. *Schoenoplectus pungens*	20%	X	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species	25	x1=	25	
FACW species		x2=		
FAC species	75	x3=	225	
FACU species	0	x4=	0	
UPL species	0	x5=	0	
Column Totals:	100	(A)	250	(B)

Prevalence Index = B/A = 2.50

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%
X Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing

Woody Vine Stratum

1.
2.
3.
Total Cover:

supporting
data in Remarks or on a separate sheet)
Problematic Hydrophyic Vegetation
(Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

% Bare Ground in Herb Stratum 50% % Cover of Biotic Crust

Remarks:
End of emergent vegetation; End of PEM; Downstream water present and emergent vegetation

US Army Corps of Engineers Arid West-Version 11-1-06

SOIL Sampling Point
WET1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR 5/3	100					C	
2 - 2.2	7.5 4/4	100					C	
2.2 - 8	10YR 5/2	95	10YR 4/6	5	C	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (LRR C)
- 1 cm Muck (A9) (LRR D)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- X Depleted Matirx (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (LRR C)
- 2 cm Muck (A10) (LRR B)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:
Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- Water Marks (B1) (Nonriverine)
- Salt Crusts (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Oder (C1)

Secondary Indicators (2 or more required)

- Water Marks (B1) (Riverine)
- Sediment Deposits (B2) (Riverine)
- Drift Deposits (B3) (Riverine)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)

____ Sediment Deposits (B2) (Nonriverine)	____ Oxidized Rhizospheres along Living Roots (C3)	____ Thin Muck Surface (C7)
____ Drift Deposits (B3) (Nonriverine)	____ Presence of Reduced Iron (C4)	____ Crayfish Burrows (C8)
____ Surface Soil Cracks (B6)	____ Recent Iron Reduction in Plowed Soil (C6)	____ Saturation Visible on Aerial Imagery (C9)
____ Inundation Visible on Aerial Imagery (B7)	____ Other (Explain in Remark)	____ Shallow Aquitard (D3)
____ Water Stained Leaves (B9)		____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ____	Depth (inches):	5.5	
Water Table Present?	Yes X	No ____	Depth (inches):	5	
Saturation Present? (includes capillary fringe)	Yes X	No ____	Depth (inches):	2-8	Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

US Army Corps of Engineers Arid West-Version 11-1-06

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/9/2008
Applicant/Owner: Landmark State: WY Sampling Point: WET2
Investigator(s): C. Adams and D. Gardner Section, Township, Range: Sec. 30, T19N R104W
Landform (hillslope, terrace, etc.) Terrace Local relief (concave, convex, none): Concave Slope (%): ____
Subregion (LRP): Interior Deserts (LRR D) Lat: 650741 Long: 4605695 Datum: NAD83 UTM12
Soil Map Unit Name: ____ NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	Is the Sampled Area Within a Wetland	Yes ____ No X
Hydric Soil Present?	Yes ____	No X		
Wetland Hydrology Present	Yes	No X		

Remarks:
P5 – upstream; P6 – downstream; PP of hole

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			

Sapling/Shrub Stratum

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species

1.	*Ericameria nauseosa*	5		UPL	
2.					
3.					
4.					
5.					
	Total Cover:	5			

Herb Stratum

1.	*Lepidium latifolium*	29	X	FAC	
2.	*Phragmites australis*	66	X	FACW+	
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
	Total Cover:	100			

Woody Vine Stratum

1.					
2.					
3.					
	Total Cover:				

% Bare Ground in Herb Stratum

% Cover of Biotic Crust

That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x1=	0
FACW species	66	x2=	132
FAC species	29	x3=	87
FACU species	0	x4=	0
UPL species	5	x5=	25
Column Totals:	100 (A)		244 (B)

Prevalence Index = B/A = 2.44

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Ericameria nauseosa is only 5% of total vegetative cover

US Army Corps of Engineers Arid West-Version 11-1-06

SOIL Sampling Point

WET2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 – 0.5	2.5Y 5/2	100					C	
0.5 – 3	2.5Y 4/3	100					LS	
3 - 10	2.5 4/4	100					S	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Histosol (A1)	Sandy Redox (S5)	Indicators for Problematic Hydric Soils[3]:
Histic Epipedon (A2)	Stripped Matrix (S6)	1 cm Muck (A9) (LRR C)
Black Histic (A3)	Loamy Mucky Mineral (F1)	2 cm Muck (A10) (LRR B)
Hydrogen Sulfide (A4)	Loamy Gleyed Matrix (F2)	Reduced Vertic (F18)
Stratified Layers (A5) (LRR C)	Depleted Matirx (F3)	Red Parent Material (TF2)
1 cm Muck (A9) (LRR D)	Redox Dark Surface (F6)	Other (Explain in Remarks)
Depleted Below Dark Surface (A11)	Depleted Dark Surface (F7)	
Thick Dark Surface (A12)	Redox Depressions (F8)	

____ Sandy Mucky Mineral (S1)	____ Vernal Pools (F9)
____ Sandy Gleyed Matrix (S4)	

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soils Present? Yes: ____ No: X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

____ Surface Water (A1)	____ Salt Crusts (B11)	____ Water Marks (B1) (Riverine)
____ High Water Table (A2)	____ Biotic Crust (B12)	____ Sediment Deposits (B2) (Riverine)
____ Saturation (A3)	____ Aquatic Invertebrates (B13)	____ Drift Deposits (B3) (Riverine)
____ Water Marks (B1) (Nonriverine)	____ Hydrogen Sulfide Oder (C1)	____ Drainage Patterns (B10)
____ Sediment Deposits (B2) (Nonriverine)	____ Oxidized Rhizospheres along Living Roots (C3)	____ Dry-Season Water Table (C2)
____ Drift Deposits (B3) (Nonriverine)	____ Presence of Reduced Iron (C4)	____ Thin Muck Surface (C7)
____ Surface Soil Cracks (B6)	____ Recent Iron Reduction in Plowed Soil (C6)	____ Crayfish Burrows (C8)
____ Inundation Visible on Aerial Imagery (B7)	____ Other (Explain in Remark)	____ Saturation Visible on Aerial Imagery (C9)
____ Water Stained Leaves (B9)		____ Shallow Aquitard (D3)
		____ FAC-Neutral Test (D5)

Secondary Indicators (2 or more required)

Field Observations:

Surface Water Present?	Yes ____	No ____	Depth (inches): ____	
Water Table Present?	Yes ____	No ____	Depth (inches): ____	
Saturation Present? (includes capillary fringe)	Yes ____	No ____	Depth (inches): ____	Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Within 5' of water

US Army Corps of Engineers Arid West-Version 11-1-06

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/9/2008
Applicant/Owner: Landmark State: WY Sampling Point: WET3
Investigator(s): C. Adams and D. Gardner Section, Township, Range: Sec. 30, T19N R104W
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none): Concave Slope (%): 25
Subregion (LRP): Interior Deserts (LRR D) Lat: 650744 Long: 4605703 Datum: NAD83 UTM12
Soil Map Unit Name: NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland	Yes ____ No X
Hydric Soil Present?	Yes	X	No			
Wetland Hydrology Present	Yes	X	No			

Remarks:
P7- of hole; P8 – upstream; P9 – downstream; Salt cedar on opposite bank; Drainage is 7' wide; Wet or potential is 1' on S side of drainage

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Ericameria nauseosa*	5		UPL
2.			
3.			
4.			
5.			
Total Cover:	5		
Herb Stratum			
1. *Phragmites australis*	67	X	FACW+
2. *Schoenoplectus pungens*	3		OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	70		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 25% % Cover of Biotic Crust

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	3	x1=	3
FACW species	67	x2=	134
FAC species	0	x3=	0
FACU species	0	x4=	0
UPL species	5	x5=	25
Column Totals:	75 (A)		162 (B)

Prevalence Index = B/A = 2.16

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%
X Prevalence Index is ≤ 3.0[1]
___ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Ericameria nauseosa is only 5% of total vegetative cover

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SOIL Sampling Point WET3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 2	2.5YR 5/3	100					C	
2 – 8	2.5YR 5/3	99	5YR 5/8	1	C	M	SCL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	6	
Water Table Present?	Yes ___	No ___	Depth (inches):	___	
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches):	___	Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek | City/County: Rock Springs, Sweetwater County | Sampling Date: 9/9/2008
Applicant/Owner: Landmark | State: WY | Sampling Point: WET4
Investigator(s): C. Adams and D. Gardner | Section, Township, Range: Sec. 30, T19N R104W
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope (%): 5
Subregion (LRP): Interior Deserts (LRR D) | Lat: 650543 | Long: 4605732 | Datum: NAD83 UTM12
Soil Map Unit Name: | NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes	X	No	
Wetland Hydrology Present	Yes	X	No	

Is the Sampled Area Within a Wetland: Yes X No

Remarks:
P20 – upstream; P21 – downstream; P22 – hole; Drainage is approximately 8' wide; Wet approximately 1'-0.5" wide with rush vegetation. Wetland fringe.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Tamarix ramosissima*	5		FACW
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Juncus balticus*	30	X	FACW+
2. *Lepidium latifolium*	1		FAC
3. Puccinellia nuttalliana	19	X	OBL
4. *Distichlis spicata*	3		FAC+
5. *Hordeum jubatum*	2		FAC-
6.			
7.			
8.			
9.			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	19	x1=	19
FACW species	35	x2=	70
FAC species	6	x3=	18
FACU species	0	x4=	0
UPL species	0	x5=	0
Column Totals:	60 (A)		107 (B)

Prevalence Index = B/A = 1.78

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

10. _____ Total Cover:

Woody Vine Stratum

1. _____
2. _____
3. _____ Total Cover:

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust

X Prevalence Index is ≤ 3.0[1]
Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks: Tamrix comprised only of 5% cover. No ULT too clayey and the banks are too steep

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SOIL Sampling Point
WET4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 7	2.5Y 5/3	90	2.5Y 4/1	10	D	M	siC	In bands
7 – 9	2.5Y 4/3	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

_____ Histosol (A1)
_____ Histic Epipedon (A2)
_____ Black Histic (A3)
_____ Hydrogen Sulfide (A4)
_____ Stratified Layers (A5) (LRR C)
_____ 1 cm Muck (A9) (LRR D)
_____ Depleted Below Dark Surface (A11)
_____ Thick Dark Surface (A12)
_____ Sandy Mucky Mineral (S1)
_____ Sandy Gleyed Matrix (S4)
_____ Sandy Redox (S5)
_____ Stripped Matrix (S6)
_____ Loamy Mucky Mineral (F1)
_____ Loamy Gleyed Matrix (F2)
_____ Depleted Matirx (F3)
_____ Redox Dark Surface (F6)
_____ Depleted Dark Surface (F7)
_____ Redox Depressions (F8)
_____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

_____ 1 cm Muck (A9) (LRR C)
_____ 2 cm Muck (A10) (LRR B)
_____ Reduced Vertic (F18)
_____ Red Parent Material (TF2)
X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____
Depth (inches): _____

Hydric Soils Present? Yes: X No: _____

Remarks:
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
_____ High Water Table (A2)
_____ Saturation (A3)
_____ Salt Crusts (B11)
X Biotic Crust (B12)
_____ Aquatic Invertebrates (B13)

Secondary Indicators (2 or more required)

_____ Water Marks (B1) (Riverine)
_____ Sediment Deposits (B2) (Riverine)
_____ Drift Deposits (B3) (Riverine)
_____ Drainage Patterns (B10)

____ Water Marks (B1) (Nonriverine)	____ Hydrogen Sulfide Oder (C1)	____ Dry-Season Water Table (C2)
____ Sediment Deposits (B2) (Nonriverine)	____ Oxidized Rhizospheres along Living Roots (C3)	____ Thin Muck Surface (C7)
____ Drift Deposits (B3) (Nonriverine)	____ Presence of Reduced Iron (C4)	____ Crayfish Burrows (C8)
____ Surface Soil Cracks (B6)	____ Recent Iron Reduction in Plowed Soil (C6)	____ Saturation Visible on Aerial Imagery (C9)
____ Inundation Visible on Aerial Imagery (B7)	____ Other (Explain in Remark)	____ Shallow Aquitard (D3)
____ Water Stained Leaves (B9)		____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 3.5
Water Table Present? Yes ____ No X Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No X Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
About 2' from water; Pipe flowing into drainage

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WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/9/2008
Applicant/Owner: Landmark State: WY Sampling Point: WET5
Investigator(s): C. Adams and D. Gardner Section, Township, Range: Sec. 25, T19N R105W
Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none): concave Slope (%): 0
Subregion (LRP): Interior Deserts (LRR D) Lat: 649916 Long: 4606265 Datum: NAD83 UTM12
Soil Map Unit Name: ____ NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes X No ____
Wetland Hydrology Present Yes X No

Is the Sampled Area Within a Wetland Yes X No ____

Remarks:
P32 – upstream; P33 – downstream; Channel 6-8'; Entire wetland 18'

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Sapling/Shrub Stratum

1.				
2.				
3.				
4.				
5.				
Total Cover:				

Herb Stratum

1.	*Schoenoplextus maritimus*	100%	X	OBL
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover:				

Woody Vine Stratum

1.				
2.				
3.				
Total Cover:				

% Bare Ground in Herb Stratum 70% % Cover of Biotic Crust

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x1=	100
FACW species	0	x2=	0
FAC species	0	x3=	0
FACU species	0	x4=	0
UPL species	0	x5=	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%
X Prevalence Index is ≤ 3.0[1]
Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
On bank: Salt Cedar, salt grass, and broadleaved pepperweed

US Army Corps of Engineers Arid West-Version 11-1-06

SOIL Sampling Point
WET5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 – 3	10YR 6/2	100						Sandy lots of color
3 – 12	10YR 4/2	79	Gley1 2.5/N	20	D	M	SC	Rocky
			5YR 5/8	1	C	RC	SC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Histosol (A1)	Sandy Redox (S5)	Indicators for Problematic Hydric Soils[3]:
Histic Epipedon (A2)	Stripped Matrix (S6)	1 cm Muck (A9) (LRR C)
Black Histic (A3)	Loamy Mucky Mineral (F1)	2 cm Muck (A10) (LRR B)
		Reduced Vertic (F18)

___ Hydrogen Sulfide (A4)	___ Loamy Gleyed Matrix (F2)	___ Red Parent Material (TF2)
___ Stratified Layers (A5) (LRR C)	X Depleted Matirx (F3)	___ Other (Explain in Remarks)
___ 1 cm Muck (A9) (LRR D)	___ Redox Dark Surface (F6)	
___ Depleted Below Dark Surface (A11)	___ Depleted Dark Surface (F7)	
___ Thick Dark Surface (A12)	___ Redox Depressions (F8)	
___ Sandy Mucky Mineral (S1)	___ Vernal Pools (F9)	
___ Sandy Gleyed Matrix (S4)		

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? Yes: X No: ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

				Secondary Indicators (2 or more required)
X	Surface Water (A1)	X	Salt Crusts (B11)	___ Water Marks (B1) (Riverine)
X	High Water Table (A2)	___	Biotic Crust (B12)	___ Sediment Deposits (B2) (Riverine)
___	Saturation (A3)	___	Aquatic Invertebrates (B13)	___ Drift Deposits (B3) (Riverine)
___	Water Marks (B1) (Nonriverine)	___	Hydrogen Sulfide Oder (C1)	___ Drainage Patterns (B10)
___	Sediment Deposits (B2) (Nonriverine)	___	Oxidized Rhizospheres along Living Roots (C3)	___ Dry-Season Water Table (C2)
___	Drift Deposits (B3) (Nonriverine)	___	Presence of Reduced Iron (C4)	___ Thin Muck Surface (C7)
___	Surface Soil Cracks (B6)	___	Recent Iron Reduction in Plowed Soil (C6)	___ Crayfish Burrows (C8)
___	Inundation Visible on Aerial Imagery (B7)	___	Other (Explain in Remark)	___ Saturation Visible on Aerial Imagery (C9)
___	Water Stained Leaves (B9)			___ Shallow Aquitard (D3)
				___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	3	
Water Table Present?	Yes X	No ___	Depth (inches):	3	
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches):	___	Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Occurs both up and downstream of point

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WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/10/2008

Applicant/Owner: Landmark State: WY Sampling Point: WET6

Investigator(s): D. Gardner and T. Spelts Section, Township, Range: Sec. 3, T18N R105W

Landform (hillslope, terrace, etc.) Stream Edge Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: 646755 Long: 4603953 Datum: NAD83 UTM12

Soil Map Unit Name: _____ NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland	Yes X No
Hydric Soil Present?	Yes	X	No			
Wetland Hydrology Present	Yes	X	No			

Remarks: P56 – upstream; P57 – downstream; 6' water; 20' on each side of water lowland/wetland species present; The sides of the channel are very steep with greater than 45% slope

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Puccinellia nuttalliana*	30	X	OBL
2. *Schoenoplextus pungens*	30	X	OBL
3. *Lepidium latifolium*	15		FAC
4. Typha spp.	5		OBL
5. *Symphyotrichum ciliatum*	20	X	FACW
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	60	x1=	60
FACW species	20	x2=	40
FAC species	15	x3=	45
FACU species	0	x4=	0
UPL species	0	x5=	0
Column Totals:	100 (A)		145 (B)

Prevalence Index = B/A = 1.45

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Submergent vegetation present in the water (*Potamogeton foliosus*); Area surrounding similar to point; Wetland vegetation present on stream edges; No emergent vegetation in water channel; Some bars present covered with vegetation

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SOIL Sampling Point WET6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)
Depth Matrix Redox Features

(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 - 1	10YR 4/2	100					C	
2 -10	Gley1 3/10Y	95	Gley2 2.5/10B	5	D	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- X Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:
P58 – soil profile, Though the value is not 4 or more, the soil was saturated during the time of survey and had all characteristics similar to a gleyed soil.
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGYWetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 12
Water Table Present? Yes X No ___ Depth (inches): 7
Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

Water was present in the soil hole: Soil was saturated through the entire profile

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WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek | City/County: Rock Springs, Sweetwater County | Sampling Date: 9/10/2008
Applicant/Owner: Landmark | State: WY | Sampling Point: WET7
Investigator(s): D. Gardner and T. Spelts | Section, Township, Range: Sec. 34, T19N R105W
Landform (hillslope, terrace, etc.): Drainage | Local relief (concave, convex, none): Concave | Slope (%): 10
Subregion (LRP): Interior Deserts (LRR D) | Lat: 647225 | Long: 4604258 | Datum: NAD83 UTM12
Soil Map Unit Name: | NWI Classification: R4AB

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ Significantly disturbed? Are "Normal Circumstances" present? Yes X No
Are Vegetation ___, Soil ___, or Hydrology ___ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes	X	No	
Wetland Hydrology Present	Yes	X	No	

Is the Sampled Area Within a Wetland Yes X No

Remarks: P67 – upstream; P68 – downstream; There is a large pipe draining in: Rip-rap present

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Puccinellia nuttalliana*	50	X	OBL
2. *Potamogeton foliosus*	50	X	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x1=	100
FACW species	0	x2=	0
FAC species	0	x3=	0
FACU species	0	x4=	0
UPL species	0	x5=	0
Column Totals:	100 (A)		100 (B)

Prevalence Index = B/A = 1

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%
X Prevalence Index is ≤ 3.0[1]

Total Cover:

Woody Vine Stratum

1.
2.
3.

Total Cover:

% Bare Ground in Herb Stratum 90 % Cover of Biotic Crust

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Mainly bare ground; High percentage of submergent vegetation present; Opposite bank vegetation dominated by *Schoenoplectus maritimus*; Uplands dominated by greasewood and salt cedar

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SOIL Sampling Point
WET7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 – 4	10YR 4/4	100					C	
4 - 8	Gley1 4/10Y	85	Gley1 2.5/N	15	D	RC	C	
8 – 10	7.5YR 2.5/2	90	5YR 4/2	10	R	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Stratified Layers (A5) (LRR C)
____ 1 cm Muck (A9) (LRR D)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)

____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1)
X Loamy Gleyed Matrix (F2)
____ Depleted Matirx (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)
____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:
____ 1 cm Muck (A9) (LRR C)
____ 2 cm Muck (A10) (LRR B)
____ Reduced Vertic (F18)
____ Red Parent Material (TF2)
____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:
Depth (inches):

Hydric Soils Present? Yes: X No: ____

Remarks:
Soil was saturated in all horizons.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X Surface Water (A1)
X High Water Table (A2)
____ Salt Crusts (B11)
____ Biotic Crust (B12)

Secondary Indicators (2 or more required)

____ Water Marks (B1) (Riverine)
____ Sediment Deposits (B2) (Riverine)
____ Drift Deposits (B3) (Riverine)

X Saturation (A3)	___ Aquatic Invertebrates (B13)	___ Drainage Patterns (B10)
___ Water Marks (B1) (Nonriverine)	___ Hydrogen Sulfide Oder (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits (B2) (Nonriverine)	___ Oxidized Rhizospheres along Living Roots (C3)	___ Thin Muck Surface (C7)
___ Drift Deposits (B3) (Nonriverine)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Surface Soil Cracks (B6)	___ Recent Iron Reduction in Plowed Soil (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remark)	___ Shallow Aquitard (D3)
___ Water Stained Leaves (B9)		___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No ___	Depth (inches):	12	
Water Table Present?	Yes X	No ___	Depth (inches):	9	
Saturation Present? (includes capillary fringe)	Yes ___	No ___	Depth (inches):	___	Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Soil saturated in horizons

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WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/10/2008
Applicant/Owner: Landmark State: WY Sampling Point: WET8
Investigator(s): D. Gardner and T. Spelts Section, Township, Range: Sec. 35, T19N R105W
Landform (hillslope, terrace, etc.) Edge of Stream Bank Local relief (concave, convex, none): Concave Slope (%): 5
Subregion (LRP): Interior Deserts (LRR D) Lat: 647806 Long: 4604695 Datum: NAD83 UTM12
Soil Map Unit Name: ___ NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ___, Soil ___, or Hydrology ___ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ___	Is the Sampled Area Within a Wetland	Yes X No ___
Hydric Soil Present?	Yes X	No ___		
Wetland Hydrology Present	Yes X	No		

Remarks: P80 – Upstream; P81 – Downstream;5' of lowland S bank; 10' of lowland N bank; Submergent vegetation present; Entire channel 30' wide

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

4.					
Total Cover:					

Total Number of Dominant Species Across All Strata: 3 (B)

Sapling/Shrub Stratum

1.					
2.					
3.					
4.					
5.					
Total Cover:					

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.67 (A/B)

Herb Stratum

1.	*Atriplex hortensis*	20	X	FAC
2.	*Atriplex heterosperma*	25	X	UPL
3.	*Puccinellia nuttalliana*	40	X	OBL
4.	*Lepidium latifolium*	10		FAC
5.	Typha species	5		OBL
6.				
7.				
8.				
9.				
10.				
Total Cover:				

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	45	x1=	45
FACW species	0	x2=	0
FAC species	30	x3=	90
FACU species	0	x4=	0
UPL species	25	x5=	125
Column Totals:	100 (A)		260 (B)

Prevalence Index = B/A = 2.60

Woody Vine Stratum

1.	
2.	
3.	
Total Cover:	

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

% Bare Ground in Herb Stratum 15% % Cover of Biotic Crust

Remarks:
200' upstream of unknown tributary or pipe with iron stained water entering from; Opposite bank *Punninellia nuttalliana(* OBL) and *Schoenoplectus pungens* (OBL) dominant; Upland similar species to all other locations: Salt cedar and greasewood

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SOIL Sampling Point
WET8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0 – 8	10YR 4/3	60	Gley1 3/N	25	D	RC	C	
			2.5YR 3/6	15	RM	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

Histosol (A1) Sandy Redox (S5) Indicators for Problematic Hydric Soils[3]: 1 cm Muck (A9) (LRR C)

___	Histic Epipedon (A2)	___	Stripped Matrix (S6)	___	2 cm Muck (A10) (LRR B)
___	Black Histic (A3)	___	Loamy Mucky Mineral (F1)	___	Reduced Vertic (F18)
___	Hydrogen Sulfide (A4)	___	Loamy Gleyed Matrix (F2)	___	Red Parent Material (TF2)
___	Stratified Layers (A5) (LRR C)	___	Depleted Matirx (F3)	X	Other (Explain in Remarks)
___	1 cm Muck (A9) (LRR D)	___	Redox Dark Surface (F6)		
___	Depleted Below Dark Surface (A11)	___	Depleted Dark Surface (F7)		
___	Thick Dark Surface (A12)	___	Redox Depressions (F8)		
___	Sandy Mucky Mineral (S1)	___	Vernal Pools (F9)		
___	Sandy Gleyed Matrix (S4)				

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:
P82- soil profile; Film of algae present on top of soil; No visible horizons; Black and red streaked mottling present throughout, appear to be located only in the root channels. Similar to Depleted Matrix, however the chroma color fails, redox features are present.
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)				Secondary Indicators (2 or more required)	
X	Surface Water (A1)	___	Salt Crusts (B11)	___	Water Marks (B1) (Riverine)
X	High Water Table (A2)	___	Biotic Crust (B12)	___	Sediment Deposits (B2) (Riverine)
X	Saturation (A3)	___	Aquatic Invertebrates (B13)	___	Drift Deposits (B3) (Riverine)
___	Water Marks (B1) (Nonriverine)	___	Hydrogen Sulfide Oder (C1)	___	Drainage Patterns (B10)
___	Sediment Deposits (B2) (Nonriverine)	___	Oxidized Rhizospheres along Living Roots (C3)	___	Dry-Season Water Table (C2)
___	Drift Deposits (B3) (Nonriverine)	___	Presence of Reduced Iron (C4)	___	Thin Muck Surface (C7)
___	Surface Soil Cracks (B6)	___	Recent Iron Reduction in Plowed Soil (C6)	___	Crayfish Burrows (C8)
___	Inundation Visible on Aerial Imagery (B7)	___	Other (Explain in Remark)	___	Saturation Visible on Aerial Imagery (C9)
___	Water Stained Leaves (B9)			___	Shallow Aquitard (D3)
				___	FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	X	No	___	Depth (inches):	12
Water Table Present?	Yes	X	No	___	Depth (inches):	7
Saturation Present? (includes capillary fringe)	Yes	___	No	___	Depth (inches):	___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks: All horizons saturated; Water present in the hole

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WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek City/County: Rock Springs, Sweetwater County Sampling Date: 9/10/2008

Applicant/Owner: Landmark State: WY Sampling Point: WET9

Investigator(s): D. Gardner and T. Spelts Section, Township, Range: Sec. 35, T19N R105W

Landform (hillslope, terrace, etc.): Edge of Streambank Local relief (concave, convex, none): Concave Slope (%): 8

Subregion (LRP): Interior Deserts (LRR D) Lat: 647783 Long: 7605365 Datum: NAD83 UTM12

Soil Map Unit Name: ___ NWI Classification: PEM

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ___
Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes X No
Hydric Soil Present?	Yes	X	No		
Wetland Hydrology Present	Yes	X	No		

Remarks:
P92 – upstream; P93 – downstream; Terrace on opposite bank dominated by Phragmites and *Lepidium latifolium*, some salt cedar also present

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1.			
2.			
3.			
4.			
5.			
Total Cover:			
Herb Stratum			
1. *Lepidium latifolium*	40	X	FAC
2. *Puccinellia nuttalliana*	20	X	OBL
3. *Juncus balticus*	20	X	FACW+
4. *Elymus smithii*	20	X	FACU
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:			
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 45 % Cover of Biotic Crust

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species	20	x1=	20	
FACW species	20	x2=	40	
FAC species	40	x3=	120	
FACU species	20	x4=	80	
UPL species	0	x5=	0	
Column Totals:	100	(A)	240	(B)

Prevalence Index = B/A = 2.4

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%
X Prevalence Index is ≤ 3.0[1]
___ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No

Remarks:
Rubber rabbitbrush on banks above; Banks mostly mud some vegetation mainly Baltic rush near the waters edge

SOIL Sampling Point
WET9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1 – 5	10YR 5/4	80	Gley1 2.5/10GY	20	D	RC	C	
5 – 11	Gley2 3/5B	70	2.5YR 4/8	10	RM	RC	C	
			Gley1 2.5/10GY	20	D	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

		Indicators for Problematic Hydric Soils[3]:
___ Histosol (A1)	___ Sandy Redox (S5)	___ 1 cm Muck (A9) (LRR C)
___ Histic Epipedon (A2)	___ Stripped Matrix (S6)	___ 2 cm Muck (A10) (LRR B)
___ Black Histic (A3)	___ Loamy Mucky Mineral (F1)	___ Reduced Vertic (F18)
___ Hydrogen Sulfide (A4)	___ Loamy Gleyed Matrix (F2)	___ Red Parent Material (TF2)
___ Stratified Layers (A5) (LRR C)	___ Depleted Matirx (F3)	X Other (Explain in Remarks)
___ 1 cm Muck (A9) (LRR D)	___ Redox Dark Surface (F6)	
___ Depleted Below Dark Surface (A11)	___ Depleted Dark Surface (F7)	
___ Thick Dark Surface (A12)	___ Redox Depressions (F8)	
___ Sandy Mucky Mineral (S1)	___ Vernal Pools (F9)	
___ Sandy Gleyed Matrix (S4)		

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: X No: ___

Remarks:
Soil saturated with water; Water present in hole; Small thin layer of salt – not enough to be classified as a crust; Possible loamy gleyed matrix however the values are not 4 or above all other indicators present.
This soil may be considered problematic due to the moderately to very strongly alkaline soils present within the Bitter Creek drainage.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

		Secondary Indicators (2 or more required)
X Surface Water (A1)	___ Salt Crusts (B11)	___ Water Marks (B1) (Riverine)
X High Water Table (A2)	___ Biotic Crust (B12)	___ Sediment Deposits (B2) (Riverine)
X Saturation (A3)	___ Aquatic Invertebrates (B13)	___ Drift Deposits (B3) (Riverine)
___ Water Marks (B1) (Nonriverine)	___ Hydrogen Sulfide Oder (C1)	___ Drainage Patterns (B10)
___ Sediment Deposits (B2) (Nonriverine)	___ Oxidized Rhizospheres along Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3) (Nonriverine)	___ Presence of Reduced Iron (C4)	___ Thin Muck Surface (C7)
___ Surface Soil Cracks (B6)	___ Recent Iron Reduction in Plowed Soil (C6)	___ Crayfish Burrows (C8)
___ Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remark)	___ Saturation Visible on Aerial Imagery (C9)
___ Water Stained Leaves (B9)		___ Shallow Aquitard (D3)
		___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes X No ___ Depth (inches): 12
Water Table Present? Yes X No ___ Depth (inches): 5

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____	Wetland Hydrology Present? Yes X No ____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:	
Remarks:	

BKS Environmental Associates, Inc.

January 20, 2009

BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

Wyoming Regulatory Office
Mr. Mike Burgan, USACOE
Reference file No. NWO-2008-2869.

Dear Mr. Burgan:

Please find BKS responses to your comments in orange. Changes have been made to the 2008 Wetland Assessment for the City of Rock Springs- Bitter Creek document to reflect the needed changes and an additional map is attached illustrating the PUS boundary.

1. Please provide a map showing where the areas identified as PUS in the wetland delineation report are located.
An additional map was created at a scale of 1:350' that illustrates only the project area in the Bitter Creek channel as it flows through the City of Rock Springs. This map indicates the line of PUS along the creek channel (CA).

2. Within the North Street to Dewar Street, which wetland data sheets were the "other data sheets previously completed" that were references in the 2nd sentence in this section? Where any of these areas wetland? Where the data sheets for WET1, WET2, and WET3 used to describe any locations within the project area?
WET1 and WET2 datasheets were not used to describe any waypoints within the project area. WET1 was designated as a PEM wetland and WET2 was designated as non-wetland.

The datasheets referred to for the North Street to Dewar Street section were WET3, WET5, and WET7. Waypoints 17, 20, and 22 were similar to WET3 and were characterized as OWUS, however due the use of absolute values on the WET3 data point; these waypoints should now be characterized by PUS. The addition of the PUS designation will likely increase the acreage of PUS wetlands. Waypoints 15, 16, and 23 were similar to WET5 and characterized as PEM; while Waypoint 37 was similar to WET7 and characterized as R4AB. The areas similar to WET 5 and WET 7 were characterized as a wetland (CA).

3. The photograph for WET3 does not seem to show 100% *Ericameria nauseosa* cover. Is the *Ericameria nauseosa* within the sample point or on the outer edge? Are the *Ericameria* on a bench above Bitter Creek, and the *Phragmites* and *Schoenoplectus* in the flat next to the creek?

The *Ericameria* is within the sample point. The *Ericameria nauseosa* was on the outer edge of the 5 foot area around the sample point and only comprised of about 5 percent cover. The *Phragmites* and *Schoenoplectus* are in the flat to slight slope next to the creek. The wetland datasheet for this point was modified to reflect those values of absolute cover. WET 3 now indicates that vegetation and hydrology are in but not soils, thus it may be considered a PUS wetland rather than OWUS (CA).

4. The same can be said for WET2. The photographs for WET2 do appear to show *Ericameria nauseosa*. However, the *Ericameria nauseosa* in the upstream and downstream photographs for WET2 appear to be on benches outside the wetland boundary. If so, they should not be included in the data point for the wetland. They can be used to show the wetland boundary, but are not appropriate for inclusion in the wetland data point.
The *Ericameria nauseosa* was within the 5 foot sample point area for herbaceous species, but only comprised of about 5 percent absolute cover. The datasheet has been changed to reflect the value for absolute cover. The discrepancy of using absolute cover values was made during the data entry into the computer (CA).

5. The report referenced a 0.01 acre of R2AB (Riverine Lower Perennial Aquatic Bed) wetland near the end of the North Street to Dewar Street section. However, the NWI map indicates Bitter Creek is R4SBF (Riverine Intermittent Streambed semi-permanently flooded) within the City of Rock Springs. Due to the intermittent flow of Bitter Creek in Rock Springs, I believe the 0.01A wetland identified in the report should be classified as R4AB instead of R2AB.
The report has been changed to reflect the change of classification (CA).

6. How deep is the 0.01A of R4AB wetland near the end of the North Street to Dewar Street section? If it is less than 6.6 feet deep, mitigation would be required to offset unavoidable impacts to this wetland if cumulative wetland impacts that will result from the project exceed 0.1 acre.
Based on the field notes the water was approximately 1 foot deep. The type of mitigation required can be discussed at a later date (CA).

7. Please provide a data sheet for the 0.01 acre of wetland near the end of the North Street to Dewar Street section.
We do not have a datasheet for this section but it was noted that it was similar to WET7. It had submergent vegetation (*Potamogeton foliosus).* The terrace was 15 feet wide and dominant with *Tamarix ramosissima, Lepidium latifolium* and *Puccinellia nuttalliana* (CA).

8. As with the 0.01A of wetland discussed above in comment #4, the wetlands at WET6 (South Side Belt to Sweetwater Creek) and WET7 (Dewar to South Side Belt (WEST)) are also most likely R4AB as opposed to the R2AB as indicated in the delineation report.
Both have been changed in the wetland report to reflect the R4AB designation (CA).

9. Was WET7 taken in the creek? With the *Potamogeton foliosus* within the data point, I would assume the point is actually in the creek channel or at least below the ordinary highwater mark. How deep is the wetland at WET7? Again, if it is less than 6.6 feet deep, mitigation

would be required to offset unavoidable impacts to this wetland if cumulative wetland impacts that will result from the project exceed 0.1 acre.
WET 7 was taken at the edge of the water, below the ordinary high water mark. The water in the creek was 12 inches deep. We could discuss the appropriate mitigation requirements at the onsite meeting, as the amount of R4AB wetlands exceeds the 0.1 acre of wetland (CA).

10. The *Puccinellia nuttalliana* at sample points WET1, WET4, and WET6-WET9 is OBL in Region 9 as opposed to FacW+ as indicated on the data sheets.
Changes have been made in the document to reflect that *Puccinellia nuttalliana* is considered an OBL as opposed to FACW+. This discrepancy was made due to the use of the 1996 species list rather than the 1988 species list (CA).

11. As indicated in the report, while WET4, WET6, WET8 and WET9 have wetland hydrology and hydrophytic vegetation, they do not have hydric soil indicators. However, the Arid West Supplement identifies several ways to determine if "problematic hydric soils" are indeed hydric. Hydric soil indicators can be masked if the wetland is located in among other things: moderately to very strongly alkaline soils, vegetated sand and gravel bars within floodplains, and recently developed wetlands. Are the soils at these sample points influenced by alkalinity, located on a sand or gravel bar, or a recently deposited? If so, could these factors be masking hydric soil indicators? The presence of *Puccinellia nuttalliana* in the majority of sample and *Ericameria nauseosa* at WET2 and WET3 would seem to indicate the soils could be alkaline, or influenced by alkalinity.
The soils in the Bitter Creek drainage are classified as Dines silt loam and Dines silt loam overflow phase according to the NRCS. The Dine Series is moderately to strongly alkaline with a pH range of 8.4 to 9. The points WET4, WET6, WET8, and WET9 may be considered hydric as the soils within the Bitter Creek drainage have a strong alkalinity, which is considered as a problematic hydric soil condition. Also, *Puccinellia nuttalliana* has a very high tolerance to salinization according to Mark Majerus in his article "Plant Materials for Saline-Alkaline Soils (1996). Additionally, *Ericameria nauseosa* has a moderately high salt tolerance according to Curtis E Swift, PH.D. in his article "Salt Tolerance of Various Temperate Zone Ornamental Plants (1997). Changes regarding the problematic soils have been added to the datasheets effected WET3, WET4, WET6, WET8, and WET9 (CA).

References:
Majerus, Mark. "Plant Materials for Saline-Alkaline Soils." USDA Natural Resources Conservation Service, Bridger Plant Materials Center. 1996.

Swift, Curtis E. PH.D. "Salt Tolerance of Various Temperate Zone Ornamental Plants." Colorado State University Extension (Horticulture). 1997.

12. As stated in the wetland delineation report, if more than 0.5A of wetland and waters of the United States will be filled (including grading) by the proposed project, an individual permit application will be required for this project. If an individual permit application is submitted, the Wyoming Regulatory Office (WRO) will be required to conduct an alternatives analysis to determine the least environmentally damaging practicable alternative (LEDPA) for the project in accordance with the 404(b)(1) Guidelines, the 1990 Memorandum of Agreement between the

Corps and the Environmental Protection Agency (EPA) know as the "sequencing memo", and other applicable documents. The LEDPA is defined as the alternative with the fewest impacts to the aquatic environment that meets the purpose and need for the project. Under the 404(b)(1) Guidelines, the WRO can only issue a permit for the LEDPA – even if that it alternative is different from what is included in the application.
This can be discussed during the site visit (CA).

13. I would like to schedule a site visit to field verify the wetland delineation report before I issue an approved jurisdictional determination.
BKS will coordinate the site visit (CA).

If you have any questions concerning any of the response to comments please contact me at 307-922-2931.

Sincerely,

Cindy Adams
Operations Manager- Rock Springs
BKS Environmental Associates, Inc.

Emailed Copy Furnished:

Timothy Kaumo
Mayor, City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Jan Striefel, FASLA, AICP, LLA
Principal and President
Project Manager for Bitter Creek EA
Landmark Design Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

REPLY TO
ATTENTION OF

To:
Concept -
Planning
Jan Striefel

February 24, 2009

Wyoming Regulatory Office

Honorable Timothy Kaumo
Mayor, City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Dear Mr. Kaumo:

This letter is in response to a request we received on October 24, 2008, from Ms. Cindy Adams of BKS Environmental Associates, Inc., for a jurisdictional determination based upon a wetland delineation conducted along Bitter Creek within the City of Rock Springs. The delineation report covers a 3.72 mile long stretch of Bitter Creek beginning in the southeast quarter of the southeast quarter of Section 25, Township 19 North, Range 105 West, and ends in the northeast quarter of the northeast quarter of Section 3, Township 18 North, Range 105 West, Sweetwater County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations are published in the Code of Federal Regulation at 33 CFR Parts 320 through 331. Information on Section 404 program requirements in Wyoming can be obtained from our web site at https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm.

On February 19, 2009, I met with Ms. Adams, Ms. Katy Halverson (also of BKS Environmental Services), Ms. Jan Striefal (Landmark Design, Inc.) and Mr. Gregory Poole (Hansen, Allen & Luce Inc.) to discuss the project. We also discussed the various alternatives available for permitting the project under Section 404 of the Clean Water Act. As proposed, the project will most likely require the addition of fill into waters of the United States. If so, a permit will be required under Section 404. Because the main purpose of the project is to reduce flooding in the City of Rock Springs, there are two permitting alternatives: nationwide permit (NWP) 43 and submittal of an individual permit application. NWP 43 authorizes filling up to 0.5 acre of waters of the United States to construct and/or modify existing storm water management facilities. NWP 43 requires submittal on a pre-construction notification. Details on NWP 43 and materials required for inclusion in the pre-construction notification are available on our website.

If more than 0.5 acre of waters of the United States will be filled - including regrading - to complete the project, an individual (aka standard) permit application will be required. Based on our discussions on February 19th, it is most likely an IP application will be required. If that is the case, please be advised that once we receive a complete application, we will issue a public notice that will include a 30-day public comment period in which all interested parties including: private citizens, government agencies, and public and private organizations will have the opportunity to provide written comments on the project. If we receive comments germane to the project, we will require the City of Rock Springs to address those comments or concerns.

Following the public comment period, we will conduct our own alternatives analysis in accordance with the National Environmental Policy Act and the 404(b)(1) Guidelines. Our alternatives analysis is required even though the City is completing you own Environmental Assessment. We will have to evaluate all alternatives to determine which alternative is the least environmentally damaging practicable alternative (LEDPA) - the alternative that has the fewest impacts to the aquatic ecosystem that meets the purpose and need for the project. Please be advised that we will have to examine all alternatives that might be suggested during the public comment period or alternatives we identify – even alternatives that were examined in the City's own EA and that you determined are not your preferred alternative. An example of potential alternatives that we could consider would be the alternative of raising the elevation of the existing levees along Bitter Creek. However, as discussed with Mr. Poole, there could be mitigating factors that could make that alternative not practicable. Once we complete our alternatives and cumulative effects analyses, we will only be able to issue a 404 permit for the LEDPA – even if that is different than your preferred alternative. Please be advised that I am not pre-judging the project as discussed on February 19th, or saying it could not be permitted. I am just informing you of our process. I did not see anything last week that I would say was "a deal killer" at this time, or anything would lead me to believe the project could not be permitted in some form or another.

In addition, as I discussed with Ms. Adams last week, we will need a detailed site specific wetland delineation that identifies the boundaries of all wetlands and other water bodies within the project area. She has completed a wetland delineation along the project corridor, but additional information will be required to determine the exact wetland boundaries within the project area.

Please be aware that the landowner is responsible for obtaining authorization prior to commencing with any activities that include a discharge of dredged or fill material in waters of the United States.

If you have any questions, please do not hesitate to contact me at (307) 772-2300 and reference file No. 2008-2869-RWY.

Sincerely,

Michael A. Burgan
Project Manager
Wyoming Regulatory Office

Copy Furnished:

Cindy Adams
BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

Jan Striefal
Landmark Design, Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Gregory Poole
Hansen, Allen & Luce Inc.
6771 South 900 East
Midvale, Utah 84047

2008 WETLAND ASSESSMENT
FOR
CITY OF ROCK SPRINGS
DEAD HORSE CANYON - BITTER CREEK DETENTION BASINS

Prepared for:

City of Rock Springs
212 D Street
City of Rock Springs, Wyoming 82901

Landmark Designs Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Prepared by:

BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

October 20, 2008

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INTRODUCTION

The following report is based upon an April 7, 2008 request by Landmark Design Inc. (LDI), of Salt Lake City, Utah, to provide technical consulting services in the form of a wetland assessment for the City of Rock Springs Bitter Creek Project. The Bitter Creek Project's objective is to reconstruct the creek channel to aid in flood control, and to improve the creek's aesthetics and community value by stabilizing the creek banks and planting appropriate wetland and upland species. The flood control is needed so properties now shown in the flood plain can be removed from the Flood Insurance Rate Map (FIRM) and the attached restrictions. The Bitter Creek Project includes building two detention basins to aid in flood control; the basins are proposed on Dead Horse Canyon Creek, which flows into Bitter Creek. The analysis for the wetland report as required by the United States Corp of Engineers (USACE) will be included in the Bitter Creek Project Environmental Assessment (EA) as required by the Wyoming Department of Environmental Quality (WDEQ)/ Abandoned Mine Land (AML).

BKS Environmental Associates, Inc. (BKS) of Rock Springs, Wyoming conducted a field survey on June 9, 2008 for Dead Horse Canyon Creek proposed detention basins. There are two proposed detention basins for Dead Horse Canyon Creek. Detention Basin #2 is located in the NE1/4 of the NW1/4 and the NW1/4 of the NE1/4 of Section 6, T18N R104W. Detention Basin #3 is located in the SE1/4 of the NW1/4 and NE1/4 of the SW1/4 of Section 1, T18N R105W, on the Rock Springs Quadrangle map. The total area of each proposed basin is:

Dead Horse Canyon Creek Detention Basin 2: 9.76 acres
Dead Horse Canyon Creek Detention Basin 3: 9.70 acres

Appendix A: Figure 1 identifies the project areas, Figure 2 identifies the Dead Horse Creek Basin #2, and Figure 3 identified Dead Horse Creek Basin #3 and the associated wetlands.

Authorization for the proposed project will be considered under Nationwide Permit (NWP) 43- Stormwater Management Facility, which requires Pre-construction Notification (PCN) on all activities involving the construction of the stormwater management facility (detention basin). NWP 43 also establishes a maximum loss of 0.5-acre of Waters of the United States (WoUS) and 300 linear feet of stream bed, but the District Engineer (DE) can waive for intermittent and ephemeral drainages.

METHODOLOGY

The wetland survey was conducted in accordance with the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual and the Arid West Supplement. Other Waters of the United States (OWUS) were also assessed during the survey. The routine wetland delineation approach with onsite inspection was utilized, and the survey was conducted by pedestrian reconnaissance. Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive

soil sampling to determine the presence of wetland criteria indicators. Wetland Determination Data Forms were utilized for each observation point. Hydrology and soils were evaluated whenever a plant community type met hydrophytic vegetation parameters based on the 50/20 Rule (as defined by the USACE), or whenever indicators suggested the potential presence of a seasonal wetland area under normal circumstances.

Soils information for the project area was un-available for Sweetwater County, Wyoming on the NRCS website. Soils for Sweetwater County have not yet been mapped.

Potential wetlands, Waters of the United States (WoUS) and OWUS were initially identified via review of area maps to include the following:

USGS 1997 Color Infrared (CIR) imagery for Rock Springs, Wyoming Quadrangle Map
USGS 1997 CIR imagery for Reliance, Wyoming Quadrangle Map

Wetland indicator categories were identified for each dominant plant species noted through use of the National List of Plant Species that Occur in Wetlands, 1988 and 1996 National Summary. Region 9 indicator categories were utilized for the project area.

Field sample locations and resulting wetland boundaries were recorded with a hand-held Garmin III Plus Global Positioning System (GPS) unit in UTM NAD 1983, Zone 12. BKS provided drafting services for the project.

RESULTS

Dead Horse Canyon Creek

Detention Basin 2

On June 9, 2008, field work was conducted for Detention Basin #2. The surveys found that no wetland conditions were present at Detention Basin #2. There was a main drainage with two tributaries within the proposed detention basin. The first drainage is located in the southern half of the proposed detention basin and contains the most diversity of plant life, all of which was upland, or facultative upland. The dominant species included were *Chrysothamnus viscidiflorus* (yellow rabbitbrush), big sagebrush, greasewood, gardner's saltbrush, *Agropyron cristatum* (crested wheatgrass), and *Bromus tectorum* (cheatgrass). A tributary to the main drainage was located in the upper middle of the proposed detention basin and intersects the main drainage at Waypoint 6, see Figure 2. The dominant vegetation within the drainage was big sagebrush, yellow rabbitbrush, and *Lesquerella ludoviciana* (foothill bladderpod). The second tributary was located near the proposed berm in the northwest corner of the detention pond and had big sagebrush, yellow rabbitbrush, and *Grayia spinosa* (spiny hopsage) as the dominant vegetation. The main drainage and its tributaries all had coarse sandy to sandy soils present and comprised of upland type vegetation species. There were no wetlands present in Detention Basin #2.

Detention Basin 3

On June 9, 2008, field work was conducted for Detention Basin #3. The surveys found that no wetland conditions were present at Detention Basin #3. There was a main drainage running through the proposed detention basin, however no wetland conditions were present, see Figure 3. The dominant vegetation within the drainage included big sagebrush, crested wheatgrass, and greasewood. The other species found within all or parts of the drainage included: thickspike wheatgrass, halogeton, pinnate tansymustard, flixweed tansymustard, cheatgrass, and desert madwort. The soil within the drainage was sandy. The upland vegetation in the rest of the basin was predominantly greasewood, crested wheatgrass, and big sagebrush with some inclusions of other grasses and forbs including halogeton. Halogeton was the most prominent weed in the area.

TABLE 1: SUMMARY OF WETLANDS WITHIN THE PROJECT AREA

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	2008 Delineation Designation	Cowardin Classification	Acreage of Cowardin Classification	Geomorphic Setting	Detention Basin Location	Jurisdictional Recommendation
Wet1	T18N R104W Sec. 6	P5, P6	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--
Wet2	T18N R104W Sec. 6	P7, P8, P9	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--
Wet3	T18N R104W Sec. 6	P13, P14	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--
Wet4	T18N R104W Sec. 6	P25, P26	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--
Wet5	T18N R104W Sec. 6	P35, P36	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	2008 Delineation Designation	Cowardin Classification	Acreage of Cowardin Classification	Geomorphic Setting	Detention Basin Location	Jurisdictional Recommendation
Wet6	T18N R104W Sec. 6	P46, P47, P48	Non-wetland	--	--	Drainage	Dead Horse Canyon Creek, Detention Basin #2	--
Wet7	T18N R105W Sec. 1	P58, P59, P60	Non-wetland	--	--	Drainage, cut-bank	Dead Horse Canyon Creek, Detention Basin #3	--
Wet8	T18N R105W Sec. 1	P95, P96	Non-wetland	--	--	Drainage, cut-bank	Dead Horse Canyon Creek, Detention Basin #3	--

TABLE 2: SUMMARY OF WETLAND DELINEATION RESULTS

Name	**Acres**
Dead Horse Canyon Creek Detention Basin #2	0.00
Dead Horse Canyon Creek Detention Basin #3	0.00
Total	**0.00**

CONCLUSION

The proposed detention basins for the Dead Horse Canyon Creek generally occurred on uplands, with the inclusion of a few ephemeral drainages. The dominant vegetation within the drainages were shrubs including big sagebrush, yellow rabbitbrush, and greasewood. The dominant grasses and forbs that also occurred within the drainages were crested wheatgrass, cheatgrass, and foothill bladderpod. These species are either classified as upland vegetation or not listed on the National Summary of Wetland Plants. No wetlands occurred on Dead Horse Canyon Creek.

The NWP 43 establishes a 0.5-acre threshold for maximum loss of WoUS and 300 linear feet of stream bed. The results of this assessment indicate that the proposed project would affect no wetlands.

Final authority over jurisdictional status of the survey area rests with the USACE.

REFERENCES

Dorn, R.D. 2001. Vascular Plants of Wyoming. 3rd Edition. Mountain West Publishing, Cheyenne, Wyoming. 289 pp.

U.S. Army Corps of Engineers. (2006). "Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. Final Report.
Natural Resource Conservation Service. 2008. Web Soil Survey.
http://websoilsurvey.nrcs.usda.gov/app/

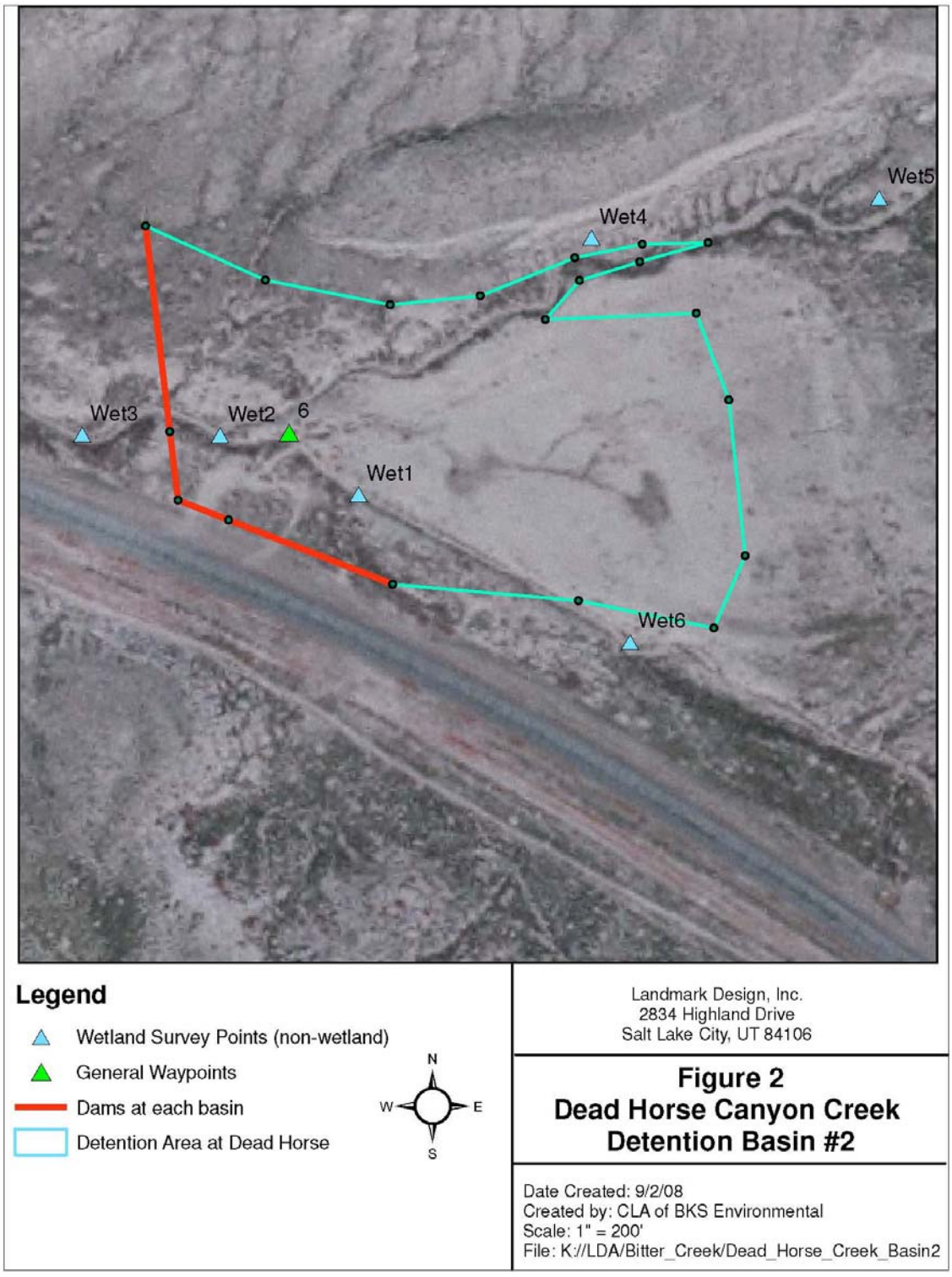
U.S. Fish and Wildlife Service. 1997. National List of Vascular Plant Species that Occur in Wetlands: 1996 National Summary.
Wyoming Game and Fish. 2008. National Wetlands Inventory Mapping from 1976.

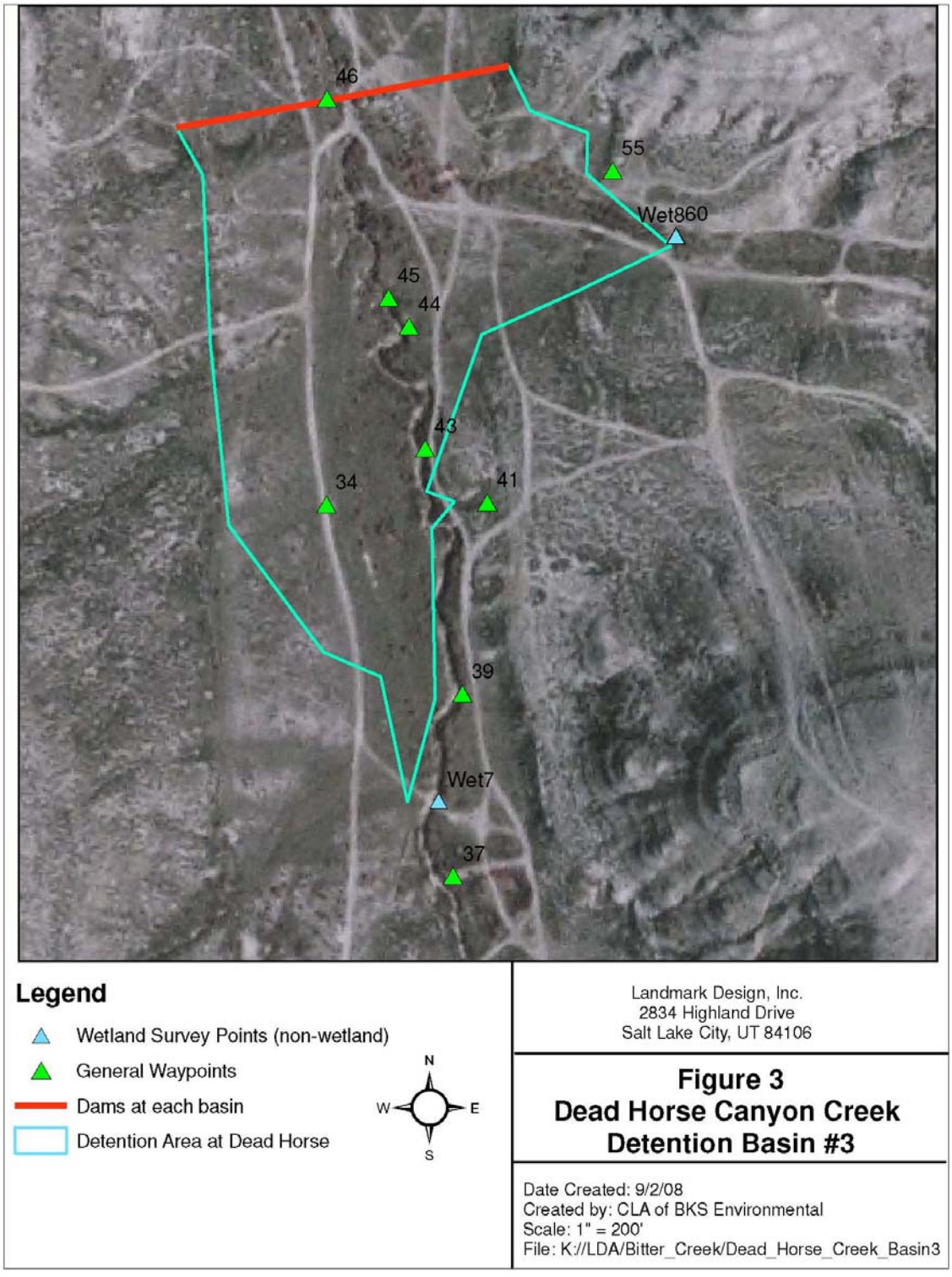
Appendix A

MAPS

Figure 1: Map of the project area including all proposed detention basins
Figure 2: Dead Horse Creek Detention Basin #2
Figure 3: Dead Horse Creek Detention Basin #3

Insert Figure 1
Project Areas (Large Map)


Wet5
Wet4
Wet3
Wet2
6
Wet1
Wet6
Legend
Wetland Survey Points (non-wetland)
General Waypoints
Dams at each basin
Detention Area at Dead Horse
N
W
E
S
Landmark Design, Inc.
2834 Highland Drive
Salt Lake City, UT 84106
Figure 2
Dead Horse Canyon Creek
Detention Basin #2
Date Created: 9/2/08
Created by: CLA of BKS Environmental
Scale: 1" = 200'
File: K://LDA/Bitter_Creek/Dead_Horse_Creek_Basin2


46
55
Wet860
45
44
43
34
41
39
Wet7
37
Legend
Wetland Survey Points (non-wetland)
General Waypoints
Dams at each basin
Detention Area at Dead Horse
N
W
E
S
Landmark Design, Inc.
2834 Highland Drive
Salt Lake City, UT 84106
Figure 3
Dead Horse Canyon Creek
Detention Basin #3
Date Created: 9/2/08
Created by: CLA of BKS Environmental
Scale: 1" = 200'
File: K://LDA/Bitter_Creek/Dead_Horse_Creek_Basin3

Appendix B

PHOTOS

Photo 5: WET1, Upstream

Photo 6: WET1, Downstream

Photo 7: WET 2, Upstream to the south

Photo 8 : Wet2, Upstream to the southeast

Photo 9: WET2, Downstream

Photo 13: WET3, Upstream

Photo 14: WET3, Downstream

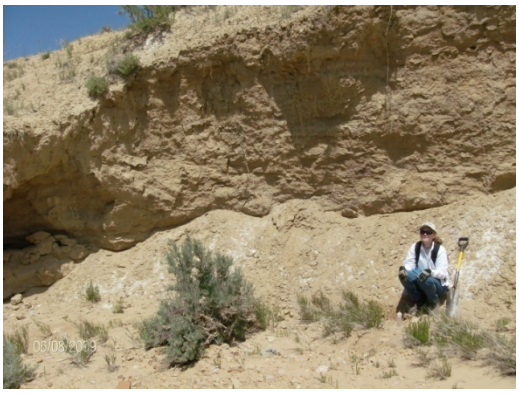
Photo 25: WET4, Upstream

Photo 26: WET4, Downstream

Photo 35: WET5, Upstream

Photo 36: WET5, Downstream

P46: WET6, Upstream



P47: WET6, Cutbank

P48: WET6, Downstream

P58: WET7, Upstream

P60: WET7, Downstream

P95: WET8, Upstream

P96: WET8, Downstream

APPENDIX C

PLANT LIST FOR PROJECT AREA

Dead Horse Canyon Creek

Detention Basin#	**Species Code**	***Common Name***	**Scientific Name**	**Wetland Code**
Dead Horse Canyon Creek 2 and 3	ACHHYM	*Achnatherum hymenoides*	indian ricegrass	UPL
Dead Horse Canyon Creek #2 and #3	AGRCRI	*Agropyron cristatum*	crested wheatgrass	UPL
Dead Horse Canyon Creek #3	ALYDES	*Alyssum desertorum*	desert madwort	UPL
Dead Horse Canyon Creek #2	AND sp.	*Androsacea species*	rockjasmine	UPL
Dead Horse Canyon Creek #3	ARTCAN	*Artemisia cana*	silver sagebrush	FACU
Dead Horse Canyon Creek #2	ARTNOV	*Artemisia nov*	black sagebrush	UPL
Dead Horse Canyon Creek #2 and #3	ARTTRI	*Artemisia tridentata*	big sagebrush	UPL
Dead Horse Canyon Creek #2	ASTBAR	*Astragalus barrii*	Barr's milkvetch	UPL
Dead Horse Canyon Creek #2	ATRCAN	*Atriplex canescens*	four-wing saltbrush	UPL
Dead Horse Canyon Creek #2 and #3	ATRCON	*Atriplex confertifolia*	shadscale saltbush	NI
Dead Horse Canyon Creek #2	ATRGAR	*Atriplex gardneri*	gardner saltbrush	UPL
Dead Horse Canyon Creek #2 and #3	BROTEC	*Bromus tectorum*	cheatgrass	UPL
Dead Horse Canyon Creek #2 and #3	CHRVIS	*Chrysothamnus viscidiflorus*	yellow rabbitbrush	UPL

Detention Basin#	**Species Code**	***Common Name***	**Scientific Name**	**Wetland Code**
Dead Horse Canyon Creek #3	CLELUT	*Cleome lutea*	yellow spiderflower	FACU
Dead Horse Canyon Creek #2	CRYFLA	*Cryptantha flavoculata*	roughseed cryptantha	UPL
Dead Horse Canyon Creek #2	CYMTER	*Cymopterus terebinthinus*	turpentine wavewing	UPL
Dead Horse Canyon Creek #2 and #3	DELGEY	*Delphinium geyeri*	Larkspur	UPL
Dead Horse Canyon Creek #2 and #3	DESPIN	*Descurainia pinnata*	Pinnate tansymustard	UPL
Dead Horse Canyon Creek #2 and #3	DESSOP	*Descurainia sophia*	flixweed tansymustard	UPL
Dead Horse Canyon Creek #2	ELYELY	*Elymus elymoides*	squirreltail	FACU-
Dead Horse Canyon Creek #2	ELYJUN	*Elymus junceus*	Russian wildrye	UPL
Dead Horse Canyon Creek #3	ELYLAN	*Elymus lanceolatus*	thickspike wheatgrass	UPL
Dead Horse Canyon Creek #2	ELYSMI	*Elymus smithii*	western wheatgrass	UPL
Dead Horse Canyon Creek #2	GRASPI	*Grayia spinosa*	spiny hopsage	UPL
Dead Horse Canyon Creek #2	GUTSAR	*Guitierrezia sarothrae*	broom snakeweed	UPL

Detention Basin#	**Species Code**	***Common Name***	**Scientific Name**	**Wetland Code**
Dead Horse Canyon Creek #2 and #3	HALGLO	*Halogeton glomeratus*	halogeton	UPL
Dead Horse Canyon Creek #2	IPOCON	*Ipomopsis congesta*	ballhead ipomopsis	UPL
Dead Horse Canyon Creek #3	KRALAN	*Krascheninnikovia lanata*	winterfat	UPL
Dead Horse Canyon Creek #2	LESALP	*Lesquerella alpina*	alpine bladderpod	UPL
Dead Horse Canyon Creek #2	LESLUD	*Lesquerella ludoviciana*	foothill bladderpod	FAC
Dead Horse Canyon Creek #2	MELOFF	*Melilotus officinalis*	yellow sweetclover	FACU
Dead Horse Canyon Creek #2	MONPUS	*Monolepis pusilla*	small povertyweed	UPL
Dead Horse Canyon Creek #2 and #3	OPUPOL	*Opuntia polyacantha*	plains prickly pear	UPL
Dead Horse Canyon Creek #2	PICDES	*Picrothamnus desertorum*	bud sagebrush	UPL
Dead Horse Canyon Creek #2 and #3	POASEC	*Poa secunda*	sandberg bluegrass	FACU
Dead Horse Canyon Creek #3	RANTES	*Ranunculus testiculatus*	curveseed butterwort	UPL
Dead Horse Canyon Creek #2 and #3	SARVER	*Sarcobatus vermiculatus*	greesewood	FACU+

Appendix D

Wetland Determination Data Forms
Arid West Region

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET1

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 6, T18N R104W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
Rocky soils.
P5: Upstream
P6: Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Chrysothamnus viscidiflorus*	100	X	UPL
2.			
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Achnatherum hymenoides*	19		UPL
2. *Elymus smithii*	62	X	FACU
3. *Melilotus officinalis*	19		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	81	x4=	324	
UPL species	119	x5=	595	
Column Totals:	200	(A)	919	(B)

Prevalence Index = B/A = 4.60

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 5/4	100					Sandy	Rocky

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5) (**LRR C)**
- ____ 1 cm Muck (A9) (**LRR D**)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matirx (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)
- ____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ____ 1 cm Muck (A9) (**LRR C**)
- ____ 2 cm Muck (A10) (**LRR B**)
- ____ Reduced Vertic (F18)
- ____ Red Parent Material (TF2)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? **Yes:** ____ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1) (**Nonriverine**)
- ____ Sediment Deposits (B2) (**Nonriverine**)
- ____ Drift Deposits (B3) (**Nonriverine**)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water Stained Leaves (B9)
- ____ Salt Crusts (B11)
- ____ Biotic Crust (B12)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Oder (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Plowed Soil (C6)
- ____ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ____ Water Marks (B1) (**Riverine**)
- ____ Sediment Deposits (B2) (**Riverine**)
- ____ Drift Deposits (B3) (**Riverine**)
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Thin Muck Surface (C7)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	____	
Water Table Present?	Yes ____	No X	Depth (inches):	____	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	____	**Wetland Hydrology Present?** Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse City/County: Rock Springs/ Sweetwater Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET2

Investigator(s): C. Adams, C. Petersen Section, Township, Range: Sec. 6 T18N R104W

Landform (hillslope, terrace, etc.) Drainage Local relief (concave, convex, none): Concave Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) Lat: Long: Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X	**Is the Sampled Area Within a Wetland** Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P7 Upstream, drainage to the S
P8 Upstream, drainage to the SE
P9 Downstream, drainage to the N

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Artemisia tridentata*	10		UPL
2. *Chrysothamnus viscidiflorus*	90	X	UPL
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Bromus tectorum*	50	X	UPL
2. *Lesquerella alpina*	10		UPL
3. *Musineon divaricatum*	40	X	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species	200	x5=	1,000
Column Totals:		(A)	(B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/4	90					Coarse Sandy	
	10YR 5/6	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C)**
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? **Yes:** ___ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___		
Water Table Present?	Yes ___	No X	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present?**	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Damp at bottom of the hole.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET3

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 6, T18N R104W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P13 Upstream (S)
P14 Downstream (N)

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Artemisia tridentata*	10		UPL
2. *Chrysothamnus viscidiflorus*	60	X	UPL
3. *Gutierrezia sarothrae*	30	X	UPL
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Cymopterus terebinthinus*	15		UPL
2. *Elymus smithii*	70	X	FACU
3. *Descurainia pinnata*	15		UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 60 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	70	x4=	280	
UPL species	130	x5=	650	
Column Totals:	200	(A)	930	(B)

Prevalence Index = B/A = 4.65

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/4	90					Coarse sandy	
	10YR 5/6	10						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C)**
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? **Yes:** ___ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___		
Water Table Present?	Yes ___	No X	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present?**	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
moist at bottom of hole

US Army Corps of Engineers Arid West-Version 11-1-06

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET4

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 6, T18N R104W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P25- Upstream
P26- Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Artemisia tridentata*	80	X	UPL
2. Grayia spinosa	10		UPL
3. *Chrysothamnus viscidiflorus*	10		UPL
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Achnatherum hymenoides*	70	X	UPL
2. *Lesquerrella ludoviciana*	15		UPL
3. *Poa secunda*	15		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 85 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	15	x4=	60	
UPL species	185	x5=	925	
Column Totals:	200	(A)	985	(B)

Prevalence Index = B/A = 4.93

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Channel bare at bottom, lots of ants in area

SOIL Sampling Point WET4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/6	90					Coarse sandy	
	10YR 5/6	6						
	5YR 5/6	4						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5) (**LRR C)**
- 1 cm Muck (A9) (**LRR D**)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)
- Loamy Mucky Mineral (F1)
- Loamy Gleyed Matrix (F2)
- Depleted Matirx (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- 1 cm Muck (A9) (**LRR C**)
- 2 cm Muck (A10) (**LRR B**)
- Reduced Vertic (F18)
- Red Parent Material (TF2)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? **Yes:** _____ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- Surface Water (A1)
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1) (**Nonriverine**)
- Sediment Deposits (B2) (**Nonriverine**)
- Drift Deposits (B3) (**Nonriverine**)
- Surface Soil Cracks (B6)
- Inundation Visible on Aerial Imagery (B7)
- Water Stained Leaves (B9)
- Salt Crusts (B11)
- Biotic Crust (B12)
- Aquatic Invertebrates (B13)
- Hydrogen Sulfide Oder (C1)
- Oxidized Rhizospheres along Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Plowed Soil (C6)
- Other (Explain in Remark)

Secondary Indicators (2 or more required)

- Water Marks (B1) (**Riverine**)
- Sediment Deposits (B2) (**Riverine**)
- Drift Deposits (B3) (**Riverine**)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)
- Thin Muck Surface (C7)
- Crayfish Burrows (C8)
- Saturation Visible on Aerial Imagery (C9)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____		
Water Table Present?	Yes _____	No X	Depth (inches): _____		
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____	**Wetland Hydrology Present?**	Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET5

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 6, T18N R104W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
Larger drainage width, about six feet wide
P35 Upstream
P36 Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Artemisia tridentata*	90	X	UPL
2. *Sarcobatus vermiculatus*	10		FACU+
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Lesquerella alpina*	50	X	UPL
2. *Poa secunda*	50	X	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 80 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	60	x4=	120	
UPL species	140	x5=	700	
Column Totals:	200	(A)	820	(B)

Prevalence Index = B/A = 3.50

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Lots of shrubs in the area, low herb stratum. 95% shrubs with about 5% herbs.

SOIL Sampling Point WET5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/3	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ____ Histosol (A1)
- ____ Histic Epipedon (A2)
- ____ Black Histic (A3)
- ____ Hydrogen Sulfide (A4)
- ____ Stratified Layers (A5) (**LRR C)**
- ____ 1 cm Muck (A9) (**LRR D**)
- ____ Depleted Below Dark Surface (A11)
- ____ Thick Dark Surface (A12)
- ____ Sandy Mucky Mineral (S1)
- ____ Sandy Gleyed Matrix (S4)
- ____ Sandy Redox (S5)
- ____ Stripped Matrix (S6)
- ____ Loamy Mucky Mineral (F1)
- ____ Loamy Gleyed Matrix (F2)
- ____ Depleted Matirx (F3)
- ____ Redox Dark Surface (F6)
- ____ Depleted Dark Surface (F7)
- ____ Redox Depressions (F8)
- ____ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ____ 1 cm Muck (A9) (**LRR C**)
- ____ 2 cm Muck (A10) (**LRR B**)
- ____ Reduced Vertic (F18)
- ____ Red Parent Material (TF2)
- ____ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? **Yes:** ____ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ____ Surface Water (A1)
- ____ High Water Table (A2)
- ____ Saturation (A3)
- ____ Water Marks (B1) (**Nonriverine**)
- ____ Sediment Deposits (B2) (**Nonriverine**)
- ____ Drift Deposits (B3) (**Nonriverine**)
- ____ Surface Soil Cracks (B6)
- ____ Inundation Visible on Aerial Imagery (B7)
- ____ Water Stained Leaves (B9)
- ____ Salt Crusts (B11)
- ____ Biotic Crust (B12)
- ____ Aquatic Invertebrates (B13)
- ____ Hydrogen Sulfide Oder (C1)
- ____ Oxidized Rhizospheres along Living Roots (C3)
- ____ Presence of Reduced Iron (C4)
- ____ Recent Iron Reduction in Plowed Soil (C6)
- ____ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ____ Water Marks (B1) (**Riverine**)
- ____ Sediment Deposits (B2) (**Riverine**)
- ____ Drift Deposits (B3) (**Riverine**)
- ____ Drainage Patterns (B10)
- ____ Dry-Season Water Table (C2)
- ____ Thin Muck Surface (C7)
- ____ Crayfish Burrows (C8)
- ____ Saturation Visible on Aerial Imagery (C9)
- ____ Shallow Aquitard (D3)
- ____ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches):	____	
Water Table Present?	Yes ____	No X	Depth (inches):	____	
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches):	____	**Wetland Hydrology Present?** Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Moist at the bottom of the hole.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #2, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET6

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 6, T18N R104W

Landform (hillslope, terrace, etc.) Drainage- cutbank | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P46 Upstream
P47 Cutbank
P48 Downstream

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Chrysothamnus viscidiflorus*	80	X	UPL
2. *Artemisia tridentata*	20	X	UPL
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Bromus tectorum*	85	X	UPL
2. *Monolepis pusilla*	15		UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 65 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:	Multiply by:	
OBL species	x1=	
FACW species	x2=	
FAC species	x3=	
FACU species	x4=	
UPL species 200	x5= 1,000	
Column Totals:	(A)	(B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Castilleja angustifolia is in the area under the *Artimeisa tridentata*, downstream of the point.

SOIL Sampling Point WET6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5Y 5/4	100					fS	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C)**
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? **Yes:** ___ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___		
Water Table Present?	Yes ___	No X	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present?**	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

Moist at the bottom of the hole.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #3, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET7

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 1, T18N R105W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 12

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P58 Upstream
P59 and P60 Downstream
Channel is about 1.5 feet wide

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Artemisia tridentata*	60	X	UPL
2. *Sarcobatus vermiculatus*	40	X	FACU+
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Bromus tectorum*	30	X	UPL
2. *Agropyron cristatum*	20	X	UPL
3. *Descurainia pinnata*	5		UPL
4. *Elymus lanceolatus*	30	X	UPL
5. *Halogeton glomeratus*	15		UPL
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	40	x4=	160	
UPL species	160	x5=	800	
Column Totals:	200	(A)	960	(B)

Prevalence Index = B/A = 4.60

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	2.5Y 4/4	100					Sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C)**
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? **Yes:** ___ **No:** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___		
Water Table Present?	Yes ___	No X	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	**Wetland Hydrology Present?**	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Bitter Creek – Detention Pond #3, on DeadHorse | City/County: Rock Springs/ Sweetwater | Sampling Date: 6/9/08

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET8

Investigator(s): C. Adams, C. Petersen | Section, Township, Range: Sec. 1, T18N R105W

Landform (hillslope, terrace, etc.) Drainage | Local relief (concave, convex, none): Concave | Slope (%): 0

Subregion (LRP): Interior Deserts (LRR D) | Lat: | Long: | Datum: NAD1983, UTM Zone 124

Soil Map Unit Name: | NWI Classification: Non-wetland

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes		No	X
Hydric Soil Present?	Yes		No	X
Wetland Hydrology Present	Yes		No	X

Is the Sampled Area Within a Wetland Yes ____ No X

Remarks:
P95 Upstream
P96 Downstream
Point near a road crossing.

VEGETATION

Tree Stratum (Use scientific names)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum			
1. *Sarcobatus vermiculatus*	100	X	FACU+
2.			
3.			
4.			
5.			
Total Cover:	100		
Herb Stratum			
1. *Agropyron cristatum*	80	X	UPL
2. *Halogeton glomeratus*	5		UPL
3. *Ranunculus testiculatus*	15		UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		
Woody Vine Stratum			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 20 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species	100	x4=	400
UPL species	100	x5=	500
Column Totals:	200	(A)	900 (B)

Prevalence Index = B/A = 4.50

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/3	100					SC	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C)**
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soils Present? **Yes:** ___ **No:** X

Remarks:
Rocky soil after five inches.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	___	
Water Table Present?	Yes ___	No X	Depth (inches):	___	
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	___	**Wetland Hydrology Present?** Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
Soil is damp at surface.

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

REPLY TO
ATTENTION OF

December 12, 2008

Forward to
Laura M.
Jennifer
Jean Streefel
(Landmark)

Wyoming Regulatory Office

Honorable Timothy Kaumo
Mayor, City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Dear Mr. Kaumo:

This letter is in response to a request we received on October 24, 2008, from Ms. Cindy Adams of BKS Environmental Associates, Inc., for a jurisdictional determination based upon a wetland delineation conducted at the location of two proposed storm water detention basins on Dead Horse Canyon Creek in Rock Springs. Detention basin #2 is located in the northeast quarter of the northwest quarter, and the northwest quarter of the northeast quarter of Section 6, Township 18 North, Range 104 West, Sweetwater County, Wyoming. Detention basin #3 is located in the southeast quarter of the northwest quarter, and the northeast quarter of the southwest quarter of Section 6, Township 18 North, Range 104 West, Sweetwater County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations are published in the Code of Federal Regulation at 33 CFR Parts 320 through 331. Information on Section 404 program requirements in Wyoming can be obtained from our web site at https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm.

Based on the information provided by Ms. Adams in the report entitled *2008 Wetland Assessment for City of Rock Springs Dead Horse Canyon – Bitter Creek Detention Basins* dated October 20, 2008, it has been determined that there are no wetlands or other waters of the United States within the project areas. Therefore, Department of the Army authorization is not required for the project because it does not require the discharge of fill material in wetlands or other waters of the United States. This determination does not eliminate the requirement to obtain any other applicable federal, state, tribal, or local permits that may be required.

In the March 28, 2000, edition of the *Federal Register* (Vol. 65, No. 60), the Corps implemented an administrative appeals process for jurisdictional determinations. This letter serves as an approved jurisdictional determination. The City of Rock Springs may appeal any determination to the Division Engineer's appeal officer, Mr. David Gesl, by obtaining a Notification of Administrative Appeal Options and Process (NAO) form at our web site. The NAO form must be submitted to Mr. Gesl at the address shown on the NAO form prior to **February 11, 2009**, or you will forfeit your right to an administrative appeal.

Thank you for your interest in cooperating with the requirements of the U.S. Army Corps of Engineers regulatory program. If you have any questions, please contact Mr. Michael Burgan at (307) 772-2300 and reference file No. NWO-2008-2866.

Sincerely,

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

Copy Furnished: (w/o enclosures)

Cindy Adams
BKS Environmental Associates, Inc.
P. O. Box 3017
Rock Springs, WY 82902

Appendix 4

Wildlife Survey Data & Correspondence

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-1 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 19-Jun Time: 5:30

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4606369 UTME 649592

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
SOSP			1					
HOSP					6			
BHCO							1	
AMRO					1			
KILL						1		

Submitter: Remarks: Near bridge, lots of car noise. Tamarisk on creek banks.

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-2 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 19-Jun Time: 5:47

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4606021 UTME 648913

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOSP			1		4			
AMRO	1							
RODO							1	1
UNK Sparrow							1	
WETA						1		
HOFI						1		2
EUST								1

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC3 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 19-Jun Time: 6:04

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4606169 UTME 648362

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOSP			2		3		1	2
EUST							1	
AMRO					2			
BRBL							2	
RODO						4		
BARS								1

Submitter:

Remarks: N side of creek
YEWA heard in residential area upon leaving

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-4 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 19-Jun Time: 6:17

Temp: 55 Wind: 0-5 mph Sky: CLEAR

Zone: 12 UTMN 4606130 UTME 648065

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
BHCO	3							
HOSP	4		2		3			
HOFI			1		1			
BRBL							1	
YEWA						1		
BARS						1		

Submitter:

Remarks: Beaver constructing dam ~400 ft upstream of pt., another dam ~250 ft downstream. Rabbitbrush, Russian Olive, willow.

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-5 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 19-Jun Time: 6:38

Temp: 55 Wind: 0-5 mph Sky: CLEAR

Zone: 12 UTMN 4605794 UTME 647764

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
CLSW							1	
KILL					1			
HOSP					2			1
VGSW				2				
HOFI						1		

Submitter: Remarks: Violet-greens nesting in bank? Tamarisk and greasewood.
Point is 125 ft from stream, which is in a steep ravine.

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-6 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 19-Jun Time: 5:41

Temp: 50 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4605533 UTME 647745

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
VGSW			1		4			
EUST					2			1
HOFI					4	3		
HOSP					1			
MODO						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-7 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 19-Jun Time: 6:01

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4605052 UTME 647792

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOSP					4			
BRBL							1	
MODO					1			
EUST								1
AMRO						1		
YEWA						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-8 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 19-Jun Time: 6:18

Temp: 60 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4604580 UTME 647760

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOFI			1		1		3	1
HOSP					1			
MODO							2	
VGSW								2
RODO							3	

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-9 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 19-Jun Time: 6:40

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4604275 UTME 647432

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOSP			1		2			1
EUST							1	
VGSW						1		1
HOFI		1						

Submitter: Remarks: Loud Traffic

Rock Springs--Bitter Creek Project Point Count

POINT ID: BC-10 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 19-Jun Time: 7:08

Temp: 60 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603900 UTME 646655

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
BRSP	1							
RODO							1	
VGSW					3			
BARS								2
HOFI					1			
NRSW						1		
SPSA						1		

Submitter: Remarks: Mallard flyover before point, three deer seen after survey, beaver also seen after survey.

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH2DAM Visit #: 1 Observer: JS

Year: 2008 Month/Day: 20-Jun Time: 5:44

Temp: 45 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603874 UTME 651094

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
ROWR					1			
SASP					1			
BRSP					1			

Submitter:

Remarks: NOFL seen before count.

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH2PT1 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 20-Jun Time: 5:36

Temp: 50 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4604327 UTME 650927

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
ROWR					4			
MODO							3	
BEWR						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH2PT2 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 20-Jun Time: 6:09

Temp: 50 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4604179 UTME 651649

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
ROWR					2			
MODO							2	
SASP					2	1		
BBMA						1		

Submitter: Remarks: Antelope with twins

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH2PT3 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 20-Jun Time: 5:59

Temp: 50 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603363 UTME 651471

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
BBMA					2			
BEWR					1			
SASP					1			
UNK (SPAR)			1					
ROWR						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH2PT4 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 20-Jun Time: 5:30

Temp: 45 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603660 UTME 650757

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
SASP					1			
BRSP			1		2			
ROWR					1			
SAVS						1		
GTTO						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH3DAM Visit #: 1 Observer: JM

Year: 2008 Month/Day: 18-Jun Time: 7:32

Temp: 60 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603377 UTME 649615

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
BRSP			1					
SASP					2	1		
AMRO					1			
HOSP			7	2				
MODO								1
EUST								1

Submitter:

Remarks: Red-shafted (Northern) Flicker, House Finch,
and 2 European Starlings seen before arriving at point.

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH3PT1 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 18-Jun Time: 7:15

Temp: 60 Wind: BREEZY Sky: CLEAR

Zone: 12 UTMN 4603747 UTME 649810

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOLA					3			3
MODO							2	
BRSP					1			
BBMA						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH3PT2 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 18-Jun Time: 6:52

Temp: 60 Wind: 0-5 mph Sky: FEW CLOUDS

Zone: 12 UTMN UTME

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
AMRO					1			1
HOSP					Many			
HOLA					1			
MODO							1	
EUST								2
WETA						1		

Submitter: Remarks: HOSPs heard in deciduous trees in residential area across main road, too many to distinguish individuals, probably 20+.

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH3PT3 Visit #: 1 Observer: JS

Year: 2008 Month/Day: 18-Jun Time: 7:16

Temp: 65 Wind: 5-10 mph Sky: CLEAR

Zone: 12 UTMN 4603363 UTME 651471

	Count <25m		Count 25-50m		Count >50 m		Flyovers	
SPECIES	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
HOSP	3							
SASP					1	1		
BEWR	1							
ROWR					1	1		
BRSP						1		
BBMA						1		

Submitter: Remarks:

Rock Springs--Bitter Creek Project Point Count

POINT ID: DH3PT4 Visit #: 1 Observer: JM

Year: 2008 Month/Day: 18-Jun Time: 6:56

Temp: 55 Wind: CALM Sky: CLEAR

Zone: 12 UTMN 4603141 UTME 650039

SPECIES	Count <25m		Count 25-50m		Count >50 m		Flyovers	
	0-3 min	4-5 min	0-3 min	4-5 min	0-3 min	4-5min	0-3 min	4-5min
BRSP					3	1		
SASP					3	2		

Submitter: Remarks: Fox seen

WYOMING GAME AND FISH DEPARTMENT

5400 Bishop Blvd. Cheyenne, WY 82006

Phone: (307) 777-4600 Fax: (307) 777-4610

Web site: http://gf.state.wy.us

GOVERNOR
DAVE FREUDENTHAL

DIRECTOR
STEVE FERRELL

COMMISSIONERS
JERRY GALLES – President
CLIFFORD KIRK – Vice President
CLARK ALLAN
FRED LINDZEY
RON LOVERCHECK
ED MIGNERY
BILL WILLIAMS, DVM

July 8, 2008

WER 4082.01
Wyoming Wildlife Consultants, LLC
Environmental Assessment
Bitter Creek Construction Project
City of Rock Springs
Sweetwater County

Greg Shedd
Wildlife Biologist
Wyoming Wildlife Consultants
PO Box 893
Pinedale, WY 82941

Dear Mr. Shedd:

The staff of the Wyoming Game and Fish Department has reviewed the Environmental Assessment for the Bitter Creek Construction Project for the City of Rock Springs in Sweetwater County. We offer the following comments for your consideration.

Terrestrial Considerations:

The reach specified for the Bitter Creek project may provide suitable habitat for yellow-billed cuckoo, a federal candidate species. Although not residents, bald eagles and trumpeter swans may use the project area on a seasonal basis. We do not expect significant impacts to these species, or to wildlife in general, from this project.

We recommend contacting the US Fish and Wildlife Service for additional information on Threatened and Endangered species.

Aquatic Considerations:

To minimize impacts to the aquatic resources of Bitter Creek, we recommend that you contact Mr. Robert Keith, Green River Fishery Supervisor, 307 875-3225 Ext 251, as this project moves forward.

Thank you for the opportunity to comment.

Sincerely,

for JOHN EMMERICH
DEPUTY DIRECTOR

JE:VS:gfb

cc: USFWS

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road – Suite 308
Cheyenne, Wyoming 82009

In Reply Refer To:

ES/61411/W.22 /WY09EC0024

Mr. Gregg Shedd
Wyoming Wildlife Consultants
P.O. Box 893
Pinedale, Wyoming 82941

Dear Mr. Shedd:

Thank you for your telephone call of December 2, 2008 regarding the Bitter Creek channel reconstruction project in Sweetwater County, Wyoming. Landmark Design is the prime contractor and proposes to reconstruct the Bitter Creek channel to contain flood events. Based on several telephone conversations with you during July and September 2008, the project will include approximately 4,100 feet of channel improvements to Bitter Creek and two, rather than three, water detention dams will be built, with both located in Dead Horse Canyon. You requested comments from the U.S. Fish and Wildlife Service (Service) regarding concerns we may have regarding fish or wildlife habitat in the Project area.

In response to your request, our office reviewed the information you provided pursuant to the Endangered Species Act (Act) of 1973 as amended, (16 U.S.C. 1531 *et seq.*), Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703, and the Bald and Golden Eagle Protection Act (BGEPA), 16 U.S.C. 668. Other fish and wildlife resources are considered under the Fish and Wildlife Coordination Act and the Fish and Wildlife Act of 1956, as amended, 70 Stat. 1119, 16 U.S.C. 742a-742j. Based on the project information you provided, my staff has determined that no threatened or endangered species are likely to occur in the Project area; however, migratory birds and other important wildlife habitat could be affected by the project as discussed below.

This project should be re-analyzed if new information reveals effects of the action that may affect listed species or designated or proposed critical habitat (1) in a manner or to an extent not considered in this letter, (2) if the action is subsequently modified in a manner that causes an effect to a listed species or designated or proposed critical habitat that was not considered in this letter, and/or (3) if a new species is listed or critical habitat is designated that may be affected by this project.

Migratory Birds
The MBTA, enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations and does not require intent to be proven. Section 703

of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird..." The BGEPA, prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing.

Work that could lead to the take of a migratory bird including an eagle, their young, eggs, or nests (for example, if you are going to construct new power lines in the vicinity of a nest), should be coordinated with our office before any actions are taken. Removal or destruction of such nests, or causing abandonment of a nest could constitute violation of one or both of the above statutes. Removal of any active migratory bird nest or nest tree is prohibited. For golden eagles, inactive nest permits are limited to activities involving resource extraction or human health and safety. Mitigation, as determined by the local Service field office, may be required for loss of these nests. No permits will be issued for an active nest of any migratory bird species, unless removal of an active nest is necessary for reasons of human health and safety. Therefore, if nesting migratory birds are present on, or near the project area, timing is a significant consideration and needs to be addressed in project planning.

If nest manipulation is proposed for this project, the project proponent should contact the Service's Migratory Bird Office in Denver at 303-236-8171 to see if a permit can be issued for this project. No nest manipulation is allowed without a permit. If a permit cannot be issued, the project may need to be modified to ensure take of a migratory bird or eagle, their young, eggs or nest will not occur.

Wetlands/Riparian Areas: Wetlands may be impacted by the proposed project. Wetlands perform significant ecological functions which include: (1) providing habitat for numerous aquatic and terrestrial wildlife species, (2) aiding in the dispersal of floods, (3) improving water quality through retention and assimilation of pollutants from storm water runoff, and (4) recharging the aquifer. Wetlands also possess aesthetic and recreational values. The Service recommends measures be taken to avoid and minimize wetland losses in accordance with Section 404 of the Clean Water Act, and Executive Order 11988 (floodplain management) as well as the goal of "no net loss of wetlands." If wetlands may be destroyed or degraded by the proposed action, those wetlands in the project area should be inventoried and fully described in terms of their functions and values. Acreage of wetlands, by type, should be disclosed and specific actions should be outlined to avoid, minimize, and compensate for all unavoidable wetland impacts.

Riparian or streamside areas are a valuable natural resource and impacts to these areas should be avoided whenever possible. Riparian areas are the single most productive wildlife habitat type in North America. They support a greater variety of wildlife than any other habitat. Riparian vegetation plays an important role in protecting streams, reducing erosion and sedimentation as well as improving water quality, maintaining the water table, controlling flooding, and providing shade and cover. In view of their importance and relative scarcity, impacts to riparian areas should be avoided. Any potential, unavoidable encroachment into these areas should be further avoided and minimized. Unavoidable impacts to streams should be assessed in terms of their functions and values, linear feet and vegetation type lost,

potential effects on wildlife, and potential effects on bank stability and water quality. Measures to compensate for unavoidable losses of riparian areas should be developed and implemented as part of the project.

Plans for mitigating unavoidable impacts to wetland and riparian areas should include mitigation goals and objectives, methodologies, time frames for implementation, success criteria, and monitoring to determine if the mitigation is successful. The mitigation plan should also include a contingency plan to be implemented should the mitigation not be successful. In addition, wetland restoration, creation, enhancement, and/or preservation does not compensate for loss of stream habitat; streams and wetlands have different functions and provide different habitat values for fish and wildlife resources.

Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

Water Quality: Based on information provided in the telephone conversations in July and September 2008, the proposed detention dams are for flood control only and will only temporarily impound water. The impounded water will be slowly released downstream in a period of two or three days. The proposed water detention dams are located in areas that are underlain by potentially seleniferous geologic formations (Upper Cretaceous marine shale), the Rock Springs Formation and the Baxter Shale Formation (Case and Cannia 1988). The Rock Springs Formation occurs at the Dead Horse Canyon Dam Site No. 2. The Rock Springs Formation can contain up to 2.7 parts per million (ppm) of selenium (Case and Cannia 1988). Baxter Shale occurs at the Dead Horse Canyon Dam Site No. 3.

Waterborne selenium concentrations greater than 2 µg/L (parts per billion) could result in impacts to fish and aquatic birds inhabiting the impounded waters. Impoundment of streams with elevated waterborne selenium concentrations could further increase selenium through evaporative concentration and create a hazard for migratory aquatic birds.

Fish also can bioaccumulate selenium directly from the water as well as from their diet. Top level consumers in aquatic systems, such as waterfowl, can readily accumulate selenium to concentrations that lead to low reproduction, embryonic deformities and increased mortality (Ohlendorf et al 1988). The current aquatic chronic criterion of 5 µg/L selenium is not adequate for preventing adverse effects on fish and aquatic birds. To protect fish, waterfowl, shorebirds, and other wildlife from adverse effects, waterborne selenium concentrations should be 2 µg/L or less (Skorupa and Ohlendorf 1991; Lemly 1993; Hamilton 2002).

Selenium also bioaccumulates in aquatic vegetation and invertebrates. Aquatic invertebrates can contain concentrations 2 to 6 times those found in aquatic plants. Selenium can concentrate in the food chain up to 300,000 times the concentration in the water (Besser et al. 1993). For example, the Service documented deformities and poor reproductive success in American avocets and eared grebes at the Kendrick irrigation project, located west of Casper, Wyoming, due to selenium. The median concentration of dissolved selenium in water samples from two closed basin ponds were 38 and 54 µg/L (See et al. 1992). Due to the bioaccumulation of selenium in food items from these ponds, aquatic birds suffered from impaired reproduction and embryonic deformities (See et al. 1992).

Chronic effects of selenium toxicity to sensitive species of fish and aquatic migratory birds are subtle and not readily observed. Chronic effects manifest themselves in immune suppression to birds (Fairbrother et al. 1994) which can make affected birds more susceptible to disease and predation. Selenium toxicity will also cause embryonic deformities and mortality (See et al. 1992, Skorupa 1991, Ohlendorf 2002). The toxic effects of selenium to sensitive species of fish include: damage to gills and internal organs, teratogenic deformities, and impaired reproduction (Lemly 2002). These effects can go undetected because the "primary point of impact is the egg" which receives the selenium from the female (Lemly 2002). Selenium effects to internal organs can also cause an increase in energy requirements thus making fish more susceptible to Winter Stress Syndrome which occurs when the water temperature drops in the autumn and causes increased metabolism (Lemly 2002). Mortality usually occurs as a result of Winter Stress Syndrome.

Although the proposed retention dams are not designed to create permanent pools or impoundments of water, it could result in the accumulation of selenium-bearing silt in the floodwater detention area. Therefore, selenium levels in bottom material from the proposed floodwater detention areas should be assessed to adequately characterize the risk of selenium to fish and wildlife that may use these areas in the event that some pooled water remains behind the detention dams.

We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species and migratory birds. If you have further questions regarding this letter or your responsibilities under the Act, please contact Pedro 'Pete' Ramirez at the letterhead address or phone (307) 772-2374, extension 236.

Sincerely,

Scott Hicks

for Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc: WGFD, Non-game Coordinator, Lander, WY (B. Oakleaf)
WGFD, Statewide Habitat Protection Coordinator, Cheyenne, WY (V. Stelter)

References

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WYOMING GAME AND FISH DEPARTMENT

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Phone: (307) 777-4600 Fax: (307) 777-4610

Web site: http://gf.state.wy.us

GOVERNOR
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CLIFFORD KIRK – Vice President
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RON LOVERCHECK
ED MIGNERY
BILL WILLIAMS, DVM

February 23, 2009

Gregory Shedd
Wyoming Wildlife Consultants, LLS
201 West Pine
Pinedale, WY 82941

Dear Mr. Shedd:

We are writing this letter in regards to the Rock Springs Bitter Creek Construction Project. Our regional biologists have initial concerns over a proposed drop structure located upstream of the Dead Horse Canyon/Bitter Creek confluence at a sewer line crossing. Because a genetically pure population of flannelmouth sucker (Wyoming species of greatest conservation need) persists upstream of the proposed project, we want to insure the drop structure can successfully pass these fish. Additionally, we feel it would be practical to construct the drop in a fashion that passes all fish species, thus eliminating the need to retrofit the structure in the future to make it "fish friendly".

After our conversation on February 9, 2009, we are confident that accommodating fish passage at the proposed structure will not be difficult to accomplish. Based on fish swim performance literature (using white sucker as a surrogate for flannelmouth sucker), a 20:1 slope and water velocity no greater than 2-3 ft./sec. could adequately pass fish. Please note that the above-mentioned slope and velocity suggestions are not "one size fits all" recommendations, but general guidelines. Further evaluation may be needed once construction plans are formalized. In regards to construction material, we prefer that the entire sloped drop not be smooth, but grouted cobble. Grouted cobble would allow fish to use interstitial spaces to negotiate the structure and provide velocity refuge. Additionally, a narrow portion of the drop structure that is smooth and funnels water during low flow periods may aid in fish passage.

Finally, we would like to thank you for including us in the preliminary project design. We would appreciate you keeping us up to date with design plans, and we will continue to provide any fish related input you may need.

Please don't hesitate to contact us if you have any questions.

Sincerely,

Kevin A. Spence Bobby Compton

Bobby Compton (fisheries biologist)
Kevin Spence (aquatic habitat biologist)

Appendix 5

Soil Sample Summary

JFC ENGINEERS SURVEYORS

SOIL SAMPLE SUMMARY

FOR

BITTER CREEK ENHANCEMENT PROJECT

Prepared For:
Landmark Design
2834 Highland Drive
Salt Lake City, UT 84106

December 2008
JFC Project No. 7987-07E

1515 Ninth Street, Suite A
Rock Springs, Wyoming 82901
Phone (307) 362-7519
Fax (307) 362-7569
Email: mail@jfc-wyo.com

Bitter Creek Enhancement Project
Summary of Soil Sampling – October 31, 2008
JFC Job No. 7987-07E

JFC Engineers and Surveyors were directed by Greg Poole of Hansen, Allen, and Luce to take composite soil samples in the Dead Horse Creek Basin. These samples are a representation of the historic heavy metal deposition in the basin. Excessive heavy metal deposition could have detrimental effects on the area's wildlife.

On October 31, 2008 Brandt Lyman, EIT and Amy M. Allen, PE of JFC Engineers and Surveyors took soil samples at four locations for a total of two composite samples. These mixed samples are a representation of the basin's historic soil deposition.

The first composite sample was taken at two locations (sites 1A and 1B) as shown on the attached map. These locations were historic deposition sites in an old retention basin. The soils in the creek channel, now cutting through the old retention basin, appear to not vary with depth. This was concluded after reviewing the 2 to 3 foot stream cut within the retention area. Therefore, the two samples were taken about 6 inches from the surface. Sample 1A was taken in a location near the streambed where no cutting was occurring (photo 2). The second was taken at the foot of the old breached retention levee approximately 2 feet above the present streambed location. These sites are shown in photographs 1 through 4.

The second composite sample was taken at sites 2A and 2B, below the breached levee, in a flat area of the basin as shown on the attached map. These locations are upstream of areas that have been recently disturbed and these locations are shown in photos 5 through 7. The samples were taken in flat areas where deposition could occur because of the slowing of storm water velocities.

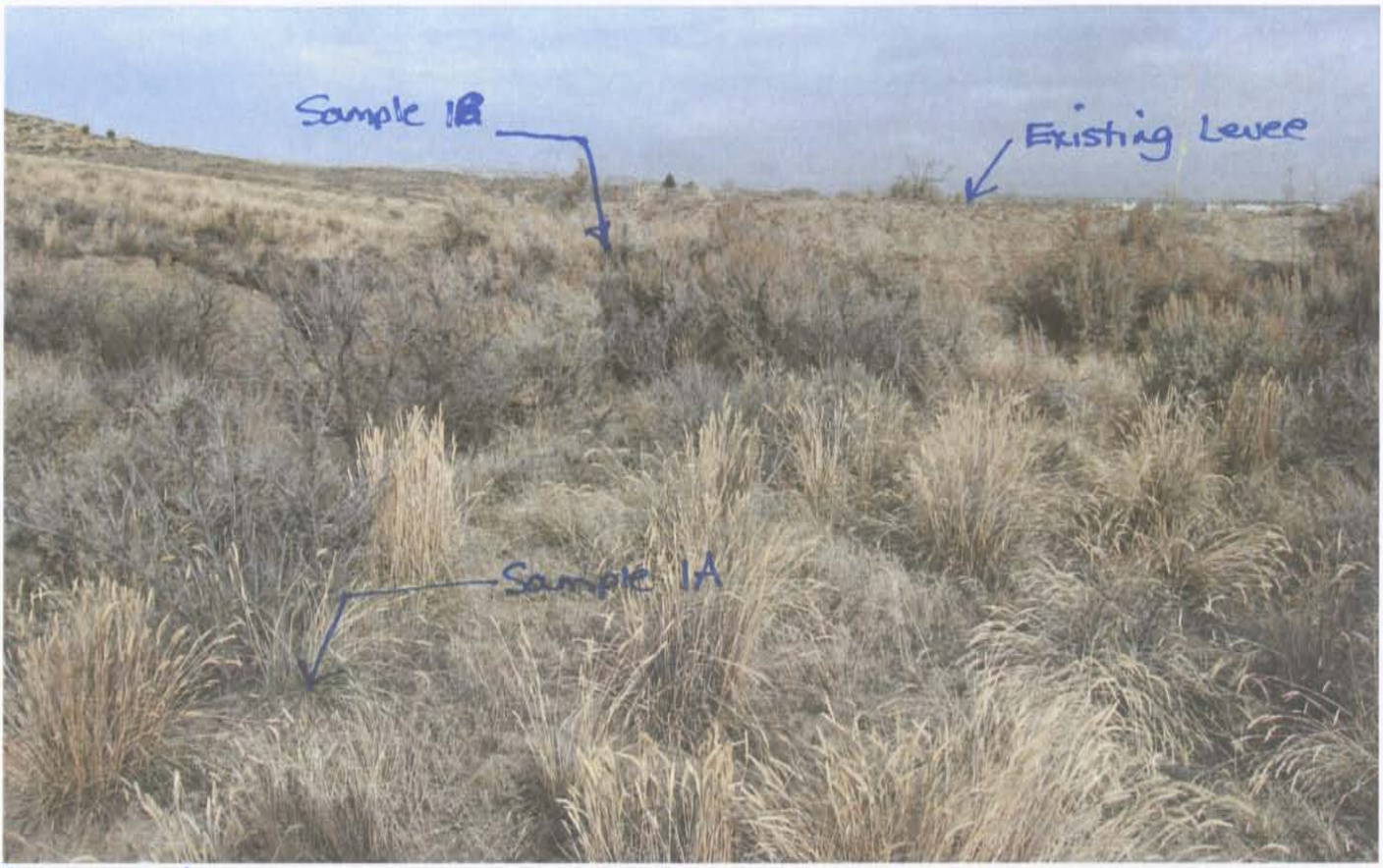
In JFC's lab, samples 1A and 1B were mixed together in the sample splitter and a composite sample was bottled for metals testing by Wyoming Analytical Laboratory. The same procedure was used for testing samples 2A and 2B. JFC performed gradations on the two composite samples and the results are attached.

Wyoming Analytical Laboratory results are also attached.

③ Sample 1A

④ Sample 1B

① Looking North @ old Levee



② Sample 1A

(7) ZB

⑤ Composite 2A

⑥ Looking North at flat area sampled for Composite 2

Brandt Lyman
JFC Engineers
1515 9th St.
Rock Springs, WY 82901

Date: November 10, 2008
Request Number: 26979
Date Received: 11-5-08
Matrix: Soil

REPORT OF ANALYSIS

Lab Number: L6676
Sample ID: Deadhorse #1 10-31-08

TCLP Metals, mg/L Method: 1311/6020		Reporting Limit, mg/L	Limit / 40 CFR 261.24
Chromium	BRL	1.0	5.0 mg/L
Arsenic	BRL	1.0	5.0 mg/L
Selenium	BRL	0.2	1.0 mg/L
Silver	BRL	1.0	5.0 mg/L
Cadmium	BRL	0.2	1.0 mg/L
Barium	BRL	20.0	100 mg/L
Mercury	BRL	0.04	0.2 mg/L
Lead	BRL	1.0	5.0 mg/L

BRL: Below Reporting Limit.

Total Metals, mg/kg Method: 3052/6020		Reporting Limit, mg/kg
Beryllium	0.345	0.001
Vanadium	7.95	0.001
Cobalt	4.03	0.001
Nickel	11.0	0.001
Copper	9.33	0.001
Zinc	39.5	0.001
Antimony	0.037	0.001
Thallium	0.087	0.001
Phosphorus	439	0.001

Method: SM 4500-CN

Cyanide, mg/kg	< 0.02

Monte L. Ellis
Laboratory Manager

WYOMING ANALYTICAL LABORATORIES, INC.
1660 Harrison St. Wallaramie@wal-lab.com (307) 742-7995
Laramie, WY 82070 Fax: (307) 721-8956

Brandt Lyman
JFC Engineers
1515 9th St.
Rock Springs, WY 82901

Date: November 10, 2008
Request Number: 26979
Date Received: 11-5-08
Matrix: Soil

REPORT OF ANALYSIS

Lab Number: L6677
Sample ID: Deadhorse #2 10-31-08

TCLP Metals, mg/L Method: 1311/6020		Reporting Limit, mg/L	Limit / 40 CFR 261.24
Chromium	BRL	1.0	5.0 mg/L
Arsenic	BRL	1.0	5.0 mg/L
Selenium	BRL	0.2	1.0 mg/L
Silver	BRL	1.0	5.0 mg/L
Cadmium	BRL	0.2	1.0 mg/L
Barium	BRL	20.0	100 mg/L
Mercury	BRL	0.04	0.2 mg/L
Lead	BRL	1.0	5.0 mg/L

BRL: Below Reporting Limit.

Total Metals, mg/kg Method: 3052/6020		Reporting Limit, mg/kg
Beryllium	0.349	0.001
Vanadium	10.6	0.001
Cobalt	6.25	0.001
Nickel	14.5	0.001
Copper	7.35	0.001
Zinc	41.0	0.001
Antimony	0.050	0.001
Thallium	0.109	0.001
Phosphorus	462	0.001

Method: SM 4500-CN

Cyanide, mg.kg	< 0.02

Monte L. Ellis
Laboratory Manager

WYOMING ANALYTICAL LABORATORIES, INC.
1660 Harrison St. Wallaramie@wal-lab.com (307) 742-7995
Laramie, WY 82070 Fax: (307) 721-8956

Amy Allen

From: Greg Poole [gpoole@hansenallenluce.com]
Sent: Thursday, November 13, 2008 4:31 PM
To: 'Jan Striefel'
Cc: Amy Allen; 'Gregg Shedd'
Subject: RE: Report
Attachments: JFC ENGINEERS 26079.pdf

Jan,

The Dead Horse soil sample analysis results are good news.

The TCLP (Toxicity Characteristic Leaching Procedure) analysis of the Dead Horse Creek samples found that the tests for Chromium, Arsenic, Selenium, Silver, Cadmium, Barium, and Lead were all below the reporting limit. The TCLP analysis (EPA Test Method 1311) is designed to determine if the material is classifiable as hazardous. The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase which is mixed with the sample and agitated for 20 (18 +2) hours after which the sample is filtered and the liquid part tested for the subject analyte. The TCLP tests the mobility of specific analytes and is used to determine if a waste meets the definition of EP Toxicity and is classifiable as a hazardous waste under RCRA (40 CFR Part 261) of D004 through D052. The fact that the selenium concentration in the samples was below the reporting limit in both samples is especially good news.

The samples were tested for the following total metals Beryllium, Vanadium, Cobalt, Nickel, Copper, Zinc, Antimony, Thallium, Phosphorus with results reported as mg/kg (which is equivalent to parts per million). The following table compares the sample measured concentration with typical soil values reported by the Department of Health and Human Services, Public Health Service Agency for Toxic Substances and Disease Registry. Beryllium and Vanadium concentrations in the soils samples are much less than typical soil values. Cobalt, Nickel, Antimony, and Thalium concentrations in the samples are in the typical range for soils.

Typical soils concentration ranges are not provided for Zinc, however, a child would have to have a daily intake of over 1/3 pound of the Dead Horse soil sample to exceed the tolerable upper intake level for Zinc.

The Agency for Toxic Substances and Disease Registry (ATSDR) does not provide a public health statement for Phosphorus. Inorganic phosphates are compounds of phosphorus and oxygen that occur in many forms and are usually combined with other elements - e.g., metals such as sodium, potassium, calcium, and aluminum. Humans are unlikely to experience adverse effects when the daily phosphorus consumption remains below 70 mg per day (this is equivalent to about 1/3 pound of the Dead Horse samples.

Metal	Deadhorse #1	Deadhorse #2	Typical Soils Metals Concentrations	Comments (comparison to typical values)	Source
	Total Metals mg/kg	Total Metals mg/kg	mg/kg		Department of Health and Human Services, Public Health Service Agency for Toxic Substances and Disease Registry
Beryllium	0.345	0.349	3	Dead Horse samples much less than typical values	http://www.atsdr.cdc.gov/toxprofiles/tp58-c1.pdf
Vandium	7.95	10.6	150	Dead Horse samples much less than typical values	http://www.atsdr.cdc.gov/toxprofiles/tp4-c1-b.pdf

Cobalt	4.03	6.25	1 to 40 (average is 7)	Dead Horse samples are in typical range	http://www.atsdr.cdc.gov/toxprofiles/tp33-c1-b.pdf
Nickel	11	14.5	4 to 80	Dead Horse samples are in typical range	http://www.atsdr.cdc.gov/toxprofiles/tp15-c1-b.pdf
Copper	9.33	7.35	2 to 250	Dead Horse samples are in typical range	http://www.atsdr.cdc.gov/toxprofiles/tp132-c1-b.pdf
Zinc	39.5	41	Not given	The tolerable upper intake level for children is about 7 mg/day and about 40 mg/day for adults.	http://www.atsdr.cdc.gov/toxprofiles/tp60-c1-b.pdf
Phosphorus	439	462	Not given	humans are unlikely to experience adverse effects when the daily phosphorus consumption remains below 70 mg/day -- about 1/3 pound of soil sample	Toxicological review of inorganic phosphates http://www.phosphatesfacts.org/library.asp
Antimony	0.037	0.05	<1	Dead Horse samples are in typical range	http://www.atsdr.cdc.gov/toxprofiles/tp23-c1.pdf
Thalium	0.087	0.109	0.3 to .07	Dead Horse samples are in typical range	http://www.atsdr.cdc.gov/toxprofiles/tp54-c1.pdf

Cyanide concentration was less than the detection limit in both samples (<0.02 parts per million).

Please call if there are questions.

Thank you,
Greg Poole
Hansen, Allen & Luce, Inc.
801 566 5599

From: Amy Allen [mailto:amyallen@jfc-wyo.com]
Sent: Wednesday, November 12, 2008 9:28 AM
To: Greg Poole; Gregg Shedd; Jan Striefel
Subject: FW: Report

Greg(g),

Attached find the results from Wyoming Analytical's soils analysis in the Dead Horse Creek Basin.

Amy

Amy M. Allen, PE

Vice President
JFC Engineers and Surveyors
1515 Ninth Street, Suite A
Rock Springs, WY 82901

307 362-7519
fax 307 362-7569

From: Wyoming Analytical Labs - Laramie [mailto:wallaramie@aol.com]
Sent: Tuesday, November 11, 2008 11:46 AM
To: Amy Allen
Subject: Report

Thank You

WARNING:
This electronic message transmission contains information from Wyoming Analytical Laboratories, which is privileged, confidential or otherwise, the exclusive property of the sender or intended recipient. If you are not the designated recipient, please be aware that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this electronic transmission in error, please notify us by telephone (307-742-7995), or by electronic mail (by reply to the sender) and promptly destroy the original transmission. Thank you for your assistance.

JFC ENGINEERS SURVEYORS

1515 NINTH STREET, SUITE A
ROCK SPRINGS, WY 82901
PHONE (307) 362-7519
FAX (307) 362-7569

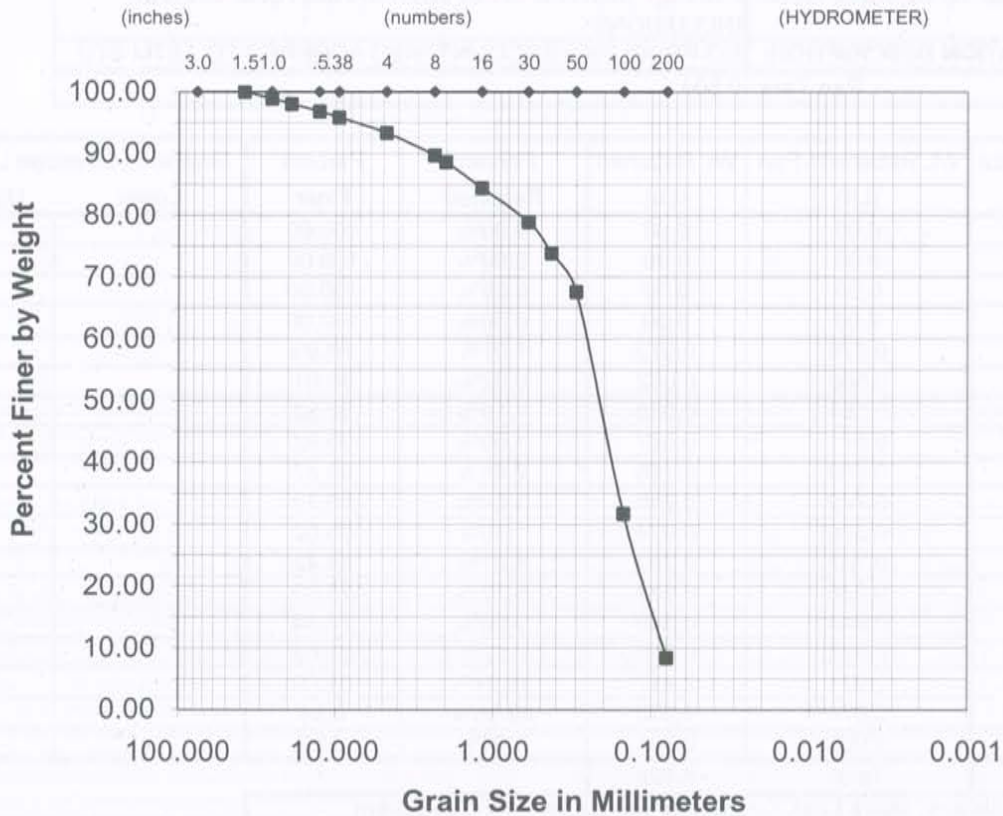
PARTICLE SIZE ANALYSIS

JFC ENGINEERS & SURVEYORS

CLIENT: Landmark Design
PROJECT: Bitter Creek Surveying and Geotechnical
JOB NO: 7987-08E
TESTED DATE: 11/25/2008
TESTED BY: JGB
TEST METHOD: ASTM C-136/C-117, ROUND SHAKER, STANI

SAMPLE NO: 7987-08E-001GD
SAMPLED BY: BDL
SOURCE: DEAD HORSE DETENTION
SAMPLE DESCRIPTION: POORLY SORTED SAND WITH SANDSTONE
GRADATION DESCRIPTION: NO PROBLEMS ENCOUNTERED

US STANDARD SIEVE SIZE OPENINGS



cobbles	course gravel	fine gravel	course sand	medium sand	fine sand	silt	clay
				SP			

Unified Soil Classification System (ASTM D2487)

COMMENTS: ASTM NUMBERS PROVIDED UPON REQUEST. NO HYDROMETER ANALYSIS CONDUCTED.

JFC ENGINEERS SURVEYORS

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FAX (307) 362-7569

JFC ENGINEERS & SURVEYORS

PARTICLE SIZE ANALYSIS

CLIENT:	Landmark Design
PROJECT:	Bitter Creek Surveying and Geotechnical
JOB NO:	7987-08E
TEST DATE:	11/25/08
TESTED BY:	JGB
TEST METHOD:	ASTM C-136/C-117, ROUND SHAKER, STANDARD STACK
SAMPLE NO:	7987-08E-001GD
SAMPLED BY:	BDL
SOURCE:	DEAD HORSE DETENTION BASIN #1
SAMPLE DESCRIPTION:	POORLY SORTED SAND WITH SANDSTONE GRAVEL INCLUSIONS
GRADATION DESCRIPTION:	NO PROBLEMS ENCOUNTERED ADHERED TO ASTM STD.
Pan Tare:	0.504

Sieve No	Sieve Size (mm)	Wt. Retained+ Pan (Lb)	Wt. Retained (Lb)	Percent Retained	Percent Finer	Gradation Envelope Limits Lower	Upper
3.0	76.20	0.00	0.00	0.00%	100.00		
2.5	63.50	0.00	0.00	0.00%	100.00		
2.0	50.80	0.00	0.00	0.00%	100.00		
1.5	38.10	0.00	0.00	0.00%	100.00		
1.0	25.40	0.576	0.072	1.07%	98.93		
0.75	19.05	0.566	0.062	0.92%	98.01		
0.50	12.70	0.584	0.080	1.19%	96.82		
0.375	9.53	0.571	0.067	1.00%	95.82		
4	4.75	0.669	0.165	2.45%	93.37		
8	2.36	0.749	0.245	3.64%	89.72		
10	2.00	0.578	0.074	1.10%	88.62		
16	1.18	0.787	0.283	4.21%	84.42		
30	0.60	0.875	0.371	5.52%	78.90		
40	0.43	0.844	0.340	5.06%	73.84		
50	0.30	0.922	0.418	6.22%	67.63		
100	0.15	2.921	2.417	35.94%	31.69		
200	0.08	2.074	1.570	23.35%	8.34		
Pan	0	1.065	0.561	8.34%	0.00		
		Total	6.725				

Percent Moisture, Mass Lost, Gradation and Uniformity Coefficient					
Pan Tare:	1.50	M_{water}:	0.31	D_{10}:	0.80
M_w+Pan:	13.08	%Mt.	2.75%	D_{30}:	0.16
M_w:	11.58	Initial Mass:	6.73	D_{60}:	0.28
M_D+Pan	12.77	Final Mass:	6.73	C_Z:	0.02
M_D:	11.27	Mass Lost(%):	0.07%	C_U:	0.35

JFC ENGINEERS SURVEYORS

1515 NINTH STREET, SUITE A
ROCK SPRINGS, WY 82901
PHONE (307) 362-7519
FAX (307) 362-7569

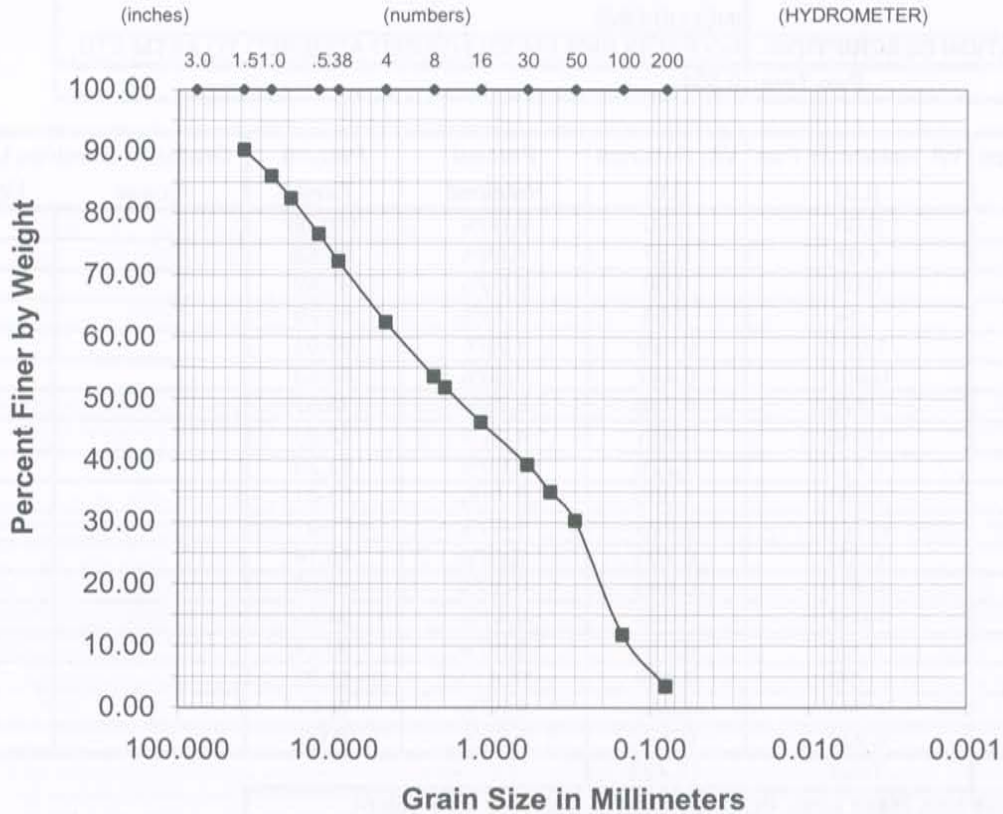
PARTICLE SIZE ANALYSIS

JFC ENGINEERS & SURVEYORS

CLIENT: Landmark Design
PROJECT: Bitter Creek Surveying and Geotechnical
JOB NO: 7987-08E
TESTED DATE: 12/1/2008
TESTED BY: JGB
TEST METHOD: ASTM C-136/C-117, ROUND SHAKER, STANI

SAMPLE NO: 7987-08E-002GD
SAMPLED BY: BDL
SOURCE: DEAD HORSE DETENTION
SAMPLE DESCRIPTION: GAP GRADED SAND WITH SANDSTONE
GRADATION DESCRIPTION: NO PROBLEMS ENCOUNTERED

US STANDARD SIEVE SIZE OPENINGS



cobbles	course gravel	fine gravel	course sand	medium sand	fine sand	silt	clay
				GP			

Unified Soil Classification System (ASTM D2487)

COMMENTS: ASTM NUMBERS PROVIDED UPON REQUEST. NO HYDROMETER ANALYSIS CONDUCTED.

JFC ENGINEERS SURVEYORS

1515 NINTH STREET, SUITE A
ROCK SPRINGS, WY 82901
PHONE (307) 362-7519
FAX (307) 362-7569

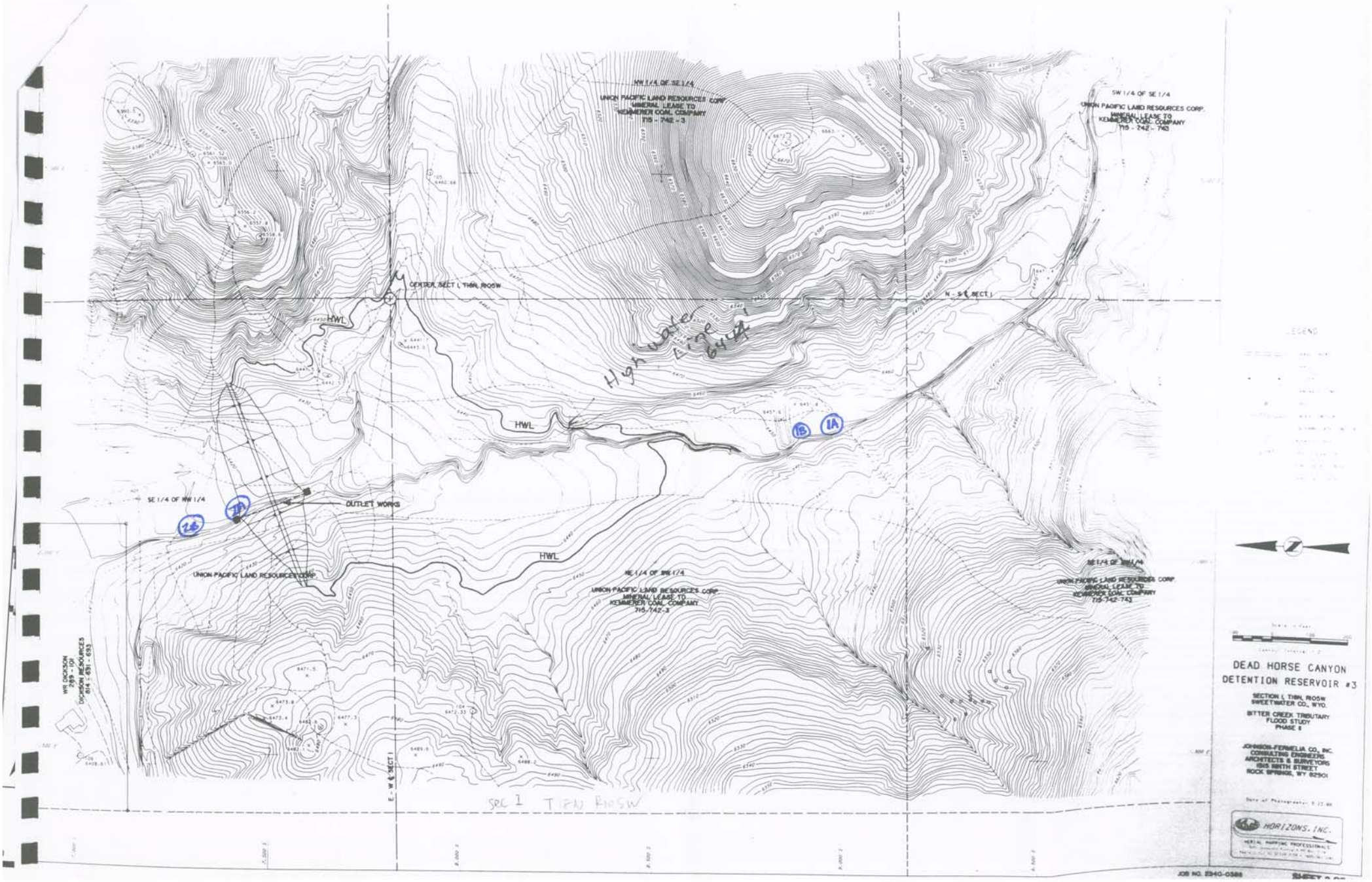
JFC ENGINEERS & SURVEYORS

PARTICLE SIZE ANALYSIS

CLIENT:	Landmark Design
PROJECT:	Bitter Creek Surveying and Geotechnical
JOB NO:	7987-08E
TEST DATE:	12/01/08
TESTED BY:	JGB
TEST METHOD:	ASTM C-136/C-117, ROUND SHAKER, STANDARD STACK
SAMPLE NO:	7987-08E-002GD
SAMPLED BY:	BDL
SOURCE:	DEAD HORSE DETENTION BASIN #2
SAMPLE DESCRIPTION:	GAP GRADED SAND WITH SANDSTONE GRAVEL INCLUSIONS
GRADATION DESCRIPTION:	NO PROBLEMS ENCOUNTERED ADHERED TO ASTM STD.
Pan Tare:	0.504

Sieve No	Sieve Size (mm)	Wt. Retained+ Pan (Lb)	Wt. Retained (Lb)	Percent Retained	Percent Finer	Gradation Envelope Limits Lower	Upper
3.0	76.20	0.00	0.00	0.00%	100.00		
2.5	63.50	1.07	0.57	4.58%	95.42		
2.0	50.80	0.00	0.00	0.00%	95.42		
1.5	38.10	1.14	0.64	5.13%	90.29		
1.0	25.40	1.033	0.529	4.26%	86.03		
0.75	19.05	0.951	0.447	3.60%	82.43		
0.50	12.70	1.220	0.716	5.76%	76.67		
0.375	9.53	1.055	0.551	4.44%	72.23		
4	4.75	1.732	1.228	9.89%	62.35		
8	2.36	1.590	1.086	8.74%	53.61		
10	2.00	0.727	0.223	1.80%	51.81		
16	1.18	1.209	0.705	5.68%	46.14		
30	0.60	1.353	0.849	6.83%	39.30		
40	0.43	1.052	0.548	4.41%	34.89		
50	0.30	1.082	0.578	4.65%	30.24		
100	0.15	2.792	2.288	18.42%	11.82		
200	0.08	1.544	1.040	8.37%	3.45		
Pan	0	0.932	0.428	3.45%	0.00		
		Total	12.422				

Percent Moisture, Mass Lost, Gradation and Uniformity Coefficient					
Pan Tare:	1.50	M_{water}:	0.81	D_{10}:	0.14
M_w+Pan:	13.23	%Mt.	7.41%	D_{30}:	0.30
M_w:	11.73	Initial Mass:	12.42	D_{60}:	4.00
M_D+Pan	12.42	Final Mass:	12.42	C_Z:	0.02
M_D:	10.92	Mass Lost(%):	-0.02%	C_U:	28.57


NW 1/4 OF SE 1/4
UNION PACIFIC LAND RESOURCES CORP.
MINERAL LEASE TO
KEMMERER COAL COMPANY
715 - 742 - 3
SW 1/4 OF SE 1/4
UNION PACIFIC LAND RESOURCES CORP.
MINERAL LEASE TO
KEMMERER COAL COMPANY
715 - 742 - 743
CENTER, SECT 1, T16N, R105W
N - S SECT.
HWL
HWL
HWL
4/95 water line
1B
1A
2A
2B
SE 1/4 OF NW 1/4
OUTLET WORKS
UNION PACIFIC LAND RESOURCES CORP.
NE 1/4 OF NW 1/4
UNION PACIFIC LAND RESOURCES CORP.
MINERAL LEASE TO
KEMMERER COAL COMPANY
715-742-3
SE 1/4 OF NW 1/4
UNION PACIFIC LAND RESOURCES CORP.
MINERAL LEASE TO
KEMMERER COAL COMPANY
715-742-743
WR DICKSON
299 - 101
DICKSON RESOURCES
614 - 631 - 633
E - W SECT.
SEC 1 T16N R105W
LEGEND
DEAD HORSE CANYON
DETENTION RESERVOIR #3
SECTION 1, T16N, R105W
SWEETWATER CO., WYO.
BITTER CREEK TRIBUTARY
FLOOD STUDY
PHASE II
JOHNSON-FERMELIA CO., INC.
CONSULTING ENGINEERS
ARCHITECTS & SURVEYORS
1515 NINTH STREET
ROCK SPRINGS, WY 82901
HORIZONS, INC.
JOB NO. 2340-0586

Appendix 6

Urban Renewal Agency Letter

MAIN STREET
UNION SQUARE
Rock Springs

October 13, 2008

Jan Striefel
Landmark Design
2834 Highland Drive
Salt Lake City, UT 84106

Dear Jan:

As Director of the Urban Renewal Agency, downtowns can be defined as "the central business district of a community that serves as the center for socioeconomic interaction in the community and is characterized by a cohesive core of commercial and mixed-use buildings, often interspersed with civic, religious and residential buildings and public spaces. . .". Rock Springs is striving for a downtown matching that definition.

The historic downtown of the City of Rock Springs is suffering three kinds of depreciation: physical, functional and economic. The consequences of the depreciation caused by years of neglect and disinvestment, owners lacking substantial funding to make repairs or improvements because financing is so difficult to obtain, and the federally mandated requirements according to FEMA are major factors affecting the viability of downtown, and place the area at a competitive disadvantage relative to more modern buildings outside the downtown area and outside the floodplain.

In the last nine months, I have been able to track an adverse economic impact of over 5 million dollars related to over 20 building improvement projects in the downtown that have failed due to the FEMA floodplain issue. This information can be disheartening when the Main Street goal is to breathe economic life into the downtown while trying to find new use and purpose for these old buildings.

The inclusion of the URA with Main Street which works closely with the National Trust for Historic Preservation shows that we have a conflict with the goals of the two programs and the barriers to development and preservation imposed by FEMA designation and stigma attached. I want to strongly encourage discussion and the

pursuit for solutions. Any assistance that I can offer as part of that process, please know I want to contribute.

Sincerely,

Lisa Mueller

CC: URA Board
Mayor Timothy A. Kaumo

Appendix 7

Brokerage Southwest Telephone Conversation

LANDMARK
DESIGN
INCORPORATED

LANDSCAPE ARCHITECTURE
AND LAND PLANNING

2834 HIGHLAND DRIVE
SALT LAKE CITY
UTAH 84106
PHONE (801) 474-3300
FAX (801) 474-3303
WWW.LDI-UT.COM

Telephone Log

Date: October 23, 2008

With: Dennis Carlson
Brokerage Southwest, Rock Spring
Local realtor.
307-362-1275 (office)
307-389-0082 (cell)

Re: Real estate market downtown Rock Springs.

(Referred by Mayor Kaumo. Dennis has lived in Rock Springs all of his life.)

He knows of a senior center project that recently fell through because of the flood plain issue in downtown.

Value of average commercial in Rock Springs (lot and building) = $200,000-300,000.
Value of average commercial in downtown Rock Springs (lot and building) = $150,000.

Commercial
Dewar Drive properties are high value and go for $16 to $16.50 per s.f.
Gateway/WalMart area sell for $20 s.f.
Cheapest place on upper side of Gateway going for $5.00-$8.00 s.f.
Downtown Rock Springs - $2.00-$3.00 s.f.
Current listings:

Range in price from $100,000 – 699,000
Average price somewhere around $160,000 – 190,000

Residential
The secondary market (pre-owned homes) may be used as comparables, but some are not selling. None of the homes in downtown are high value – probably in the range of about $100,000.

Checked 52 on the multiple listings in R.S. in the range of $50,000 to $200,000. 11 were in downtown - $59,000-$188,490. 41 properties located elsewhere in R.S. – 69,900-$199,900.

Appendix 8

Rock Springs National Bank Telephone Conversation

(with Heather Anderson)

Telephone Log

Date: October 27, 2008

With: Heather Anderson
Commercial Loan Officer
Rock Springs National Bank
307-362-8815

Re: Commercial loans in downtown Rock Springs.

Downtown is a problem.

Biggest problem is that purchasers have to have flood insurance just to purchase.

Cost to remodel, redevelop, or construct in the floodplain requires raising the property to above flood level, which is sometimes impossible due to adjacent properties and uses, and financial burdens.

Clients wants to purchase and expand bowling alley – problem is not the acquisition, but the expansion where getting out of the floodplain is required for expansion. The project failed.

LANDMARK DESIGN INCORPORATED

LANDSCAPE ARCHITECTURE AND LAND PLANNING

2834 HIGHLAND DRIVE
SALT LAKE CITY
UTAH 84106
PHONE (801) 474-3300
FAX (801) 474-3303
WWW.LDI-UT.COM

Appendix 9

Rock Springs National Bank Telephone Conversation

(with Linda McGovern)

LANDMARK
DESIGN
INCORPORATED

LANDSCAPE ARCHITECTURE
AND LAND PLANNING

2834 HIGHLAND DRIVE
SALT LAKE CITY
UTAH 84106
PHONE (801) 474-3300
FAX (801) 474-3303
WWW.LDI-UT.COM

Telephone Log

Date: October 27, 2008

With: Linda McGovern
Residential Loan Officer
Rock Springs National Bank
307-362-8815

Re: Real estate market downtown Rock Springs.

Residential Market

Have had problems financing properties on Front Street and K Street and in other areas of downtown. Purchasers must first mitigate the property being in the flood plain which requires a survey proving that it is not in the floodplain, raising the floor level to above the designated floodplain, or obtaining flood insurance. There is a stigma associated with downtown that the Urban Renewal Agency has been trying to battle, but with limited success.

There was a developer who wanted to put a condominium project in downtown that was in the floodplain, and he thought he had the problem worked out by putting underground parking as the first level. But it appeared too risky, and no one would invest to make it happen.

Appendix 10

BLM and Anadarko Correspondence

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Rock Springs Field Office
280 Highway 191 North
Rock Springs, Wyoming 82901-3447

TAKE PRIDE® IN AMERICA

In Reply Refer To:
9172 (WYD04)

FEB 26 2009

Jan Striefel, FASLA, AICP, LLA 9172
Principal and President
Landmark Design Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Dear Ms Striefel:

Thank you for the opportunity to comment on the proposed Rock Springs Bitter Creek Cleanup Project. Upon review of the project we would like to make the following comments.

In regards to pages 34 and 36 we have the following comments:

> The area in which Detention Basin #2 is located is a VRM III designation not II as noted. Projects in class III VRM areas should "partially retain existing character of the landscape" Green River RMP (1997) pg 21. "All surface disturbing actions, regardless of the visual resource management class, are required to be mitigated to reduce visual impacts. This will be achieved by designing and locating the disturbance in a manner that most closely meets the minimum degree of contrast acceptable for the visual resource management class" Green River RMP, (1997) pg 21. The detention basin can be further evaluated for compliance with VRM III once an application and engineering drawings are received by the Rock Springs Field Office of the Bureau of Land Management (BLM). Additional information may also be required by the Realty staff for the permitting process.

If you have any questions, please feel free to contact the BLM Hydrologist, Dennis Doncaster at (307) 352-0207 or dennis_doncaster@blm.gov .

Sincerely,

Bernard Weynand

Bernard Weynand
Assistant Field Manager, Resources

ents

Subject: Re: BLM Comments
From: Jeromy_Caldwell@blm.gov
Date: Mon, 9 Mar 2009 09:40:02 -0600
To: Jan Striefel <jans@ldi-ut.com>

Jan,

The letter you have contains the comments most related to BLM. The draft of the letter had some additional comments that applied to maintanance and monitoring that were discussed during the meeting on 02-26-09.

> The effects of this project will not only be associated with the installation but its maintenance over the life of the project. A description of potential maintenance procedures, estimated frequency of maintenance and potential sediment volumes and storage locations would provide a more complete picture of the cost of constructing and maintaining this project.
> Monitoring of conditions at key locations after post construction high flows would provide information regarding project success and improve the likelihood of efficient maintenance. Establishing a reasonable monitoring program in this document would address this issue.

During the meeting we also discussed the need to protect reclamation efforts from off road vehicles or other disturbance.

Thanks,

Jeromy Caldwell
Supervisory Wildlife Biologist
Rock Springs FO, BLM
280 HWY 191 N
Rock Springs, Wyoming 82901
(307) 352-0335-Office
(307) 352-0329-Fax

Jan Striefel
<jans@ldi-ut.com>

03/03/2009 10:59 AM

To: jeromy_caldwell@blm.gov, dennis_doncaster@blm.gov

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Rock Springs Field Office
280 Highway 191 North
Rock Springs, Wyoming 82901-3447

cc: Corresp.
Jana M. & Jennifer
Jan Shreffel - Landscape Design

In Reply Refer To:
WYW167697
2800 (WYD04)

FEB 25 2009

CERTIFIED – 7005 2570 0000 8258 8900 – RETURN RECEIPT REQUESTED

Mayor Tim Kaumo
City of Rock Springs
212 D Street
Rock Springs, WY 82901

Re: Bitter Creek Reconstruction Plan

Dear Mayor Tim Kaumo:

The Bureau of Land Management, Rock Springs Field Office has received your right-of-way application for a flood control structure and detention basin on February 19, 2009 and I will be processing the application.

In reviewing your application, it has been determined that:

__X__ The application is complete and will be processed;

_____ The application is incomplete (please note the list below for an explanation why your application is not considered complete).

The BLM goal for processing right-of-way applications is to reach a decision within 60 calendar days of receipt of a complete application. If an application cannot be processed within that 60-day period, BLM is required to inform you of that fact prior to the 30th calendar day and tell you when you may expect a final decision on your application.

If you have any questions, you may contact me at (307) 352-0334. Please refer to the assigned case number, WYW167697, in future correspondence.

Sincerely,

Patricia Hamilton

Patricia Hamilton
Lead Realty Specialist

SURFACE USE AGREEMENT AND DETENTION BASIN EASEMENT

STATE OF WYOMING §
§ KNOW ALL PERSONS BY THESE PRESENTS:
COUNTY OF SWEETWATER §

THIS Surface Use Agreement and Detention Basin Easement (hereinafter called "Agreement"), is made this ____ day of March, 2009, between ANADARKO LAND CORP., f/k/a Union Pacific Land Resources Corporation, a corporation of the State of Nebraska, P.O. Box 1330, Houston, TX 77251-1330, Grantor, and the CITY OF ROCK SPRINGS, State of Wyoming, whose address is 212 D. Street, Grantee, Wyoming 82901, Grantee.

WITNESSETH, That Grantor, for and in consideration of the sum of One Dollar ($1.00) waived and other good and valuable consideration, to it in hand paid by Grantee, the receipt whereof is hereby acknowledged, has granted, sold and conveyed, and by these presents does grant, sell and convey unto Grantee, and unto its successors and assigns, a nonexclusive easement for right-of-way for the construction, operation, maintenance, repair, renewal, reconstruction and use of a parcel of land for a storm water detention basin, described in Exhibit "A" and any necessary appurtenances (hereinafter called "Detention Basin"), under, over and across the surface of the land situated in the County of Sweetwater, State of Wyoming (hereinafter called "Premises"). Exhibit "A" is attached and made a part hereof, together with the right of ingress and egress to and from Premises for the purpose of exercising the rights granted.

RESERVING, however, to Grantor, its successors and assigns, the right to construct at any and all times and to maintain roads, highways, pipelines and telephone, telegraph and electric power pole and wire lines, over, under and across, without cost, expense or compensation whatsoever to Grantee but in such a way as not unreasonably to interfere with the Detention Basin as described in Exhibit "A" of Grantee on the Premises; it being understood that the right so reserved to Grantor, its successors and assigns, is retained along with the general right of Grantor, its successors and assigns, to the use of the Premises for any purpose not inconsistent with the use by Grantee of said easement for the purposes herein defined. The easement granted hereby is nonexclusive and Grantor may grant such other easements and rights-of-way over and across the Premises as it may elect, provided that any such other grant not unreasonably interfere with the rights granted to Grantee by this easement. The easement granted hereby and described in Exhibit "A" is for a parcel of land as described in Exhibit "A".

This Agreement is made subject to all outstanding leases and other outstanding rights, including, but not limited to, those for highways and other roadways and rights of way for irrigation ditches, pipelines, pole and wire lines and the right of renewals and extensions of the same, and subject also to all conditions, limitations, restrictions, encumbrances, reservations or interests of any person which may affect the Premises, whether recorded or unrecorded, and is made without covenant of title or for quiet enjoyment.

The Agreement herein made is on the express condition that Grantor, its successors and assigns, shall not be liable to Grantee, its successors or assigns, for any damage occurring to the Detention Basin constructed or to be constructed by Grantee, its successors and assigns, upon the Premises or for any other damage whatsoever occasioned by, attributable to or related to subsidence of the surface of the Premises as a result of mining underneath the same or resulting in any other way from the removal of coal or other minerals in or underlying the Premises.

All operations hereunder shall be conducted at the expense of Grantee and in compliance with all Federal, State and County laws, rules, ordinances, permits and regulations which are applicable to the area of operations including but not limited to those pertaining to environment, health, safety, fire, sanitation, conservation, water pollution, and fish and game. All of Grantee's operations hereunder shall be conducted in a prudent manner. **IF, AS A RESULT OF GRANTEE'S OPERATIONS UPON OR USE OF SAID PREMISES HEREUNDER, ANY STATUTE, LAW, ORDINANCE, RULE, REGULATION, PERMIT OR REQUIREMENT IS VIOLATED, GRANTEE SHALL PROTECT, SAVE HARMLESS, DEFEND AND INDEMNIFY GRANTOR AND ITS AFFILIATES, THEIR OFFICERS, EMPLOYEES AND/OR AGENTS, AGAINST AND FROM ANY AND ALL PENALTIES, FINES, COSTS AND EXPENSES, INCLUDING COURT COSTS AND COUNSEL FEES, IMPOSED UPON OR INCURRED BY GRANTOR AND/OR ITS AFFILIATES, THEIR OFFICERS, EMPLOYEES AND/OR AGENTS, RESULTING FROM, OR CONNECTED WITH, SUCH VIOLATION AND/OR VIOLATIONS.**

Grantee shall not suffer or permit any mechanic's lien, or other lien, to be filed against said Premises or any part thereof, by reason of work, labor, services, or materials supplied, or claimed to have been supplied, to Grantee, or anyone claiming under Grantee. If any such mechanic's lien, or other lien, shall at any time be filed against said Premises, Grantee shall cause the same to be discharged of record within thirty (30) days of the date of filing the same; and if Grantee shall fail to discharge such lien within such period, then Grantor may, at its option, discharge the same by paying the amount claimed to be due without inquiry into and regardless of the validity of the same and Grantee shall thereupon reimburse Grantor within thirty (30) days of receipt of Grantor's request for any payment so made.

Grantee is advised that the generation, transportation, treatment, storage and disposal of hazardous wastes are controlled by the Federal Resource Conservation and Recovery Act of 1976 and regulations issued pursuant to the Act and subsequent Acts by the United States Environmental Protection Agency (EPA) and/or state agencies. If Grantee's use of the Premises shall include any regulated hazardous waste activities, Grantee shall obtain a hazardous waste permit from the EPA or appropriate state agency and shall provide copy of same to Grantor within thirty (30) days following Grantee's receipt of said permit.

Grantee shall exercise its right of ingress and egress to the Premises only over such routes as reasonably designated by Grantor. With respect to the use of Grantor's existing roads, or roads hereafter constructed by Grantor ("Grantor's Roads"). Any repair or maintenance work on Grantor's Roads arising solely from the use of Grantor's Roads by Grantee shall be at the sole expense of Grantee. Any repair or maintenance work on Grantor's Roads arising solely from the use of Grantor's Roads by Grantor shall be at the sole expense of Grantor. All other maintenance or repair to Grantor's Roads shall be shared equally by Grantor and Grantee, provided, however, that Grantee will not be responsible for the repair of any Grantor's Roads which Grantee does not use. Grantor shall, from time to time, invoice Grantee for its share of the maintenance and repair costs to Grantor's Roads and Grantee shall pay those invoices within 30 days of receipt. Grantee shall have the right to audit applicable records of Grantor within one year after the date of an invoice to verify the accuracy of the invoice. Grantee's use of Grantor's Roads shall not interfere with Grantor's access and use of Grantor's Roads. Grantor's use of Grantor's Roads shall not unreasonably interfere with Grantee's access and use of Grantor's Roads. Grantee agrees to maintain, at its sole cost and expense, all roads constructed by Grantee and used solely by Grantee for ingress and egress.

GRANTEE, FOR ITSELF, ITS SUCCESSORS AND ASSIGNS, BY THE ACCEPTANCE OF THIS EASEMENT, AGREES TO INDEMNIFY AND HOLD HARMLESS GRANTOR AND ITS AFFILIATES, THEIR OFFICERS, AGENTS, EMPLOYEES, SHAREHOLDERS, INSURERS, CONTRACTORS, SUCCESSORS OR ASSIGNS ("GRANTOR'S INDEMNITEES"), FROM AND AGAINST ANY AND ALL CLAIMS, DEMANDS, SUITS, CAUSES OF ACTION, LOSSES, DAMAGES, LIABILITIES, FINES, PENALTIES AND COSTS, INCLUDING REASONABLE ATTORNEYS' FEES AND COSTS OF LITIGATION, ("CLAIMS") RELATING TO, ARISING OUT OF, OR CONNECTED, DIRECTLY OR INDIRECTLY, WITH GRANTEE'S CONSTRUCTION, OPERATION, MAINTENANCE, REPAIR, RENEWAL, RECONSTRUCTION, REMOVAL OR USE OF SAID DETENTION BASIN OR THE BURSTING OF OR LEAKS IN SAID DETENTION BASIN, OR ANY PART THEREOF, OR THIS AGREEMENT, NO MATTER WHEN ASSERTED; INCLUDING WITHOUT LIMITATION, CLAIMS RELATING TO (A) INJURY OR DEATH OF ANY PERSON OR PERSONS WHOMSOEVER, (B) DAMAGES TO OR LOSS OF ANY PROPERTY OR RESOURCES, (C) COMMON LAW CAUSES OF ACTION SUCH AS NEGLIGENCE, GROSS NEGLIGENCE, STRICT LIABILITY, NUISANCE OR TRESPASS, (D) FAULT IMPOSED BY STATUTE, RULE, REGULATION OR OTHERWISE, (E) ENVIRONMENTAL CLAIMS, OR (F) INTERFERENCE WITH THE PROPER OPERATION OF SIGNAL, TELEPHONE OR TELEGRAPH LINES, OR OTHER ELECTRICALLY OPERATED DEVICES OR APPURTENANCES OF GRANTOR OR ITS AFFILIATES, OR OF ITS OR THEIR TENANTS; PROVIDED, HOWEVER, IF A CLAIM IS CAUSED IN WHOLE OR PART BY THE NEGLIGENCE OR WILLFUL MISCONDUCT OF GRANTOR OR ANY OF ITS AFFILIATES OR ANY OF ITS OR THEIR OFFICERS, EMPLOYEES AND/OR AGENTS, THEN GRANTEE'S INDEMNIFICATION AND HOLD HARMLESS OBLIGATIONS ASSUMED IN THIS PARAGRAPH SHALL BE REDUCED IN PROPORTION TO THE PRO RATA NEGLIGENCE OR WILLFUL MISCONDUCT, IF ANY, BY GRANTOR OR ANY OF ITS AFFILIATES OR ANY OF ITS OR THEIR OFFICERS, EMPLOYEES, AND/OR AGENTS IN CONNECTION WITH SAID CLAIM. NOTHING HEREIN SHALL BE CONSTRUED AS MEANING THAT GRANTEE IS AGREEING TO INDEMNIFY AND HOLD HARMLESS GRANTOR FOR GRANTOR'S OWN NEGLIGENCE OR WILLFUL MISCONDUCT.
GRANTEE'S DUTY TO DEFEND IS INDEPENDENT OF ITS DUTY TO INDEMNIFY. GRANTEE SHALL DEFEND GRANTOR INDEMNITEES REGARDLESS OF WHETHER ITS DUTY TO INDEMNIFY IS DISPUTED. GRANTEE' DUTY TO DEFEND, INDEMNIFY, AND HOLD GRANTOR HARMLESS SHALL INCLUDE ALL REASONABLE ATTORNEY' FEES, COURT COSTS AND ALL OTHER CLAIM RELATED EXPENSES.

As used herein "Environmental Claims" means all Claims for pollution or environmental damages of any kind, including without limitation, those relating to: (a) remediation and/or clean-up thereof, (b) damage to and/or loss of any property or resource, and/or (c) injury or death of any person(s) whomsoever resulting from environmental contamination; such Claims for pollution or environmental damages shall include, but not be limited to, those relating to breach and/or violation of Environmental Laws, common law causes of action such as negligence, gross negligence, strict liability, nuisance or trespass, or fault imposed by statute, rule, regulation or otherwise, asbestos, or potentially hazardous substances, all costs associated with remediation and clean up, and fines and penalties associated with any of the foregoing. As used herein, "Environmental Laws" means all laws, statutes, ordinances, permits, orders, judgments, rules or regulations which are promulgated, issued or enacted by a governmental entity or authority having appropriate jurisdiction that relate to (a) the prevention of pollution or environmental damage, (b) the remediation of pollution or environmental damage, or (c) the protection of the environment generally; including without limitation, the Clean Air Act, as amended, the Clean Water Act, as amended, the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, the Federal Water Pollution Control Act,

as amended, the Resource Conservation and Recovery Act of 1976, as amended, the Safe Drinking Water Act, as amended, the Toxic Substance and Control Act, as amended, the Superfund Amendments and Reauthorization Act of 1986, as amended, the Hazardous and the Solid Waste Amendments Act of 1984, as amended, and the Oil Pollution Act of 1990, as amended. Grantee shall remediate any type of chemical or hazardous substance spill according to requirements of all federal, state and local authorities having jurisdiction. Grantee shall give the required notice of such spills to the proper governmental agencies (federal, state, and local) as required by law. This provision shall expressly survive any termination of this Agreement.

The term "affiliate" (or "affiliates" as the case may be) as used herein means any corporation which directly or indirectly controls, or is controlled by, or is under common control with Grantor.

Grantee shall not assign this Easement, or any interest herein, without the prior written consent of Grantor, which consent shall not be unreasonably withheld.

Grantee hereby agrees to provide Grantor with an as-built plat of the Detention Basin installed in the exercise of the rights granted hereunder within ninety (90) days of completion or construction.

Grantee, at its sole cost and expense, shall comply with any and all federal, state and/or local regulations, statutes, permits, ordinances or otherwise applicable requirements for fencing, signage, placards or other safety requirements for detention ponds or basins. Grantee agrees at all times to keep the Premises safe, in good order, and free of noxious and undesirable weeds and grasses, including, but not limited to, thistle, foxtail, cattail, and “marsh grasses”, and shall not allow the same to go to seed. Grantee shall also remove all litter and debris, all at Grantee’s sole cost and expense. Grantor shall be responsible to remove any litter and debris that it may bring onto the Subject Lands.

Unless Grantor otherwise agrees in writing, upon termination of this Agreement, or on any earlier termination of Grantee’s use of the Detention Pond, Grantee shall fully restore, repair or replace the surface of the land affected by such termination to as near as possible the original condition or as may be required by law or any agreement to which Grantee is subject, or shall pay for or otherwise compensate Grantor for any damages to the land resulting from Grantee’s activities and operations on the Premises. Grantee shall eradicate all noxious weeds from the Premises. Additionally, Grantee shall not change the location of or injure any permanent fences or irrigation structures located on the Premises. Within 90 days following termination of this Agreement, Grantee will remove all equipment and property used or placed by Grantee on the Premises.

For the purposes of this Agreement, abandonment by the Grantee of the Detention Basin shall be defined as Grantee’s failure to use the Detention Basin or any portion thereof for the uses heretofore stated for a period of twenty-four (24) consecutive months or Grantee otherwise abandons the Detention Basin within a shorter period of time. In the event of abandonment by the Grantee of the Detention Basin, all rights herein granted to the Grantee in the Premises shall cease and terminate with respect to the Premises so abandoned, and Grantee, its successors or assigns, shall deliver to Grantor a recordable instrument evidencing that the title to the Premises so abandoned is free and clear of said easement as well as any liens, encumbrances, clouds upon or defects in the title to said Premises created or permitted to be created by Grantee, its successors or assigns. Termination of the rights granted hereunder shall not relieve Grantee, its successors and assigns from compliance with the covenants and agreements contained herein, subject to the events of force majeure.

If the Detention Basin or any portion thereof are abandoned or Grantee fails to use the Detention Basin for a period in excess of twenty-four (24) consecutive months, and Grantee fails to remove the Detention Basin so abandoned and restore the portion of the Premises to which the abandoned Detention Basin are appurtenant to its original condition within one hundred twenty (120) days after receipt of notice from Grantor to perform such activities, Grantor may perform such activities for the behalf of Grantee and Grantee shall thereupon reimburse Grantor within forty-five (45) days of receipt of Grantor's request for any payment so made, regardless of the reasonableness of the cost of such activities.

The Agreement is also made by Grantor and accepted by Grantee subject to the possible relocation of the Detention Basin granted herein. Grantor or its affiliates shall give Grantee written notice of any intention to relocate said Detention Basin granted hereunder. Said notice shall be provided not less than six (6) months prior to commencement of such relocation. If such relocation is required by Grantor, Grantor shall provide Grantee, subject to availability of property suitable for the intended use, a substitute right-of-way for the placement of Grantee's relocated Detention Basin at no additional cost, with the exception of damages to crops, fences, livestock or water supply ditches. Grantor and Grantee hereby agree that the cost associated with the physical relocation of Grantee's Detention Basin shall be Grantee's sole responsibility.

In accordance with Section 1445(b)(2) of the Internal Revenue Code, Grantor, Federal ID No. 13-2678588 , certifies that it is not a foreign corporation and withholding of Federal Income Tax from the amount realized will not be made by Grantee. Grantor understands that this certification may be disclosed to the Internal Revenue Service by the Grantee and that any false statement made here could be punished by fine, imprisonment, or both.

Subject to the foregoing, the terms and conditions of this grant shall be applicable to Grantee, its successors and assigns.

IN WITNESS WHEREOF, Grantor and Grantee have executed this Agreement on the date(s) set forth below in the acknowledgments, to be effective on the day and year first written above.

ANADARKO LAND CORP.

_____

Jane Ann Byroad
Agent and Attorney-in-Fact

CITY OF ROCK SPRINGS

By: _____

Name: _____

Title: _____

STATE OF TEXAS)
) ss:
COUNTY OF MONTGOMERY)

The foregoing instrument was acknowledged before me this ____ day of _____, 2009, by Jane Ann Byroad as Agent and Attorney-in-Fact of Anadarko Land Corp.

WITNESS my hand and official seal.

My commission expires _____.

_____
Notary Public

(SEAL)

STATE OF WYOMING)
) ss:
COUNTY OF SWEETWATER)

The foregoing instrument was acknowledged before me this ____ day of _____,2009, by _____, as _____ of City of Rock Springs.

WITNESS my hand and official seal.

My commission expires _____.

_____
Notary Public

(SEAL)

EXHIBIT "A"

A forty (40) acre parcel of land located in the SE ¼ of NW ¼, NE ¼ of the SW ¼, and the NW ¼ of SE ¼ of Section 1, Township 18 North, Range 105 West, 6th Principal Meridian, Sweetwater County, Wyoming.

Appendix 11

DEQ Air Quality Division Letter

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

October 29, 2008

Jan Striefel, Principal and President
Landmark Design Inc.
2834 Highland Drive
Salt Lake City, UT 84106

RE: Rock Springs, Wyoming
Environmental Assessment

Dear Ms. Striefel:

The Air Quality Division received a copy of your letter dated October 20, 2008 requesting comments on the environmental impact for the proposed Bitter Creek Reconstruction Project.

The compliance section of the Air Quality Division does not foresee any adverse air quality impacts associated with such a project with the exception of possible dust problems during construction. Your environmental planning with respect to Air Quality should include effective dust control procedures such as frequent watering and/or chemical stabilization of any exposed earth including stockpiles. Reduction of wind blown dust off of exposed acreage can be accomplished using various techniques such as compaction, mulching and reseeding during the post construction phase. Earth or other materials tracked onto paved streets should be removed promptly by water or other means. Good dust management practices will allow you to comply with the Wyoming Air Quality Standards and Regulations. For more information see the Chapter 3, Section 2 of the Wyoming Air Quality Standards and Regulations.

Please call me at 307-335-6977 if you have questions concerning this matter.

Sincerely,

Marty Hamilton
Air Quality Engineer
Air Quality Division

Appendix 12

State Historic Preservation Office (SHPO) Letter

ARTS. PARKS. HISTORY.
Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
http://wyoshpo.state.wy.us

23 February 2009

RECEIVED
FEB 24 2009
DEQ-AML Lander

Marcia Murdock
AML NEPA Compliance Coordinator
Department of Environmental Quality
510 Meadowview Dr.
Lander, WY 82520

Re: Rock Springs Bitter Creek Reconstruction Project (SHPO File # 0209KLH003)

Dear Ms. Murdock:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that prehistoric sites 48SW17342, 48SW17343, and 48SW17344 as well as the Union Pacific Railroad Bridge over Bitter Creek, 48SW17184, are not eligible for listing in the National Register of Historic Places. We also concur that the Pilot Butte Avenue Bridge/Dewar Bridge is a non-contributing segment of the Lincoln Highway, 48SW1834. In addition, we concur that the Bitter Creek Flood Controls, 48SW17183, are eligible for listing in the National Register of Historic Places.

We also concur that the Bitter Creek Flood Controls, site 48SW1718, will be adversely impacted. Pursuant to 36 CFR 800.5-6, consultation between your staff and the SHPO is necessary in order to further discuss ways to mitigate the adverse effects.

This letter should be retained in your files as documentation of continuing consultation with the SHPO. Please refer to SHPO project # 0209KLH003 on any future correspondence regarding this project. If you have any questions, please contact me at 307-777-7828.

Sincerely,

Kara Hahn

Kara Hahn
Historian

Appendix 13

Draft Final Environmental Assessment Comments & Responses

SUMMARY OF COMMENTS RECEIVED
FOR THE DRAFT FINAL ENVIRONMENTAL ASSESSMENT
ROCK SPRINGS BITTER CREEK CLEAN-UP PROJECT

Comment Period commenced April 25, 2009 and ended May 31, 2009. The following chart identifies the source of the comment and the date received, the comment (in some cases summarized), and the response.

Received From/Date	Comment	Response
Johnny Portillo, Questar Gas, May 5, 2009. Received via email.	Questar Gas has 3-4 crossings; as the project begins, the One-Call process should take care of locations when contractor begins the work.	Coordination with Questar will take place during Preliminary and Final Design; the One Call process will be utilized.
Marcia Murdock, DEQ/AML, May 27, 2009. Received via email.	Minor typos: one at the top of page 42 where it says (Bitter Creek Bitter and...); on the summary table - page 47 – under vegetation and wetlands, DOE should be COE. Under the Creek Corridor block, the actual meaning of the first two bullets is not really clear. Is 1.61 acres permanently lost from the location it is in, and then replaced within an 8 acre mitigation wetland that reestablishes the lost 1.61 acres and also adds an additional 6.4 acres of new wetland?	Typos have been corrected. 1.61 acres will be removed during construction; some may be replaced after re-grading, etc; but some may be permanently removed due to installation of slope protection. Wetlands improvements are planned along the creek and into other areas where they can succeed and where there is space to do so. That accounts for the additional 6.8 acres in the DFEA. COE did review the preliminary draft, provided comments which are included in Appendix 3, and requested additional delineations, which have been completed.
Dennis Doncaster, Hydrologist, BLM, Rock Springs Field Office, May 27, 2009. Received via email.	Regarding Dead Horse Canyon Creek Detention Basin #2 on BLM Lands. The concept is sound but success and long term hydrologic stability will depend on design, construction, and maintenance. Specific actions	Preliminary and Final Design will be coordinated with the BLM. Required specifications will be met. Assume they will also be incorporated into the lease agreement between the City of Rock Springs and BLM.

	required: *Follow Gold Book standards for culvert displacement and soil compaction. *Install energy dissipation devices at lower end of culvert that are sufficient to prevent additional erosion resulting from the presence of the structure. *Examine the structure on a regular basis and after high flow events. *Provide needed maintenance to the structure and channel on a timely basis.	
Barb Sahl, Storm Water Program Coordinator, DEQ – Water Quality, May 27, 2009. Received via email.	If more than one-acre is disturbed, a permit is needed.	The required permits will be obtained.
Mark Conrad, NEPA Coordinator, Wyoming DEQ-Water Quality. May 29, 2009. Received via email.	Any work in the stream is likely to exceed our Class 2C turbidity criterion of a 15 NTU increase in turbidity. A Temporary Turbidity Waiver from WDEQ-WQD will be required; plan on at least a month for the application for a waiver to go through the public notice process. Also, during the 404 process, the USACOE will likely send this project to WDEQ-WQD for section 401 review of the final stream reconstruction plans. The DFEA did not appear to provide the temporary storage capacity of the detention basins, or any estimate of how much they would reduce the peak flows in Dead Horse Canyon Creek or Bitter Creek.	All required waivers, permits, etc. will be obtained. The proposed detention for Dead Horse Canyon Creek is based on the preferred alternative identified in the "Level II - Feasibility Study Phase IA Report for Rock Springs, Wyoming Flood Control Projects Bitter Creek Tributaries" (JFCo. Inc., 1989). The proposed detention basin on BLM property is master planned to have 64 acre-feet of temporary storage with a maximum 100-year storm runoff discharge from the detention basin

	The DFEA did not appear to describe what parts of the project would be constructed first.	of 350 cfs. The proposed detention basin on Anadarko Petroleum land is master planned to have 39 acre-feet of temporary storage with a maximum 100-year release rate of 250 cfs. The target maximum 100-year flow in Dead Horse Canyon Creek below the propose detention sites is 1,100 cfs. The proposed detention on Dead Horse Canyon Creek is not expected to change the design 100-year discharge rates in Bitter Creek. The Bitter Creek drainage is large compared with Dead Horse Canyon Creek and the FEMA Flood Insurance Rate Study does not identify a change in flood flow with the confluence with Dead Horse Canyon Creek. The Master Plan which is included in Appendix 1, identifies a potential first phase as the farthest downstream section behind Plaza Mall at the confluence of Sweetwater Creek; however, preliminary design is currently underway and there may be other options explored before a final phase one project is selected
John Emmerich, Deputy Director, Wyoming Game and Fish Department. May 29, 2009. Received via postal service.	Document was reviewed. Comments on terrestrial wildlife and aquatic environment were included in letter dated July 8, 2008. No additional concerns.	July 8, 2008 letter is included in Appendix 4. May 29, 2009 letter attached.

Addendum

Final Environmental Assessment
Rock Springs Bitter Creek Clean-Up Project

(September 2009)

January 2011

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Appendix 1: State Historic Preservation Office (SHPO) Correspondence

Letter from Kara Hahn, National Register Coordinator, Wyoming State Parks and Cultural Resources, Historic Preservation Office to Marcia Murdock, AML NEPA Compliance Coordinator, DEQ, November 29, 2010.

Letter from Marcia Murdock, AML NEPA Compliance to Ms. Mary Hopkins, State Historic Preservation Officer, November 5, 2010.

Appendix 2: United States Army Corps of Engineers Permit

City of Rock Springs Resolution No. 2011-05 Accepting the Department of Army Permit from the Corps of Engineers.

Attachment 1: Preliminary Project Plans
Attachment 2: Historic Properties Preservation
Attachment 3: Wetland Mitigation Plan

Appendix 3: Additional Information Required by United States Army Corps of Engineers

"Bitter Creek Detention Alternative," Greg Poole, Hansen Allen & Luce, August 25, 2010.

"Bitter Creek Roadless Alternative," Greg Poole, Hansen Allen & Luce, August 26, 2010.

"Bitter Creek Levee Alternative," Greg Poole, Hansen Allen & Luce, August 26, 2010.

"Affected Properties Analysis," Jan Striefel, Landmark Design, June 24, 2010.

Letter from Mr. Thomas B. Johnson, P.E., U.S. Army Corps of Engineers, Wyoming Regulatory Office to Mr. Gregory J. Poole, P.E., Hansen Allen & Luce, Inc, April 30, 2010

Appendix 4: Water Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

Memorandum from Hansen Allen & Luce Engineers (Tyler Allen and Greg Poole) to Bitter Creek Rehabilitation Project Files, Dead Horse Canyon Hydrology, August 27, 2009 (Revised October 28, 2010).

Appendix 5: Wetland and Vegetation Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

"2010 Wetland Assessment for City of Rock Springs Dead Horse Canyon Creek Levee Project, Part of the Bitter Creek Project", BKS Environmental Associates, Inc., Rock Springs, Wyoming, October 21, 2010.

Letter from Matthew A. Bilodeau, U.S. Army Corps of Engineers, Program Manager, Wyoming Regulatory Office, to Jennifer Shields, Assistant Planner, City of Rock Springs, Wyoming, October 25, 2010.

Appendix 6: Wildlife Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

“Wildlife Evaluation Amendment, Bitter Creek Construction Project, Phase I, Dead Hose Levee Improvements,” Wyoming Wildlife Consultants LLC, Pinedale, Wyoming, October 2010.

Introduction

This document is an Addendum to the "Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project"[1] (Final EA). As such, it provides additional information to supplement data and analysis contained in the above referenced document. That document will not be reproduced or replicated herein; however, this Addendum is incorporated into the Final EA to provide a *revised* Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project. The reader is advised to consult the Final EA as background for this Addendum. The original document is available for review at the City of Rock Springs city offices and on line at *www.rswy.net*, and is attached herein.

This Environmental Assessment is required by the National Environmental Policy Act (NEPA) because of federal involvement in the project. Office of Surface Mining (OSM) is funding a portion of the project. The U.S. Army Corps of Engineers (COE) has jurisdiction over wetlands in the affected creeks. Upon review of the Final EA, it was determined that the original document contained insufficient data to verify that wetlands and cultural resources would not sustain *significant impacts* from the proposed action. Both OSM and COE must determine that there will be no significant adverse environmental impacts resulting from the proposed action before they can authorize this action to proceed. Therefore additional information and analysis was requested. This included procurement of a wetland permit from the COE to determine actual impacts to wetlands, and any required wetland mitigation for these impacts. Additionally, the cultural resource evaluation had found that a National Register of Historic Places-eligible property would be *adversely affected* by the project unless mitigation that would reduce the effect and protect the resource was developed. Further consultation with SHPO was required to determine if the adverse effect could be mitigated, and if so, what would be required. The City of Rock Springs (City) has undertaken further study and evaluation to better document the effects upon these resources, and to address these concerns.

While the COE was reviewing the wetland permit application, they requested a more detailed review of additional alternatives that had initially been considered and rejected by the City during its early planning. These findings are also discussed below.

Subsequent to the request to address the above-listed data gaps, the City also discovered that the Federal Emergency Management Agency (FEMA) would require rehabilitation and extension of old flood control levees along Dead Horse Canyon Creek to attain the goals of this project. The affected area for this new portion of the project had not been previously identified, and therefore resource evaluations and impact analyses were required for the newly identified affected area. This Addendum document also discusses the findings from the additional environmental evaluation on the proposed Dead Horse Canyon Creek levee rehabilitation as an "Additional Proposed Action".

[1] Landmark Design Inc., "Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project," Rock Springs, Sweetwater County, Wyoming, September 28, 2009.

A. Outstanding Questions on Impacts to Environmental Resources

1. Unresolved Cultural Resource Questions

1.1 Affected Cultural Resources

When the Final EA was completed, there were unresolved questions with regard to historic floodwalls that line portions of the Bitter Creek Channel. These walls are within the area to be affected by the construction of the flood control improvements. The cultural report found that these historic structures were eligible for enrolment on the National Register of Historic Places, and further, the report found that the floodwalls would likely be adversely affected. The State Historic Preservation Officer (SHPO) agreed with these determinations. Such a finding would not allow the federal agencies to find that there was "no significant impact" that would result from this project. Therefore, additional consultation with SHPO was necessary to determine mitigating actions.

The City's engineering consultant was requested to more fully develop plans for the work in the areas of the floodwalls so that the actual impacts to the floodwalls would be known. During this process, the engineer was able to design in protective strategies that would not only protect the walls, but would allow their incorporation into the project in a way that would enhance the stability of the historic structures. With the revision of the construction plans, and fleshing out of protective strategies, along with a stipulation that requires a cultural monitor onsite when construction occurs around the historic floodwalls, the project will no longer produce an adverse effect on these floodwalls.

The design of the additional work now required in the Dead Horse Canyon Creek area that is tributary to and contiguous with the Bitter Creek main stem also incorporated mitigative and protective strategies. The final consultation with SHPO resulted a finding of no adverse effect on the historic floodwalls along both Bitter Creek and Dead Horse Canyon Creek, provided that all protective actions, including the presence of a cultural monitor during construction near these walls, are strictly observed by the City during construction of this project.

1.2 Mitigation of Affected Cultural Resources

The detailed stipulations that will provide mitigation of impacts to the historic floodwalls for both segments in the Bitter Creek main stem drainage, and for the segments in the Dead Horse Canyon Creek drainage are found in the correspondence presented in Appendix 1.

For any construction work on and around both areas with historic floodwalls, the City will ensure that a qualified archeologist is present to monitor excavation, and the walls as they are exposed during construction will be recorded photographically by the archeological monitor. The construction project will be conducted such that damage to the walls will be avoided. In addition to avoiding damage to the existing walls, the historic walls may require stabilization and/or repair. The floodwall segments in the Dead Horse Canyon Creek area will be avoided by construction.

2. Unresolved Wetland Resource Questions

2.1 Affected Wetlands Resources

When the Final EA was completed, there were unresolved questions with regard wetlands impacts. Although at that time, the COE had accepted the final wetland delineation[2] provided by the City as valid, the COE had not made a determination on wetland impacts or mitigation requirements, nor had a COE permit been issued to the City for this proposed action. Absent the COE determination, the significance of the impact from this project upon wetlands resources could not be determined. Therefore the federal agencies could not find that "no significant impact" to wetlands would result from this project. The final determinations on wetlands impacts have now been determined, and a copy of the COE permit is provided in Appendix 2. The wetland delineation and the subsequent COE evaluation have determined that 1.12 acres of wetlands and 4.48 acres of other waters would be impacted by construction of this project. The affected areas are within the Bitter Creek channel area.

2.2 Mitigation of Affected Wetlands Resources

Although 1.12 acres of wetlands and 4.48 acres of other waters would be impacted throughout the life of the project, the project will compensate for the affected wetlands through creation of a low-flow channel and a two-year flood channel where wetlands can be reestablished. The two-year channel will be reseeded with sedges and grasses, and natural recolonization is expected to provide replacement wetlands, and potentially increased wetland acreage. Given that wetlands are expected to reestablish in the affected areas, there is no net loss anticipated as a result of the proposed action. No further mitigation is required.

3. Additional Alternatives Considered

During review of the wetland permit application for the Bitter Creek Clean-up Project, COE requested an evaluation of additional alternatives beyond those presented in the Final EA. These additional alternatives included the following:

- "Construction of a detention reservoir on Bitter Creek upstream of the project area at the most feasible geographic location to contain only the volume of water that would exceed existing channel capacity during a 100-year flood."[3]

- "Construction of levees in upland beyond the existing bank line to contain the 100-year flood throughout the entire project area with no alteration of wetland within the existing channel."[4]

[2] BKS Environmental Associates, Inc. "2009 Wetland Assessment for City of Rock Springs Bitter Creek", March 19, 2009.
[3] Letter from Thomas B. Johnson, P.E., Project Manager, Wyoming Regulatory Office, Department of the Army, Corps of Engineers, Omaha District, April 30, 2010.
[4] Letter from Thomas B. Johnson, P.E., Project Manager, Wyoming Regulatory Office, Department of the Army, Corps of Engineers, Omaha District, April 30, 2010

- "Construction of the proposed action without any new access roads within or outside of the channel. Eliminate all channel adjustments that were necessary solely to accommodate roads."[5]

Reports pertaining to all three alternatives and a copy of the letter from the USACOE are contained in Appendix 3. Following reevaluation and analysis of these alternatives, they were all confirmed to be infeasible and were not recommended. Additional information was also provided to COE regarding properties affected by the proposed action (Appendix 3).

B. Additional Proposed Action

1. Description of the Additional Proposed Action

The Proposed Action discussed in the Final EA was the channel improvement, realignment, and cleanup of the Bitter Creek drainage. The Additional Proposed Action in this revised Final EA involves alterations to an existing levee identified by the Federal Emergency Management Agency (FEMA) during its review and consideration of a Conditional Letter of Map Revision (CLOMR) related to the Rock Springs Bitter Creek Clean-up Project. At the time of the review, it was discovered that the embankments on Dead Horse Canyon Creek (a tributary drainage to Bitter Creek) are considered levees because adjacent properties are below the elevation of the creek bottom. As a consequence, FEMA has required that the levees be accredited.

The Additional Proposed Action includes improvements to approximately 3,100 lineal feet (± 0.58 mile) of Dead Horse Canyon Creek. The section just above the confluence with Bitter Creek has concrete-lined slopes and bottom – a length of approximately 700 lineal feet. Improvements along the channel include raising the elevation of the levee in some locations to accommodate the required free-board (3 feet above the anticipated 100 year flood level, at bridges, 4 feet is required), slope improvements to address steepness and erosion, and installing a culvert in the reach from Gobel Street north where the drainage is adjacent to existing residential dwellings and historic floodwalls (see Figure 1).

[5] Ibid.

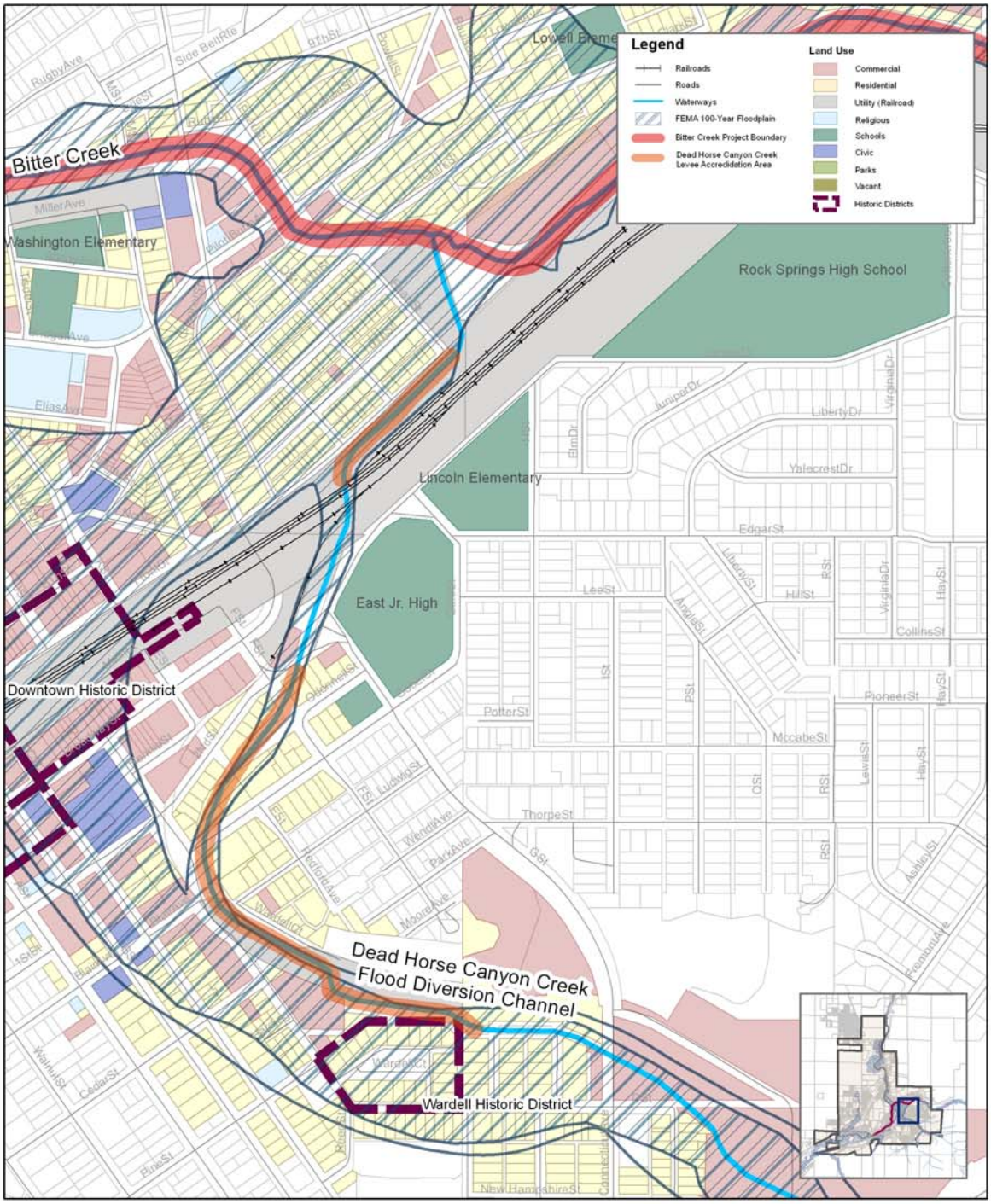


Figure 1: Land Use with Historic Districts

Rock Springs Bitter Creek Clean-Up Project
Addendum to Final Environmental Assessment

Rock Springs, Sweetwater County, Wyoming
January 2011

2. Need for the Additional Proposed Action

The Need for the Proposed Action is described in the Final EA document as the need to alleviate flooding in significant portions of the City of Rock Springs, and to construct the means to control flooding such that FEMA would revise the Flood Insurance Rate Maps to remove affected portions of the City from this mapping. The need for the Additional Proposed Action is the same. Dead Horse Canyon Creek contributes to the flooding in Rock Springs, and therefore, controlling flooding in Dead Horse Canyon Creek is a necessary element in this project. The proposed action, as described in the Final EA, in conjunction with the Dead Horse Canyon Creek Detention Basins constructed upstream of this section of the creek, and the levee improvements in this additional proposal are integral to controlling flows in Bitter Creek and flooding in Rock Springs. None of the unselected alternatives evaluated in the Final EA, nor the additional alternatives identified above, precludes the need to raise the levees on Dead Horse Canyon Creek.

3. Additional Proposed Action – Selected Alternative

The Additional Proposed Action is to clean-out the Dead Horse Canyon Creek Flood Diversion Channel through Rock Springs, to stabilize the banks, and to raise and repair the levees as required for FEMA standards. The channel is defined by three distinct sections. The section beginning at the confluence with Bitter Creek and extending upstream to the 2nd Street Bridge is concrete lined. This section runs parallel to North Front Street, which includes a historic flood wall. Minor clean-up activities are required in this area, and approximately 1.5 feet will be added to the top of the levee approaching the 2nd Street Bridge. The historic flood wall will not be impacted (see Figure 2).

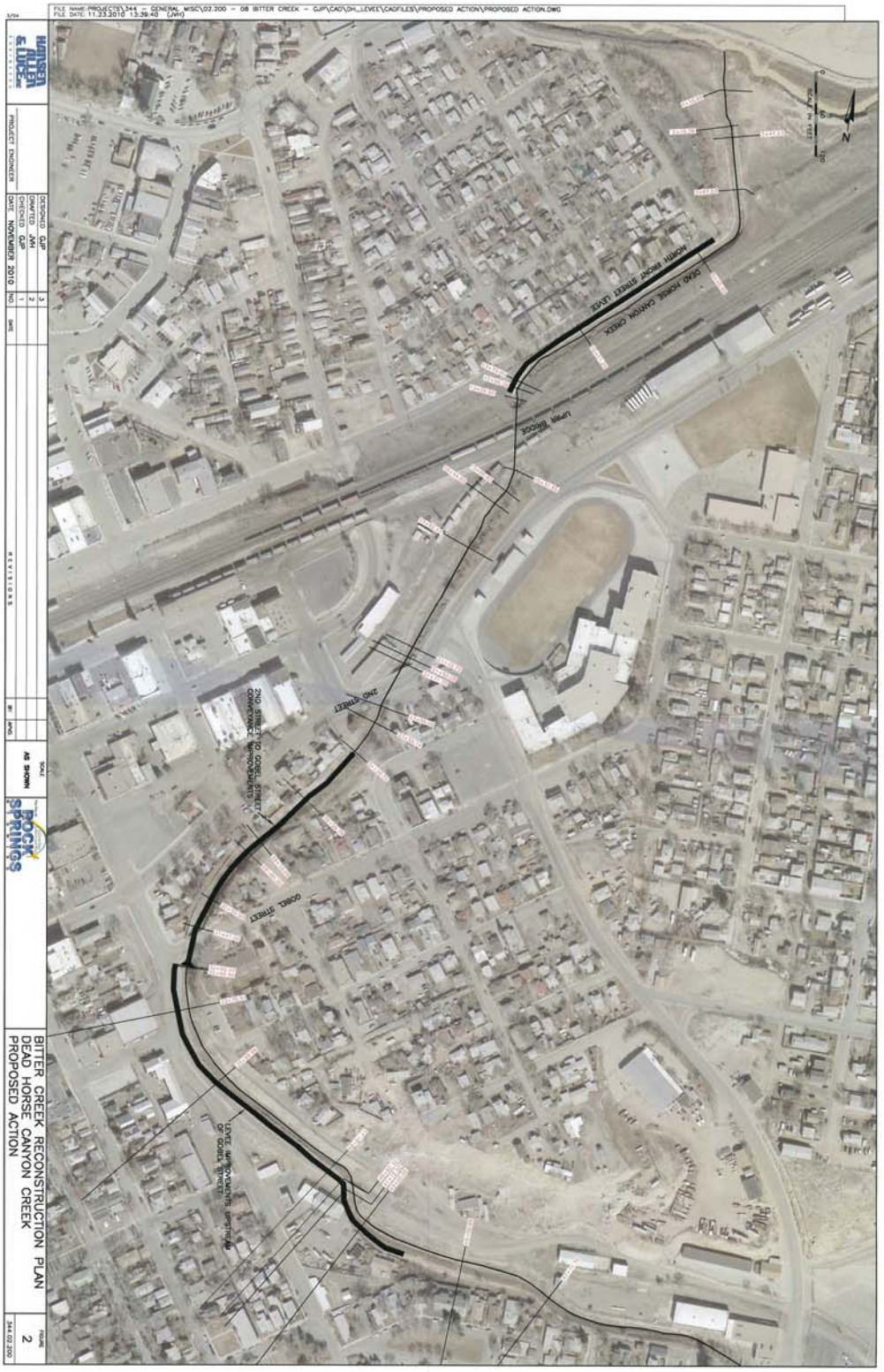
The section between the 2nd Street Bridge and Gobel Street will receive a concrete box culvert placed in the bottom of the channel. The culvert will be buried, raising the grade above the culvert, and the disturbed areas will be revegetated. This section has historic flood walls on both sides of the channel. It is the intent to avoid these walls and to not disturb the adjacent side slopes.

The final section between Gobel Street and approximately Massachusetts Street will be excavated, the banks will be altered, and the levee will be raised between 1.5 and 3 feet in places. The intent of the proposed action, combined with the Bitter Creek Reconstruction Project, is to eliminate flooding in sensitive residential, commercial, and retail areas, remove barriers to economic development and property improvements, enhance living conditions in the City of Rock Springs, and create a stable, aesthetically pleasing stream system through town.

4. No Action Alternative

The No Action alternative would not alter Dead Horse Canyon drainage. This alternative provides no assurance that flooding in downtown Rock Springs will be controlled, and no relief of the economic and other impacts described in the Final EA document.

Figure 2: Additional Proposed Action – Selected Alternative

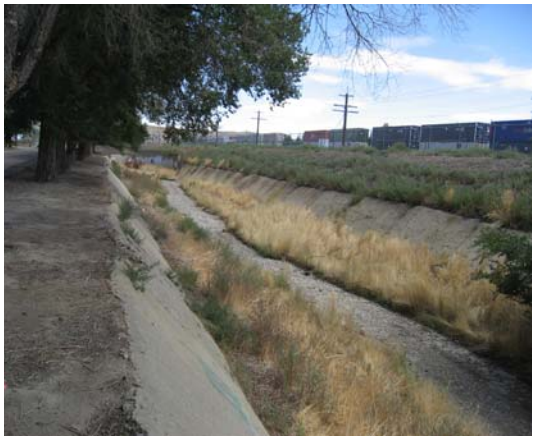


5. Affected Environment

5.1. General Setting

The additional project area is located within the corporate limits of the City of Rock Springs. Beginning at the downstream reach of the Dead Horse Canyon Creek area that would be affected, approximately between stations 649.9 and 1299.28 on the plan drawings (The North Front Street Levee), the creek bed is concrete-lined on the bottom and side slopes (Photos 1 and 2). This section of the creek bed has been modified and straightened in the past, and a stone floodwall was constructed. The creek bed runs roughly parallel to North Front Street, and the floodwall is adjacent to the street side.

Images from the northern end just before the confluence with Bitter Creek



1. Looking north along Front Street

2. Looking south along Front Street

The section between approximate stations 2309.0 and 3141.0 (2nd Street to Goble Street) is steeply sloped and contains stone floodwalls along the upper bank of the creek bed on both sides. This section is immediately adjacent to residential dwellings that have relied on retaining walls to support the bank, and the floodwalls above the bank to protect their properties which are at lower elevation than the walls (Photo 3).

The remaining reach extends south and east of the Gobel Street Bridge to the end of the project at approximately Massachusetts Avenue (Levee Improvements Upstream of Gobel Street). This length is steeply sloped and eroded, and includes an existing pedestrian bridge and a paved asphalt trail along the top of the levee between the Gobel Street Bridge and the pedestrian bridge (Photos 4 & 5).

Images from behind the residential units between the Gobel Street and 2nd Street bridges

3. At the Gobel Street Bridge looking north

Images from the upstream reach of the project

4. Looking north to the Gobel Street Bridge

5. Looking north at approximately Massachusetts Avenue

5.2. Affected Resources of the Additional Proposed Action and No Action Alternatives

5.2.1 Cultural Resources

A cultural inventory of the additional project area was conducted; this included a 150-foot corridor (75-feet on either side of the upper edge of the flood diversion channel), amounting to approximately 12.65-acres.[6] The objective of this Class III cultural resource inventory was to provide a complete record of the cultural properties, identifiable from surface and natural exposures (profiles) occurring within the study area, and to determine the relationship of the cultural resources to proposed additional disturbance areas. To meet these objectives an extensive pedestrian survey was conducted of the proposed levee improvement and channel clean-up area in Dead Horse Canyon Creek. The entire area inventoried is located on private land or City of Rock Springs land. Private residential and commercial properties were not inventoried as they are not legally accessible, and construction will be restricted to the existing diversion channel area.

One previously documented segment of 48SW17183, the masonry flood control wall built along Bitter Creek was noted in the area of the inventory. Two previously undocumented segments of this flood control wall group were recorded along the Dead Horse Canyon Flood Diversion Channel. A previously undocumented railroad spur (48SW17926), and a truss bridge located along this railroad spur (48SW17927) were also recorded. Two modern street

[6] "City of rock Springs Dead Horse Canyon Flood Diversion Channel Clean-up; Appendix A to the 2008 City of Rock Springs Bitter Creek Clean-up, Killpecker Creek Detention Pond (Dam Site 1), and Bitter Creek Dead Horse Canyon Detention Pond (Dam Sites 2 and 3, Class III cultural resource inventory (10-WAS-399", Western Archaeological Services, Inc., November 2, 2010.

overpasses are present at 2nd Street and Gobel Street; both are modern and were not recorded for this project. Very crude stone rip-rapping was noted along the bank of the channel at the 2nd Street Bridge consisting of dry laid sandstone blocks, cinder blocks, and rubber car and truck tires. This rip-rapping is not associated with the 1930s and 1940s flood control wall segments noted along this channel and along Bitter Creek. The rip-rapping was not recorded for this project. No prehistoric sites or isolated resources were noted in the inventory area.

5.2.2 Water Resources

The confluence of Dead Horse Canyon Creek and Bitter Creek is located near the Pearl Street Park in the City of Rock Springs about 21.6 miles upstream from the confluence of Bitter Creek with Green River. Please refer to the Bitter Creek Watershed description in the Affected Environment Water Resources section of the Final EA (September 28, 2009) for a more detailed description of the geology and climate.

Dead Horse Canyon Creek is an ephemeral drainage flowing only in response to a runoff event. The Dead Horse Canyon Creek drainage basin lies in the foothills south of Rock Springs. A study has been completed of Dead Horse Canyon storm runoff (see Appendix 4). Peak predicted storm runoff flow rates for Dead Horse Canyon Creek are summarized in the following table.

Table 1 - Dead Horse Canyon Creek Predicted Peak Storm Runoff Flows

LOCATION	Drainage Area (square miles)	10% Chance** (10-Year) cfs	1% Chance** (100-Year) cfs
Confluence of Dead Horse and Tributary No. 2 drainages	6.1	275 *257	659 *499
Old UPRR Bridge (Trestle Foot Bridge located near intersection of Cedar Street and D Street)	6.9	317 *299	749 *592
Confluence with Bitter Creek	7.41	344 *326	805 *656

* Reduced flows due to construction of new detention basins on Dead Horse Canyon Creek drainage and Tributary No. 2 Drainage.
**A 10% Chance runoff event has a 10 percent chance of being equaled or exceeded in any given year.

"Prior to the development of the town, the [Dead Horse Canyon Creek] drainage flowed down what is now C Street, across the railroad tracks and into the original Bitter Creek channel near modern Bunning Park. In 1915, the stream was rechanneled to the east of the downtown area through a flood diversion channel."[7] The 1915 flood diversion channel basically follows the present Dead Horse Canyon Creek alignment and combines with Bitter Creek at Pearl Park (near Pilot Butte Avenue).

The construction of the "flood diversion channel" for Dead Horse Canyon Creek was the result of two severe rainstorm events occurring in two years (July 30, 1914 and July 28, 1915). Each of these flood events resulted in significant flooding in downtown Rock Springs especially along C Street. The "flood diversion channel" (a 2,700 feet long ditch with a 20-foot bottom width and 5-feet channel depth) was constructed beginning in the fall of 1915. The 1924 and 1937 Bitter Creek construction projects included work in Dead Horse Canyon Creek.

The Dead Horse Canyon Creek "flood diversion channel" served well with no major flooding from 1916 to 1989. On July 12, 1989, a heavy thunderstorm over the Dead Horse Canyon drainage resulted in a "four foot wall of water". The "flood diversion channel" bank was overtopped just upstream of the Gobel Street Bridge resulting in extensive flooding and damage along C Street and D Street.[8]

5.2.3 Vegetation and Wetland Resources

Wetland Resources

The wetland delineation was conducted on October 5, 2010 for the Dead Horse Canyon Creek Levee locations. The Arid West Supplement to the COE manual was referenced to delineate the wetlands. No wetlands were identified in the proposed levee sections of Dead Horse Canyon Creek. The creek bottom in the levee area had drainage patterns present but no other indicator of hydrology, the soils were dry, and the dominant vegetation was upland. The COE has determined that is does not have jurisdiction over this diversion channel. (See Appendix 5.)

Threatened and Endangered Species

There are potentially one endangered and two threatened plant species in the area, *Penstemon haydenii* (blowout penstemon) and *Sprinthes diluvialis* (Ute Ladies' tresses orchid) and *Gaura neomexicana* spp. *Coloradensis* (Colorado Butterfly plant) respectively; that could be present in the area, however, as described below, habitat conditions are generally not conducive to their presence. No individuals or populations were identified during field work. (See Appendix 5.)

[7] Appendix A, Class III Cultural Resource Inventory for the City of Rock Springs Dead Horse Canyon Flood Diversion Channel Clean-up, Sweetwater County, Wyoming," Western Archaeological Services, November 2, 2010.
[8] Ibid.

The Colorado butterfly plant's habitat is in drainage bottoms along bends of grassy stream channels and along moist floodplains. The Colorado butterfly plant is currently found in Laramie and Platte Counties in Wyoming and Weld County in Colorado. The project area had no habitat due to the topography of the channel and often steep banks, thus no individuals or populations of the species were identified along the Dead Horse Canyon Creek levee project area.

The Ute Ladies' Tresses orchid requires a late season water source that potentially has a seed source, sandy or loamy textured soils that are not clayey, the presence of hydrophytic edge vegetation and low vegetation competition, and absence of excess salt accumulation. There is no existing habitat at the levee project area of Dead Horse Canyon Creek as there was no late season water source present, thus no Ute Ladies Tresses were identified along the creek. The nearest known population of Ute Ladies Tresses' is on the Green River south of the Flaming Gorge Reservoir, which is downstream of the project area; there are currently no known populations in Sweetwater County, Wyoming.

In Wyoming, Blowout penstemon is restricted to two habitat types: steep, northwest facing slopes of active sand dunes with less than five percent vegetative cover; and on north facing sandy slopes, on the lee side of active blowouts with 25-40 percent vegetative cover (USFWS, 2008). This species is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. The project area along Dead Horse Canyon Creek provides non-existent habitat, and no individuals or populations were identified within the project area.

5.2.4 Fish and Wildlife Resources

Wildlife Habitat

No critical wildlife habitat is identified within the city limits and no critical wildlife habitat occurs within a significant distance of the project addition. Remnant individuals of mule deer (*Odocoileus hemionus*) use the levee as a travel lane; however, no appreciable deer habitat occurs within the portions of the levee to be improved. Implementation of the levee improvements will not likely alter the qualities of the levee that provide safe and secretive passage for deer. Potential passerine habitat is marginal, and no migratory passerine birds were observed using the area. (See Appendix 6.)

Dead Horse Canyon Creek Levee does not contain water except during storm and flood events and there are no aquatic concerns associated with the improvements.

Threatened and Endangered Species

Threatened and endangered species are adequately addressed in the original Wildlife Evaluation for the Bitter Creek Final EA. There are no additional concerns for threatened and endangered species, or their habitat, with the inclusion of the Dead Horse Canyon Creek Levee improvements.

5.2.5 Socio-Economics

The information contained in the Final EA regarding Demographics, Downtown Development and Redevelopment, Commercial Property Values and Financing, Residential Property Values and Financing, Affected Historic Properties, and Other Affected Properties are unchanged. See Figure 1 – Land Use with Historic Districts.

Property Ownership

The majority property owners along this length of Dead Horse Canyon Creek affected by the Additional Proposed Action include the Union Pacific Railroad (UPRR) and the City of Rock Springs. See Figure 3 – Land Ownership. The UPRR property contains no tracks or other improvements, and is currently being used by the public as a trail. Levee improvements will require construction activity on these properties, and will remove them from the 100-year flood plain, thus it is anticipated that easements will be negotiated with these entities. Easements and donations of property from the Union Pacific Railroad have already been established for some of the property currently shown as belonging to the City.

There are sixteen private properties (residential) adjacent to the creek however most properties do not appear to include the creek bed. Two properties may include the area of the creek bed. Construction in the creek bed may require purchase of the private property or negotiation of an easement. Since the property in question is not developable, easements are anticipated and recommended. Throughout the remainder of the additional project area construction activity will raise the elevation of the levee from zero to 3 feet where needed, make improvements to the sloped banks, and install a culvert between the Gobel Street Bridge north to the 2nd Street Bridge (approximately F Street). The intent is to avoid impact, or repair any construction impact to the properties.

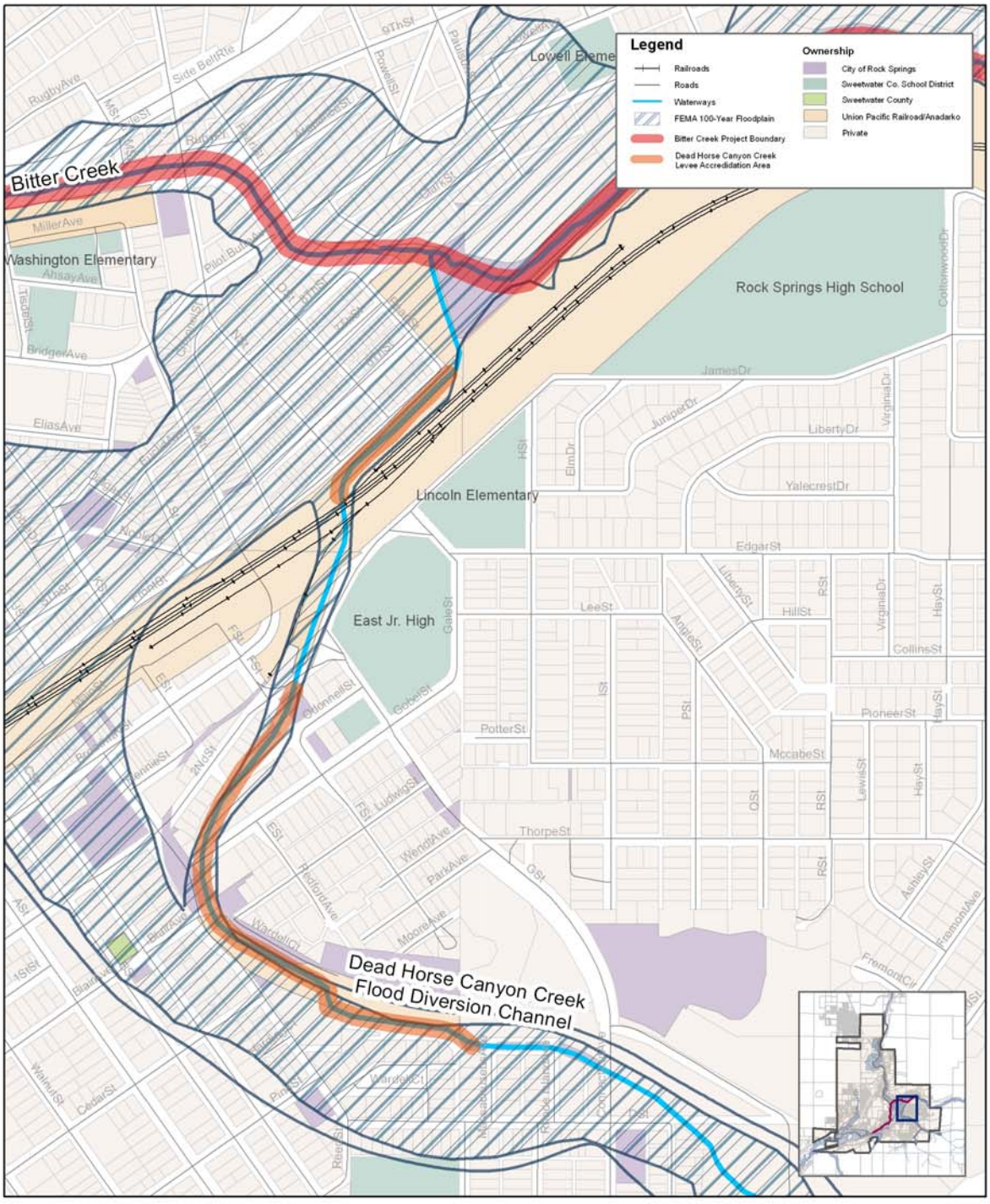


Figure 3: Land Ownership

Rock Springs Bitter Creek Clean-Up Project
Addendum to Final Environmental Assessment

Rock Springs, Sweetwater County, Wyoming
January 2011

5.2.6 Recreational Resources

The information contained in the Final EA regarding City Parks, Recreation Facilities, Public Lands, and Visual Resources remain relevant. Additional information is provided regarding trails.

Trails

There is an existing, publicly-used, paved asphalt trail along the top of the west side of the levee from the Gobel Street Bridge south to the pedestrian bridge (city-owned property). The trail continues south on the east side of the creek bed (railroad property). The paved trail is identified as an Off System Bike Path on the City's bicycle path map.

It ends at the Gobel Street Bridge and becomes an on-street path along 2nd Avenue. It is the intent to repair and replace the paved asphalt trail wherever it is affected by construction and to assure that the trail system remains connected. The planned and existing trails in this additional project area are shown on Figure 4 – Park and Recreation Resources.

With the installation of the closed box culvert between Gobel Street and 2nd Avenue, there is the potential to also include a continuation of the paved trail through the covered creek bed and connect to 2nd Avenue at F Street with an off-street trail. This would increase the length of the safer, off-street trail.

5.2.7 Soils and Farmlands

Addition of the proposed action in Dead Horse Canyon Creek corridor does not alter the effects of the project. No additional analysis needed.

5.2.8 Air Quality

Addition of the proposed action in Dead Horse Canyon Creek corridor does not alter the effects of the project. No additional analysis needed.

5.2.9 Noise

Addition of the proposed action in Dead Horse Canyon Creek corridor does not alter the effects of the project. No additional analysis needed.

5.2.10 Special Areas of Concern

Addition of the proposed action in Dead Horse Canyon Creek corridor does not alter the effects of the project. No additional analysis needed.

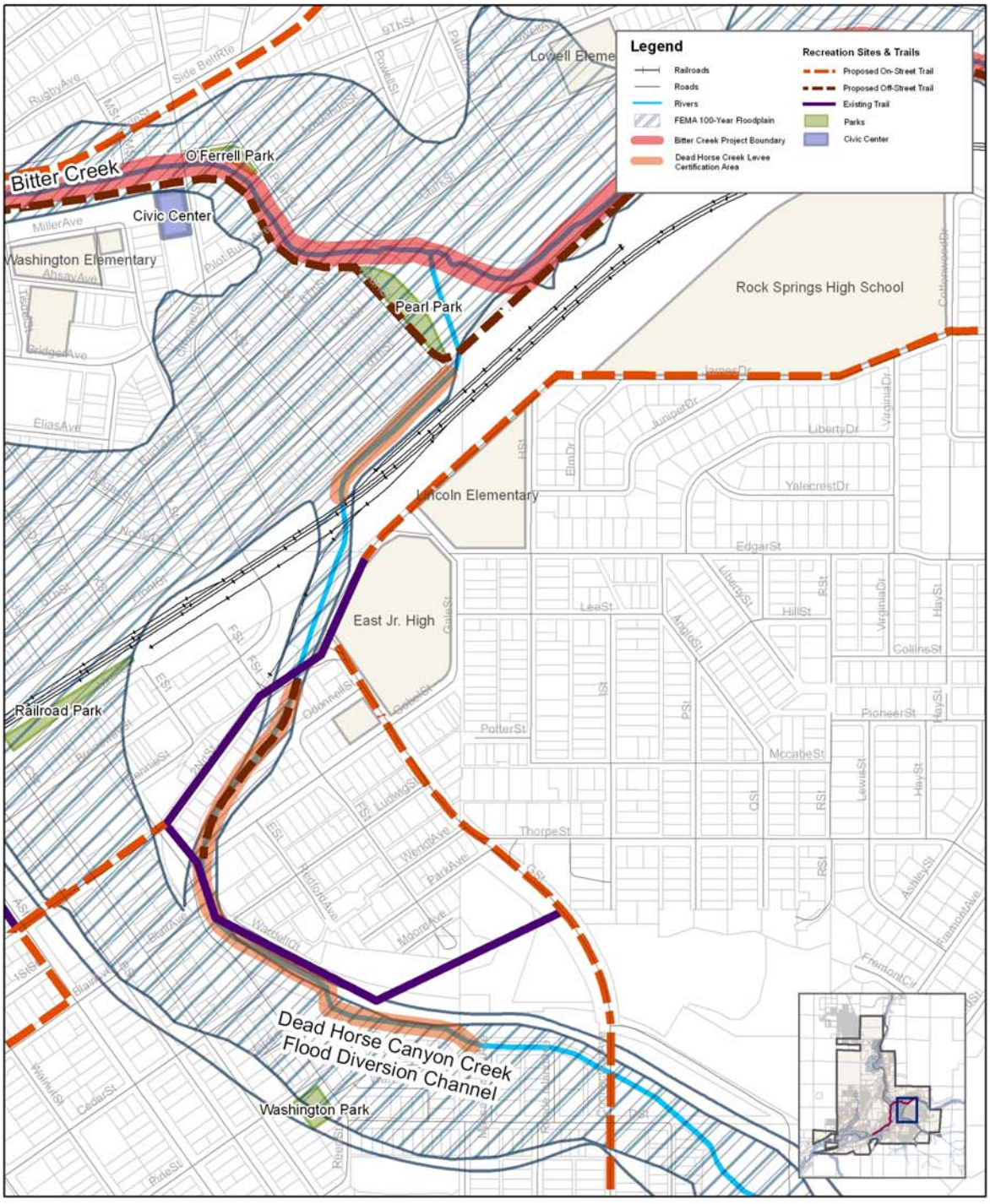


Figure 4: Park and Recreation Resources

Rock Springs Bitter Creek Clean-Up Project
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Rock Springs, Sweetwater County, Wyoming
January 2011

6. Environmental Impacts of the Additional Proposed Action and No Action Alternatives

6.1 Cultural Resource Effects

6.1.1. Direct and Indirect Effects

Additional Proposed Action

Direct impacts of the Additional Proposed Action would primarily result from construction related activities in the areas where the stone walls are located along the Dead Horse Canyon Creek corridor. The Wyoming State Historic Preservation Office (SHPO) has concurred on the eligibility determinations of the cultural evaluation for this project, and has agreed that the flood walls can be protected wit the proposed mitigation strategies. During construction, should it be discovered that there could be adverse impacts to the floodwalls, Section 106 consultation would be reentered with the SHPO. Activities considered to have the greatest potential effect on cultural resources include blading and trenching; however, every effort will be made to protect the walls and incorporate them into the final design. The results of portions of the construction activities are anticipated to provide better stability to the walls. A beneficial effect from the Proposed Action would be the protection of portions of these historic walls from future flood damage.

No Action Alternative

No additional effects on cultural resources would be expected to occur beyond the current situation. Existing historic properties would remain in the 100-year floodplain.

Mitigation

Historic resources would first be mitigated by avoidance, then by other measures as determined in consultation with the SHPO and as incorporated into the regulatory compliance stipulations for the project (see Appendix 1). Monitoring of construction activity by a qualified cultural monitor onsite will protect the resources from harm, and will facilitate any further discussion with the SHPO should the need arise during construction. Application of the mitigation measures identified below would minimize potential impacts to cultural resources.

- If at any time during construction, maintenance, or use of the project area, previously unanticipated or unknown cultural resources are discovered, all activities would be suspended in the area of discovery until the discovery can be evaluated and protected as recommended by SHPO. Continued operation would be conducted in such a fashion as to permit no further damage to the discovered cultural resource.

- Protective measures could be implemented in consultation with the SHPO. Mitigation of effects to cultural resources would be determined through consultation with SHPO. The City of Rock Springs has committed to incorporating the stone walls as much as

possible into the project design. Mitigation will be determined during further consultation with SHPO (see Appendix 1).

Cumulative Effects

If actions were to cause unmitigated adverse effect to a National Register eligible property such as the stone floodwalls, the impact could be unavoidable and cumulative resulting in the loss of historic resources. Because the intent is to protect and avoid the walls during construction of the Additional Proposed Action, adverse cumulative effect is not anticipated. Conversely, this project could provide a very positive impact to the City of Rock Springs and the region.

6.2 Water Resources Effects

6.2.1 Direct and Indirect Effects

Additional Proposed Action

The proposed Dead Horse Canyon Creek conveyance improvements (levee improvements and box culvert) will not have adverse effects to water quality nor quantity. The additional project component is part of the Bitter Creek Clean-up Project and is expected to have lasting positive effects to the community through increased flood protection and decreased flood insurance costs. The proposed conveyance improvements are divided into three parts: North Front Street Levee, 2nd Street to Gobel Street Conveyance Improvements, and Levee Improvements Upstream of Gobel Street.

North Front Street Levee. The proposed action includes cleaning the concrete channel (sediment removal) to restore capacity and increasing the height of the levee for about 100 feet downstream of the UPRR Bridge. Concrete channel cleaning will be performed during a time of no flow and as a result will not have an adverse effect on water quality nor quantity. The elevation of the existing top of the levee will be increased by about 1.5 feet for about 100 feet downstream of the UPRR Bridge in order to provide the four feet of required freeboard within 100 feet of a bridge. The area to be raised is currently very sparsely vegetated with upland herbaceous plants. Construction of the berm on top of the levee will not affect normal creek flows and will not have adverse effects.

2nd Street to Gobel Street Conveyance Improvements. The existing levee in this reach will be replaced with a box culvert conveyance system. Because the existing channel is ephemeral and does not have riparian vegetation, the replacement of the open channel with a closed box culvert will not adversely affect water quality. The existing channel and steep side slopes have been a source of sediment which should be reduced with the construction of the closed conduit.

Levee Improvements Upstream of Gobel Street. The protection of the levee embankment with the construction of a gabion (or mass block) slope protection system will protect the levee embankment from sloughing and erosion. It is expected that the existing channel erosion through this reach will be reduced.

No Action Alternative

The no action alternative would not allow accreditation of the levee and would reduce the overall effectiveness of the Bitter Creek Clean-up Project.

Mitigation

A Wyoming Pollution Discharge Elimination System (WYPDES) permit will be required for construction and will limit and control erosion during and following construction.

Cumulative Effects

The Dead Horse Canyon Creek flood conveyance improvement project is part of the Bitter Creek Clean-up Project and is expected to have lasting positive effects to the community through increased flood protection and decreased flood insurance costs.

6.3 Vegetation and Wetland Resources Effects

6.3.1 Direct, Indirect and Cumulative Effects

Additional Proposed Action

There were no wetlands or threatened and endangered species identified in the Dead Horse Canyon Creek levee project area and therefore there are no direct, indirect or cumulative impacts to wetlands and vegetation in that portion of the project area (see Appendix 5).

No Action Alternative

The no action alternative would have no effect on these resources in the Dead Horse Creek Canyon corridor.

6.4 Fish and Wildlife Resource Effects

6.4.1 Direct, Indirect and Cumulative Effects

Additional Proposed Action

The vegetation growing in the areas where the improvements will occur will be lost. Because the affected area does not contain functional wildlife habitat, no impacts to the viability of wildlife populations in the area are expected. No significant changes in abundance or breeding status of any vertebrate wildlife species in the area are expected as a result of this project amendment. No additional cumulative impacts are expected from the inclusion of the Dead Horse Levee improvements (see Appendix 6).

No Action Alternative

The no action alternative would have no effect on these resources in the Dead Horse Creek Canyon corridor.

6.5 Socio-Economic Effects

Addition of the proposed action in Dead Horse Canyon does not alter the effects of the project. No additional analysis needed.

6.6 Recreation Resource Effects

6.6.1 Direct, Indirect and Cumulative Effects

Additional Proposed Action

With the repair and replacement of the existing asphalt path, there will be no impact or additional analysis needed. If the trail is extended through the creek bed as an off-street connection to F Street, it will be an extension of a safer trail type in the City and also provide opportunities for more of the public to become aware of the historic flood walls. This will enhance interpretive opportunities for the project.

No Action Alternative

The no action alternative would have no effect on these resources in the Dead Horse Creek Canyon corridor.

6.7 Soils and Farmlands Effects

Addition of the proposed action in Dead Horse Canyon does not alter the effects of the project. No additional analysis needed.

6.8 Air Quality Effects

Addition of the proposed action in Dead Horse Canyon does not alter the effects of the project. No additional analysis needed.

6.9 Noise Effects

Addition of the proposed action in Dead Horse Canyon does not alter the effects of the project. No additional analysis needed.

7. Summary of Effects

Table 2 summarizes the effects related to the No Action Alternative and the Additional Proposed Action.

Table 2 – Summary of Effects: No Action and Proposed Action

No Action Alternative	Proposed Action	Mitigation
Cultural Resources		
• No anticipated change. • Existing historic properties would remain in the 100-year floodplain.	• Enhanced opportunity for the public to become aware of and appreciate the historic floodwalls. • Incorporate historic floodwalls into the project design.	• Avoidance of historic properties is preferable. • If avoidance is not possible, measures minimizing potential impacts to cultural resources and mitigation of those resources will be determined between the SHPO and the City of Rock Springs. This may include monitoring of surface disturbances by a professional archeologist and determining how cultural resources will be incorporated into the project design. • Discovery of unanticipated cultural resources would require suspension of activities. A consultation between the City and SHPO would then occur.
Water Resources—Water Quality		
No change.	No anticipated change.	• Creek side slopes should be laid back where possible and protected with erosion control matting and vegetation. • Signing and enforcements should be implemented to control ORV use along the creek. • Compliance with a WYPDES stormwater permit.

Water Resources—Water Quality, continued		
		• Best management practices for erosion control should be implemented, including: ▪ Use of erosion control blankets and revegetation as quickly as practical. ▪ Limiting the length of disturbance/reducing exposed banks.
Water Resources—Water Quantity		
No anticipated change.	No anticipated change.	None.
Water Resources—Flooding		
• The potential for flooding remains unchanged. • 360 acres of developed land remain in the FEMA designated 100-year floodplain.	• Improved conveyance capacity and lowering the flood elevation will remove 360 acres of developed land from the FEMA designated 100-year floodplain.	None.
Vegetation and Wetlands		
No anticipated change.	No anticipated change.	None.
Fish & Wildlife		
No anticipated change.	No anticipated change.	None.
Socio-Economics		
No change.	Properties will be removed from the 100-year floodplain making financing for development and redevelopment easier and removing financial and other disincentives and burdens.	• Impacts to adjacent properties during construction should first be avoided. • Any minor impacts to properties resulting from construction will be mitigated by restoring the properties to the current level of development or better.
Recreation		
No change.	Existing trail will be retained or replaced.	• Any impacts to the trail due to construction will be mitigated by repairing and reconstructing. • Increased interpretive opportunities with the extension of the off-street trail and more public access to viewing the historic flood walls.

Soils & Farmland		
No prime or state unique farmlands		
Air Quality		
No change.	Dust during construction only.	Effective dust control procedures should be incorporated into the project to comply fully with the Wyoming Air Quality Standards and Regulations.
Noise		
No change.	Noise during construction only.	Construction-related noise should adhere to the City of Rock Springs Noise Ordinance.
Special Areas of Concern		
No special areas of concern		

8. List of Persons and Agencies Contacted to Assist in the Preparation of the Environmental Assessment

The following either replace persons and agencies shown in the Final EA or are in addition to those previously presented. All others shown in the Final EA remain pertinent.

U.S. Department of the Army, Corps of Engineers, Omaha District

Thomas Johnson, P.E., Project Manager, Wyoming Regulatory Office, Cheyenne, Wyoming

9. List of Preparers

Correction: In the "Rock Springs Bitter Creek Clean-up Project Final Environmental Assessment," September 28, 2009, to which this document is an addendum, the consultant who prepared the wildlife assessment and report was misidentified. The correct preparer is Wyoming Wildlife Consultants, Pinedale, Wyoming (John Dahlke and Gregg Shedd).

10. References Cited

BKS Environmental Associates, Inc. "2009 Wetland Assessment for City of Rock Springs Bitter Creek", March 19, 2009.

Johnson, D, "Appendix A, Class III Cultural Resource Inventory Report for the City of Rock Springs Dead Horse Canyon Flood Diversion Channel Clean-up, Sweetwater County, Wyoming 10-WAS-399", Western Archaeological Services, November 2, 2010.

Western Archaeological Services, "Appendix A, Class III Cultural Resource Inventory for the City of Rock Springs Dead Horse Canyon Flood Diversion Channel Clean-up, Sweetwater County, Wyoming," November 2, 2010.

Appendices

Appendix 1: State Historic Preservation Office (SHPO) Correspondence

Letter from Kara Hahn, National Register Coordinator, Wyoming State Parks and Cultural Resources, Historic Preservation Office to Marcia Murdock, AML NEPA Compliance Coordinator, DEQ, November 29, 2010.

Letter from Marcia Murdock, AML NEPA Compliance to Ms. Mary Hopkins, State Historic Preservation Officer, November 5, 2010.

Appendix 2: United States Army Corps of Engineers Permit

City of Rock Springs Resolution No. 2011-05 Accepting the Department of Army Permit from the Corps of Engineers.

Attachment 1: Preliminary Project Plans
Attachment 2: Historic Properties Preservation
Attachment 3: Wetland Mitigation Plan

Appendix 3: Additional Information Required by United States Army Corps of Engineers

"Bitter Creek Detention Alternative," Greg Poole, Hansen Allen & Luce, August 25, 2010.

"Bitter Creek Roadless Alternative," Greg Poole, Hansen Allen & Luce, August 26, 2010.

"Bitter Creek Levee Alternative," Greg Poole, Hansen Allen & Luce, August 26, 2010.

"Affected Properties Analysis," Jan Striefel, Landmark Design, June 24, 2010.

Letter from Mr. Thomas B. Johnson, P.E., U.S. Army Corps of Engineers, Wyoming Regulatory Office to Mr. Gregory J. Poole, P.E., Hansen Allen & Luce, Inc, April 30, 2010

Appendix 4: Water Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

Memorandum from Hansen Allen & Luce Engineers (Tyler Allen and Greg Poole) to Bitter Creek Rehabilitation Project Files, Dead Horse Canyon Hydrology, August 27, 2009 (Revised October 28, 2010).

Appendix 5: Wetland and Vegetation Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

"2010 Wetland Assessment for City of Rock Springs Dead Horse Canyon Creek Levee Project, Part of the Bitter Creek Project", BKS Environmental Associates, Inc., Rock Springs, Wyoming, October 21, 2010.

Letter from Matthew A. Bilodeau, U.S. Army Corps of Engineers, Program Manager, Wyoming Regulatory Office, to Jennifer Shields, Assistant Planner, City of Rock Springs, Wyoming, October 25, 2010.

Appendix 6: Wildlife Resources Update to "Final Environmental Assessment for the Rock Springs Bitter Creek Clean-Up Project" (September 2009)

“Wildlife Evaluation Amendment, Bitter Creek Construction Project, Phase I, Dead Hose Levee Improvements,” Wyoming Wildlife Consultants LLC, Pinedale, Wyoming, October 2010.

Addendum

Final Environmental Assessment
Rock Springs Bitter Creek Clean-Up Project

(September 2009)

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Appendix 1

State Historic Preservation Office (SHPO) Correspondence

ARTS. PARKS. HISTORY.
Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
http://wyoshpo.state.wy.us

RECEIVED
NOV 30 2010
DEQ-AML Lander

29 November 2010

Marcia Murdock
AML NEPA Compliance Coordinator
Department of Environmental Quality
510 Meadowview Dr.
Lander, WY 82520

Re: Rock Springs Bitter Creek Reconstruction Project (SHPO File # 0209KLH003)

Dear Ms. Murdock:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that the truss bridge, 48SW17927, and the Colony Coal Mine railspur, 48SW17926 are not eligible for listing in the National Register of Historic Places. We also concur that the Segment 3D of the Flood Control Structure along the Dead Horse Canyon Flood Diversion Channel, 48SW17183, and Segments 5A and 5B of the Flood Control Structures along the Dead Horse Canyon Flood Diversion Channel, 48SW1783, are eligible for listing in the National Register of Historic Places.

We also concur that the Bitter Creek Flood Controls, 48SW1718, and the Flood Control Structures along the Dead Horse Canyon Flood Diversion Channel, 48SW1783, will not be adversely affected by the project as planned. However, if, as the project progresses, the plans change and the project adversely affects any historic resources, further consultation with our office will be necessary.

This letter should be retained in your files as documentation of a SHPO concurrence on your finding of no historic properties adversely affected. Please refer to SHPO project # 0209KLH003 on any future correspondence regarding this project. If you have any questions, please contact me at 307-777-7828.

Sincerely,

Kara Hahn

Kara Hahn
National Register Coordinator

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

7007 1490 0002 1624 1240

November 5, 2010

Ms. Mary Hopkins, State Historic Preservation Officer
Wyoming Department of State Parks and Cultural Resources
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002

Re: Continued Consultation Rock Springs Bitter Creek Reconstruction Project and transmittal of Additional Class III Cultural Resource Inventory for Dead Horse Canyon Work Area (Ref #0209KLH003)

Dear Ms. Hopkins:

In January 2009, AML initiated consultation with your office regarding the Bitter Creek Reconstruction Project. This is a project for which the City of Rock Springs (City) is proponent, but AML is involved because some AML funds were provided to the City by the Wyoming Legislature. This rendered the Office of Surface Mining the lead federal agency on this consultation. Because this undertaking requires an Army Corps of Engineers (COE) wetland permit, COE is also a party to this consultation. The City of Rock Springs is also a party in this consultation as the project proponent. Our initial consultation identified some historic floodwalls (48SW17183) from a WPA project, referred to hereafter as the "Bitter Creek Floodwalls", as National Register of Historic Places-eligible, and potentially adversely affected by this undertaking if the impacts to this resource were unmitigated. Further project development now allows to us revise the initial finding on this undertaking. Given the increased details of the planning and design, as well as further evaluation, our finding is that this project can proceed with no adverse effect on cultural resources, provided that avoidance and mitigation strategies discussed in detail below are followed. The long-term effect of this project will ultimately be a positive one in that historic resources discussed in this report will be protected and conserved, and the project itself, once complete will provide a number of other historic resources with flood protection.

During the intervening time period, project designs have advanced and the potential impacts to these walls are now better defined. Designs now incorporate protective measures that will mitigate the effect to these historic structures. Also, in a recent development, while the City was working with FEMA, an additional Area of Potential Effect (APE) was identified within the Dead Horse Canyon drainage basin. The recently completed cultural survey of that expanded APE identified additional segments of historic floodwalls (48SW17183), referred to hereafter as the "Dead Horse Floodwalls", from the same historic period. This letter transmits the Class III Cultural Report on the expanded APE, and also presents our revised finding of effect on the

Bitter Creek Floodwalls as well as a finding of effect on the newly identified Dead Horse Floodwalls. In short, the Project engineer has identified methods to reduce and mitigate the potential effect to these cultural resources, and we now find that that adverse effect on these resources can be avoided, provided that the protective measures are carefully implemented.

In addition to identifying the new floodwall segments in the Dead Horse Canyon Flood Diversion Channel and adding these floodwalls to the description and designation of 48SW17183, the expanded survey identified two other historic features. These include a truss bridge identified as 48SW17927 and a railroad spur that served the CC&C No. 2 Mine, identified as 48SW17926. Both of these new features were evaluated as not eligible to the NRHP, therefore the proposed undertaking will not affect these.

Because all of the identified historic floodwalls are included as part of 48SW17183, and these have been found to be eligible for listing on the NRHP, avoidance and mitigation strategies have been developed to protect and conserve this resource. The following discussion and the attached drawings illustrate the protective, conservation, and mitigative actions proposed by the City, specific to the different floodwall areas, to ensure that adverse effect on these resources can be avoided.

Monitoring

For any construction work on and around both areas with historic floodwalls, the City shall ensure that a qualified archeologist is present to monitor excavation, and the walls as exposed during construction will be recorded photographically by the archeological monitor. It is anticipated that work around the floodwalls will occur during different phases of construction work, therefore, separate reports for each such construction phase that will involve proximity to the floodwalls will be required. The documentary photographs will be included in the monitoring reports that will be submitted to SHPO upon conclusion of work at each floodwall location (i.e., one report for the Dead Horse Floodwalls, and another report for the Bitter Creek Floodwalls). The monitoring archeologist will provide input into the effect of repairing or stabilizing the historic floodwalls such that their integrity will be preserved during the construction and thereafter to the extent possible.

During construction monitoring, in the event it is determined that adverse effect to a given wall segment is unavoidable, SHPO will be consulted, and the resource will be recorded at a level of detain equivalent to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation.

There is the possibility that unanticipated cultural resources may be discovered. If potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures will be instituted. Construction will cease at the location of discovery, and a qualified archeologist will assess the value of these potential cultural resources and make recommendations to the City and SHPO on the discovery. If the archeologist determines that the

potential find is a bona fide cultural resource, then work will be suspended at that location until data recovery or another such appropriate mitigative action, agreed to by SHPO, can be completed.

Protection of Bitter Creek Floodwalls

The City plans to preserve and protect the existing historic Bitter Creek Floodwalls (48SW17183), and has incorporated these structures into the project design. There is also a historic Gabion slope mattress structure that will be protected and restored as needed. Construction will be conducted to be protective of the historic Bitter Creek floodwalls. Whenever construction will occur at or immediately adjacent to the floodwalls, an archaeological monitor shall be present. The construction project will be conducted such that damage to the walls will be avoided. In addition to avoiding damage to the existing walls, the historic walls may require stabilization and/or repair.

In areas where the Bitter Creek reconstruction project includes excavation along the toe of an historic wall the following steps may be implemented as required to preserve the wall. This protective strategy includes Segment 3D, which is also discussed in the attached report.

Prior to construction, the walls will be investigated by pothole excavation, likely using a vacuum truck, to define the elevation of the toe of the existing wall. This information will be used to design a sheet pile or other means for stabilizing the toe if needed. If sheet pile is used, it will be driven along the base of the wall in the channel prior to excavation for the deepened channel. This action is anticipated to provide toe stability beneath the existing wall as sediment is subsequently excavated from around the wall.

As the walls are uncovered, and the need for appropriate repairs is evaluated, the monitoring archeologist will assist in definition of the actual prescription for repair of the wall, if needed. Because of substantial sedimentation in some areas, the condition of the walls, and the amount of repair needed, cannot be known until the walls are completely uncovered. The ultimate goal will be protection and stabilization of the historic walls. During this process, the items that will be evaluated are anticipated to include such questions as follow:

- Assess functionality and condition of the wall segment.
- If the wall is deteriorating, what are the consequences if the wall is not repaired?
- If the wall is to be repaired, define repair means. Examples could include replacing missing stones or rebuilding the Gabion mattress where corroded wire reinforcement threatens its integrity.

The attached drawings, Sheet 1 and Sheet 2, provide an illustration of drainage cross-sections where the Bitter Creek Floodwalls presently exist. As can be seen from these illustrations, a considerable amount of infill sediment must be removed to uncover the walls and provide acceptable flow capacity for the reconstructed channel. Where the channel is reconfigured, engineering controls such as hard armoring or vegetation plantings will help control erosion around the historic walls, and provide additional stability of the channel surrounding the walls.

Attached Sheets P-8 and P-9 provide location context for the Bitter Creek Floodwalls (labeled as existing rock walls). Attached Sheet P-5 provides location context for the historic Gabion slope mattress.

Protection of Dead Horse Floodwalls

During FEMA review of project components, it was determined that some existing levees along the Dead Horse Canyon drainage will require reconstruction in order for them to be accepted by FEMA. This portion of Dead Horse Canyon drainage was not initially evaluated because construction here was not planned. The attached Class III Cultural Report presents the findings of the cultural survey for this work area within the expanded APE for the undertaking.

The new survey identified additional WPA-era floodwalls along a portion of the Dead Horse Canyon work area. These floodwalls are considered to be part of the originally identified floodwall group designated as 48SW17183 (eligible, SHPO concurrence). It has been determined that the Dead Horse Floodwalls (Segments 5A and 5B) can be avoided by construction, and in fact, the stability of the floodwall structure would be enhanced by the proposed action at this location. See attached Figure A.

Construction will be conducted to be protective of the historic Dead Horse Floodwalls. Whenever construction will occur at or immediately adjacent to the floodwalls, an archaeological monitor shall be present. The construction project will be conducted such that damage to the walls will be avoided. Although construction is expected not to affect the Dead Horse Floodwalls, if it is later determined by the archaeological monitor that adverse effect to a given wall segment is unavoidable, SHPO will be consulted, and the resource will be recorded at a level of detain equivalent to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation.

The proposal to install a box culvert would allow higher soil elevations beneath the wall and would relieve the stress (both from erosion and stability) on the existing wall foundations. Because the floodwaters would be contained within in the buried box culvert, there would no longer be erosion damage to the floodwalls, and the higher ground surface would reduce the potential for slumping beneath the walls.

Rather than enlarge the existing levees in that drainage segment to bring them into compliance with current FEMA specifications, the proposal is to install a closed concrete box culvert to fully contain the flood flow. With the culvert installed, the area would be completely backfilled over the culvert, leaving a flattened trough in the area below the Dead Horse Floodwalls (see attached Sheet 2). The added soil over the culvert would bring the grade back up below the walls, providing better support to the toe of the walls which are presently failing due to extensive erosion beneath them. The walls themselves would not be involved with or incorporated into the construction, but would instead be avoided. This design, as illustrated in the attached report, is anticipated to provide better protection of the adjacent properties through containment of the flow, and also to provide greater stability of the floodwalls and individual retaining walls that

have been built by private landowners along this reach. The present configuration of the levees in this location is unstable, and repair would be much more complicated than installation of the proposed box culvert. The levees in the locale have likely been reworked several times since they were built, and some of the local residents have individually affected the levee, and perhaps stability of the walls as well, with individual construction actions along their lot lines over time.

The mitigative actions would be to provide better structural stability by stabilizing the toe of the material presently supporting the walls, and by covering the concrete culvert and restoring a trough-like drainage appearance, the visual impact would be mitigated (the culvert would be hidden from view). In addition to these protective actions, the ultimate configuration of the location may involve installation of a walking path over the culvert, along the walls, providing the public with the opportunity to view the walls close up.

Reporting

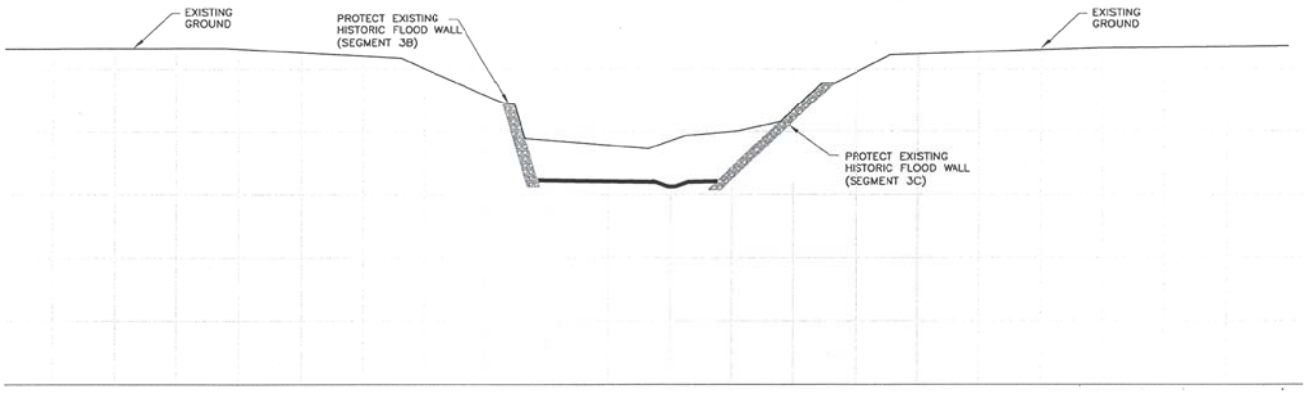
Rock Springs shall provide a final monitoring report, with photographs, to SHPO detailing results of mitigation procedures and any incidental data recovery no later than ninety days (90) following the completion of construction at each floodwall location.

In consideration of the protection and mitigation actions stipulated in the discussion above, OSM and COE find that there will be no adverse effect on these cultural resources provided that all stipulations are met. Please provide me with a letter of concurrence on this project. This consultation will be used in completion of required NEPA documentation on the project by both AML/OSM and COE. Should you require further information, or wish to discuss our findings in greater detail, please contact me at (307) 335-6946.

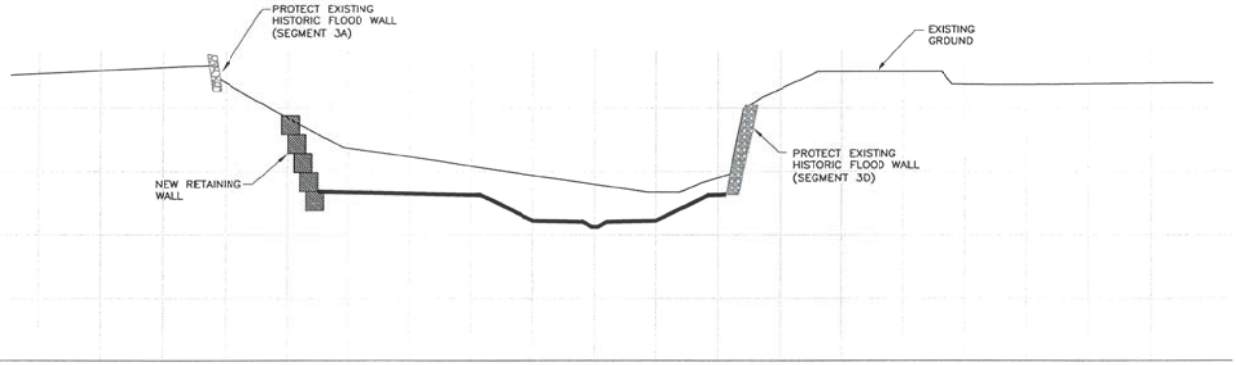
Sincerely,

Marcia B. Murdock
AML NEPA Compliance Coordinator

cc Alan Edwards, Grant File (w/o attachments)
Thomas Johnson, COE Cheyenne (w/o attachments)
Jan Striefel, Landmark Design (w/o attachments)
Jennifer Shields, City of Rock Springs (w/o attachments)
Chron File



Sta 261+17



Sta 265+00

0 10 20 30

NOTE: CROSS SECTIONS TAKEN LOOKING UPSTREAM

PROGRESS PRINT
8.27.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\344 - GENERAL MISC\02.210 - DET BASINS\CAD\BC WALL SECTIONS\HISTORIC FLOOD WALL SECTIONS.DWG
FILE DATE: 8.27.2010 12:32:47 (MPW)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	GJP	3			
DRAFTED	MPW	2			
CHECKED	GJP	1			
DATE	AUGUST 2010	NO.	DATE	REVISIONS	BY APVD.

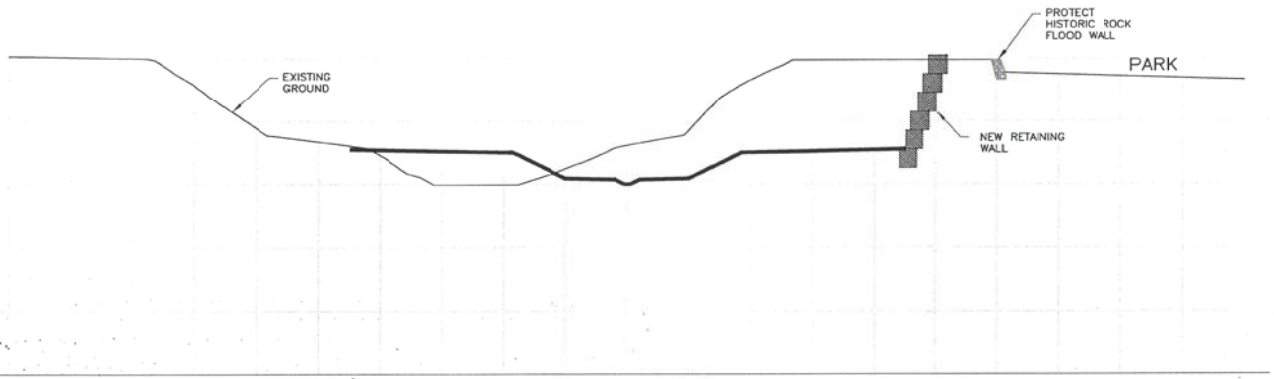
SCALE

The City of Rock Springs Wyoming

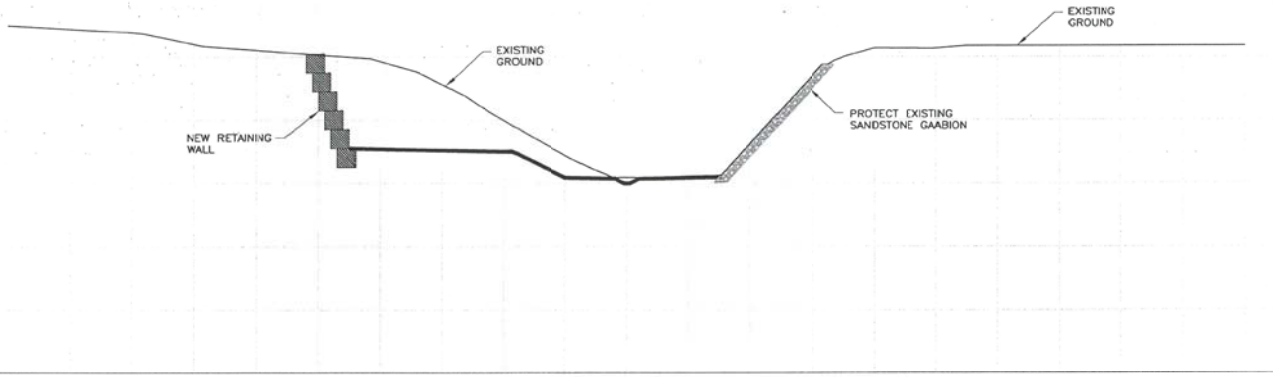
BITTER CREEK RECONSTRUCTION PLAN
PROTECTION OF HISTORIC FLOOD WALLS
CROSS SECTIONS

SHEET 1

344.02.200



Segment 4
Sta 195+00



Segment 4
Sta 205+75

0 10 20 30

NOTE: CROSS SECTIONS TAKEN LOOKING UPSTREAM

PROGRESS PRINT
8.27.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\344 - GENERAL MISC\02.210 - DET BASINS\CAD\BC WALL SECTIONS\HISTORIC FLOOD WALL SECTIONS.DWG
FILE DATE: 8.27.2010 12:32:47 (MPW)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	GJP
DRAFTED	MPW
CHECKED	GJP
DATE	AUGUST 2010

NO.	DATE	REVISIONS	BY	APVD.
3				
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1				

SCALE

The City of ROCK SPRINGS WYOMING

BITTER CREEK RECONSTRUCTION PLAN
PROTECTION OF HISTORIC FLOOD WALLS
CROSS SECTIONS

SHEET 2

344.02.200

FILE NAME: 344 – GENERAL MISC\02.200 – 08 BITTER CREEK – GJP\CADD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:21:23 (CAH)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	JEB
DRAFTED	JVH
CHECKED	GJP
DATE	DECEMBER 2009

NO.	DATE	REVISIONS	BY	APVD.
3				
2				
1				

SCALE: AS SHOWN

The City of ROCK SPRINGS Wyoming

BITTER CREEK RECONSTRUCTION PLAN
STA. 246+00 TO STA. 261+00

SHEET P–8

344.02.200

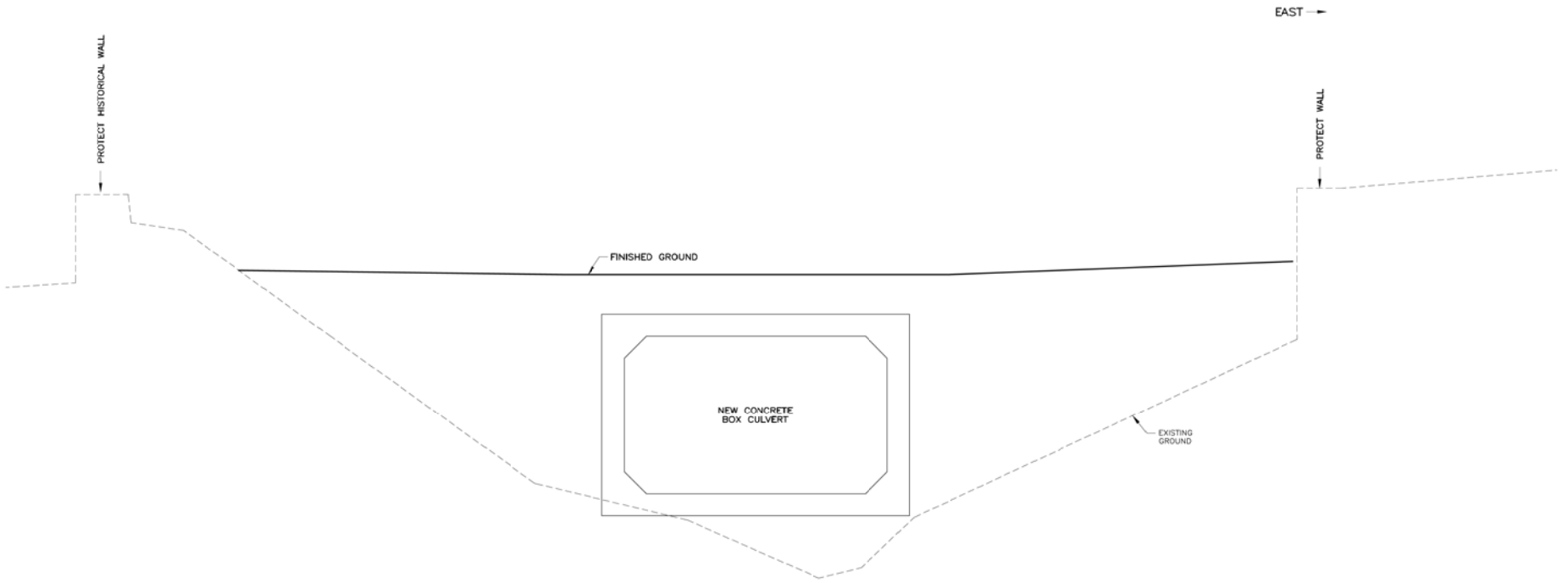
HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB	3				SCALE	The City of ROCK SPRINGS WYOMING	BITTER CREEK RECONSTRUCTION PLAN STA. 261+00 TO STA. 276+00	SHEET P-9
		DRAFTED JVH	2				AS SHOWN			344.02.200
		CHECKED GJP	1							
		DATE DECEMBER 2009	NO.	DATE	REVISIONS	BY	APVD.			

FILE NAME: 344 - GENERAL MISC\02.200 - 08 BITTER CREEK - GJP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:21:23
PLOT BY: JVH (CAM)
10/97

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB DRAFTED JVH CHECKED GJP DATE DECEMBER 2009	3 2 1 NO.	DATE	REVISIONS	BY	APVD.	SCALE AS SHOWN	BITTER CREEK RECONSTRUCTION PLAN STA. 201+00 TO STA. 216+00	SHEET P-5 344.02.200

FILE NAME: 344 - GENERAL MISC\02.200 - 08 BITTER CREEK - GJP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
PLT DATE: 11.25.2009 10:21:23 (CAH)

Figure A. Location of 48SW17183 Segments 5A and 5B. The intent is to install the culvert while protecting the historic walls. The culvert will allow higher soil elevations below the wall and would relieve the stress (both from erosion and stability) on the existing wall foundations.



TYPICAL CROSS SECTION STATION 29+00 TO 32+50
LOOKING DOWNSTREAM

0 1 2
SCALE IN FEET

PROGRESS PRINT
10.14.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\144 - GENERAL MISC\02.200 - 08 BITTER CREEK - GJP\CAD\DH_LEVEE\CADFILES\DH_XS_3102.DWG
FILE DATE: 10.14.2010 12:23:57 (GAU)

HANSEN ALLEN & LUCE, INC. ENGINEERS
LANDMARK DESIGN

DESIGNED TGA	3				
DRAFTED	2				
CHECKED GJP	1				
DATE OCTOBER 2010	NO.	DATE	REVISIONS	BY	APVD.

SCALE

The City of Rock Springs Wyoming

DEAD HORSE CANYON CREEK
GOBEL ST TO 2ND ST
TYPICAL CROSS SECTION

SHEET 2
344.02.219

Appendix 2

United States Army Corps of Engineers Permit

RESOLUTION NO. 2011- 05

A RESOLUTION ACCEPTING A DEPARTMENT OF THE ARMY PERMIT FROM THE CORPS OF ENGINEERS, OMAHA DISTRICT, WYOMING REGULATORY OFFICE, AND AUTHORIZING, CARL R. DEMSHAR, JR., AS MAYOR OF THE CITY OF ROCK SPRINGS, WYOMING, TO EXECUTE SAID ARMY PERMIT ON BEHALF OF SAID CITY.

WHEREAS, a Department of the Army Permit for the Bitter Creek Reconstruction Project, Bitter Creek Portion, has been submitted to the City of Rock Springs for acceptance; and

WHEREAS, the City of Rock Springs desires to accept said Army Permit.

NOW, THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF ROCK SPRINGS, STATE OF WYOMING:

Section 1. That the Army Permit from the Corps of Engineers, Omaha District, Wyoming Regulatory Office, for the Bitter Creek Reconstruction Project, Bitter Creek Portion, attached hereto and by this reference made a part hereof, is hereby accepted and approved by the City of Rock Springs, Wyoming.

Section 2. That the Mayor of the City of Rock Springs, be and he is hereby authorized, empowered and directed to execute said Army Permit, on behalf of said City; and that the City Clerk of said City, be and she is hereby authorized and directed to attach to each duplicate original of said Army Permit a certified copy of this resolution.

PASSED AND APPROVED this 4th day of January, 2011.

David M. Tate
President of the Council

Carl R. Demshar
Mayor

Attest:

Tina M. Iarufelli
City Clerk

THE STATE OF WYOMING)
COUNTY OF SWEETWATER) ss.
CITY OF ROCK SPRINGS)

I, Carl R. Demshar, Jr., Mayor of the City of Rock Springs, Wyoming, do hereby proclaim that the foregoing Resolution of the said City of Rock Springs was, on the date thereof, duly and regularly passed and approved by the City Council of the said City of Rock Springs and by the Mayor of said City and attested by the City Clerk of said City, and I do hereby proclaim the same to be in full force and effect from and after the date of its passage and approval.

Mayor

THE STATE OF WYOMING)
COUNTY OF SWEETWATER) ss.
CITY OF ROCK SPRINGS)

I, Lisa M. Tarufelli, City Clerk of the City of Rock Springs, Wyoming, do hereby certify that on this 4th day of January, 2011, the foregoing Resolution of the City of Rock Springs was proclaimed by the Mayor of said City to be in full force and effect from and after the passage thereof as set forth in said Resolution, and that the same was posted by me in the office of the City Clerk as directed by the City Council on the 4th day of January, 2011, at 8 p.m. of said day.

City Clerk

DEPARTMENT OF THE ARMY PERMIT

Permittee: City of Rock Springs

Permit No.: NWO-2008-02869

Issuing Office: Omaha District, Wyoming Regulatory Office (CENWO-OD-RWY)

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Bitter Creek Reconstruction Project, Bitter Creek Portion. The project area includes a 3.05-mile reach of Bitter Creek from the eastern crossing of Highway 376 (South Side Belt Route) to the confluence with Sweetwater Creek.

The project includes stream channel modifications necessary to conform to a Conditional Letter of Map Revision approved by the Federal Emergency Management Agency. Excavation activities would generate approximately 420,000 cubic yards of excess soil that would be hauled to the City Shop on Community Park Drive for processing. Any soil contaminated with petroleum products and other deleterious compounds would require disposal at an approved landfill. Proposed channel modifications would affect 1.08 acres of palustrine emergent wetland, 0.04 acre of palustrine scrub-shrub wetland, and 4.48 acres of stream channel. Stream banks would be stabilized using a combination of flatter slopes and retaining walls in areas where lateral expansion is constrained by urban development. The total volume of fill necessary to stabilize the channel would be approximately 7,400 cubic yards. Temporary cofferdams may be required to manage surface water during construction. Attachment 1 contains preliminary plans and cross-sections consisting of 18 drawings.

Project Location: The project area is located in Sections 25, 26, 34, and 35, Township 19 North, Range 105 West, Sweetwater County, Wyoming.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **December 31, 2015**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permittee must deliver a complete copy of this permit to all third parties involved in undertaking authorized activities.

2. The permittee must provide copies of final plans and specifications to the District Engineer at least 30 days prior to the date scheduled for initiation of construction. The permittee must receive written verification that this authorization remains valid for any proposed project modifications prior to initiating construction.

3. The permittee must implement all protective, conservation, and mitigative actions concerning preservation of Historic Flood Walls (Cultural Site 48SW17183) as defined in correspondence from the Wyoming Department of Environmental Quality (WDEQ) to the Wyoming State Historic Preservation Officer (WSHPO) dated November 5, 2010 contained in Attachment 2. Copies of all monitoring reports must be submitted to the District Engineer, WDEQ, and WSHPO. These three agencies must also be notified immediately if any previously unknown cultural resources are discovered during construction and all construction activity that may affect the resource must cease immediately. Construction will remain suspended until the District Engineer notifies the permittee and confirms that construction can resume.

4. The permittee must implement the *City of Rock Springs, Bitter Creek Reconstruction Project, Wetland Mitigation Plan* dated December 16, 2010 contained in Attachment 3, to compensate for wetland losses due to construction. The plan includes establishment of approximately 5.35 acres of wetland adjacent to a low-flow channel in the 2-year floodplain. Monitoring must be conducted annually for a period of four years beginning in the year after construction in accordance protocol defined in the mitigation plan. Reports that document monitoring results are due on October 30 each year monitoring is required. Wetland establishment must be successful, which is defined as having at least 3.2 acres of palustrine emergent and 0.12 acre of scrub-shrub wetlands in the same reach where wetland losses occur (Stations 193+00 to 273+00) with approximately 80% aerial coverage by hydrophytes and less than 5% noxious weeds. Additional mitigation measures could be required if success is not achieved within four years after completion.

5. That equipment for handling, conveying and discharging materials during construction shall be operated to prevent dumping or spilling the materials into the waters of the U.S. except as approved herein. Only those materials identified in the Project Description are authorized to be discharged.

6. That all soils containing petroleum compounds or other substances sufficient to be characterized as hazardous waste must be removed from the project area and disposed of at appropriate facilities. Hazardous waste is defined by the Wyoming Department of Environmental Quality, Solid & Hazardous Waste Division Chapter 2 regulations. Discharge of hazardous waste into Bitter Creek or adjacent wetland through redistribution of soil or by any other method is prohibited.

7. That all dredged or excavated materials, with the exception of that authorized herein, will be placed on an upland site above the ordinary high water line in a confined area, not classified as a wetland, to prevent the return of such materials to the waterway.

8. That during construction, no petroleum products, chemicals, or other deleterious materials shall be allowed to enter or be disposed of in such a manner so that they could enter the water and that precautions be taken to prevent entry of these materials into the water.

9. That all construction debris (which includes excess dredge and/or fill materials, wood, cleared vegetation, concrete, and all other materials not specifically addressed in the permit) will be disposed of on land in such a manner that it cannot enter a waterway or wetland.

10. That all work in the waterway is performed in such a manner so as to minimize increases in suspended solids and turbidity which may degrade water quality and damage aquatic life outside the immediate area of operation.

11. That only clean riprap materials will be utilized in order to avoid the percolation of fines which would result in excessive local turbidity.

12. That the clearing of vegetation will be limited to that which is absolutely necessary for construction of the project.

13. That all areas along the bank disturbed or newly created by the construction activity will be seeded with vegetation indigenous to the area for protection against subsequent erosion.

14. That owners of water supply intakes, or other activities that may be affected by suspended solids and turbidity increases caused by construction activity in the watercourse, shall be given sufficient notice to allow preparation for any changes in water quality.

15. That no more than half of the stream channel will be blocked at any one time so as not to diminish the flow downstream of the project.

16. That measures will be employed to prevent wet concrete from entering the waterway.

17. That concrete trucks will be washed at a site and in such a manner that wash water cannot enter the waterway.

18. That when the District Engineer has been notified that a dredging or filling activity is adversely affecting fish or wildlife resources or the harvest thereof and the District Engineer subsequently directs remedial measures, the permittee will comply with such directions as may be received to suspend or modify the activity to the extent necessary to mitigate or eliminate the adverse effect as required.

After a detailed and careful review of all conditions contained in this permit, the permittee acknowledges that, although said conditions were required by the U.S. Army Corps of Engineers, the permittee agreed to those conditions voluntarily to facilitate issuance of the permit and the permittee will comply fully with all permit conditions.

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the River and Harbors Act of 1899 (33 U.S.C. 403).

(**X**) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

_____ 1-5-11

(PERMITTEE) *(DATE)*

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Robert J. Ruch 1/10/11

(DISTRICT ENGINEER) *(DATE)*
Colonel, Corps of Engineers

By: _____
Matthew A. Bilodeau, Program Manager
Wyoming Regulatory Office

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE)	*(DATE)*

*U.S. GPO: 1988-520-324

MB
1-1

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

November 29, 2010

Mr. Timothy A. Kaumo, Mayor
City of Rock Springs
212 D Street
Rock Springs, WY 82901

RE: Certification of Department of the Army permit 2008-02869 to undertake the Bitter Creek Reconstruction Project. The project area is located in Sections 25, 26, 34, and 35 Township 19 North, Range 105 West, Sweetwater County, Wyoming.

Dear Mr. Kaumo:

In accordance with the provisions of Section 401 of the Clean Water Act, Wyoming Department of Environmental Quality (WDEQ) has reviewed the application and supplemental information submitted by Mr. Gregory J. Poole of Hansen, Allen and Luce, Inc. on your behalf.

The primary purpose of the project is flood control, with a secondary objective of stream enhancement, especially in previously altered reaches. Proposed channel modifications include excavation and widening, bank stabilization and re-grading, and construction of retention walls and grade control structures. Post-construction channel slope will be similar to pre-construction channel slope, and grade control structures will be constructed to allow passage of fish across a range of flows. The project will affect 1.08 acres of palustrine emergent wetland, 0.04 acres of palustrine shrub-scrub wetland, 0.27 acres of riverine aquatic bed, and 4.21 acres of other waters. The project will compensate for the affected wetlands through creation of a low flow channel and 2-yr flood channel. The 2-yr channel will be reseeded with sedges and grasses and stabilized with erosion control fabric. The constructed channel is expected to promote wetland development that exceeds existing acreage.

The following standard conditions apply when operating equipment or otherwise undertaking construction in water of the state:

1. Construction equipment should not be operated below the existing water surface except as follows:

US Army Corps of Engineers
WY Regulatory Office
Received
12/2/10

Vehicles and equipment should not push or pull material along the channel bottom. Work below the water surface which is essential for project completion (such as preparation of culvert bedding or footing installations) is acceptable to the extent that it does not create turbidity in excess of the Chapter 1 Surface Water Standards. Fording a stream at only one location is preferred. In all cases, frequent fording should not occur in areas where extensive turbidity will be created. In all game fisheries, activities associated with this permit shall not increase turbidity by more than 10 nephelometric turbidity units (NTUs).

In accordance with Section 23(c)(2) of the Chapter 1 Surface Water Standards, the administrator of the Water Quality Division may authorize temporary increases in turbidity above the numeric criteria in Section 23 (a) of the Standards in response to an individual application for a specific activity. An application must be submitted and a variance approved by the administrator before any temporary increase in turbidity above the numeric limits takes place.

2. Any temporary crossings, bridge supports, cofferdams, or other structures that will be needed during the period of construction should be designed to handle high flows that could be anticipated during the construction period. All structures should be completely removed from the stream channel at the conclusion of construction and the area restored to a natural appearance.

3. Care must be taken to minimize disturbance. Stream bank and wetland vegetation should be protected except where its removal is absolutely necessary for completion of the work.

Any vegetation, debris, or other material removed during construction must be disposed of at some location other than in a stream channel or wetland area, and where it cannot enter a stream channel or wetland during high stream flow or runoff events.

All cut and fill slopes that will not be protected with riprap should be re-vegetated with appropriate plant species to prevent erosion.

4. All fill should consist of suitable material and be compacted and subsequently protected from erosion. Areas to be filled should be cleared of all vegetation, debris and other materials that could destabilize the fill.

5. The period and timing of construction should be adjusted as necessary to minimize conflicts with fish migration and spawning, where applicable.

6. Measures must be taken to prevent any petroleum products, chemicals, or other deleterious materials from entering a water of the State. A spill contingency plan should be developed for all projects where a large amount of petroleum products or solvents will be stored on the project site, and must be prepared when storage of these materials exceeds the federal limits.

Other Related Water Quality Permitting Requirements

Erosion/Sediment Control: A WYPDES storm water permit for construction activities is required from the Wyoming Department of Environmental Quality (WDEQ) before any surface disturbance takes place for any project that will clear, grade, or otherwise disturb **one or more acres.** A general permit has been established for this purpose and either the project sponsor or general contractor is responsible for complying with the provisions of the general permit if total disturbance exceeds one acre, and for filing a Notice of Intent (NOI) if total disturbance exceeds five acres. The NOI should be filed no later than 30 days prior to the start of construction activity. Please contact Barb Sahl at 307-777-7570 for additional information.

The major requirements of the storm water general permit pertain to the development and implementation of a pollution prevention plan along with regular inspection of pollution control facilities. The permit is required for the surface disturbances associated with construction of the project, access roads, construction of wetland mitigation sites, borrow and stockpiling areas, and equipment staging and maintenance areas.

Non-Storm Water Discharges: A WYPDES discharge permit from WDEQ may be required for point source discharges to surface waters not related to storm water runoff such as discharges from gravel crushing and washing operations, cofferdam or site dewatering, vehicle or machinery washing, or other material processing operations if they are conducted. Depending on the type of operation, the length of operation, and the type of discharge either a general temporary discharge permit or an individual discharge permit may be required. Please be advised that if an individual permit is required, processing will require at least 90 days. Contact Roland Peterson at 307-777-7090 for additional information.

SPCC (Spill Prevention Control and Countermeasures): If above ground storage of petroleum products exceeds 1,320 gallons in total or more than 660 gallons in a single tank an SPCC plan may have to be developed as provided for in the Environmental Protection Agency's Oil Pollution Prevention regulations (40CFR112). The Region 8 EPA office in Denver should be contacted for guidance.

This letter constitutes state certification of this project as required by Section 401 of the Clean Water Act. Please be advised that this letter **is not an authorization to begin construction**. This letter does not exempt you or your contractor from any other federal, state or local laws or regulations, nor does it provide exemption from legal action by private citizens for damage to property that the activity may cause.

The Department also reserves the right to amend, modify, suspend or revoke this certification or any of its terms or conditions as may be appropriate or necessary to protect water quality and associated beneficial uses.

Sincerely,

Lou Harmon for
John Wagner for

John V. Corra
Director
Department of Environmental Quality

JVC/JFW/JRZ/rm/10-1047

cc: Julia McCarthy, US EPA Region 8, 1595 Wynkoop Street, Denver, CO 80202-1129
Thomas Johnson, USACE, 2232 Dell Range Blvd, Suite 210, Cheyenne, WY 82009
Gregory Poole, Hansen, Allen, and Luce, Inc. 6771 South 900 East, Midvale UT 84047

F:\Division\WQD\401\Individual\2010\NWO-2008-02869

City of Rock Springs
DA Permit No.: NWO-2008-02869

ATTACHMENT 1

Preliminary Project Plans

BITTER CREEK RECONSTRUCTION PLAN
STA. 143+00 TO STA. 156+00

SHEET P-1

344.02.200

SCALE AS SHOWN

CITY OF ROCK SPRINGS

LANDMARK DESIGN

DESIGNED	JEB
DRAFTED	JVH
CHECKED	GJP
DATE	DECEMBER 2009

NO.	DATE	REVISIONS	BY	APVD.
1				
2				
3				

FILE DATE 11.23.2009 10:01:03 (CAM)
FILE NAME 344 - 01CREEK_MISC\02.200 - 02 BITTER CREEK - GJP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG

BITTER CREEK RECONSTRUCTION PLAN
STA. 156+00 TO STA. 171+00

SHEET P-2

344.02.320

LANDMARK DESIGN

DESIGNED JEB
DRAFTED JVH
CHECKED GJP
DATE DECEMBER 2009

REVISIONS

NO.	DATE	BY	APVD.
1			
2			
3			

SCALE AS SHOWN

ROCK SPRINGS

FILE NAME 344 - GENERAL MISC\02.300 - CE BITTER CREEK - E:\PJ\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE 11.25.2009 10:31:23 (GMT)

FILE NAME 344 - GENERAL MISC\03.200 - 68 BITTER CREEK - EXP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:21:23 (DAN)

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DRAFTED JVH	2						
CHECKED GJP	1						
DATE DECEMBER 2009	NO.	DATE	REVISIONS			BY	APVD.

SCALE: AS SHOWN

BITTER CREEK RECONSTRUCTION PLAN
STA. 171+00 TO STA. 186+00

SHEET P-3

344.02.200

FILE NAME 344 - GENERAL MISC 02.200 - GB BITTER CREEK - GJP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:21:23 (GAI)

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB	3					SCALE	BITTER CREEK RECONSTRUCTION PLAN STA. 186+00 TO STA. 2011+00	SHEET P-4
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		CHECKED GJP	1							344.02.200
		DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.		

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	CHECKED GJP	1							
	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.		344.02.200

BITTER CREEK RECONSTRUCTION PLAN
STA. 201+00 TO STA. 216+00

FILE NAME 344 - GENERAL NOTES 02.200 - 03 BITTER CREEK - SUP\CAD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE 11:35:2009 10:31:03 (DAY)

FILE NAME 344 - GENERAL MISC\ 02.200 - 08 BITTER CREEK - GJP\ CAD\ PRELIMINARY DESIGN\ PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:31:23 (GJP)

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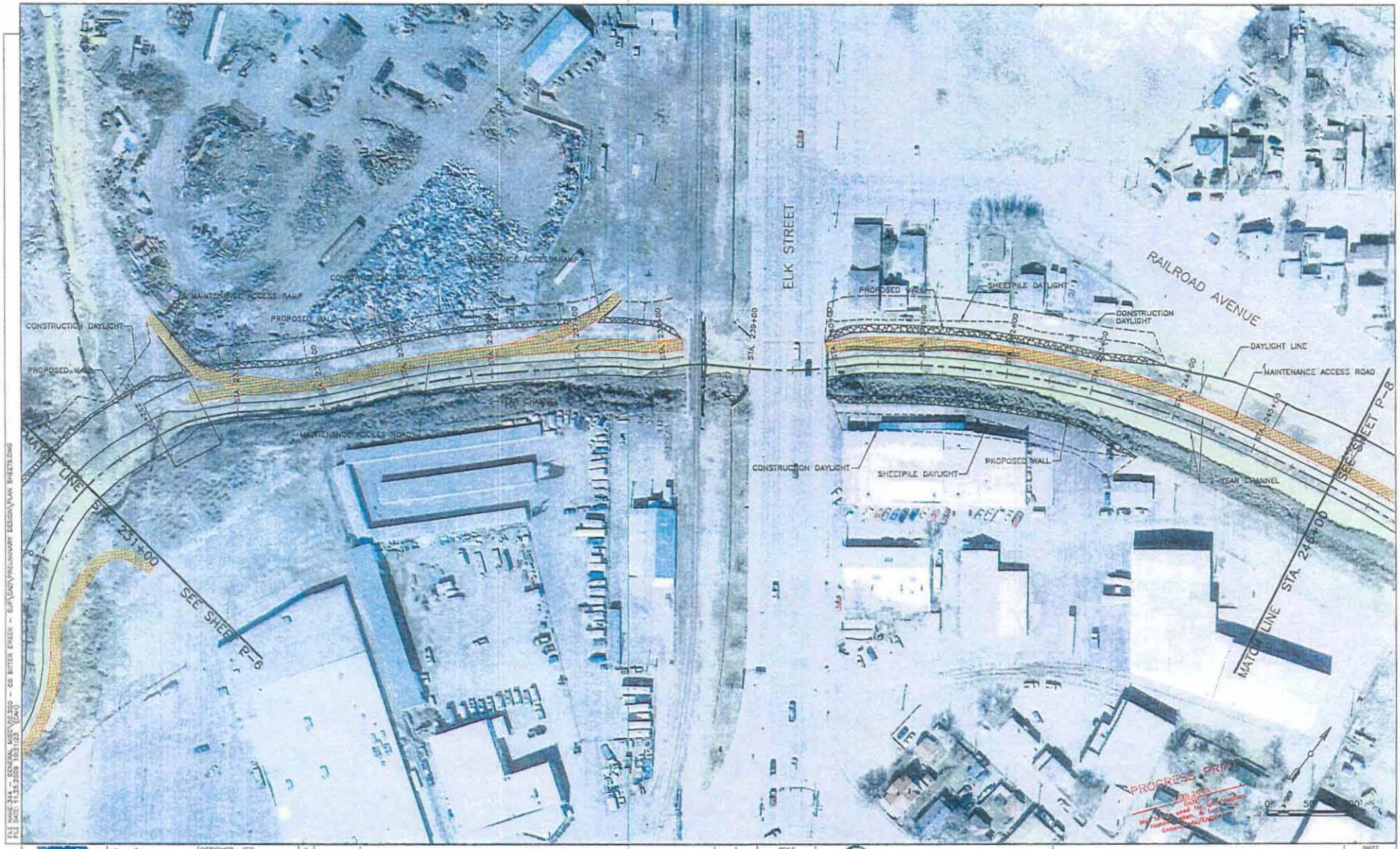
	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.		



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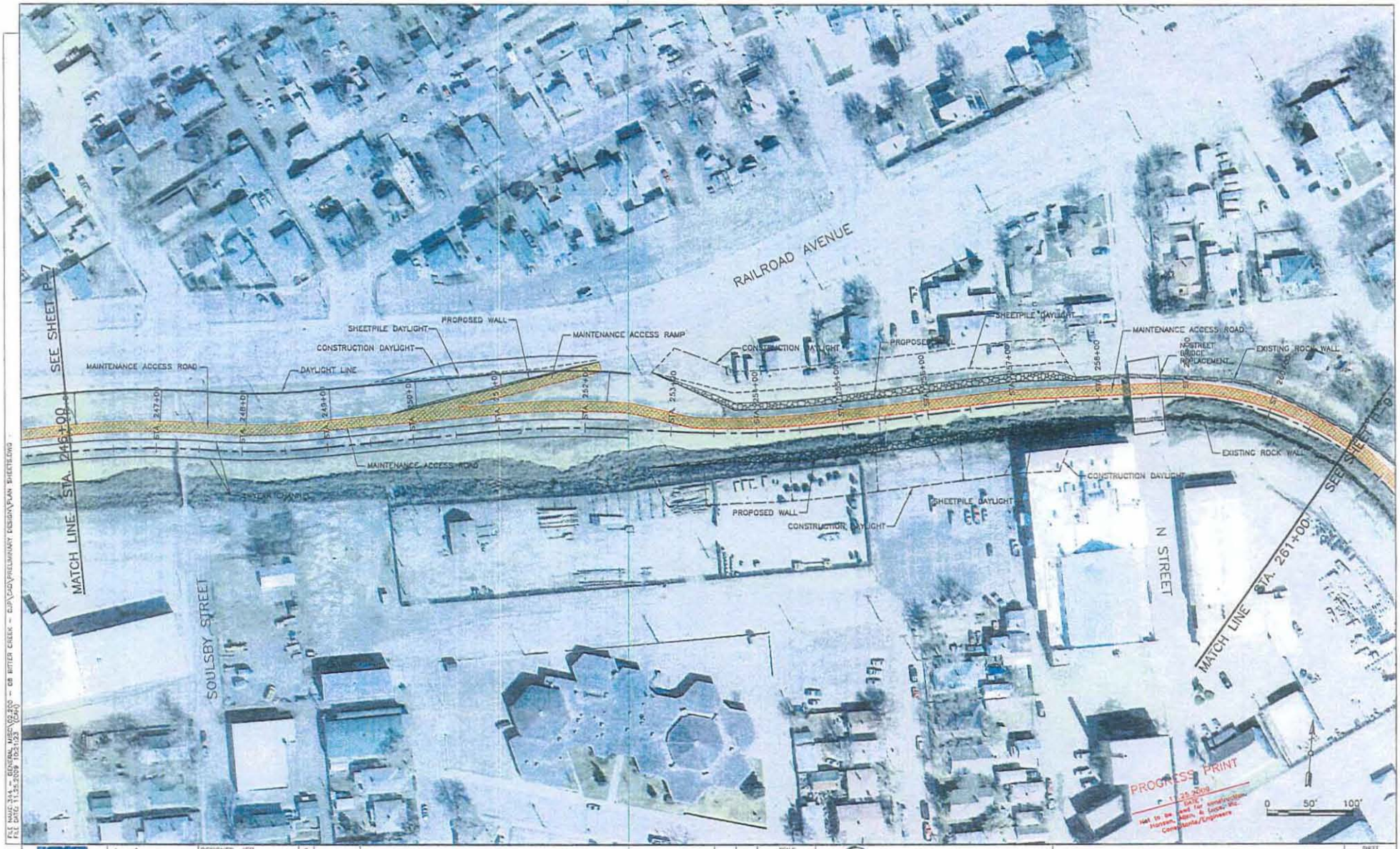
	CHECKED CJP	1					
	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.

SCALE: AS SHOWN

BITTER CREEK RECONSTRUCTION PLAN
STA. 231+00 TO STA. 246+00

SHEET P-7

344.02.200



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	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.

SCALE AS SHOWN

BITTER CREEK RECONSTRUCTION PLAN
STA. 246+00 TO STA. 261+00

SHEET P-8

344.02.200

FILE NAME: 344 – BENCHMARK MISC\02.200 – 08 BITTER CREEK – EJP\CAD\PRELIMINARY PLAN\PLAN SHEETS.DWG
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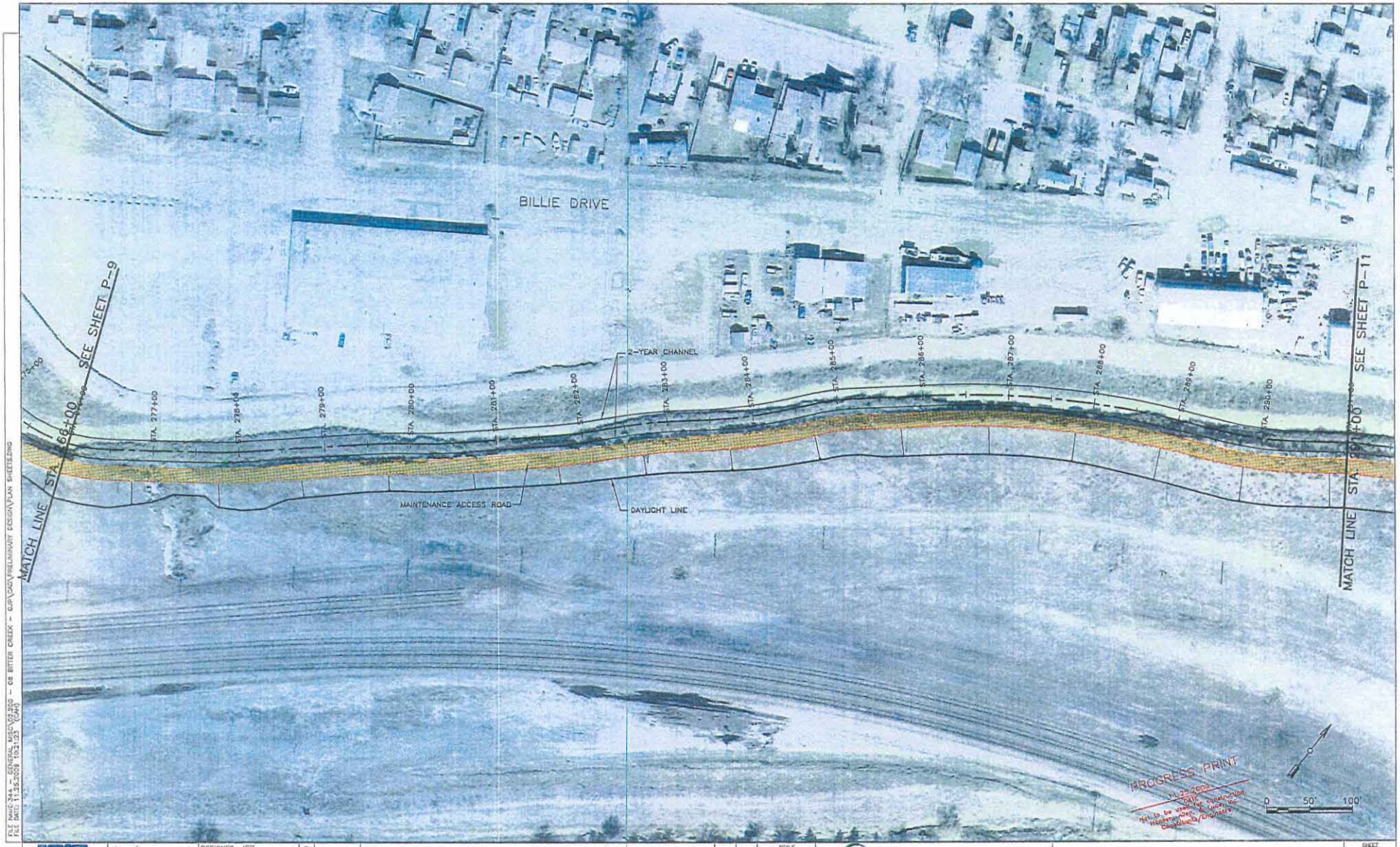

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FILE DATE 11.25.2009 10:21:23 (AM)

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	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.			344.02.200

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	DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.		

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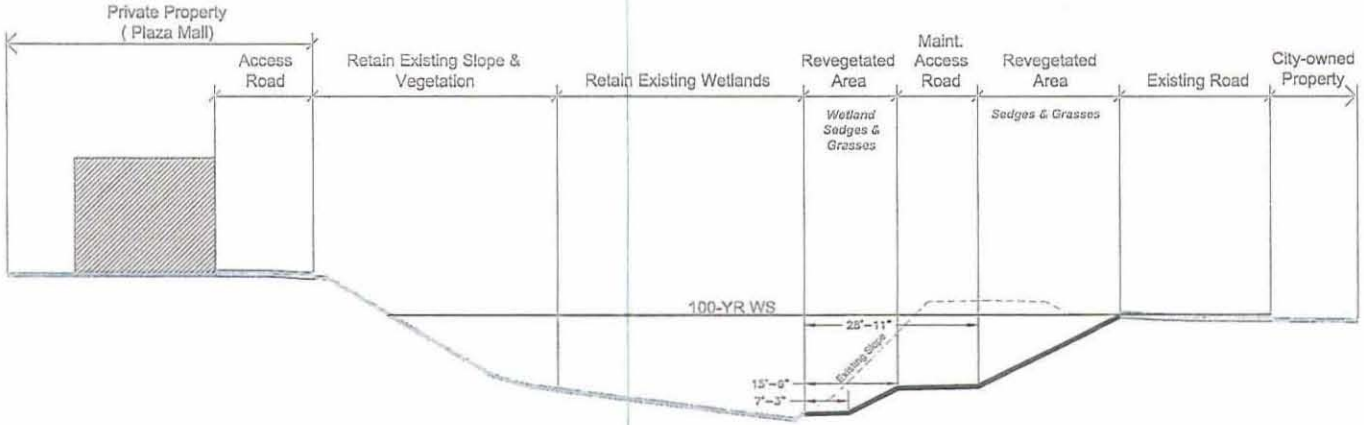
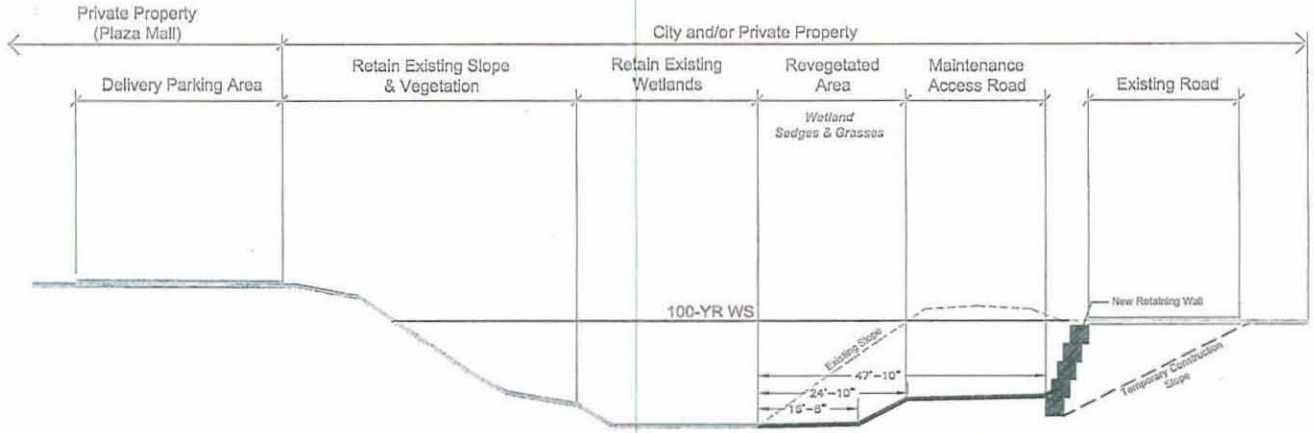
Sta 143+00 to Sta 155+70



Reach 2

Sta 155+70 to Sta 162+00



PROGRESS PRINT
8.25.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

HANSEN ALLEN & LUCE	LANDMARK DESIGN	DESIGNED JEB	3					SCALE	ROCK SPRINGS	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS	SHEET XC-1
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		DATE DECEMBER 2009	NO.	DATE	REVISIONS	BY	APVD.				

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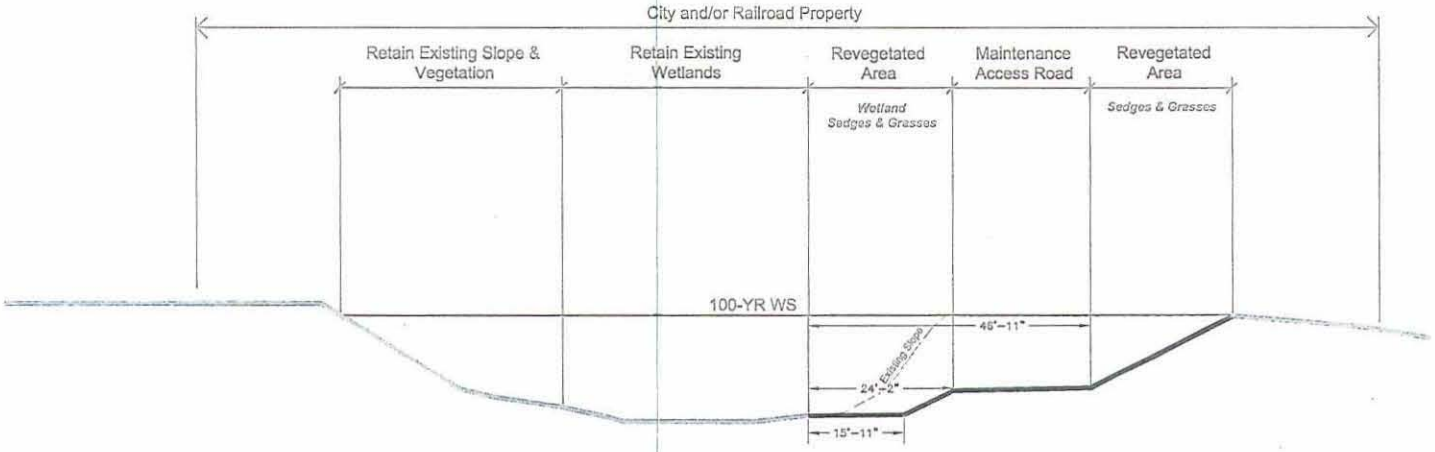
Reach 3

Sta 166+10 to Sta 188+50



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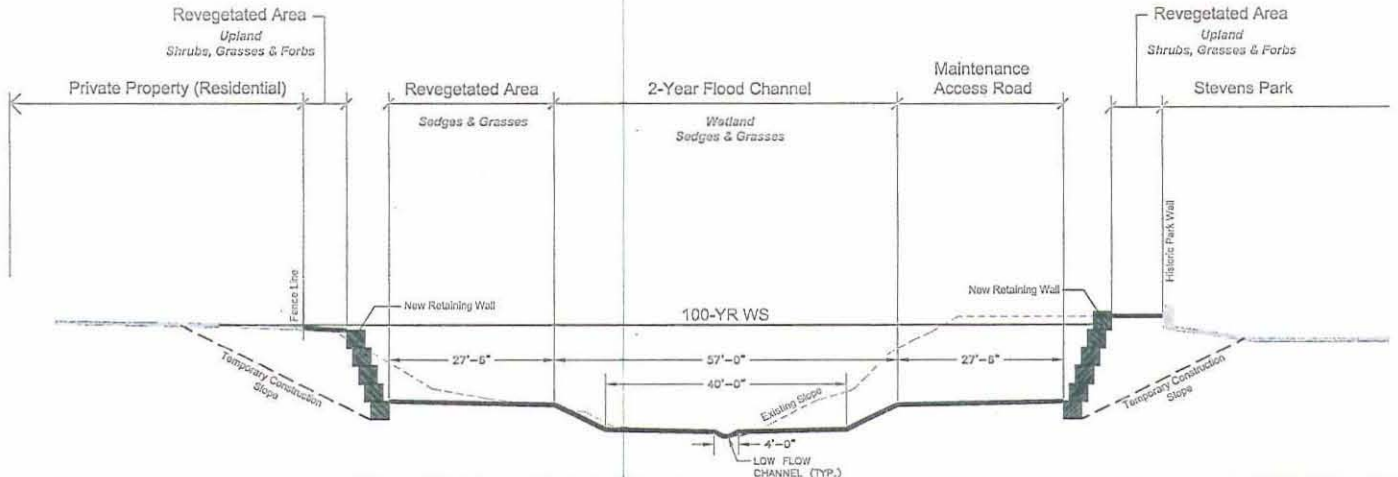

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Hansen, Allen, & Luce, Inc.
Consultants/Engineers

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB	3					SCALE	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS
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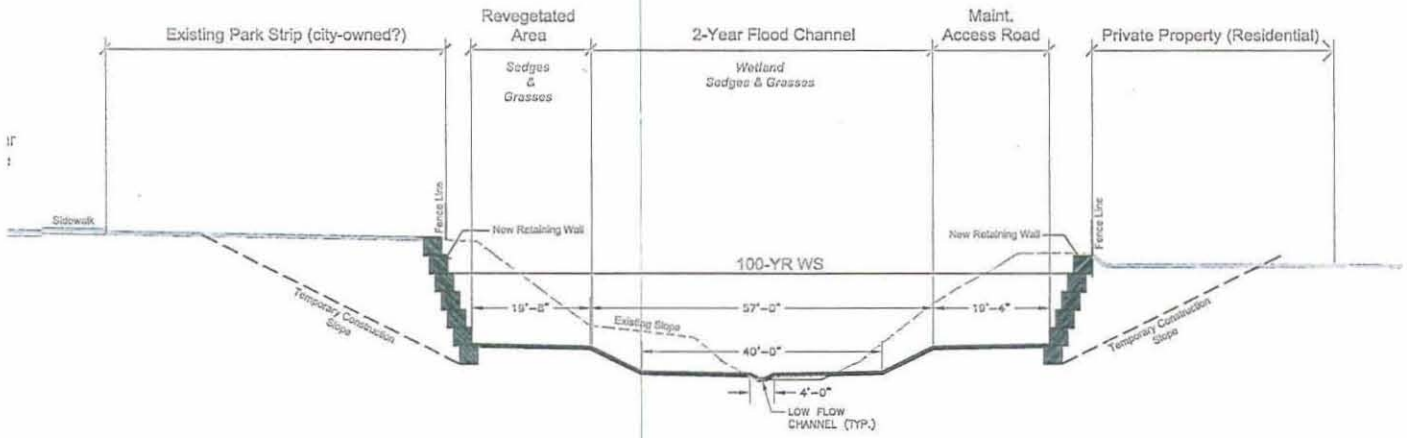
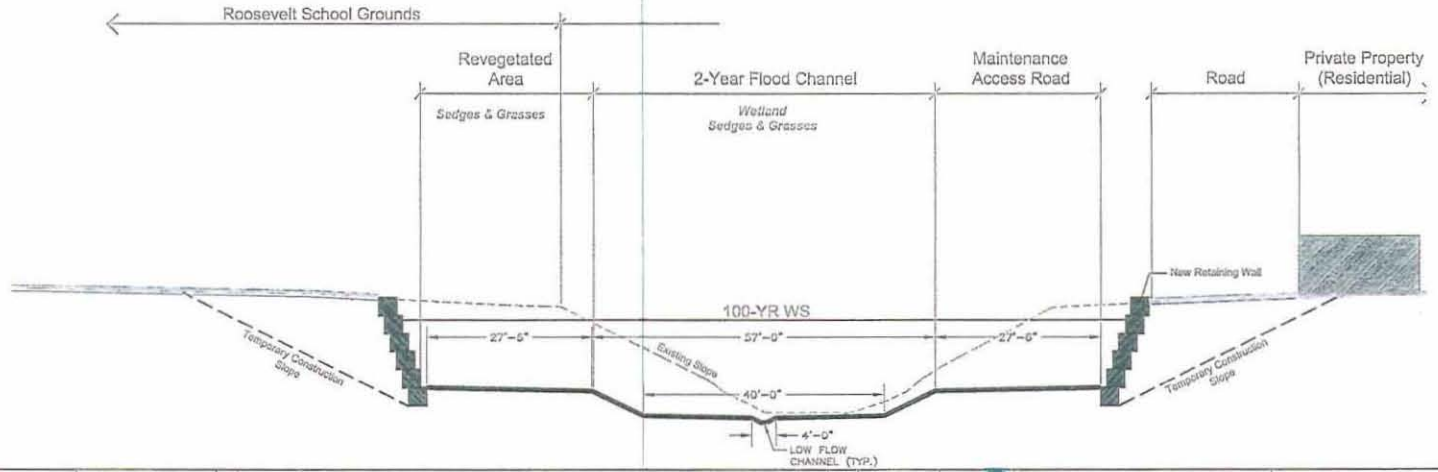
Reach 5

Sta 201+00 to Sta 205+80



Reach 6

Sta 208+50 to Sta 212+50



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Hansen, Allen, & Luce, Inc.
Consultants/Engineers

HANSEN ALLEN & LUCE	LANDMARK DESIGN	DESIGNED JCB	3			SCALE	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS
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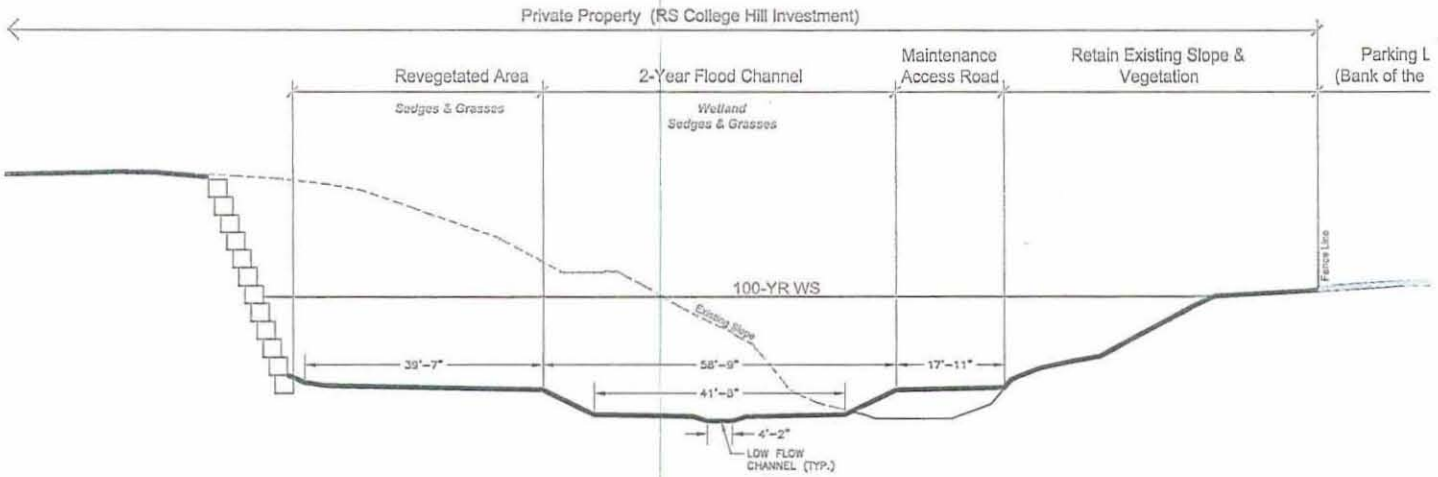
SHEET XC-3
344.02.200

Reach 7

Sta 212+50 to Sta 232+70



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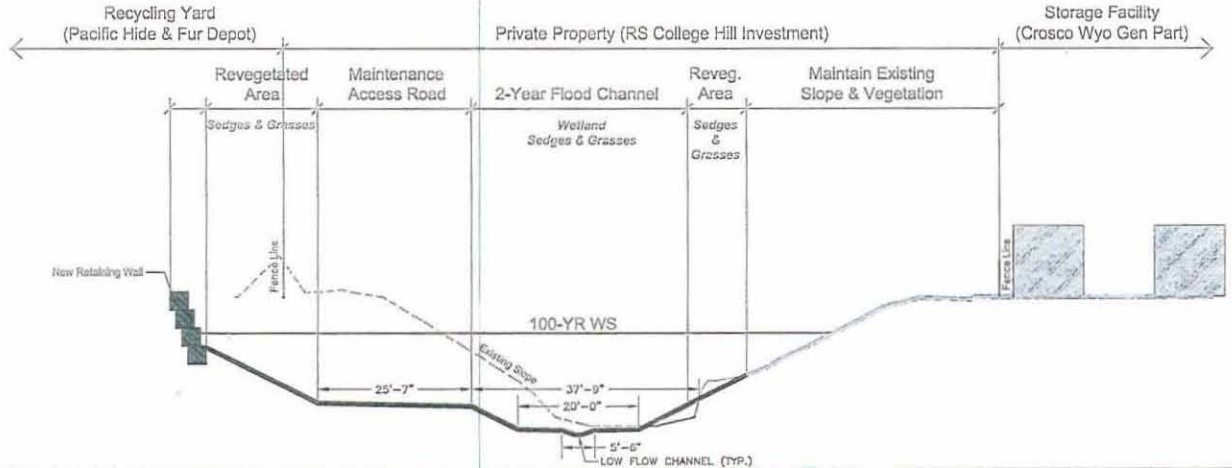
Sta 232+70 to Sta 238+40



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Hunsaker, Baker, & Lutz, Inc.
Consultants/Engineers

HUNSAKER BAKER & LUTZ	LANDMARK DESIGN	DESIGNED JEB	3					SCALE	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS
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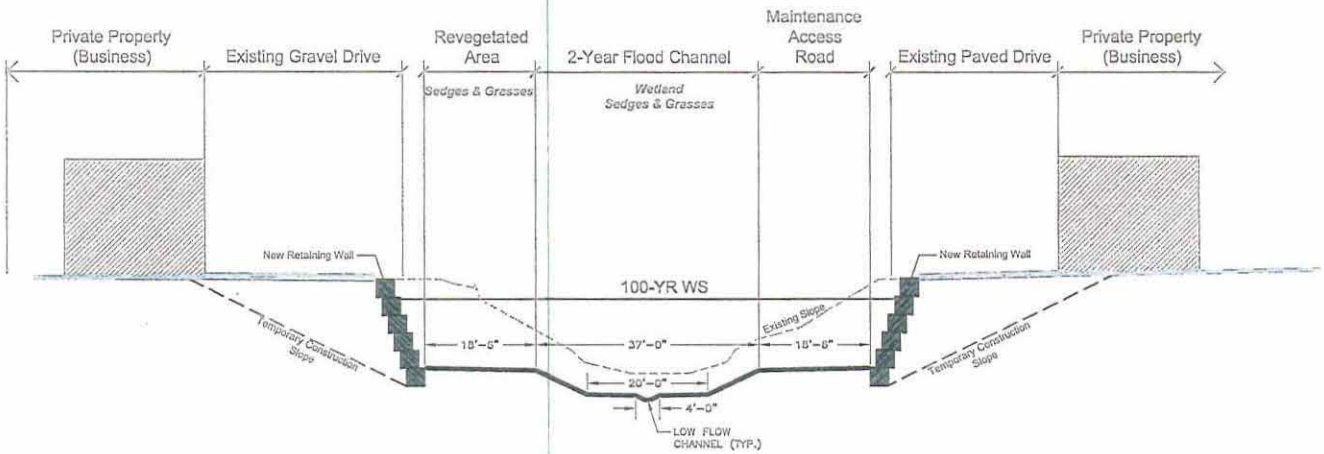
		CHECKED GJP	1						
		DATE DECEMBER 2009	NO.	DATE	REVISIONS		BY	APVD.	SHEET XC-4 344.02.200

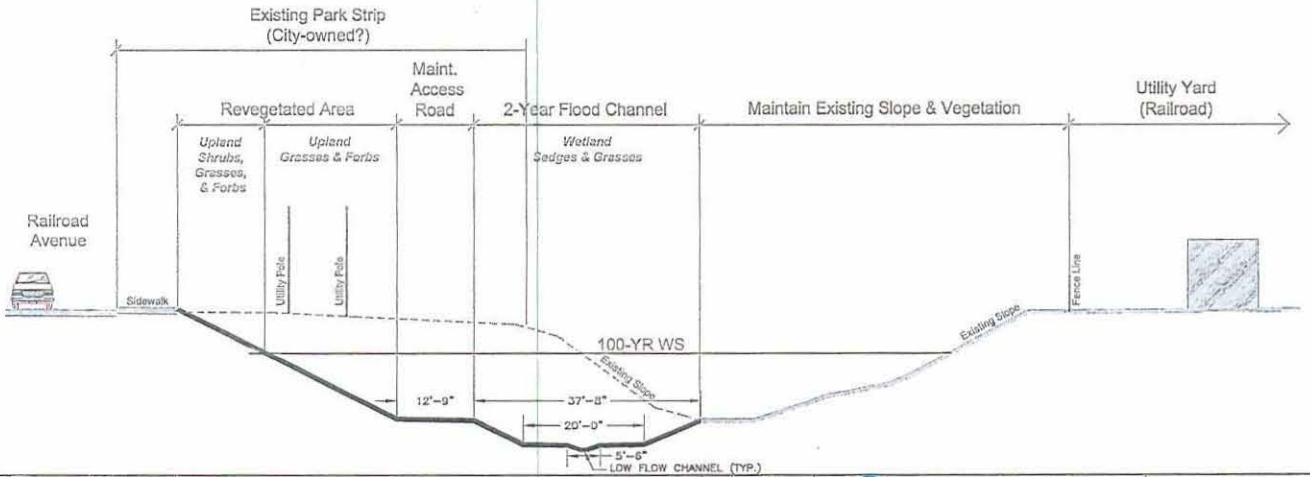
Reach 9

Sta 240+60 to Sta 243+80



Reach 10

Sta 243+80 to Sta 254+00



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8.25.2010
DATE
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Hansen, Allen, & Luce, Inc.
Consultants/Engineers

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FILE DATE: 8/25/2010 11:24:05 (CAH)

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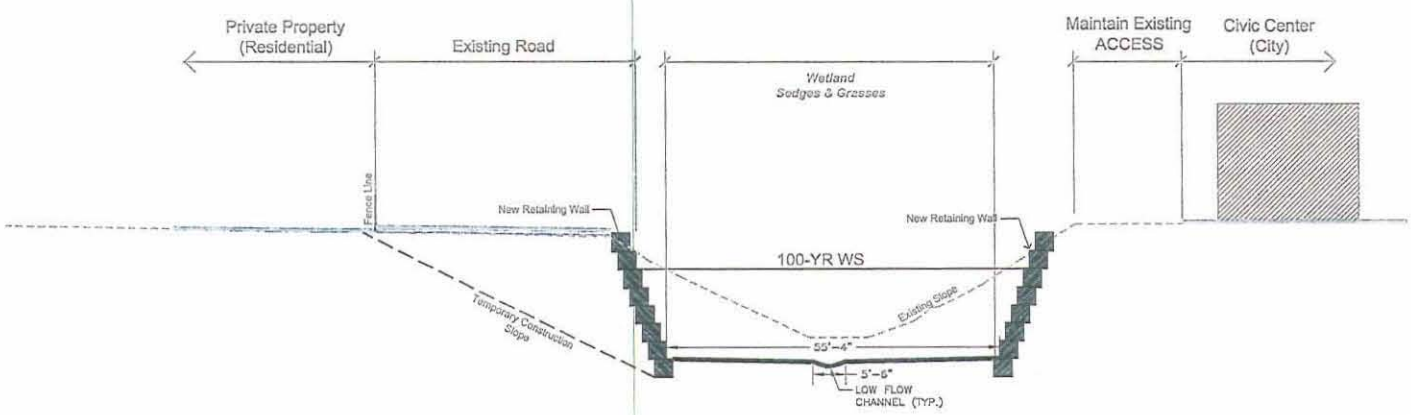
		DATE DECEMBER 2009	NO.	DATE	REVISIONS	BY	APVD.		

SHEET XC-5
344.02.200

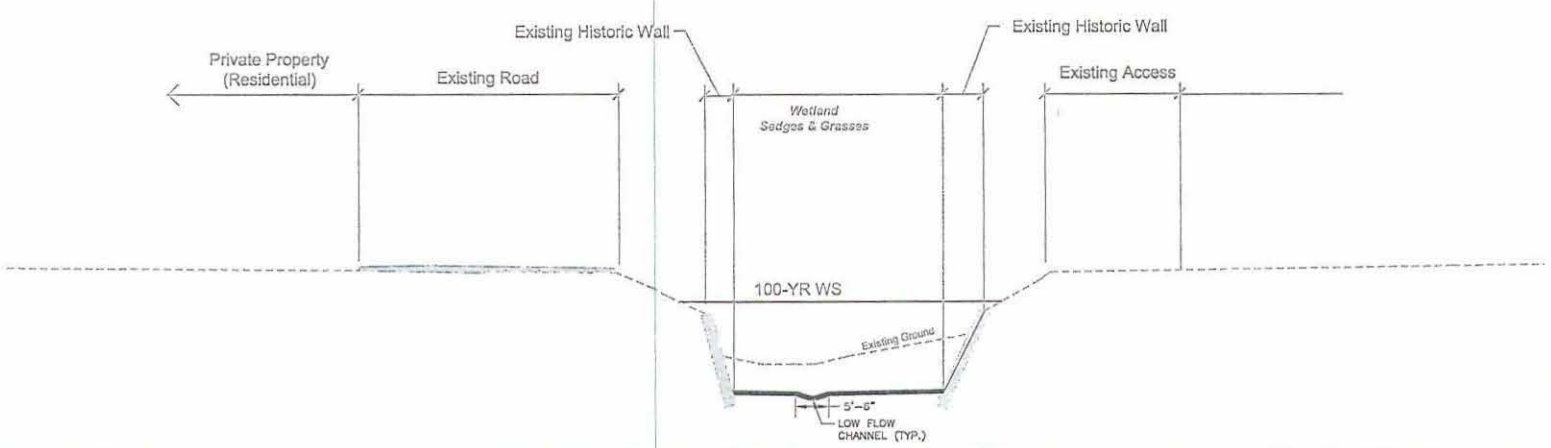
Reach 11

Sta 257+64



Reach 11

Sta 262+00



PROGRESS PRINT
8.25.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

HANSEN ALLEN & LUCE	LANDMARK DESIGN	DESIGNED JEB	3					SCALE	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS
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		DATE DECEMBER 2009	NO.	DATE	REVISIONS	BY	APVD.		

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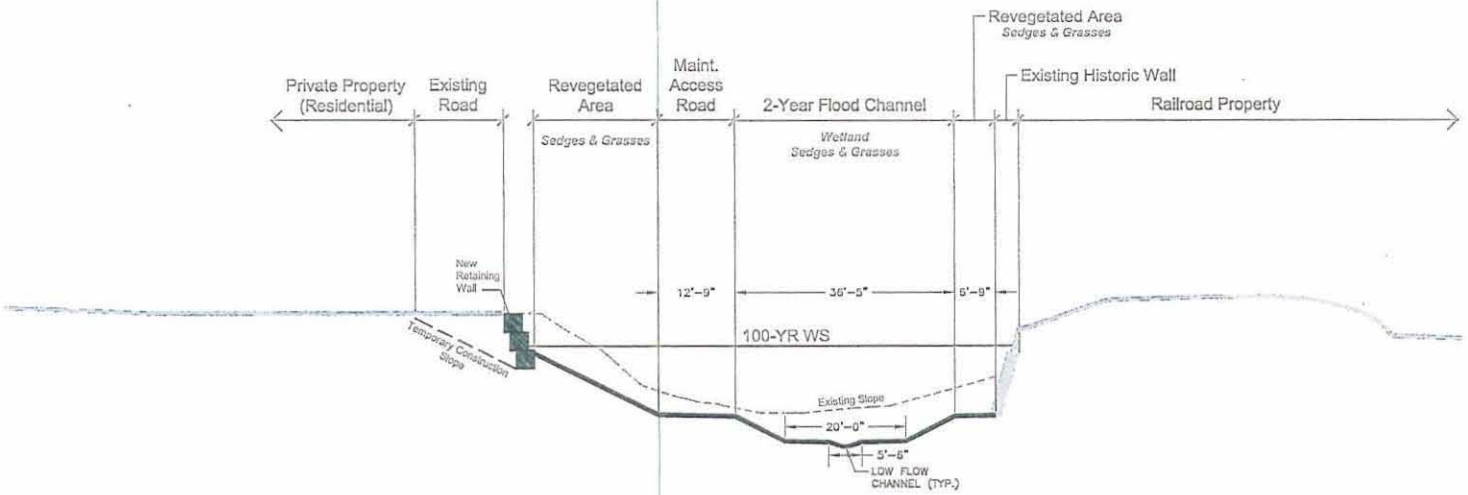
Reach 12

Sta 265+70 to Sta 270+30



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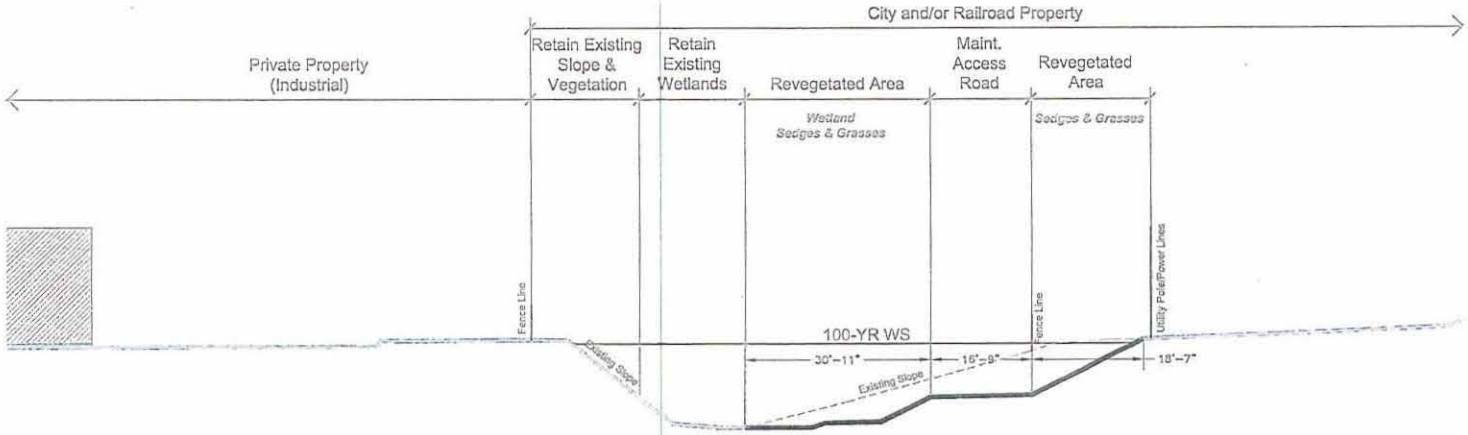
Sta 273+40 to Sta 303+20



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8.25.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\344 - GENERAL WORK\02.200 - CB BITTER CREEK - CJP\CAD\PRELIMINARY DESIGN\XC SECTIONS_120709\XC SECTIONS_120709.DWG
FILE DATE: 8.25.2010 11:34:08 (CAH)

HANSEN ALLEN & LUCE	LANDMARK DESIGN	DESIGNED JEB	3						SCALE	ROCK SPRINGS	BITTER CREEK RECONSTRUCTION PLAN CROSS SECTIONS	SHEET XC–7
		DRAFTED JH	2									
		CHECKED GJP	1									344.02.200
		DATE DECEMBER 2009	NO.	DATE	REVISIONS			BY	APVD.			

City of Rock Springs
DA Permit No.: NWO-2008-02869

ATTACHMENT 2

Historic Properties Preservation

ARTS. PARKS. HISTORY.
Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
http://wyoshpo.state.wy.us

RECEIVED
NOV 30 2010
DEQ-AML Lander

29 November 2010

Marcia Murdock
AML NEPA Compliance Coordinator
Department of Environmental Quality
510 Meadowview Dr.
Lander, WY 82520

Re: Rock Springs Bitter Creek Reconstruction Project (SHPO File # 0209KLH003)

Dear Ms. Murdock:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that the truss bridge, 48SW17927, and the Colony Coal Mine railspur, 48SW17926 are not eligible for listing in the National Register of Historic Places. We also concur that the Segment 3D of the Flood Control Structure along the Dead Horse Canyon Flood Diversion Channel, 48SW17183, and Segments 5A and 5B of the Flood Control Structures along the Dead Horse Canyon Flood Diversion Channel, 48SW1783, are eligible for listing in the National Register of Historic Places.

We also concur that the Bitter Creek Flood Controls, 48SW1718, and the Flood Control Structures along the Dead Horse Canyon Flood Diversion Channel, 48SW1783, will not be adversely affected by the project as planned. However, if, as the project progresses, the plans change and the project adversely affects any historic resources, further consultation with our office will be necessary.

This letter should be retained in your files as documentation of a SHPO concurrence on your finding of no historic properties adversely affected. Please refer to SHPO project # 0209KLH003 on any future correspondence regarding this project. If you have any questions, please contact me at 307-777-7828.

Sincerely,

Kara Hahn

Kara Hahn
National Register Coordinator

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

7007 1490 0002 1624 1240

November 5, 2010

Ms. Mary Hopkins, State Historic Preservation Officer
Wyoming Department of State Parks and Cultural Resources
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002

Re: Continued Consultation Rock Springs Bitter Creek Reconstruction Project and transmittal of Additional Class III Cultural Resource Inventory for Dead Horse Canyon Work Area (Ref #0209KLH003)

Dear Ms. Hopkins:

In January 2009, AML initiated consultation with your office regarding the Bitter Creek Reconstruction Project. This is a project for which the City of Rock Springs (City) is proponent, but AML is involved because some AML funds were provided to the City by the Wyoming Legislature. This rendered the Office of Surface Mining the lead federal agency on this consultation. Because this undertaking requires an Army Corps of Engineers (COE) wetland permit, COE is also a party to this consultation. The City of Rock Springs is also a party in this consultation as the project proponent. Our initial consultation identified some historic floodwalls (48SW17183) from a WPA project, referred to hereafter as the "Bitter Creek Floodwalls", as National Register of Historic Places-eligible, and potentially adversely affected by this undertaking if the impacts to this resource were unmitigated. Further project development now allows to us revise the initial finding on this undertaking. Given the increased details of the planning and design, as well as further evaluation, our finding is that this project can proceed with no adverse effect on cultural resources, provided that avoidance and mitigation strategies discussed in detail below are followed. The long-term effect of this project will ultimately be a positive one in that historic resources discussed in this report will be protected and conserved, and the project itself, once complete will provide a number of other historic resources with flood protection.

During the intervening time period, project designs have advanced and the potential impacts to these walls are now better defined. Designs now incorporate protective measures that will mitigate the effect to these historic structures. Also, in a recent development, while the City was working with FEMA, an additional Area of Potential Effect (APE) was identified within the Dead Horse Canyon drainage basin. The recently completed cultural survey of that expanded APE identified additional segments of historic floodwalls (48SW17183), referred to hereafter as the "Dead Horse Floodwalls", from the same historic period. This letter transmits the Class III Cultural Report on the expanded APE, and also presents our revised findings of effect on the

US Army Corps of Engineers
WY Regulatory Office
Received
11/8/10

Bitter Creek Floodwalls as well as a finding of effect on the newly identified Dead Horse Floodwalls. In short, the Project engineer has identified methods to reduce and mitigate the potential effect to these cultural resources, and we now find that that adverse effect on these resources can be avoided, provided that the protective measures are carefully implemented.

In addition to identifying the new floodwall segments in the Dead Horse Canyon Flood Diversion Channel and adding these floodwalls to the description and designation of 48SW17183, the expanded survey identified two other historic features. These include a truss bridge identified as 48SW17927 and a railroad spur that served the CC&C No. 2 Mine, identified as 48SW17926. Both of these new features were evaluated as not eligible to the NRHP, therefore the proposed undertaking will not affect these.

Because all of the identified historic floodwalls are included as part of 48SW17183, and these have been found to be eligible for listing on the NRHP, avoidance and mitigation strategies have been developed to protect and conserve this resource. The following discussion and the attached drawings illustrate the protective, conservation, and mitigative actions proposed by the City, specific to the different floodwall areas, to ensure that adverse effect on these resources can be avoided.

Monitoring

For any construction work on and around both areas with historic floodwalls, the City shall ensure that a qualified archeologist is present to monitor excavation, and the walls as exposed during construction will be recorded photographically by the archeological monitor. It is anticipated that work around the floodwalls will occur during different phases of construction work, therefore, separate reports for each such construction phase that will involve proximity to the floodwalls will be required. The documentary photographs will be included in the monitoring reports that will be submitted to SHPO upon conclusion of work at each floodwall location (i.e., one report for the Dead Horse Floodwalls, and another report for the Bitter Creek Floodwalls). The monitoring archeologist will provide input into the effect of repairing or stabilizing the historic floodwalls such that their integrity will be preserved during the construction and thereafter to the extent possible.

During construction monitoring, in the event it is determined that adverse effect to a given wall segment is unavoidable, SHPO will be consulted, and the resource will be recorded at a level of detain equivalent to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation.

There is the possibility that unanticipated cultural resources may be discovered. If potential cultural resources are discovered during subsurface excavations at the site of construction, the following procedures will be instituted. Construction will cease at the location of discovery, and a qualified archeologist will assess the value of these potential cultural resources and make recommendations to the City and SHPO on the discovery. If the archeologist determines that the

potential find is a bona fide cultural resource, then work will be suspended at that location until data recovery or another such appropriate mitigative action, agreed to by SHPO, can be completed.

Protection of Bitter Creek Floodwalls

The City plans to preserve and protect the existing historic Bitter Creek Floodwalls (48SW17183), and has incorporated these structures into the project design. There is also a historic Gabion slope mattress structure that will be protected and restored as needed. Construction will be conducted to be protective of the historic Bitter Creek floodwalls. Whenever construction will occur at or immediately adjacent to the floodwalls, an archaeological monitor shall be present. The construction project will be conducted such that damage to the walls will be avoided. In addition to avoiding damage to the existing walls, the historic walls may require stabilization and/or repair.

In areas where the Bitter Creek reconstruction project includes excavation along the toe of an historic wall the following steps may be implemented as required to preserve the wall. This protective strategy includes Segment 3D, which is also discussed in the attached report.

Prior to construction, the walls will be investigated by pothole excavation, likely using a vacuum truck, to define the elevation of the toe of the existing wall. This information will be used to design a sheet pile or other means for stabilizing the toe if needed. If sheet pile is used, it will be driven along the base of the wall in the channel prior to excavation for the deepened channel. This action is anticipated to provide toe stability beneath the existing wall as sediment is subsequently excavated from around the wall.

As the walls are uncovered, and the need for appropriate repairs is evaluated, the monitoring archeologist will assist in definition of the actual prescription for repair of the wall, if needed. Because of substantial sedimentation in some areas, the condition of the walls, and the amount of repair needed, cannot be known until the walls are completely uncovered. The ultimate goal will be protection and stabilization of the historic walls. During this process, the items that will be evaluated are anticipated to include such questions as follow:

- Assess functionality and condition of the wall segment.
- If the wall is deteriorating, what are the consequences if the wall is not repaired?
- If the wall is to be repaired, define repair means. Examples could include replacing missing stones or rebuilding the Gabion mattress where corroded wire reinforcement threatens its integrity.

The attached drawings, Sheet 1 and Sheet 2, provide an illustration of drainage cross-sections where the Bitter Creek Floodwalls presently exist. As can be seen from these illustrations, a considerable amount of infill sediment must be removed to uncover the walls and provide acceptable flow capacity for the reconstructed channel. Where the channel is reconfigured, engineering controls such as hard armoring or vegetation plantings will help control erosion around the historic walls, and provide additional stability of the channel surrounding the walls.

Attached Sheets P-8 and P-9 provide location context for the Bitter Creek Floodwalls (labeled as existing rock walls). Attached Sheet P-5 provides location context for the historic Gabion slope mattress.

Protection of Dead Horse Floodwalls

During FEMA review of project components, it was determined that some existing levees along the Dead Horse Canyon drainage will require reconstruction in order for them to be accepted by FEMA. This portion of Dead Horse Canyon drainage was not initially evaluated because construction here was not planned. The attached Class III Cultural Report presents the findings of the cultural survey for this work area within the expanded APE for the undertaking.

The new survey identified additional WPA-era floodwalls along a portion of the Dead Horse Canyon work area. These floodwalls are considered to be part of the originally identified floodwall group designated as 48SW17183 (eligible, SHPO concurrence). It has been determined that the Dead Horse Floodwalls (Segments 5A and 5B) can be avoided by construction, and in fact, the stability of the floodwall structure would be enhanced by the proposed action at this location. See attached Figure A.

Construction will be conducted to be protective of the historic Dead Horse Floodwalls. Whenever construction will occur at or immediately adjacent to the floodwalls, an archaeological monitor shall be present. The construction project will be conducted such that damage to the walls will be avoided. Although construction is expected not to affect the Dead Horse Floodwalls, if it is later determined by the archaeological monitor that adverse effect to a given wall segment is unavoidable, SHPO will be consulted, and the resource will be recorded at a level of detain equivalent to Historic American Building Survey/Historic American Engineering Record (HABS/HAER) documentation.

The proposal to install a box culvert would allow higher soil elevations beneath the wall and would relieve the stress (both from erosion and stability) on the existing wall foundations. Because the floodwaters would be contained within in the buried box culvert, there would no longer be erosion damage to the floodwalls, and the higher ground surface would reduce the potential for slumping beneath the walls.

Rather than enlarge the existing levees in that drainage segment to bring them into compliance with current FEMA specifications, the proposal is to install a closed concrete box culvert to fully contain the flood flow. With the culvert installed, the area would be completely backfilled over the culvert, leaving a flattened trough in the area below the Dead Horse Floodwalls (see attached Sheet 2). The added soil over the culvert would bring the grade back up below the walls, providing better support to the toe of the walls which are presently failing due to extensive erosion beneath them. The walls themselves would not be involved with or incorporated into the construction, but would instead be avoided. This design, as illustrated in the attached report, is anticipated to provide better protection of the adjacent properties through containment of the flow, and also to provide greater stability of the floodwalls and individual retaining walls that

have been built by private landowners along this reach. The present configuration of the levees in this location is unstable, and repair would be much more complicated than installation of the proposed box culvert. The levees in the locale have likely been reworked several times since they were built, and some of the local residents have individually affected the levee, and perhaps stability of the walls as well, with individual construction actions along their lot lines over time.

The mitigative actions would be to provide better structural stability by stabilizing the toe of the material presently supporting the walls, and by covering the concrete culvert and restoring a trough-like drainage appearance, the visual impact would be mitigated (the culvert would be hidden from view). In addition to these protective actions, the ultimate configuration of the location may involve installation of a walking path over the culvert, along the walls, providing the public with the opportunity to view the walls close up.

Reporting

Rock Springs shall provide a final monitoring report, with photographs, to SHPO detailing results of mitigation procedures and any incidental data recovery no later than ninety days (90) following the completion of construction at each floodwall location.

In consideration of the protection and mitigation actions stipulated in the discussion above, OSM and COE find that there will be no adverse effect on these cultural resources provided that all stipulations are met. Please provide me with a letter of concurrence on this project. This consultation will be used in completion of required NEPA documentation on the project by both AML/OSM and COE. Should you require further information, or wish to discuss our findings in greater detail, please contact me at (307) 335-6946.

Sincerely,

Marcia B. Murdock

Marcia B. Murdock
AML NEPA Compliance Coordinator

cc Alan Edwards, Grant File (w/o attachments)
Thomas Johnson, COE Cheyenne (w/o attachments)
Jan Striefel, Landmark Design (w/o attachments)
Jennifer Shields, City of Rock Springs (w/o attachments)
Chron File

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB DRAFTED JVH CHECKED GJP DATE DECEMBER 2009	3 2 1 NO.	DATE	REVISIONS	BY	APVD.	SCALE AS SHOWN	BITTER CREEK RECONSTRUCTION PLAN STA. 201+00 TO STA. 216+00	SHEET P-5 344.02.200

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PLT DATE: 11.25.2009 10:21:23 (CAH)

FILE NAME: 344 – GENERAL MISC\02.200 – 08 BITTER CREEK – GJP\CADD\PRELIMINARY DESIGN\PLAN SHEETS.DWG
FILE DATE: 11.25.2009 10:21:23 (CAH)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	JEB
DRAFTED	JVH
CHECKED	GJP
DATE	DECEMBER 2009

NO.	DATE	REVISIONS	BY	APVD.
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1				

SCALE: AS SHOWN

The City of ROCK SPRINGS Wyoming

BITTER CREEK RECONSTRUCTION PLAN
STA. 246+00 TO STA. 261+00

SHEET P–8

344.02.200

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB	3				SCALE	The City of ROCK SPRINGS WYOMING	BITTER CREEK RECONSTRUCTION PLAN STA. 261+00 TO STA. 276+00	SHEET P-9
		DRAFTED JVH	2				AS SHOWN			344.02.200
		CHECKED GJP	1							
		DATE DECEMBER 2009	NO.	DATE	REVISIONS	BY	APVD.			

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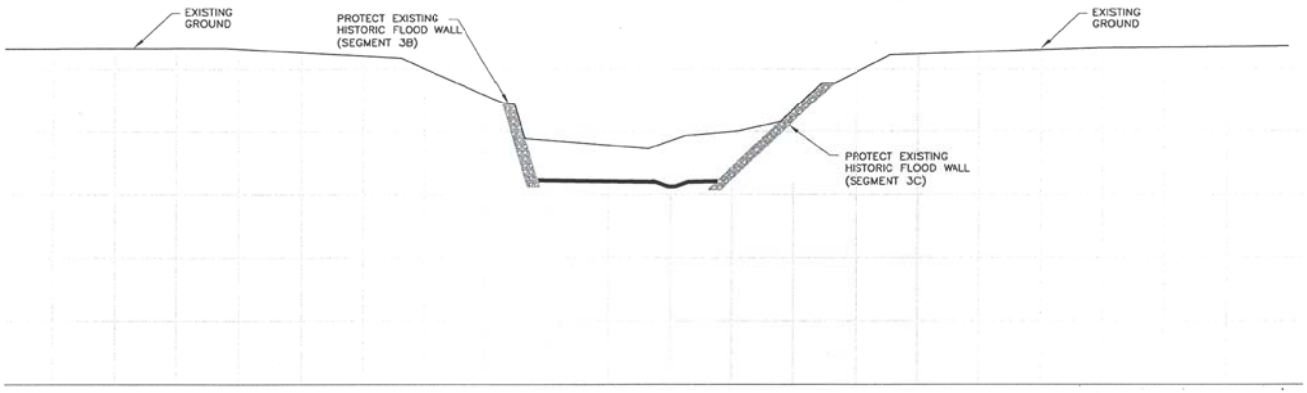
10/97



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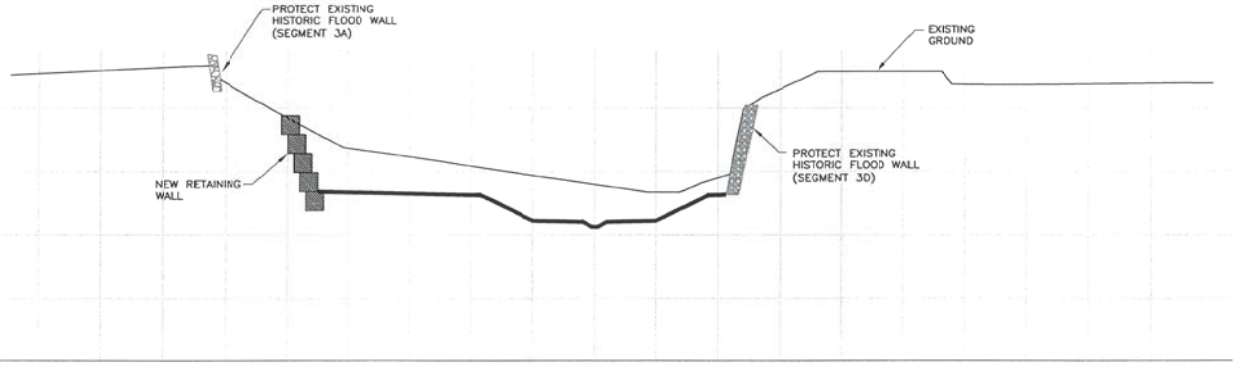


Sta 265+00

0 10 20 30

NOTE: CROSS SECTIONS TAKEN LOOKING UPSTREAM

PROGRESS PRINT
8.27.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\344 - GENERAL MISC\02.210 - DET BASINS\CAD\BC WALL SECTIONS\HISTORIC FLOOD WALL SECTIONS.DWG
FILE DATE: 8.27.2010 12:32:47 (MPW)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	GJP	3			
DRAFTED	MPW	2			
CHECKED	GJP	1			
DATE	AUGUST 2010	NO.	DATE	REVISIONS	BY APVD.

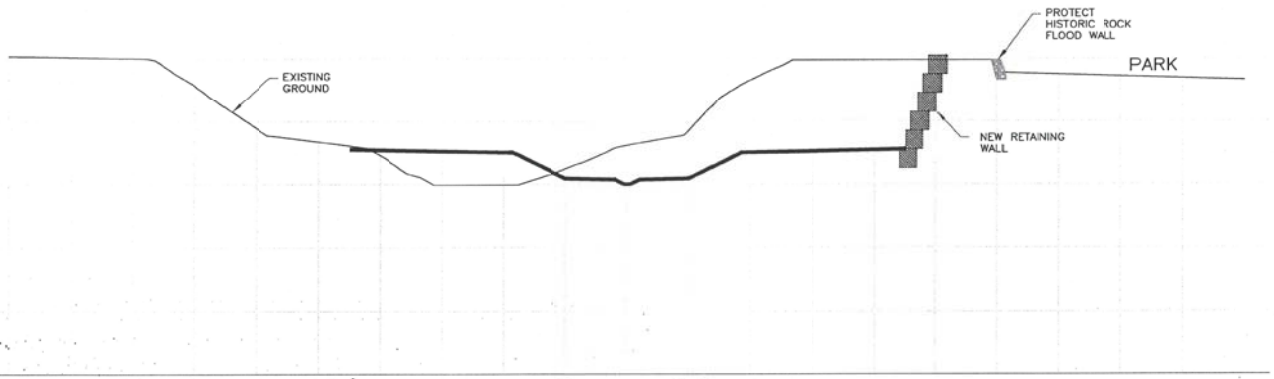
SCALE

The City of Rock Springs Wyoming

BITTER CREEK RECONSTRUCTION PLAN
PROTECTION OF HISTORIC FLOOD WALLS
CROSS SECTIONS

SHEET 1

344.02.200



Segment 4
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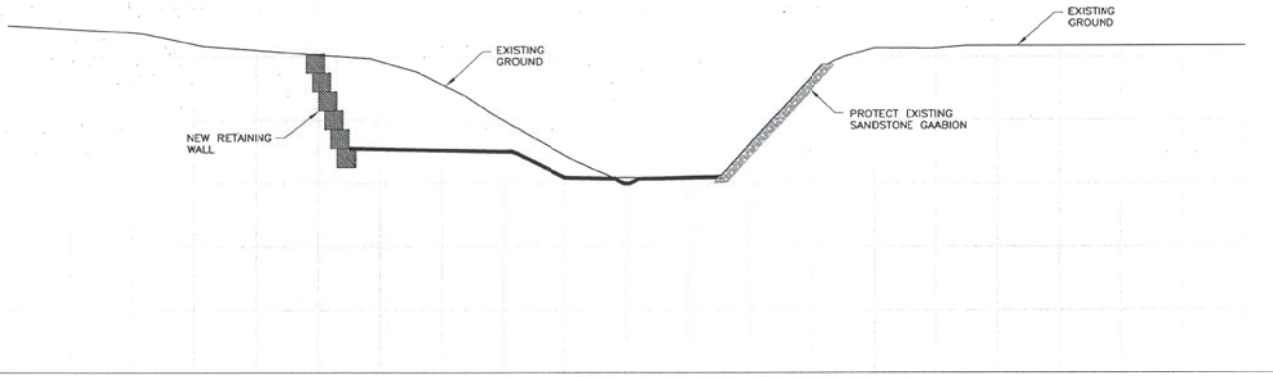

Segment 4
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NOTE: CROSS SECTIONS TAKEN LOOKING UPSTREAM

PROGRESS PRINT
8.27.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

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FILE DATE: 8.27.2010 12:32:47 (MPW)

HANSEN ALLEN & LUCE ENGINEERS

LANDMARK DESIGN

DESIGNED	GJP
DRAFTED	MPW
CHECKED	GJP
DATE	AUGUST 2010

NO.	DATE	REVISIONS	BY	APVD.
3				
2				
1				

SCALE

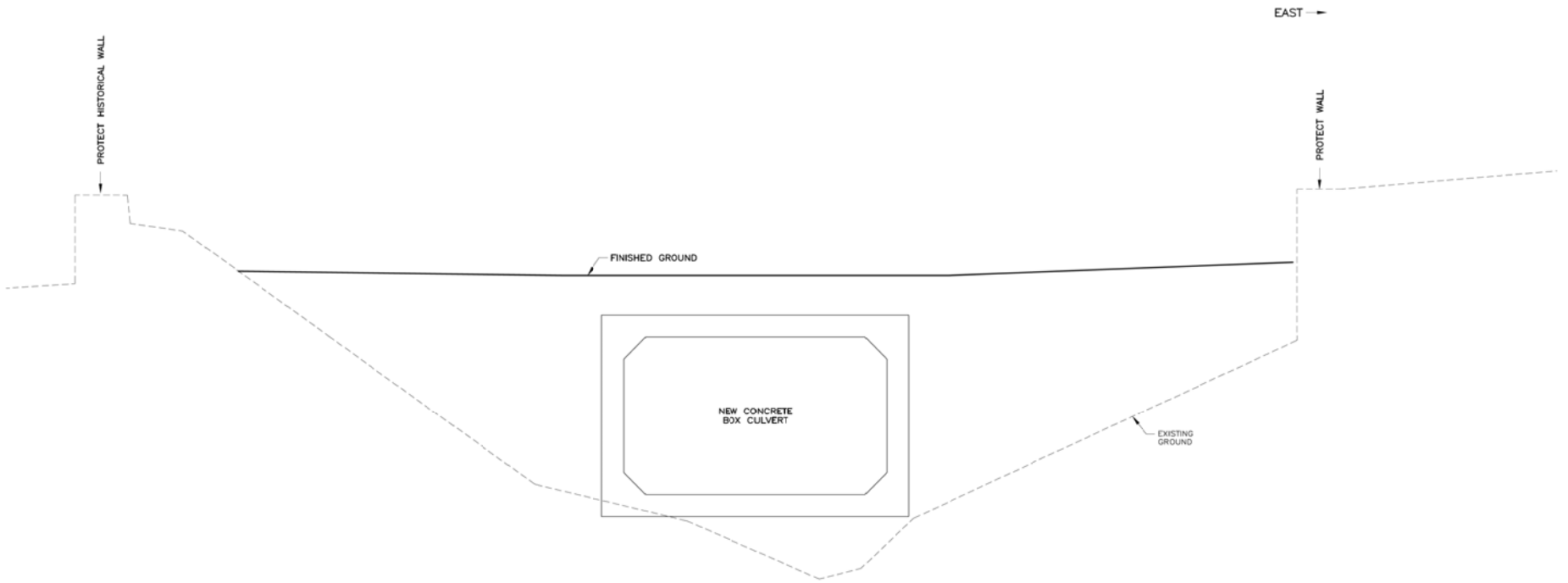
The City of ROCK SPRINGS WYOMING

BITTER CREEK RECONSTRUCTION PLAN
PROTECTION OF HISTORIC FLOOD WALLS
CROSS SECTIONS

SHEET 2

344.02.200

Figure A. Location of 48SW17183 Segments 5A and 5B. The intent is to install the culvert while protecting the historic walls. The culvert will allow higher soil elevations below the wall and would relieve the stress (both from erosion and stability) on the existing wall foundations.



TYPICAL CROSS SECTION STATION 29+00 TO 32+50
LOOKING DOWNSTREAM

0 1 2
SCALE IN FEET

PROGRESS PRINT
10.14.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

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FILE DATE: 10.14.2010 12:23:37 (DAH)

HANSEN ALLEN & LUCE, Inc. ENGINEERS
LANDMARK DESIGN

DESIGNED TGA	3					SCALE
DRAFTED	2					
CHECKED GJP	1					
DATE OCTOBER 2010	NO.	DATE	REVISIONS	BY	APVD.	

The City of ROCK SPRINGS WYOMING

DEAD HORSE CANYON CREEK
GOBEL ST TO 2ND ST
TYPICAL CROSS SECTION

SHEET 2
344.02.210

10/07

ARTS. PARKS. HISTORY.
Wyoming State Parks & Cultural Resources

State Historic Preservation Office
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002
Phone: (307) 777-7697
Fax: (307) 777-6421
http://wyoshpo.state.wy.us

23 February 2009

RECEIVED
FEB 24 2009
DEQ-AML Lander

Marcia Murdock
AML NEPA Compliance Coordinator
Department of Environmental Quality
510 Meadowview Dr.
Lander, WY 82520

Re: Rock Springs Bitter Creek Reconstruction Project (SHPO File # 0209KLH003)

Dear Ms. Murdock:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project. We have reviewed the project report and find the documentation meets the Secretary of the Interior's Standards for Archaeology and Historic Preservation (48 FR 44716-42). We concur with your finding that prehistoric sites 48SW17342, 48SW17343, and 48SW17344 as well as the Union Pacific Railroad Bridge over Bitter Creek, 48SW17184, are not eligible for listing in the National Register of Historic Places. We also concur that the Pilot Butte Avenue Bridge/Dewar Bridge is a non-contributing segment of the Lincoln Highway, 48SW1834. In addition, we concur that the Bitter Creek Flood Controls, 48SW17183, are eligible for listing in the National Register of Historic Places.

We also concur that the Bitter Creek Flood Controls, site 48SW1718, will be adversely impacted. Pursuant to 36 CFR 800.5-6, consultation between your staff and the SHPO is necessary in order to further discuss ways to mitigate the adverse effects.

This letter should be retained in your files as documentation of continuing consultation with the SHPO. Please refer to SHPO project # 0209KLH003 on any future correspondence regarding this project. If you have any questions, please contact me at 307-777-7828.

Sincerely,

Kara Hahn

Kara Hahn
Historian

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

Dave Freudenthal, Governor

John Corra, Director

7007 1490 0002 1550 3554

January 22, 2009

Ms. Mary Hopkins, Interim State Historic Preservation Officer
Wyoming Department of State Parks and Cultural Resources
Barrett Building, 3rd Floor
2301 Central Avenue
Cheyenne, WY 82002

Re: Class III Cultural Resource Inventory for Rock Springs Bitter Creek Reconstruction Project

Dear Ms. Hopkins:

Attached is a comprehensive Class III Cultural Report for the Bitter Creek Reconstruction Project, prepared by Western Archaeological Services for Landmark Design and the City of Rock Springs. The City of Rock Springs is the project proponent, but because they have use of federal funds through the Wyoming AML Program, AML is providing support and coordination for environmental clearances. This transmittal is, therefore, on behalf of the City of Rock Springs.

The report covers the known area of potential effect for the project, which largely centers on the channel of Bitter Creek as it passes through Rock Springs. The project will make improvements to the main channel to provide better management of flood flows. There are some historic flood control structures that the report recommends as National Register-eligible that may be affected by the construction project, some adversely if unmitigated. I understand Jana Pastor has discussed these features with you, and that SHPO is willing to help the City complete HABS/HAER as necessary, as mitigation for these impacts. Jana and I assume this will require an MOU between the City of Rock Springs and SHPO. While federal funds may be used on this project, and federal involvement is also necessary for federal compliance issues; this is not an AML project per se. Therefore, we believe that it is not appropriate for AML to be party to the MOU. Two flood control impoundment areas were also surveyed, and one was later dropped from consideration. The survey results for the dropped site are presented in the report. There are no cultural resources at the second impoundment site that remains part of the project area of potential effect.

The findings of the report are self explanatory, and are not reiterated in this letter. Please provide me with a letter of concurrence on this project. This consultation will be used in completion of required NEPA documentation on the project. Should you require further information, please contact me at (307) 335-6946.

Sincerely,

Marcia B. Murdock
AML NEPA Compliance Coordinator

cc Rick Chancellor, Grant File
Chron File

Lander Field Office • 510 Meadowview Drive • Lander, WY 82520 • http://deq.state.wy.us

ABANDONED MINES	AIR QUALITY	LAND QUALITY	SOLID & HAZARDOUS WASTE	WATER QUALITY
(307) 332-5085	(307) 332-6755	(307) 332-3047	(307) 332-3924	(307) 332-3144
FAX 332-7726	FAX 332-7726	FAX 332-7726	FAX 332-7726	FAX 332-3183

City of Rock Springs
DA Permit No.: NWO-2008-02869

ATTACHMENT 3

Wetland Mitigation Plan

CITY OF ROCK SPRINGS

BITTER CREEK RECONSTRUCTION PROJECT

WETLAND MITIGATION PLAN

December 16, 2010

LANDMARK DESIGN

HANSEN ALLEN & LUCE inc ENGINEERS

INTRODUCTION

In 1925 Bitter Creek was realigned around what was then the town of Rock Springs in response to a disastrous flood in 1924. The diversion project benefited the growing city as well as the railroad and coal companies by controlling some flooding, though it did not effectively control the one percent chance flood (100-year flood).

Flood conditions on Bitter Creek continue to cause residential neighborhoods and commercial/retail areas to be designated as Special Flood Hazard Areas (SFHA) within the Federal Emergency Management Agency (FEMA) 100-year floodplain. This designation puts severe restrictions on development opportunities, requires property owners to pay costly flood insurance premiums, and restricts the community's opportunities for economic development and growth. These impacts cause hardship to individual property owners within the designated floodplain, and effectively constrain development or rejuvenation of the Historic Downtown District and associated residential neighborhoods.

The proposed Bitter Creek Reconstruction project is needed to provide flood protection for a significant portion of modern-day central Rock Springs, and to provide the basis for FEMA to revise the existing Flood Insurance Rate Map (FIRM). The intent of the project is to control flooding, and eliminate the potential for further damage to vulnerable residential and commercial/retail areas, remove barriers to economic development and property improvements, enhance living conditions in the City of Rock Springs, and create a stable, aesthetically pleasing stream system through town.

The proposed project extends along Bitter Creek from the confluence with Sweetwater Creek upstream to the east South Belt Route Bridge (see Figure 1 attached).

An Environmental Assessment has been completed for the project (Final Environmental Assessment Rock Springs Bitter Creek Clean-Up Project, Landmark Design Inc., 2009 available http://www.rswy.net/egov/docs/1256573457_568817.pdf).

DESCRIPTION OF IMPACTED WETLANDS

Bitter Creek through Rock Springs is an incised channel with steep often eroding side slopes. Existing wetland resources include a fringe of palustrine emergent (PEM) and palustrine scrub-shrub (PSS) communities adjacent to the stream channel according to the *2009 Wetland Assessment for City of Rock Springs Bitter Creek* dated July 2, 2009 prepared by BKS Environmental Associates. Please see the attached map (Block 23 Figure-1 Project Affected Wetlands) for the location of wetlands within the project area.

Proposed channel modifications would affect 1.08 acres of PEM wetland, 0.04 acre of PSS wetland, and 4.48 acres of other waters (stream channel). Establishment of approximately 5.35 acres of PEM wetland adjacent to a low-flow channel within the 2-year flood plain in the project reach is proposed as compensatory mitigation.

Photos 1 through 4 were taken in June 2007 and are representative of the pre-project wetland conditions.

Photo 1 (IMG_4634) This photo is taken from about Station 176+00 looking downstream towards the West South Belt Route Bridge. The proposed action will leave the existing channel bottom and associated fringe of wetlands as is and expand the channel to the south (left side) of the channel.

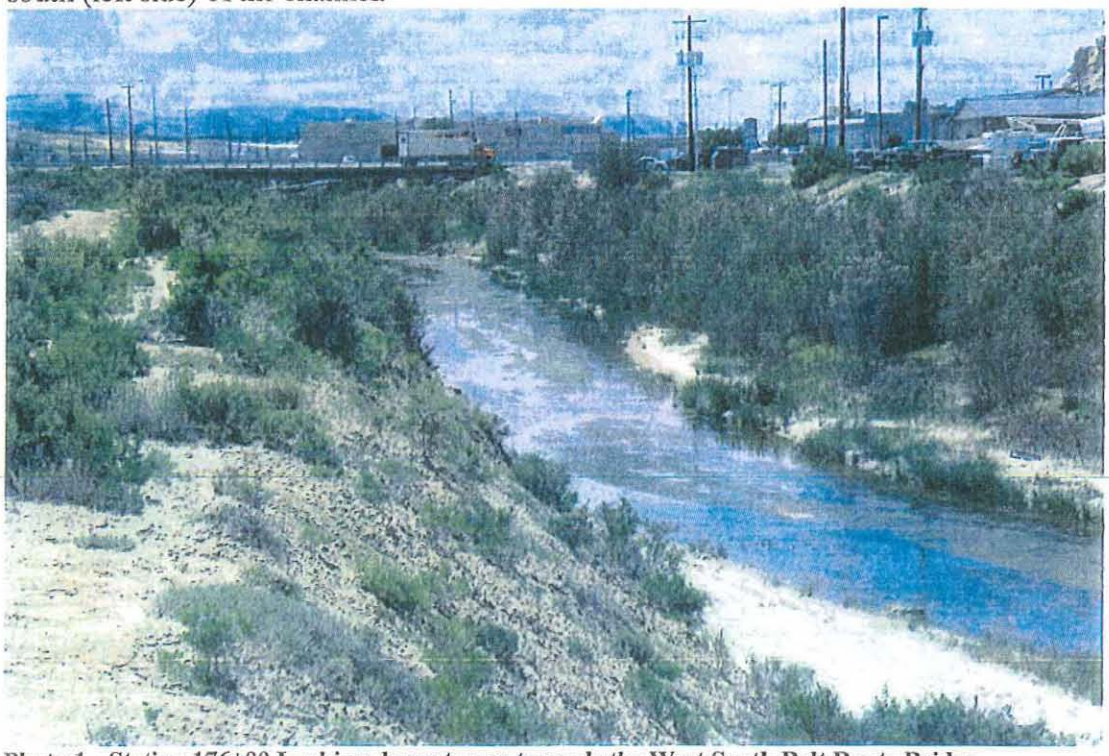


Photo 1 - Station 176+00 Looking downstream towards the West South Belt Route Bridge

Photo 2 (IMG_4592 above Dewar Street) About Thomas Street looking downstream towards Dewar Street Bridge. Please note the fringe of wetlands along the toe of channel slope as well as the wetlands on the sediment bar. The sediment bar wetlands would likely be typical of the wetlands which will establish on the 2-year flood channel bottom.

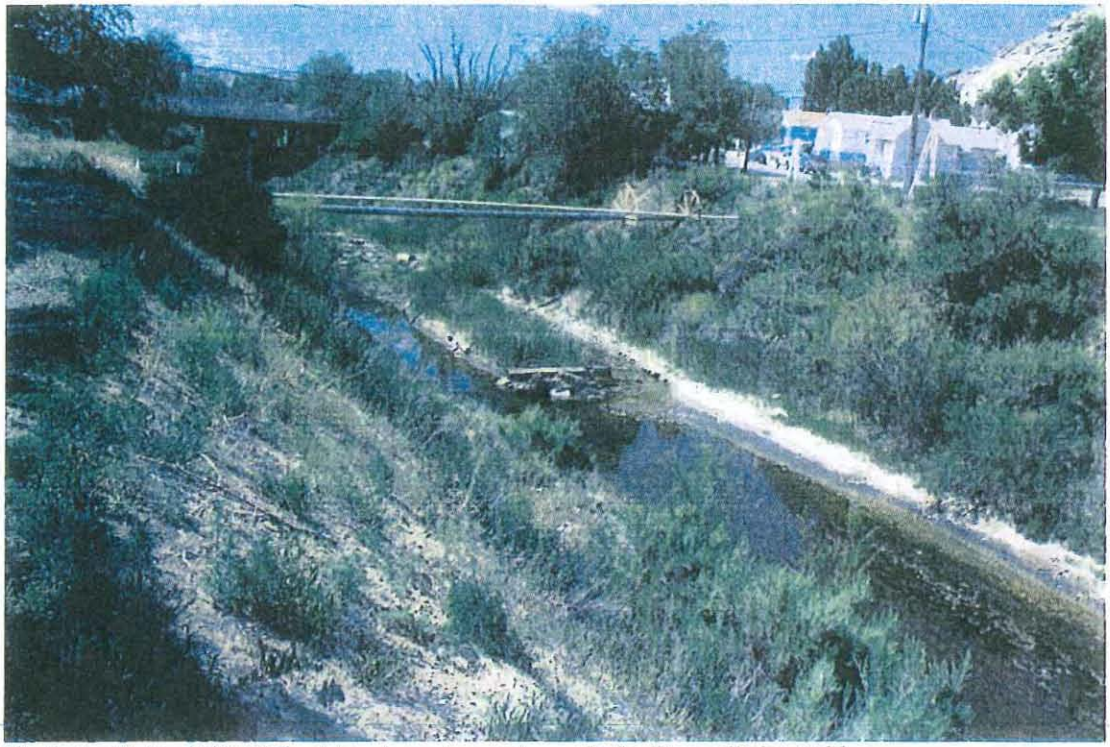


Photo 2 - Station 212+00 Looking downstream towards the Dewar Drive Bridge

Photo 3 (IMG_4567) Confluence of Bitter Creek with Killpecker Creek at about Station 231+50 looking across the Bitter Creek channel up the Killpecker Creek channel.

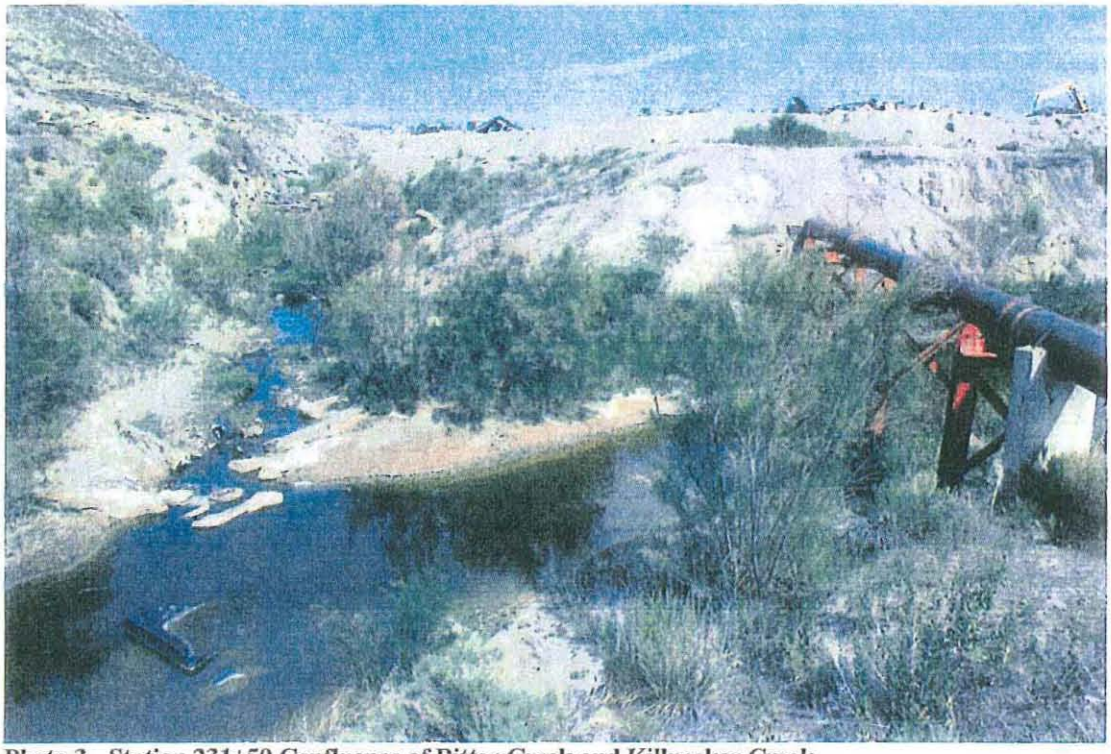


Photo 3 - Station 231+50 Confluence of Bitter Creek and Killpecker Creek

Photo 4 (IMG_4530) Looking downstream from N Street Bridge (about Station 258+50) along the diversion channel constructed in 1925. Please note the fringe of wetlands along the toe of the channel slope.

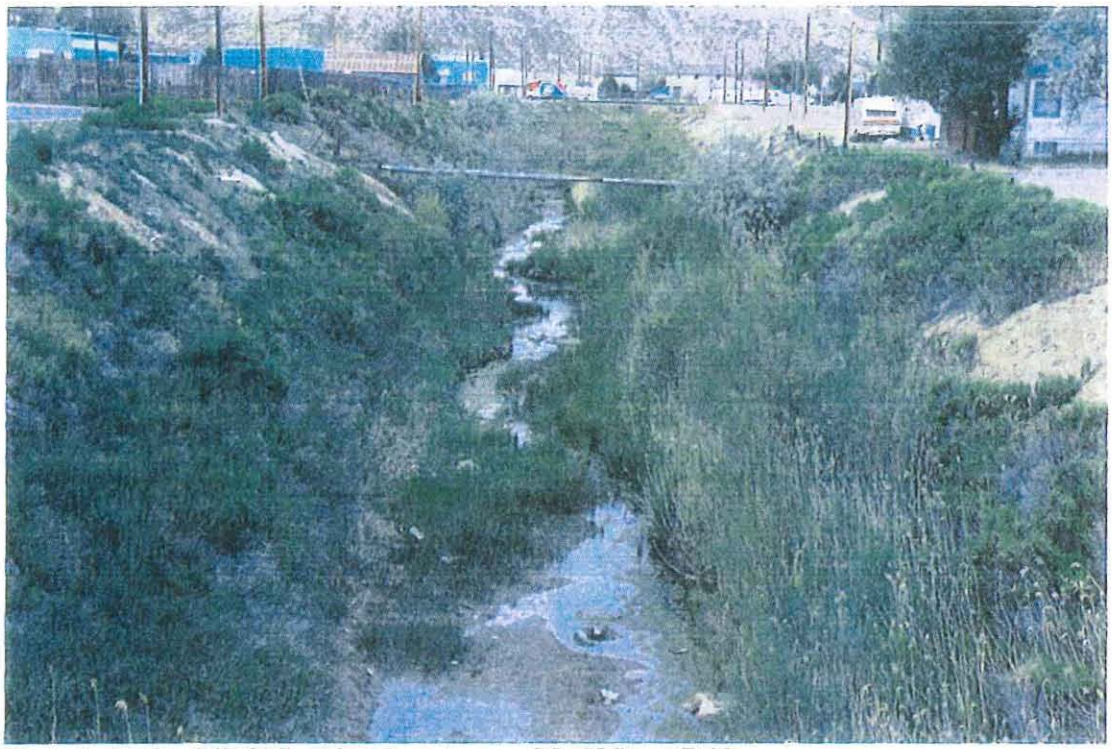


Photo 4 - Station 258+00 Looking downstream of the N Street Bridge.

WETLAND MITIGATION

OBJECTIVE

It is the intent to avoid wetlands wherever possible and several locations where existing wetlands can be avoided have been identified. In those areas where wetlands will be affected, it is the intent to restore, enhance, and establish new wetland areas. All of the mitigation will take place within the corridor and adjacent to Bitter Creek, and will replicate existing wetlands.

MITIGATION DESIGN

The mitigation will take place within the Bitter Creek stream corridor and will restore, enhance, and establish new wetlands. Figure 2 provides an example of the proposed channel improvements showing a typical relationship of the existing and proposed channel. The proposed channel bottom (designated 2-Year Flood Channel) is wider than the existing channel bottom. The 2-Year Flood Channel bottom is within a foot of the low-flow channel invert elevation and hence should support wetland vegetation similar to the PEM wetland communities that currently exist as a narrow fringe along the toe of the existing channel slopes.

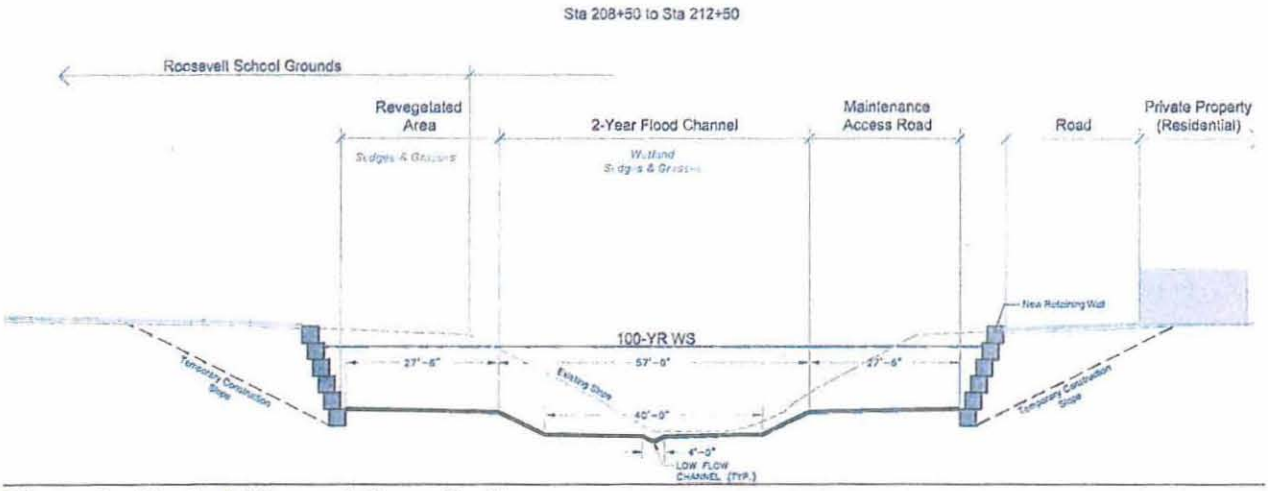


Figure 2. Typical Channel Cross Section

The proposed channel with the wetland bottom is constructed in the location of the existing channel and will result in a wider wetland section. Long term positive effects are expected due to the increase in wetlands. A detail of the proposed wetland channel bottom is provided in Figure 3.

The project will be completed in phases as funding permits and mitigation measures will be implemented concurrent with each phase accounting for losses as they occur. Construction methods anticipated include excavation of portions of channel causing removal of wetland vegetation utilizing a backhoe and grader, temporary sheet piles, installation of gabions to support the steep slopes, matting to protect the bottom of the creek, and planting of wetland and upland vegetation. Existing soils excavated from wetland areas will be salvaged and reused providing a source of native vegetative material and seeds. It is anticipated that the wetland areas will become established quickly through replacement of topsoil, seeding, wetland plugs, and perhaps pole plantings. The proposed wetland seed mix is provided in the following table.

PROPOSED WETLAND SEED MIX

Botanical Name	Common Name	Pounds/Acre
Grasses		
Carex aquatilis	Water sedge	2
Carex nebraskensis	Nebraska sedge	2
Juncus balticus	Baltic rush	2
Puccinellia airoides	Nuttal alkaligrass	6
Puccinellia distans	Alkaligrass	6
Scripus acutus	Hardstem bulrush	2
Total pounds per acre		20

Drill seed if possible; broadcast and harrow to lightly cover seed where drilling is not possible.

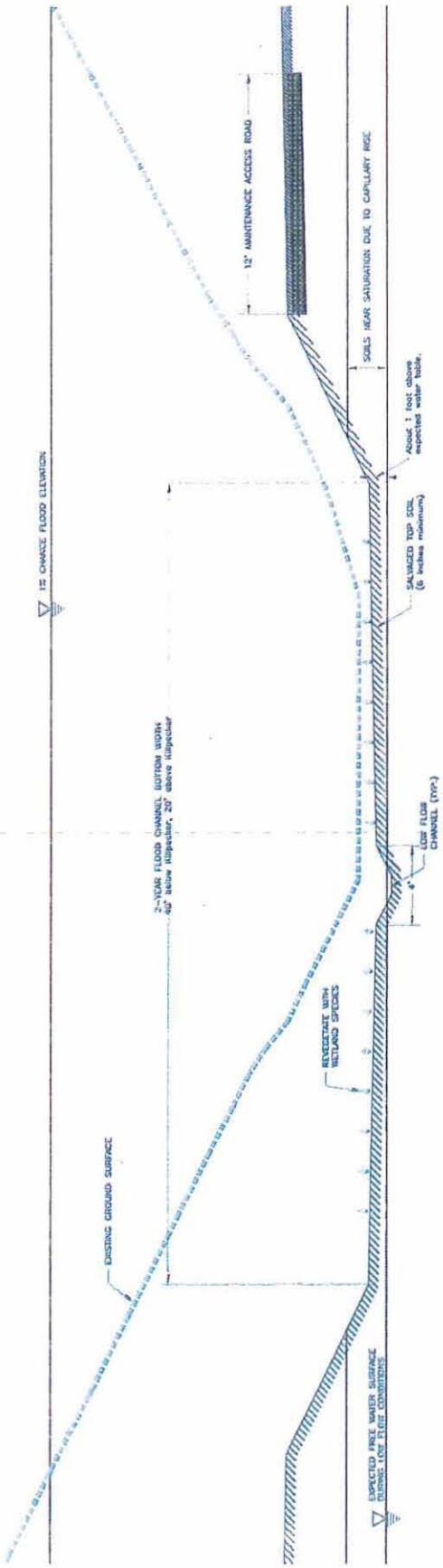


Figure 3 Wetland Channel Bottom

The creek corridor is through a developed area and is adjacent to numerous private residential and commercial properties in addition to property owned by the City of Rock Springs and the Union Pacific Railroad Company. With the exception of the properties identified in the Affected Properties Report, all of the work will take place within the creek corridor and on City-owned or railroad-owned property.

PHASING AND FUNDING

Phases will be constructed from downstream to upstream and will only be constructed if funding is available.

MAINTENANCE AND MONITORING

MAINTENANCE PLAN

The City of Rock Springs will maintain the Bitter Creek Corridor as a flood control channel under City ownership. Wetland established in the corridor will be protected from future development in perpetuity under City management. Access roads are planned to allow equipment into the stream corridor to remove sediments, debris, and other undesirable materials. The City will also be responsible for invasive plant control.

PERFORMANCE STANDARDS

A photo record will be kept for selected locations through out the re-vegetation process. Specific cross section stations will be selected as representative and will be reviewed on an annual basis until growth of desirable vegetation is deemed successful. Vegetation establishment will be deemed successful when there is a dominance of hydrophytes with at least 80% canopy coverage and less than 5% noxious weeds. Mitigation success will be achieved when at least 3.2 acres of PEM wetland and 0.12 acre of PSS wetland is established within the same reach where wetland losses occur (Stations 193+00 to 273+00).

MONITORING

Annual monitoring will be performed at selected channel cross sections during the growing season each year beginning in the year after completion of each phase of channel construction. Monitoring will continue until success has been achieved on each phase and could be discontinued if success is achieved on a phase prior to initiating another phase. A monitoring report will be prepared each year that monitoring is conducted. The report will include: photos, vegetation species identification, wetland community delineation, mapping of wetland communities, and qualitative documentation of stream banks stability confirming control of erosion. Corrective measures would be implemented if success is not achieved within four years after construction according to protocol established by the U.S. Army Corps of Engineers.

Appendix 3

Additional Information Required by United States Army Corps of Engineers

ROCK SPRINGS
BITTER CREEK PROJECT COE PERMIT ADDITIONAL INFORMATION
BITTER CREEK DETENTION ALTERNATIVE
August 25, 2010

INTRODUCTION

A letter from the Wyoming Regulatory Office of the Corps of Engineers (Thomas Johnson, April 30, 2010) described requirements for further alternatives analysis required for the evaluation of the Department of the Army 404 permit application. One of the additional alternatives to be evaluated is storage.

> **"Storage.** Construction of a detention reservoir on Bitter Creek upstream of the project area at the most feasible geographic location to contain only the volume of water that would exceed existing channel capacity during a 100-year flood."

The Army Corps of Engineers (COE) undertook a Section 205 feasibility study of flood control alternatives for Bitter Creek through Rock Springs including detention on Bitter Creek. The earlier COE work is summarized in the attached letter report (November 8, 1990) from the COE project files for the Bitter Creek Section 205 study.

The November 8, 1990 report states: "The required reservoir capacity to provide a FEMA level of protection to Rock Springs (approximately a 50-year level of protection using Corps hydrology) is about 5,000 acre-feet excluding sediment (for a downstream channel capacity of 4,000 cfs)."

"New basin contour mapping was also developed, as well as a stage-volume curve for the potential basin. Prior reconnaissance investigations use(d) existing data (20-ft contour USGS maps)." The basin contour mapping and the stage-volume curve for the potential detention basin site are currently not available.

The COE Section 205 Study located the proposed dam at about 2.7 miles upstream of the Rock Springs east South Belt Route Bridge.

The COE Section 205 Feasibility Study found that "Using the detailed topographic mapping, it was determined that backwater levees along the adjacent Union Pacific Railroad tracks and the Chevron spur alignment through the potential site would be required to protect the tracks. Without those levees, only about 2,500 acre-feet could be stored in the basin without encroachment on the embankment of the railroad tracks. It was found that backwater levees on the order of 10 to 11 feet high and 3,400 feet long would be required to provide detention capacity of about 4,000 acre-feet.

ANALYSIS

The current Bitter Creek HEC-RAS water surface profile model of existing conditions, confirms that the existing channel capacity is about 4,000 cfs. Although, a levee would be needed in the vicinity of River Station 29510.17 (about Paulsen Street) to provide

sufficient freeboard to remove the low area about 150 feet north of the channel from the FEMA flood plain.

The best estimate of the required design detention volume to reduce 100-year FEMA flows to the existing Bitter Creek channel capacity is 5,000 acre-feet.

The best mapping currently available is the USGS 20-ft contour mapping. The "new basin contour mapping" referred to in the Section 205 study summary report was not found in a search of the files.

Reviewing the detention basin site proposed in the Section 205 study reveals that the site is located where topographic features force the Bitter Creek flows into a narrower flood plain section downstream of the confluence of Bitter Creek and Salt Wells Creek. Based on review of the USGS contour mapping, the site identified by the COE in 1990 is the most feasible geographic location.

The Section 205 study summary indicates that a detention volume of 4,000 acre-feet at this site requires levees along the railroad lines of 10 to 11 feet high. It does not appear that a detention basin layout was completed with the 5,000 acre-feet design volume. The Detention Basin Alternative Location Map (COE 1990, see attached copy) is for a detention volume of 3,400 acre-feet.

Using the USGS 20-foot contour mapping and the figure from the COE Section 205 feasability study, a detention basin was laid out to accommodate the 5,000 acre-feet design storage (see attached Figure 1 - Detention Alternative Conceptual Plan). The maximum inundation area for the detention basin during a major flood event is about 700 acres. The ownership of the land potentially inundated in a major flood is provided in Table 1.

TABLE 1
LAND OWNERSHIP AND MAXIMUM AREA INUNDATED DURING MAJOR FLOOD

LAND OWNER	AREA POTENTIALLY INUNDATED IN MAJOR FLOOD EVENT (ACRES)
Bureau of Land Management	400
Rock Springs Grazing Association	300
TOTAL	700

Approximately 5 acres of land will be required at the dam site for construction and maintenance of the dam.

A new permanent access road will also be required to the dam site. It appears that the best permanent access would be from Middle Baxter Road with a length of about 3

miles. Assuming a required access road easement width of 20 feet (12 foot access road plus shoulders), results in an estimated access road right of way area of 7 acres.

The potential inundated area of a major flood includes about 8 acres of National Wetland Inventory wetlands (labeled as Freshwater Emergent Vegetation and Other). In addition there may be creek fringe wetlands similar to those mapped through Rock Springs. The estimated lengths of stream channel potentially inundated during a major flood event are provided in Table 2 with a projection of the affected wetlands. The average width of wetlands delineated on Bitter Creek through Rock Springs is 12 feet (including Palustrine Emergent, Riverine Aquatic Bed, and Palustrine Scrub Shrub Wetland). Estimated wetland areas associated with affected lengths of Bitter Creek through the possible dam site and inundated area are provided in Table 2.

TABLE 2
BITTER CREEK CHANNEL LENGTHS IN POTENTIAL INUNDATION AREA

IDENTIFICATION	CREEK LENGTH (feet)	APPROXIMATE CREEK WETLAND AREA (acres)
Directly Affected by Dam Construction	1,700	0.5
Frequently Flooded	15,100	4.2
Rarely Flooded (less than 0.2% chance)	11,700	3.2
TOTAL	28,500	7.9

Therefore the total area of potentially affected wetlands is about 16 acres (8 acres mapped in the National Wetlands Inventory and 7.9 acres estimated as in Table 2).

COST ESTIMATE

The estimated project cost for the Bitter Creek Detention alternative is $26.9 million (see attached conceptual detailed cost estimate). The costs for control of flooding from Dead Horse Canyon Creek are common to all the alternatives and are not included in the Bitter Creek Detention cost estimate.

CONSTRAINTS & UNCERTAINTIES & CONSIDERATIONS

- The average depth to bedrock at the location of the proposed dam was assumed to be 30 feet. The COE originally planned to conduct geotechnical investigations to confirm feasibility, however the project was stopped prior to completing the investigation.

- Based on the available mapping, it appears that the I-80 travel lanes are higher than 6300 feet and not affected by the potential inundation area. However, the accuracy of the available mapping is not sufficient to assure that I-80 will not be affected. If I-80 is affected, it may need to be raised. This may affect feasibility of the detention alternative. A field survey would be required to confirm that I-80 will not be impacted.

- Land cost projections are based on results from previous sales. However, actual land costs may vary significantly.

- The Overland Trail passes along Bitter Creek near the dam site. The actual trail location is uncertain due to past flood water and erosion events. There is a risk of impact to the Overland Trail.

- This alternative would preclude the planned benefit to wetlands incorporated into the preferred plan.

- The COE 1990 Section 205 feasibility study identified that there could be significant sediment deposition in the proposed detention basin. The detention basin will likely require significant sediment removal after each major storm event. The planned outlet will not detain the normal annual peak flows, but during larger flood events deposition may occur. This deposition would most likely impact the existing wetlands within the potential inundation area.

- An environmental analysis will need to be conducted and extensive geotechnical work performed before a definitive analysis can be prepared.

RECOMMENDATION

Based on the previous analysis by the Corps which found the detention alternative to be infeasible, and this preliminary analysis, it is recommended that this alternative not be considered viable. The unknown geotechnical issues and the critical elevation of the highway make this alternative too much of a risk at this time.

ROCK SPRINGS
BITTER CREEK - DETENTION BASIN ALTERNATIVE
August 25, 2010 revised

PROJECT COST ESTIMATE

No.	ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	ls	6%	$1,073,000
2	SWPPP & Temporary Drainage Bypass Works	1	ls	$55,000	$55,000
3	Clearing and Grubbing	38	acres	$5,000	$190,000
4	Foundation excavation	57,300	cy	$10	$573,000
5	Foundation treatment	1	ls	$300,000	$300,000
6	Roller Compacted Concrete	76,400	cy	$95	$7,258,000
7	Shoring for face during construction	1500	lf	$660	$990,000
8	Outlet Culvert (18' x 10' box culvert)	40	lf	$1,600	$64,000
9	Primary Outlet Structure	1	ls	$20,000	$20,000
10	Outlet Structure (erosion control etc.)	1	ls	$35,000	$35,000
11	Access Road	15000	lf	$82	$1,230,000
12	Revegetation	32	acres	$10,000	$320,000
13	Fence	4000	feet	$18	$72,000
14	Railroad Protective Levee	264,800	cy	$10	$2,648,000
15	Chevron RR Protective Levee	126,100	cy	$10	$1,261,000
16	Erosion control matting on Levee side slopes	151,000	sy	$6	$906,000
17	Top soil, seed bed prep, & seeding	39	acres	$13,000	$507,000
18	Levee north side from about Paulsen St. to Lowell St.	2,600	lf	$80	$208,000
19	Land Costs levee (item 18) no buildings impacted	2	acres	$87,000	$174,000
20	Land Costs for dam site and access road right of way	12	acres	$2,000	$24,000
21	Flood easement costs	700	acres	$1,500	$1,050,000
	TOTAL CONSTRUCTION ESTIMATE				$18,958,000
	Contingency at 30%				$5,687,000
	Environmental, geotechnical, and hydrologic investigations and permitting				$700,000
	Design and Engineering at 8%				$1,517,000
	TOTAL ESTIMATED COST				$26,862,000

November 8, 1990

Colorado/Great Basin Branch

Mr. Glenn Sugano
Director of Public Works
City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Dear Mr. Sugano:

Thank you for allowing my staff to explain the interim results of the Bitter Creek at Rock Springs Feasibility study to your City Council on October 30, 1990. I understand that you and the city council are concerned because the detention basin concept is not economically viable and that you are now in the process of deciding whether or not to continue the feasibility study. The purpose of this letter is to highlight our studies to date and to outline a possible path to continue with the investigation.

Enclosed is a general description of the studies completed thus far and their results pertaining to the detention basin concept. Recently completed pertinent information used in the study includes the draft hydrologic office report, detention basin topographic maps, reassessment of the levees required to protect the Union Pacific Railroad, and estimates on sediment inflow to the basin. Nine copies of the hydrology office report have been forwarded for your review. As you can see from the report, the volume generated by the snowmelt flood event will govern in sizing the basin. The required reservoir capacity to provide a FEMA level of protection to Rock Springs (approximately a 50-year level of protection using Corps hydrology) is about 5,000 acre-feet excluding sediment (for a downstream channel capacity of 4,000 cfs). The estimated average annual equivalent benefits for this level of flood protection are $200,000 to $300,000. A preliminary cost estimate was made for a smaller 4,000 acre-foot reservoir, ignoring sediment removal but including the extensive backwater levees necessary to protect the railroad. The resulting benefit-cost ratio is about 0.8 to one. We strongly suspect that if the significant additional cost required for sediment removal were included in the analysis, the benefit-cost ratio would be much less. Even if we assumed a downstream channel carrying capacity of 5,000 cfs (requiring a 4,500 acre-foot basin), the benefit-cost ratio would be less than unity.

1 of 3

As you know, because of the above we do not believe proceeding with a detention basin concept at this time would be a productive use of study funds. I understand this determination is disappointing to you and that a non-detention dam alternative may limit study participation by the State of Wyoming. However, (1) there is a high potential for flood damages within the town of Rock Springs, (2) a project including levee and channel work is not influenced as much with a snowmelt event as with a detention basin, (3) there are presently major restrictions to capacity in the channel within Rock Springs, and (4) previous and current studies tend to show that the FEMA rain flood flow rate of 7,800 cfs may be effectively moved through the town with some levee and channel modifications. Because of this, I believe a plan with such modifications may be feasible and warrant Federal participation.

I am preparing, and will forward to you under separate cover, a schedule of tasks necessary to complete the study. This schedule takes into account the above information and assumes a feasible project is identified in future studies. The two initial tasks in the schedule are (1) your review and comment on the draft hydrology report and (2) identification of pertinent elements of the potential channel/levee improvement alternative. I recommend you defer making a decision to either terminate or continue the study until completion of these two tasks. At that time, you will know what channel improvement measures could be effectively pursued.

I understand that you may have several significant comments on the draft hydrology report. I recommend that after we receive your comments, we get the appropriate technical representatives together to resolve any remaining issues. I estimate that the necessary work to identify the potential channel improvement plan can be accomplished with currently available funds.

Again, I fully understand your disappointment in the results of the studies to date. However, we believe that the flood threat to Rock Springs is severe, and I hope you share the desire to proceed toward a potential solution to this serious problem. Please let me know your desires regarding the future disposition of the study. I can be reached at (916) 551-1850.

Sincerely,

RICE
ENG
YEP

Walter Yep
Chief, Planning Division

Enclosure

cc: Plng Div
Am River Br
CO/GB Br
San Joaquin Basin Br

283

BITTER CREEK AT ROCK SPRINGS WYOMING
SECTION 205 FEASIBILITY STUDY

GENERAL DESCRIPTION OF STUDIES

Upon receipt of both Federal funds and the initial local installment from Rock Springs City, the study was initiated in May of 1990. Before initiation of costly geotechnical explorations and material design studies (identified in the negotiated Scope of Study), several preceding tasks were undertaken to determine if the detention basin alternative outlined in the reconnaissance study was viable. The first task was a feasibility level hydrology study which included a previously unestimated snowmelt flood analysis. (Snowmelt was not included IN the reconnaissance or the FEMA hydrology.) New basin contour mapping was also developed, as well as a stage-volume curve for the potential basin. Prior reconnaissance investigations use existing data (20-ft contour USGS maps). Having determined the governing hydrologic storm events and detailed site parameters, the various flood events were then routed through the potential detention basin. The following tabulation is a synopsis of the results of the routing studies (excluding necessary sediment capacity):

Event (yr)	Release (cfs)	Required Capacity (af) Rain	Snowmelt
50	4,000	4,000	5,000
	5,000	2,800	4,500
100	4,000	7,000+	10,000+
	5,000	5,000+	7,000+

Using the detailed topographic mapping, it was determined that backwater levees along the adjacent Union Pacific Railroad tracks and the Chevron spur alignment through the potential site would be required to protect the tracks. Without those levees, only about 2,500 acre-feet could be stored in the basin without encroachment on the embankment of the railroad tracks. Conversations with a Union Pacific representative indicated that they (railroad company) would not allow inundation of their embankments. It was found that backwater levees on the order of 10 to 11 feet high and 3,400 feet long would be required to provide detention capacity of about 4,000 acre-feet.

Evaluation of historic sediment data suggests that substantial sediment deposition is likely. Additional storage capacity and continuous sediment removal would be necessary to maintain the desired level of protection. Based on the capacity limitations of the site, costs for the enlarged backwater levees, and the potential extraordinary costs associated with sediment removal, it was concluded that a detention basin alternative is not viable.

CONVERSATION RECORD

TIME: 10:50 a.m. | DATE: 8 November 1990

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☐ INCOMING ☒ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
Glenn Sugano	Director of Public Works	307-362-7542

ROUTING

NAME/SYMBOL	INT

SUBJECT: BITTER CREEK AT ROCK SPRINGS, SECTION 205 FEASIBILITY STUDY

SUMMARY

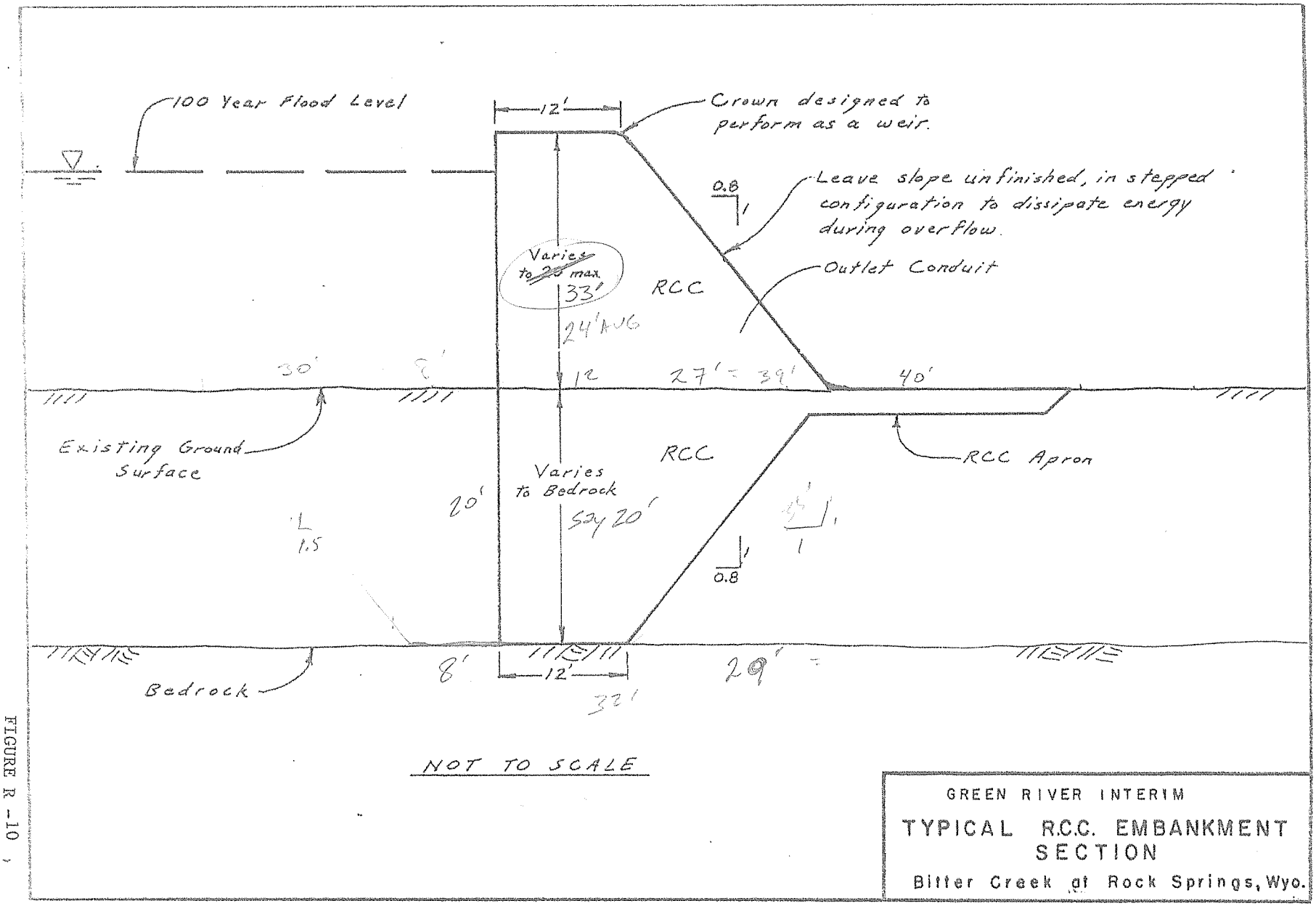
I telephoned Mr. Sugano concerning the subject study and a letter that Planning Division would be sending to them. Mr. Sugano stated that the Rock Springs City Council had decided to terminate their joint studies with the Corps on Bitter Creek. Mr. Sugano stated that their Legal staff had indicated that they would need to pass a binding resolution although they have voted to terminate the study. Mr. Sugano was cordial and requested that the letter that we had prepared be mailed to them. He also stated that they were aware of their flood problems on Bitter Creek and that the State of Wyoming would help them in the design of channel improvements. The City of Rock Springs will construct sections of channel improvement after consultation with FEMA. Rock Springs will notify Sacramento District formally by letter of their decision.

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
ROBERT HAHNE	Robert Hahne	8 November 1990

ACTION TAKEN

SIGNATURE	TITLE	DATE



NOT TO SCALE

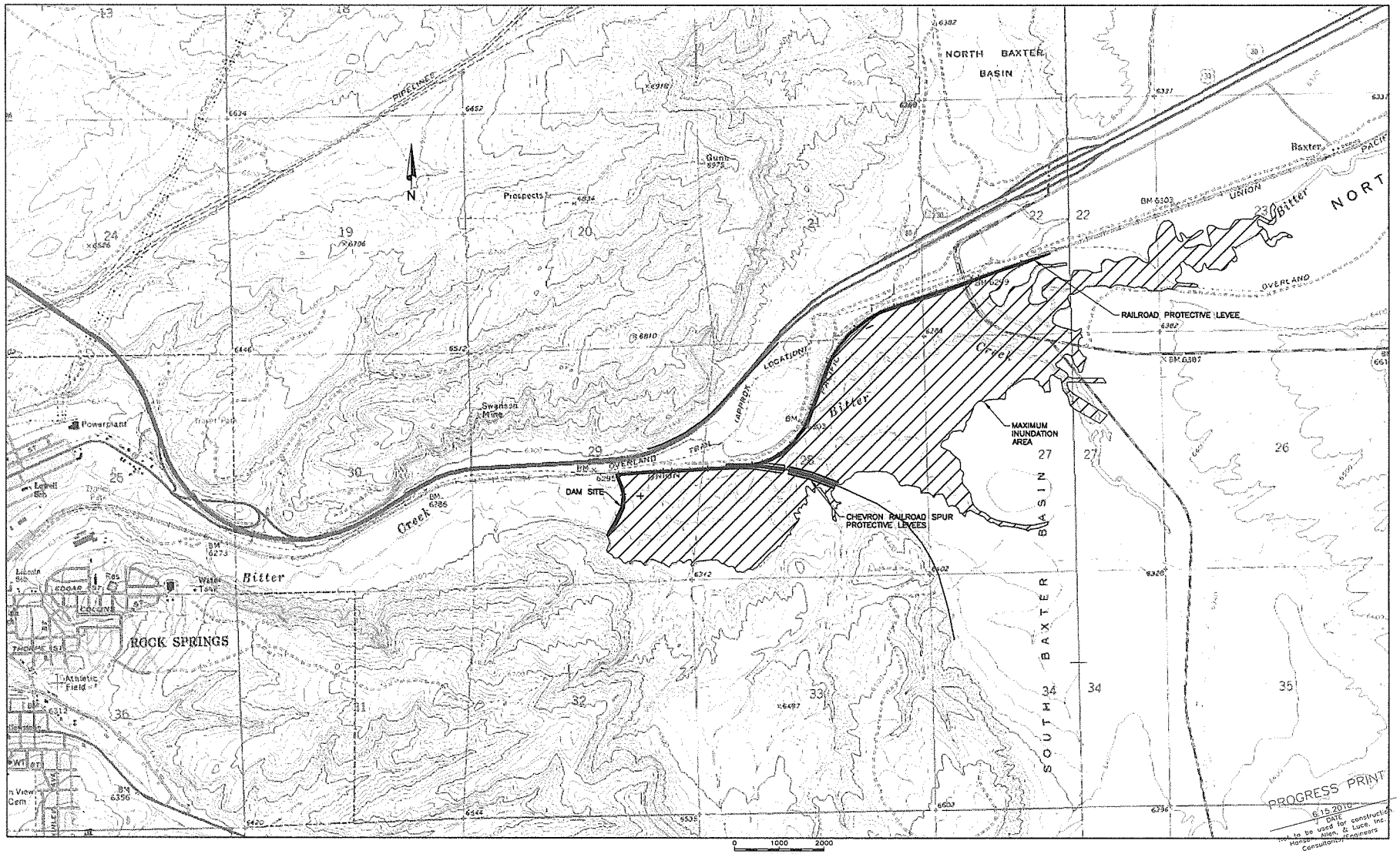
GREEN RIVER INTERIM

TYPICAL R.C.C. EMBANKMENT SECTION

Bitter Creek at Rock Springs, Wyo.

UPDATE June 2010 GIP
CONCEPTUAL

FIGURE R - 10



HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED GJP	3					SCALE AS SHOWN	ROCK SPRINGS	BITTER CREEK DETENTION ALTERNATIVE CONCEPTUAL PLAN
		DRAFTED JVH	2							
		CHECKED GJP	1							
		DATE JUNE 2010	NO.	DATE	REVISIONS	BY	APVD			SHEET ? 344.02.210

FILE DATE: 6.15.2010 FILE NAME: 344.02.210 - DET BASINS\CAD\CADFILES\DETENTION ALTERNATIVE CONCEPTUAL PLAN.DWG

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ROCK SPRINGS
BITTER CREEK PROJECT COE PERMIT ADDITIONAL INFORMATION
BITTER CREEK ROADLESS ALTERNATIVE
August 26, 2010

INTRODUCTION

A letter from the Wyoming Regulatory Office of the Corps of Engineers (Thomas Johnson, April 30, 2010) described requirements for further alternatives analysis required for the evaluation of the Department of the Army 404 permit application. One of the additional alternatives to be evaluated is the proposed project Bitter Creek channel improvements without access roads.

ANALYSIS

We have laid out an alternative to the Bitter Creek channel improvement plan which does not include maintenance access road within the flood channel cross section. The roadless cross section is similar to the preferred alternative cross section in that wherever possible it includes a low flow channel, a 2-year flow channel, and a 100-year flood channel (see attached typical cross section). The bottom of the 2-year flow channel is set about 1 foot higher than the low flow channel to promote the expansion of wetlands and provide for the transport of sediment through the project area as best possible.

If a maintenance access road is not included, the area of OWUS (Other Waters of the U.S.) affected by the project would be reduced by about 0.84 acres and the area of PEM (Palustrine Emergent, fringed wetlands) affected by the project would be reduced by 0.15 acres. This reduction in wetland impact is between the Grant Street Bridge and Elk Street Bridge and results from being able to leave the existing creek bed in this reach alone.

The long term viability of a flood control project on the Bitter Creek which does not accommodate ongoing maintenance is severely compromised and not likely to be successful. The creek has a history of high sediment loads at times due to the intensity of rainfall on the high desert and due to upstream channel instability. Much of the tributary area has poor vegetative cover and is susceptible to erosion. The suspended sediment concentrations in Bitter Creek flood waters are expected to be highly variable. The proposed channel cross section has been designed to accommodate the variation in sediment concentration as much as possible, but it is expected that there may be significant deposition in places as a result of a significant flood event. It would then be critical to have good access to the bed to provide for restoration of the channel.

COST ESTIMATE

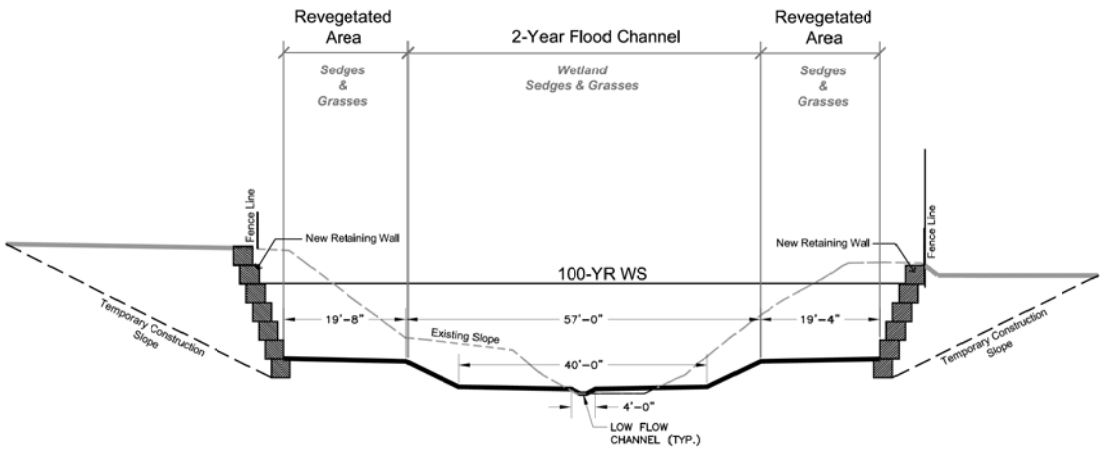
The roadless alternative would be expected to cost about $384,000 less than the proposed project with access roads (computed as the difference between the cost of constructing the 16,000 feet of access road at $40 per foot versus cost to revegetate the same area at $12 per square yard assuming a 12 foot access road width).

RECOMMENDATION

The long term viability of a flood control project of this scale on the Bitter Creek which does not accommodate ongoing maintenance is severely compromised and very unlikely to be successful, therefore the roadless alternative is not recommended. The creek bed's location in

a very developed area of the city where steep banks and adjacent development are typical make it almost impossible to maintain without an access roadway constructed integral to the project. Without maintenance to remove sediments and debris, its flood control effectiveness would be greatly diminished and a potential threat to adjacent properties.

TYPICAL CHANNEL CROSS SECTION WITHOUT ACCESS ROAD



PROGRESS PRINT
8.26.2010
DATE
Not to be used for construction.
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

0 5 10 15

FILE NAME: PROJECTS\344 - GENERAL MISC\02.200 - 08 BITTER CREEK - GJP\CAD\PRELIMINARY DESIGN\BC SECTIONS_120709\ALTERNATING ANALYSIS_120709.DWG
FILE DATE: 8.26.2010 13:08:51 (CAH)

HANSEN ALLEN & LUCE ENGINEERS	LANDMARK DESIGN	DESIGNED JEB DRAFTED JH CHECKED GJP DATE AUGUST 2010	3 2 1 NO.	DATE	REVISIONS	BY	APVD.	SCALE	ROCK SPRINGS	BITTER CREEK RECONSTRUCTION PLAN ALTERNATING ANALYSIS TYPICAL ROADLESS CROSS SECTION	SHEET 1 344.02.200

10/07

ROCK SPRINGS
BITTER CREEK PROJECT COE PERMIT ADDITIONAL INFORMATION
BITTER CREEK LEVEE ALTERNATIVE
August 26, 2010

INTRODUCTION

A letter from the Wyoming Regulatory Office of the Corps of Engineers (Thomas Johnson, April 30, 2010) described requirements for further alternatives analysis required for the evaluation of the Department of the Army 404 permit application. One of the additional alternatives to be evaluated is construction and certification of a levee system instead of channel improvements.

The FEMA levee accreditation requirements are found in 44 CFR Section 65.10. The requirements are also summarized on "Meeting the Criteria for Accrediting Levee Systems on NFIP Flood Maps How-to-Guide for Floodplain Managers and Engineers (FEMA, November 2008)

ANALYSIS

In order to meet the primary objective for the project (flood control for the downtown area of Rock Springs), the levee alternative would have to be combined with the control of flooding from Dead Horse Canyon Creek. The preferred alternative for control of flooding from Dead Horse Canyon Creek is construction of two detention basins upstream of Rock Springs in the Dead Horse Canyon drainages. The need to control flooding from Dead Horse Canyon Creek is a common factor for all of the Bitter Creek alternatives.

Following is a summary of the levee requirements (italics) with comments based on the Bitter Creek system.

1. **Freeboard.** *Minimum freeboard required is 3 feet above the Base Flood Elevation (BFE) all along the length of the levee, and an additional 1 foot within 100 feet of structures (such as bridges) or wherever the flow is restricted. An additional 0.5 foot of freeboard is required at the upstream end of a levee.*
    a. Most of the levee and diversion constructed in the 1920s to convey Bitter Creek flood flows from the confluence with Dead Horse Canyon Creek to Killpecker Creek around developed properties and mining support facilities do not meet the freeboard requirements. In order to meet the freeboard requirements, six bridges and bridge approaches will need to be raised significantly; (two of these bridges are state highways).

2. **Closures.** *All openings must be provided with closure devices that are structural parts of the system during operation and designed according to sound engineering practice.*
    a. All storm drains entering the Bitter Creek channel from areas which would be protected by the levee system will require closure devices. There are 62 locations affected.

3. **Embankment Protection**. *Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base*

flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.

a. The levee and channel banks below the levee will require erosion protection. There are several areas where the existing channel banks are eroding. Channel banks in areas to receive levee certification (either with a new or existing levee) will require analysis and modification as needed to comply with the erosion control requirements.

b. Where possible, the oversteep and eroding channel banks should be laid back on about a 2 horizontal to 1 vertical side slope, protected with erosion control matt, and revegetated. Where it is not possible to modify the slope of the channel bank, a retaining wall will be required.

4. **Embankment and Foundation Stability Analyses.** *Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided must evaluate expected seepage during loading conditions associated with the base flood and must demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability.*

5. **Settlement Analyses.** *Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in USACE Engineer Manual 1110–1–1904, Soil Mechanics Design— Settlement Analysis, must be submitted.*

6. **Interior Drainage.** *An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than 1 foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.*

a. This can be problematic should high creek flows coincide with a rainstorm event over the city. Emergency pumping may be required to prevent flooding of buildings caused by backups in the storm drain system.

PRELIMINARY DESIGN

The levee alternative was laid out in accordance with FEMA guidelines and includes the following features:

- Three feet of freeboard above the expected 100-year flood elevation.
- Four feet of freeboard above the expected 100-year flood elevation at road crossings.
- Automatic closures for storm drainage facilities discharging from the area protected by the levee to the creek.
- Wherever possible the existing levee system was incorporated into the alternative resulting in an enlargement of the existing levee.

- In areas where the existing creek banks are oversteep, the toe of the new levee was set back from the top of creek bank based on a 2 horizontal to 1 vertical slope from the stream bed.

Preliminary plans of the levee alternative are attached along with a typical section.

COST ESTIMATE

The estimated project cost for the Bitter Creek Levee alternative is $42.3 million (see attached conceptual detailed cost estimate). The costs for control of flooding from Dead Horse Canyon Creek are common to all the alternatives and are not included in the levee cost estimate.

CONSTRAINTS & UNCERTAINTIES & CONSIDERATIONS

- The levee alternative would result in an impact to about 25 acres of private land and would impact about 65 existing residential and commercial buildings in an already economically depressed area of the city.

- Levee flood protection systems require regular inspections and certifications. Regulatory view and direction regarding levee systems have become much more stringent since the New Orleans Katrina levee failures.

- Areas protected by a levee system would be required to be mapped as Zone X on FEMA flood plain maps.

- Areas which would be protected by the levee system have existing drainage facilities that drain to Bitter Creek. This can be problematic should high creek flows coincide with a rainstorm event over the city. Emergency pumping may be required to prevent flooding of buildings caused by backups in the storm drain system.

RECOMMENDATION

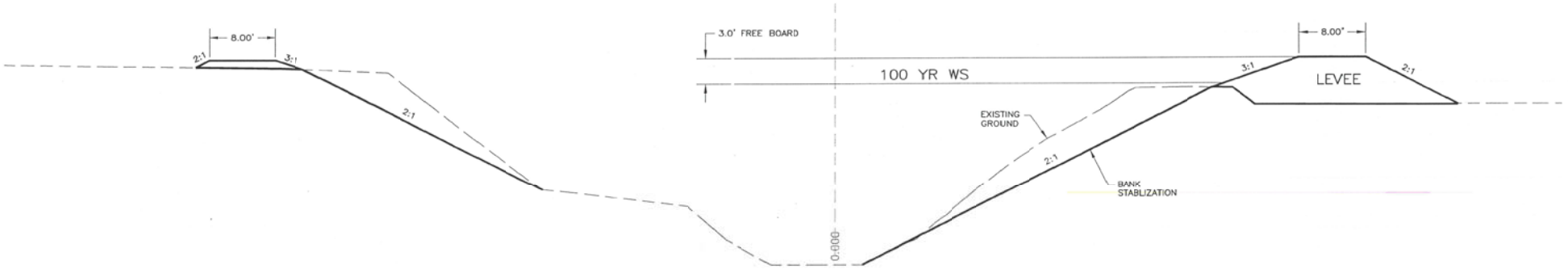
Because of the large disruption to existing residences and commercial businesses, the need to remove and reconstruct six bridges to a higher elevation over the creek, levee maintenance and re-certification requirements, and risks associated with drainage from protected areas; the levee alternative is not recommended.

ROCK SPRINGS
BITTER CREEK PROJECT
LEVEE ALTERNATIVE
Updated August 25, 2010

BITTER CREEK LEVEE ALTERNATIVE DETAILED CONCEPTUAL COST ESTIMATE

No.	ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
1	Mobilization/Demobilization	1	L.S.	6%	$296,000
2	SWPPP	1	L.S.	$72,000	$72,000
3	Clearing and Grubbing	25	Acres	$8,000	$200,000
4	Foundation Preparation	121,000	CY	$10	$1,210,000
5	Levee North Side	46,000	CY	$10	$460,000
6	Levee South Side	231,000	CY	$10	$2,310,000
7	Erosion control matting on Levee side slopes	113,740	SY	$6	$682,440
8	Channel bank stabilization	41,140	SY	$9	$370,260
9	Retaining wall	600	LF	$1,080	$648,000
10	Topsoil, Seed Bed Prep, & seeding	25	Acres	$13,000	$325,000
11	Raise Dewar St. Bridge 3 feet	1	L.S.	$2,630,000	$2,630,000
12	Raise RR Bridge flood walls 1 foot	1	L.S.	$31,000	$31,000
13	Raise Elk Street Bridge 4 feet	1	L.S.	$2,900,000	$2,900,000
14	Raise Soulsby St. Bridge 6 feet	1	L.S.	$110,000	$110,000
15	Raise N Street Bridge Approach 4 feet	1	L.S.	$1,290,000	$1,290,000
16	Raise Pilot Butte Street Bridge 4 feet	1	L.S.	$1,870,000	$1,870,000
17	Restoration of surface improvements adjacent to raised portions of approaching streets.	1,500	LF	$60	$90,000
18	Land cost - parcel with no buildings	3	Acres	$87,000	$261,000
19	Land cost - parcel with buildings	22	Acres	$261,000	$5,742,000
20	Relocation and loss of business costs	1	L.S.	$650,000	$650,000
21	Buildings impacted	65	bldgs	$120,000	$7,800,000
22	Drainage Facilities (thru levees with automatic closures)	62	each	$8,000	$496,000

TOTAL CONSTRUCTION ESTIMATE	$30,443,700
Contingency at 30%	$9,133,000
Special studies (geotechnical, surveying, right of way)	$250,000
Design and Engineering at 8%	$2,435,000
TOTAL ESTIMATED COST	$42,261,700



LEVEE ALTERNATIVE
TYPICAL CROSS SECTION

0 3 6 9 12

PROGRESS PRINT
8.26.2010
DATE
Not to be used for construction
Hansen, Allen, & Luce, Inc.
Consultants/Engineers

FILE NAME: PROJECTS\344 - GENERAL WSC\02.210 - DET BASINS\ENG\COE ALTS\BC SECTIONS_120709\SECTION 204+00.DWG
FILE DATE: 8.26.2010 09:19:28 (MPW)

HANSEN ALLEN & LUCE, INC. ENGINEERS
LANDMARK DESIGN

DESIGNED	GJP	3			
DRAFTED	MPW	2			
CHECKED	GJP	1			
DATE	AUGUST 2010	NO.	DATE	REVISIONS	BY APVD.

SCALE

ROCK SPRINGS

BITTER CREEK RECONSTRUCTION PLAN
LEVEE ALTERNATIVE
CROSS SECTIONS

SHEET 1
344.02.200

AFFECTED PROPERTIES ANALYSIS
Bitter Creek Reconstruction Project
Prepared by Landmark Design Inc.
June 24, 2010

Introduction
The purpose of this analysis was to identify properties that may be affected due to construction activities and improvements on Bitter Creek as it runs through the City of Rock Springs, Wyoming. The analysis utilizes preliminary design drawings prepared by Hansen Allen & Luce Associates and represents the best information available to date. Final design will require survey data to more accurately locate property lines and structures, and may affect the information contained in this document.

Public and Quasi-public Property
It is assumed that creek improvements on public and quasi-public properties will not require the purchase of land. Rather, agreements (MOUs) or easements will be worked-out as necessary or required. In each case, the direct benefit to the property is in confining and limiting the flood plain and eliminating development restrictions. There will be no impact to existing structures or permanent facilities that are known at this time; though restoration of fences and pavements may be needed. Underground utilities and other elements that can only be defined once a property survey is completed for the properties will need to be evaluated at a later date when more detailed design is complete. A property boundary survey will also be needed to more accurately access the quantity of land affected to be negotiated in the MOU or easement.

Private Property Temporarily Affected During Construction
These properties will be affected during construction, but should have no lasting permanent effects. Encroachment on these properties is needed to make channel improvements as the project is currently, preliminarily designed. Work will include access onto the properties to install sheet piling to protect adjacent structures, construction of floodwalls, or slope contouring to accommodate a 100-year flood event. As indicated in the Environmental Assessment,[1] affected private properties will be restored to the original condition or better. No property acquisition is anticipated.

It is important to note that several private property owners are encroaching onto adjacent properties and beyond the recorded property boundary as shown on property maps received from Sweetwater County. In some cases, the property is being used for storage of vehicles, recreational vehicles, trailers, implements and equipment, and other movable items. The City may work with these property owners to have them remove the items, and then determine whether or not they will allow the property owners to continue to encroach on adjacent properties that do not appear to be in their ownership. In other cases, property owners appear to be utilizing adjacent properties outside of their property boundary to provide access to either residential or commercial uses. Construction activities will interrupt the use of these accesses, but should be able to be restored following construction. Again, the City may need to work with

[1] Final Environmental Assessment, Rock Springs Bitter Creek Clean-up Project, Rock Springs, Sweetwater County, Wyoming, September 28, 2009.

the property owners to establish permanent easements or make other arrangements to protect the access.

In the specific situation of Mr. Robert Hautala[2] of JC Jacobs Carpet One located at 610 Elk Street, the effects to the property are temporary. The land in question is outside of the property boundary and is being used for access to the business, primarily for loading. Sheet piling will be required in order to construct the flood wall which will affect access to the building during construction; however, it appears that access can also be achieved through the south side of the building and around from the back. It is the intent to remove the piling and restore the property to its current condition or better. It is anticipated that it will not be necessary to acquire property at this location; however a permanent easement or MOU may be needed between Mr. Hautala and the owner of record of the property being utilized for access. (It is assumed to be City-owned.)

Private Property Permanently Affected

Several properties will be minimally affected permanently and will require the acquisition of small portions of the property or negotiation of an easement. The results include effects during construction that will require access onto the property to construct a flood wall, provide maintenance access, or make other bank improvements. A permanent flood wall or access will be left within the property line at the completion of the project. Temporary construction impacts are also anticipated, but those portions of the property will be restored to the current condition or better. There are two entire properties which may need to be purchased to make room for the improvements.

The total acreage of all properties that will be affected permanently is about 80-acres. This total represents the total acreage of each property that is affected, while the actual areas of the properties that could be affected are significantly less – approximately 4-acres. See Figure 1 on the following page.

[2] Letter from Mr. Hautala to the U.S. Army Corps of Engineers providing public comment on the proposed project dated April 2, 2010. COE Application No. : NOW-2008-02869

Figure 1 – Private Property Permanently Affected

PRIVATE PROPERTY - PERMANENTLY AFFECTED - PERMANENT STRUCTURES ON PRIVATE PROPERTY							
OWNER OF RECORD	ADDRESS	DEED ACRES	EST. ACRES AFFECTED	EST. S. F. AFFECTED	CURRENT CONDITION	ACTION REQUIRED	EST. COST*
GUNYAN RONALD L III & JUANITA	913 McCarty Ave.	0.27	0.0050	219.68	Back yard facing onto creek with miscellaneous trailers, vehicles, etc. stored.	Easement or acquisition needed for flood wall. Temporarily relocate vehicles during construction. Restore fences, etc.	$439
ORTEGA JUSTIN C & WINNER	911 McCarty Ave.	0.24	0.0038	166.36	Back yard facing onto creek with miscellaneous trailers, vehicles, etc. stored.	Easement or acquisition needed for flood wall. Temporarily relocate vehicles during construction. Restore fences, etc.	$333
DMT ENTERPRISES INC	805 McCarty Ave.	0.16	0.0037	162.53	Undeveloped property.	Easement or acquisition.	$325
DIX PAT J	717 Muir Ave.**	0.14	0.1400	6,098.40	Residential (home and garage)	Property acquistion required.	$35,500
KUMER JOHN R & BURON DENNIS K	740 Muir Ave.***	0.25	0.0318	1,384.16	Residential structure affected.	Property acquisition required.	$76,700
EDWARDS JOHN E & ANN M	830 West St.	0.14	0.0030	131.33	Undeveloped corner extending into creek; sheetpiling required.	Easement or acquisition.	$263
PINER MYRTLE J ETAL	814 West St.	0.08	0.0038	164.32	Residential. Construction impacts due to sheetpiling; flood wall within existing property line	Easement or acquisition.	$329
STEVENSON FAMILY LIVING TRUST	806 1/2 West St.	0.13	0.0078	341.01	Residential. Construction impacts due to sheetpiling; flood wall within existing property line	Easement or acquisition.	$682
STEVENSON FAMILY LIVING TRUST	220 McClellan St.	0.34	0.0238	1,038.22	Development encroaches off property; possible trade.	Trade property affected for property currently encroached on.	$0
FOSTER GEORGIA L	501 Dewar Dr.	0.25	0.0155	676.99	Residential; impacts from sheetpiling.	Easement or acquisition of unused corner; restore concrete wall.****	$21,354
SOUTHERN FOODS GROUP LP	66 Center St.	0.97	0.0099	431.75	Undeveloped storage yard.	Easement or acquisition for maintenance access.	$863
RS COLLEGE HILL INVESTMENTS		73.12	3.4435	150,000.00	Undeveloped.	Easement and negotiations during development review process prior to development.	$0
PACIFIC HIDE & FUR DEPOT		7.53	0.4574	19,922.40	Recycling storage.	Easement or acquisition for access road and flood wall.	$39,845
CUELLAR RUBEN	1000 Clark St.	0.23	0.0231	1,005.53	Residential, industrial	Easement or acquisition; property needed for access road; creek improvements	$2,011
ZANETTI PETE FAMILY TRUST	1130 Billie St.	3.54	0.1160	5,053.63	Undeveloped.	Easement or acquisition for maintenance access road.	$10,107
		83.85	**4.17**	**181,742.69**			**$188,751**

NOTES
*Estimated cost for undeveloped residential property in this area is $1 - $3 per sq. ft Value used was $2. Assumes that the affected property will be purchased rather than acquire an easement.
**Assessed value of this property is $2,684.00. Realtor/broker used this number times 9.5 to come up with a value.
***Assessed value of this property is $8,973. Realtor/broker used this number times 9.5 to come up with a value.
****Estimated cost to restore property fences, walls, etc. - estimated by Landmark Design Inc.

SOURCE
Land and Property Costs: Dennis Carlson, Brokerage Southwest, Rock Springs, Wyoming.
Restoration Costs: Estimated based on level of impact by Landmark Design Inc.

Appendix 4

Water Resources Update

HANSEN ALLEN & LUCE inc
ENGINEERS

Memorandum

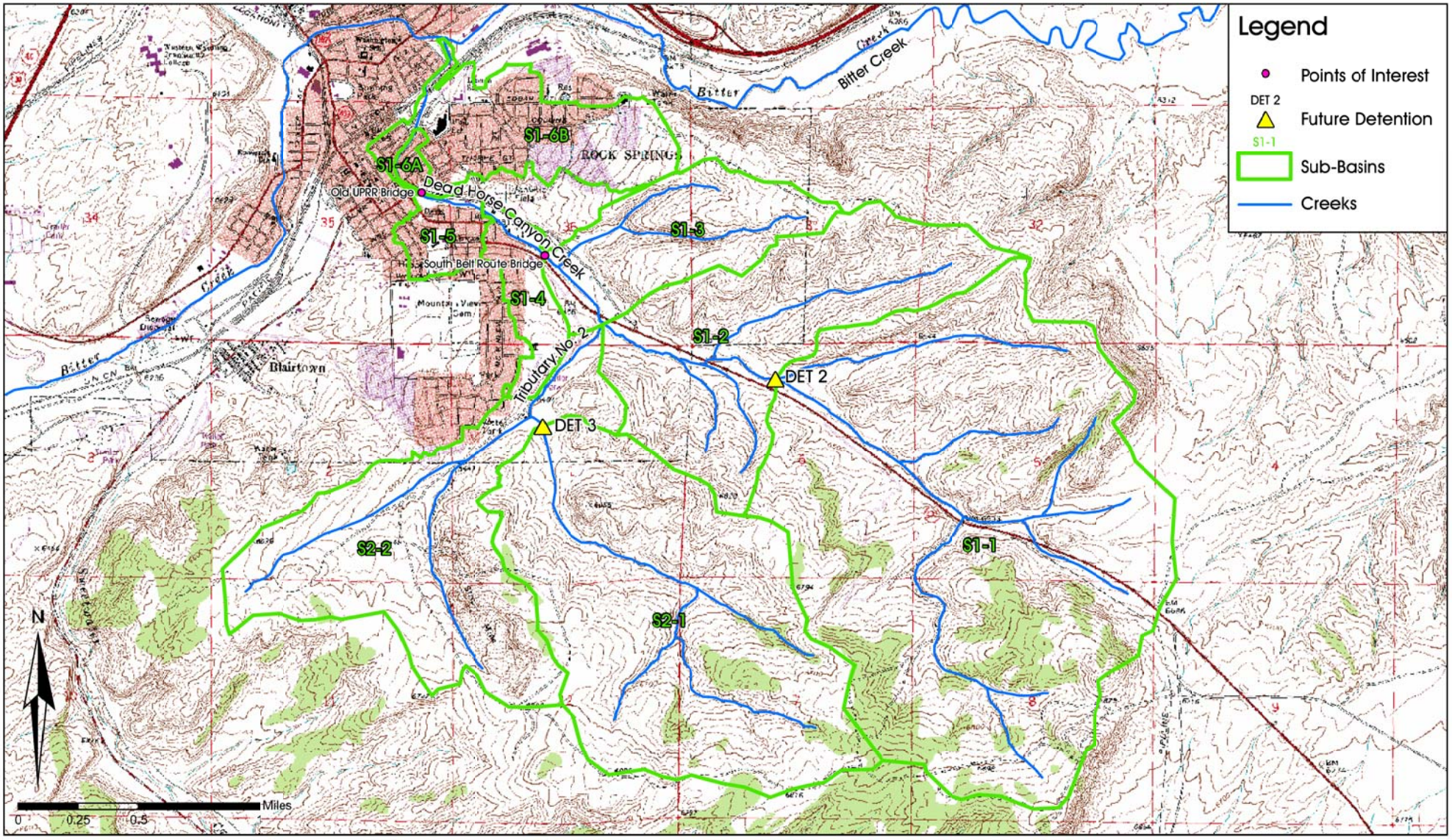
DATE: August 27, 2009 (Revised October 28, 2010)
TO: Bitter Creek Rehabilitation Project Files
FROM: Tyler Allen and Greg Poole, P.E.
PROJECT: Rock Springs, Bitter Creek Rehabilitation
TOPIC: Dead Horse Canyon Hydrology
PROJECT NO.: 344.02.200

INTRODUCTION

The City of Rock Springs, Wyoming has a history of flooding. The main contributor to the flooding is Bitter Creek which runs east to west through the middle of the City. Tributary to Bitter Creek is Dead Horse Canyon Creek which has been identified to contribute to the flooding of a portion of the city. A study performed by Johnson-Fermelia Co., Inc. (1989), now known as JFC Engineers and Surveyors, found that the flooding problems attributed to Dead Horse Canyon Creek can be alleviated with the addition of two detention basins (designated Detention Reservoir No. 2 and Detention Reservoir No. 3, see drawings in Appendix E) which will reduce storm runoff peak flow rates to the channel carrying capacity. The detention basins are to be constructed on Dead Horse Canyon Creek and one of its tributary channels known as Tributary No. 2 as shown in Figure 1.

Hansen, Allen, & Luce, Inc. (HAL) was contracted to assist in the preparation of a conditional letter of map revision (CLOMR) based on proposed improvements to Bitter Creek which includes the two detention basins in the Dead Horse Canyon Creek watershed. In order to determine and document the benefits of the proposed detention basins, a detailed hydrologic analysis of the area of Dead Horse Canyon Creek was needed. The FEMA flood insurance rate study (FEMA, 1998) states that the U.S. Army Corps of Engineers (COE) performed hydrologic and hydraulic analyses for the study with original work completed in 1985 and a revision in 1988; however, official data requests through FEMA and COE have failed to produce the details needed from the hydrologic studies of Dead Horse Canyon Creek. It was therefore determined that a current study of the area was necessary.

This memorandum documents the hydrologic study performed by HAL for the area of Dead Horse Canyon. The following sections include: design rainstorm, sub-basin hydrology, results, and regional regression comparison.



HANSEN ALLEN & LUCE inc ENGINEERS	CITY OF ROCK SPRINGS BITTER CREEK REHABILITATION	DEAD HORSE CANYON WATERSHED AND FUTURE DETENTION LOCATIONS	FIGURE 1

FEMA also requested information for the 50-year and 10-year storms and an addendum to this memorandum dated February 2010 was also revised and is included in this additional data request.

DESIGN RAINSTORM

FEMA's Flood Insurance Study (FIS) (FEMA, 1998) indicates that flooding in the City of Rock Springs may be generated in the summer by either intense general rain storms over larger tributary areas or localized cloudburst storms in the smaller drainage areas. These were considered to produce more severe flooding than floods generated by snowmelt in the area. The FIS (FEMA, 1998) evaluated the results of synthetic 24-hour general rain storms and 3-hour cloudburst storms.

The National Oceanic and Atmospheric Administration (NOAA) Precipitation-Frequency Atlas 2 Volume II-Wyoming isopluvial maps and procedures (NOAA, 1973) was used for the current study to determine precipitation depths of 2.4-inches and 1.3-inches for the 100-year, 24-hour storm and the 100-year 3-hour storm respectively. A sensitivity analysis was performed using the HEC-HMS (COE Hydrologic Engineering Center Hydrologic Modeling System, version 3.3, 2008) model to determine which produces greater peak flows in the area. The model predicts that greater peak flows result from the 100-year, 24-hour storm in the Dead Horse Canyon Creek Watershed.

A 500-year, 24-hour precipitation depth of 3.7-inches was determined using procedures described in the SCS TP-40 (SCS, 1961) and precipitation data presented in the NOAA Precipitation-Frequency Atlas 2 Volume II-Wyoming (NOAA, 1973).

SUB-BASIN HYDROLOGIC CHARACTERISTICS

Sub-basins for the Dead Horse Canyon Creek Watershed are shown in Figure 1. The SCS runoff curve number method was used to calculate storm runoff volumes for each of the sub-basins and the SCS Unit Hydrograph was used to generate hydrographs.

Sub-basin Curve Numbers were assigned using methods from the SCS Technical Release-55 (TR-55) (SCS, 1986). The important parameters for determining Curve Number values are: hydrologic soil group, vegetative cover, and land use (percent impervious area). The hydrologic soil group was assigned to different areas throughout the watershed through the use of a soils map and soil map unit descriptions provided by Martin Rosek of the Natural Resource Conservation Service (NRCS, formerly known as SCS) office in Rock Springs, Wyoming. Each of the soil map units was comprised of more than one type of soil. Each of these soil types were assigned a hydrologic soil group based on information provided in the TR-55 and discussion with NRCS personnel. Each soil unit was assigned a single hydrologic soil group according to the

dominant group in the unit. The dominant soils in the area are either of the hydrologic soil groups D (high runoff potential) or C (moderate to high runoff potential). Where there was any uncertainty in the type of soil or to which soil group they belonged, soil group D was assigned to the area to be conservative. The delineation of the soils as provided by the NRCS along with the soils unit descriptions are included in Appendix A along with a chart showing the determination of hydrologic soil group assignments.

Aerial photography and field reconnaissance were used to map vegetation cover type and density. Land use was determined based on areal photographs taken in 2004, tax parcel maps provided by Sweetwater County (last updated in April of 2009), and a site visit for general confirmation of the assumptions made about the area.

Curve Numbers were then calculated for each sub-basin and are listed in Table 1. The detailed calculations used to determine overall sub-basin curve numbers are given in Appendix B.

TABLE 1
SUB-BASIN CHARACTERISTICS

SUB-BASIN	AREA (sq miles)	Area Weighted CN	Lag Time (min)
S1-1	2.672	87	94.5
S1-2	0.901	87	59.5
S1-3	0.435	86	45.2
S1-4	0.145	89	17.0
S1-5	0.221	89	22.0
S1-6A	0.03	90	17.9
S1-6B	0.42	90	33.9
S2-1	1.544	76	88.8
S2-2	0.985	85	61.1

The lag times for undeveloped sub-basins (S1-1, S1-2, S1-3, S2-1, S2-2) were calculated using Simas and Hawkins' (1998) regression equation. For the sub-basins which are mostly developed (S1-4, S1-5, S1-6A, S1-6B), the methods prescribed in TR-55 (SCS, 1986) were used. Lag times are reported in Table 1 and the detailed computations are shown in Appendix C.

Due to the ephemeral nature of the flow in Dead Horse Canyon Creek and Tributary No. 2, it was assumed there was no baseflow. Routing was estimated by the Kinematic Wave method.

RESULTS

Computed peak discharges generated by the HEC-HMS model for a 100-year rainstorm runoff event with and without the proposed detention are displayed in Table 2. Table 2 also presents results for the 500-yearr rainstorm event. The existing effective HEC-2 water surface profile model of Dead Horse Canyon Creek was used to define the creek flood carrying capacity. The old UPRR Bridge (river mile 0.788) was found to have the limiting capacity (600 cfs) for the system. The detention basins have therefore been sized to reduce the flow to 600 cfs at the old UPRR Bridge. Required detention volumes are shown on Table 3. The HEC-HMS model input, the model map, and the results are included in Appendix D. Detention stage-discharge relationships were based the conceptual design drawings which were a result of JFC's 1989 Study. These drawings and information on the determination of the required detention volumes are included in Appendix E.

TABLE 2
PEAK FLOWS FROM 100-YR and 500-YR RAINSTORM RUNOFF EVENT DETERMINED WITH HEC-HMS MODEL

LOCATION	HEC-HMS ELEMENT	DRAINAGE AREA (mi^2)	100-yr PEAK DISCHARGE W/O DETENTION (cfs)	100-yr PEAK DISCHARGE W/ DETENTION (cfs)	500-yr Peak Discharge (cfs)
Detention Reservoir No. 2	S1-1, DET 2	2.67	336	256	698
Detention Reservoir No. 3	S2-1, DET 3	1.54	95	48	264
Dead Horse Above Tributary No. 2	J1-2	3.57	452	348	941
Tributary No. 2 at mouth	J2-2	2.53	208	155	515
Dead Horse Below Tributary No. 2	DH_TRIB2	6.10	659	499	1,455
South Side Belt Route Bridge	J1-3	6.54	711	553	1,568
Old UPRR Bridge	J1-5	6.90	749	592	1,643
Dead Horse at Mouth	Bitter Creek Confluence	7.41	805	656	1,758

TABLE 3
FUTURE DETENTION

DETENTION LOCATION (See Figure 1)	MODEL ID	TRIBUTARY AREA (mi^2)	PREDICTED 100-yr PEAK INFLOW (cfs)	TARGET 100-yr PEAK DISCHARGE (cfs)	REQUIRED DETENTION VOLUME (ac-ft)
Dead Horse Canyon Creek above Tributary No. 2	DET 2	2.67	336	260	20
Tributary No. 2	DET 3	1.54	95	50	14

COMPARISON TO EXISTING FIS FLOWS AND REGIONAL REGRESSION EQUATIONS

A comparison was made between the peak flows generated by the HEC-HMS model, regional regression equations published by the USGS (2003) for streams in the State of Wyoming (see Table 4 for comparisons and Appendix F for computations), and the peak flows reported in the existing FIS report (FEMA, 1998). The regression equations were developed for undeveloped areas and therefore comparisons were only made to the undeveloped areas of the Dead Horse Canyon Creek watershed. Although the HEC-HMS model peak flows are much lower than the FIS flows, they are within the range of the regional regression equation average standard error of prediction (SE_p) for the 100-year peak flows (Table 4). The 500-year peak flows predicted by the HEC-HMS model were slightly higher than the upper limits of the SE_p at a few locations. Based on the current information gathered for this study, it is believed that the discharge values predicted by the current HEC-HMS model study are the best available predictions of flood flows for Dead Horse Canyon Creek.

TABLE 4
REGIONAL REGRESSION EQUATION COMPARISON FOR 100-YR PEAK FLOWS

LOCATION	HEC-HMS MODEL		USGS REGIONAL REGRESSION		FIS
	ELEMENT	PEAK DISCHARGE (cfs)	PEAK DISCHARGE (cfs)	RANGE OF SE_p (cfs)	PEAK DISCHARGE (cfs)
100-yr Peak Flows					
Detention Reservoir No. 2*	S1-1	336	328	121 - 534	-
Dead Horse Above Tributary No. 2	J1-2	452	377	139 - 614	1,400
South Side Belt Route Bridge	J1-3	711	502	186 - 819	-
Dead Horse Below Tributary No. 2	DH_TRIB2	659	489	181 - 798	2,400
Detention Reservoir No. 3*	S2-1	95	251	93 - 410	-
Trib. 2 at mouth	J2-2	208	318	118 - 518	1,000
500-yr Peak Flows					
Detention Reservoir No. 2*	S1-1	698	575	155 - 995	-
Dead Horse Above Tributary No. 2	J1-2	941	656	177 - 1,134	2,700
South Side Belt Route Bridge	J1-3	1,568	859	232 - 1,485	-
Dead Horse Below Tributary No. 2	DH_TRIB2	1,455	838	226 - 1,450	4,800
Detention Reservoir No. 3*	S2-1	264	449	121 - 776	-
Trib. 2 at mouth	J2-2	515	559	151 - 968	2,100

* Peak Discharge rates determined for undetained flows at these locations.

CONCLUSIONS

- The new peak discharges presented in Table 2 are based on current detailed information, were compared to peak flow regression equations developed for the area, and were calculated using accepted standard practices; therefore, it is recommended that they be adopted for use in the flood delineations for Dead Horse Canyon Creek.
- The addition of 20 acre-feet of detention at the DET 2 location (located on Dead Horse Canyon Creek upstream of the mouth of Tributary No. 2 see Figure 1) and 14 acre-feet of detention at DET 3 (located on Tributary No. 2 see Figure 1) can reduce the predicted 100-year peak storm runoff flow rate in Dead Horse Canyon Creek to that which can be carried without flooding.

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Appendix A
Soils Information

INDEX

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• Soil Group Determination Chart 2	2
• NRCS Soils Delineation Map	2
• NRCS Soil Unit Descriptions	18

Project: Bitter Creek Rehabilitation / Dead Horse Hydrology
Project #: 344.02.200
Client: Landmark Design, Inc.,
City of Rock Springs

Soil Group Determination Chart

NRCS Soil Code	Name	Soil Group	%	Weighted Soil Group
126	Unknown			Assumed D
151	Unknown			Assumed D
401	Dumps, Mine			Assumed D
405	Unknown			Assumed D
436	Teagulf	C	60	D
	Pepal	B	20	
	Kandaly	A	20	
	Huguston	D		
	Haterton	D		
	McCullen	B		
451	Unknown			Assumed D
452	Huguston	D	50	D
	Teagulf	C	25	
	Haterton	D	25	
	Pepal	B		
	Wint	C		
	Kandaly	A		
455	Thayer	C	85	C
	Leckman	B	15	
	Quealman	B/C		
458	Rock Outcrop	Relatively Impervious	30	D
	Spool	C	30	
	Huguston	D	30	
	Leckman	B	10	
	Terada	B		
	Kandaly	A		
459	Rock Outcrop	Relatively Impervious	40	D
	Wint	C	25	
	Horsley	D	25	
	Tasselman	D	10	
	Haterton	D		
	Leckman	B		
461	Rock Outcrop	Relatively Impervious	100	D
466	Huguston	D	40	D
	Rock Outcrop	Relatively Impervious	10	
	Terada	B	30	
	Leckman	B	20	
	Kandaly	A		
	Wintin	C		

NRCS Soil Code	Name	Soil Group	%	Weighted Soil Group
467	Horsley	D	35	D
	Huguston	D	20	
	Rock Outcrop	D	20	
	Haterton	D	25	
	Kandaly	A		
	Teagulf	C		
	Wint	C		
	Youjay	D		
486	Stansbury	C	40	C
	Wint	C	20	
	Huguston	D	20	
	Rock Outcrop	Relatively IMpervious	20	
	Horsley	D		
	Leckman	B		
818	Firehole	C	40	D
	Jansley	D	30	
	Rock Outcrop	Relatively Impervious	15	
	Buckboard	B	15	
	Haterton	D		

NRCS SOILS DELINEATION MAP

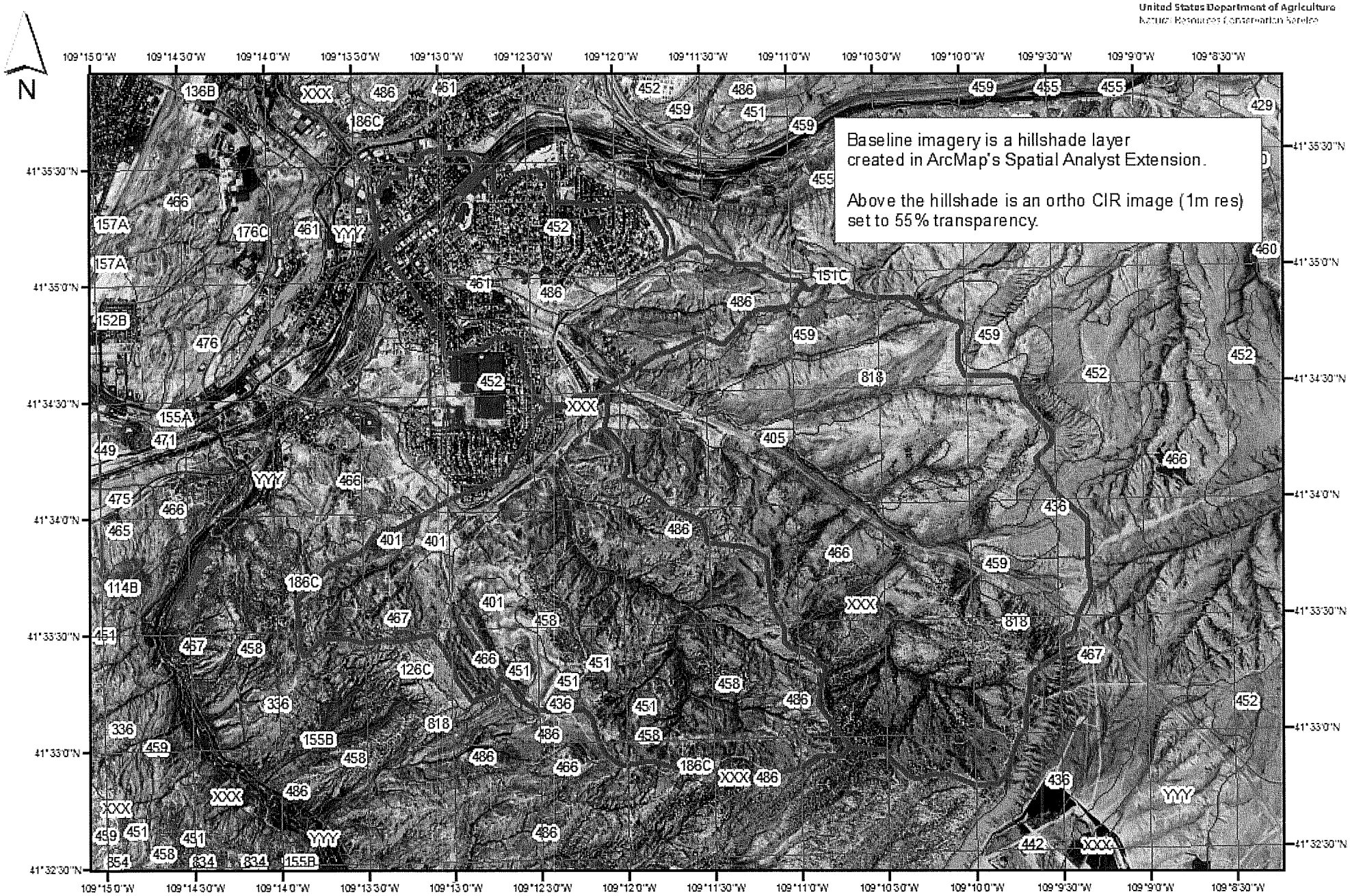
A request was made to the NRCS regarding information on soils in the Dead Horse Canyon Creek watershed. With that request an initial estimation of the boundaries of the watershed was sent to give an idea of the area for which information was needed. This initial delineation of the watershed and its sub-basins was included in the soils delineation map supplied to HAL. Since then the delineation of the boundaries of the watershed and its sub-basins have been refined (see Figure 1).

This information regarding the map and the soil unit descriptions was also sent by email per Drew Mather of the NRCS in Rock Springs, Wyoming:

> The numbers on the map correspond to map units. These are attached to this email in sequential order. There are a couple of notes about the symbols on the map:
>
> The 'XXX' symbol on the map refers to map unit '455' and will be corrected in further exports of this area.
>
> The '136C' does not have a map unit description, but we do have '136B'.
> The 'C' refers to a slope range of 6-15%.
>
> The '186C' does not exist in our old legend. Our best guess as to what this map unit is is '486'. The 'C' as above, is the slope range.

Dead Horse Sub Basins

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service



Legend

- Dead Horse Basin Boundary
- Map Unit Delineations

0 0.25 0.5 1 Miles

1:39,700

Special request map created by
Phillip Drew Mather for Martin Rosek, 5-14-2009

(136B) Teagulf-Pepal fine sandy loams, 3 to 6 percent slopes

This mapping unit consists of gently sloping and undulating upland pediments. Elevations are 6,200 to 7,200 feet. Average annual precipitation is about 8 inches. Average annual air temperature is about 44°F. and the average summer air temperature is about 65°F.; the frost-free season is 90 to 120 days.

This unit is composed of about 60 percent Teagulf fine sandy loam and about 20 percent Pepal fine sandy loam. Included in mapping and making up about 20 percent of the mapping unit are small areas of Huguston, Terada, Haterton and Horsley soils.

Teagulf is a moderately deep, well drained soil formed in residual material. Typically, it has a surface layer of pale brown fine sandy loam 15 inches thick. The underlying layer is highly calcareous, very pale brown fine sandy loam 20 inches thick and underlain by soft sandstone.

Permeability is moderately rapid. Reaction is moderately or strongly alkaline. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is slow to medium and the water erosion hazard is slight to moderate. The wind erosion hazard is moderate.

Pepal is a very deep, well drained soil formed in residual material and alluvium. The underlying layer is highly calcareous, very pale brown fine sandy loam to 60 inches or more.

Permeability is moderately rapid. Reaction is moderately or strongly alkaline. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow to medium and the water erosion hazard is slight to moderate, gullies in stream channels occur. The wind erosion hazard is moderate.

These soils are rangeland and are used for grazing by cattle and sheep and for wildlife habitat.

Native vegetation on the Teagulf and Pepal soils is mainly big sagebrush, rabbitbrush, shadscale, spiny hopsage, bluebunch, wheatgrass, needleandthread, needleleaf sedge and thick spike wheatgrass. The potential production under good range management is 500 lbs. per acre annually. Some areas are used for urban development for which they are well suited.

Capability unit: VIe5 dryland; IIIe5 irrigated - design groups 14 & 6.
Range site: Sandy 7-9" P.Z.

Type location. Sec. 9, T19N, R105W. Sweetwater County, Wyoming.

401 Dumps, mine

This miscellaneous land type consists of waste rock, general refuse and reworked soil material that without major reclamation is incapable of supporting vegetation. Included are minor areas of pits or excavated areas that are mostly bare rock. These areas are too varied to make general predictions.

Capability subclass: 8S

Range site: none

436 Teagulf-Pepal fine sandy loams, 0 to 6 percent slopes

This map unit is on nearly level to undulating and gently sloping residual upland plains. Areas are irregular in shape and 10 to 500 acres in size. The native vegetation is shrubs, forbs and grasses. Elevation is 6,200 to 7,200 feet. The average annual precipitation is about 8 inches. The average annual air temperature is about 44 degrees F. and the average frost-free season is about 100 days.

This unit is about 60 percent Teagulf fine sandy loam and 20 percent Pepal fine sandy loam. Included in mapping are small areas of Kandaly fine sand, Huguston fine sandy loam, Haterton loam and McCullen loam making up about 20 percent of the total acreage. The percentages vary from one area to another. These soils are too intermixed to map separately.

The Teagulf soil is moderately deep and well drained. It formed in residuum and alluvium from sedimentary rock. Typically the surface layer is light brownish gray fine sandy loam about 3 inches thick. The subsoil is light grayish brown fine sandy loam about 7 inches thick. The next layer is highly calcareous light olive brown fine sandy loam about 25 inches thick, underlain by shale.

Permeability of the Teagulf soil is moderately rapid above the shale. Available water capacity is low, 2.2 to 4.5 inches. Effective rooting depth is 20 to 40 inches.

The Pepal soil is very deep and well drained. It formed in alluvium from sedimentary rock. Typically the surface layer is light brownish gray fine sandy loam about 1 inch thick. The subsoil is pale brown fine sandy loam about 14 inches thick. The next layer is highly calcareous, very pale brown fine sandy loam about 15 inches thick. The substratum is light brownish gray fine sandy loam to 60 inches.

Permeability of the Pepal soil is moderately rapid. Available water capacity is moderate, 6 to 7.5 inches. Effective rooting depth is 60 inches or more.

Runoff on this unit is slow to medium and the hazard of water erosion is slight to moderate. The hazard of soil blowing is moderate.

This unit is used mainly for grazing. It is also used for wildlife habitat mainly antelope, rabbits, other small mammals, sage grouse and other birds. Some minor areas have also been used for urban development.

The potential plant community on the Teagulf and Pepal soils is mainly needle-andthread, Indian ricegrass, thickspike wheatgrass and big sagebrush. If the vegetation deteriorates the amount of shrubs increse. Under further deterioration of plant cover cheatgrass and other annual weeds invade. In an average year the yield is approximately 500 pounds of air dry herbage per acre. It ranges from 300 pounds in unfavorable years to 700 pounds in favorable years. Management practices suitable on this unit are deferred grazing, rotation grazing and brush control.

Where used for urban development the main limitation is the moderate depth to shale which must be considered in making excavations and in installing septic tanks, otherwise this unit is well suited to homesite developments.

Capability class: 6E

Range sites: Teagulf - Sandy, 7 to 9" P.Z., Green River & Great Divide Basins
Pepal - Sandy, ditto
Kandaly - Sands, ditto
Huguston - Shallow Sandy, ditto
Haterton - Shallow Loamy, ditto
McCullen - Loamy, ditto

Note: This soil description is tentative and subject to revision.

(452) Huguston-Teagulf fine sandy loams, 3 to 8 percent slopes

This map unit is on gently sloping to sloping residual uplands predominantly over sandstone bedrock. Slopes are smooth. The native vegetation is mainly shrub grassland. Elevation is 6,000 to 7200 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 40 to 45 degrees F., and the average frost-free period is 90 to 120 days.

This unit is 50 percent Huguston sandy loam and 25 percent Teagulf fine sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Also included are small areas of Haterton, Pepal, Winton, and Kandaly soils and Rock outcrop. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Huguston soil is shallow and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is pale brown sandy loam about 3 inches thick. The subsoil is light yellowish brown sandy loam about 10 inches thick over sandstone. Depth to bedrock ranges from 10 to 20 inches.

Permeability of the Huguston soil is moderately rapid. Available water capacity is about 1½ to 2½ inches. Effective rooting depth is 10 to 20 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

The Teagulf soil is moderately deep and well drained. It formed in residuum derived dominantly from sandstone. Typically, the surface layer is pale brown fine sandy loam about 8 inches thick. The subsoil is light yellowish brown or brownish yellow fine sandy loam about 24 inches thick over sandstone. Depth to bedrock ranges from 20 to 40 inches.

Permeability of the Teagulf soil is moderately rapid. Available water capacity is about 2½ to 5 inches. Effective rooting depth is 20 to 40 inches. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate.

This unit is used for domestic livestock grazing by cattle and sheep, and wildlife habitat.

The potential plant community on the Huguston soil is mainly big sagebrush, low rabbitbrush, needleandthread, Indian ricegrass, and thickspike wheatgrass. The average annual production of air-dry vegetation ranges from 200 to 450 pounds. The potential plant community on the Teagulf soil is mainly needleandthread, thickspike wheatgrass, Indian ricegrass, shadscale and big sagebrush. The average annual production of air-dry vegetation ranges from 300 to 700 pounds.

Capability unit: VIIe14 dryland

Range sites: Huguston soil - Shallow Sandy 7-9" P.Z.
Teagulf soil - Sandy 7-9" P.Z.

Type location: Sweetwater County, Wyoming; Sec. 25, T18N, R106W.
About 6 miles southwest of Rock Springs.

This soil description is tentative and subject to revision.

Thayer fine sandy loam, 1 to 6 percent slopes (455)

These very deep, well drained soils are on gently sloping alluvial fans throughout the soil survey area. Elevations are 6,200 to 7,200 feet. The average annual precipitation is about 8 inches. Average annual air temperature is about 43°F., and the average summer air temperature is about 63°F. The frost-free season is 80 to 110 days.

Typically, the Thayer soil is a pale brown, strongly alkaline fine sandy loam to 60 inches or more. It is formed in alluvium derived from sedimentary rock. Permeability is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches. Native vegetation is mainly Gardner saltbush, bottlebrush squirreltail, Sandberg bluegrass, greasewood, bud sagewort and Indian ricegrass.

Included in mapping are small areas of Leckman and Quealman soils totaling less than 15 percent of the mapping unit.

These soils are used mainly for rangeland and wildlife habitat. Some areas are used for urban development. Surface runoff is slow to medium and the water erosion hazard is moderate. Wind erosion hazard is moderate.

Capability unit: VIs12 dryland; IVs12 irrigated-design groups 14 and 6.
Range Site: Saline Upland, 7-9" P.Z.
Type Location: Sweetwater County, Wyoming. Section 8, T18N, R100.
This soil description is tentative and subject to revision.

(458) Rock outcrop-Spool-Huguston complex, 8 to 40 percent slopes

This mapping unit consits of steep, rocky uplands. Elevations are 6,300 to 7,000 feet. Average annual precipitation is about 8 inches. Average annual air temperature is about 44°F. and the average summer air temperature is about 65°F.; the frost-free season is 80 to 110 days.

This unit is composed of about 30 percent Rock outcrop, about 30 percent Spool loamy fine sandy, that occur mainly on ridge tops, and about 30 percent Huguston fine sandy loam that occur mainly on lower slopes. Included in mapping and making up about 10 percent of the mapping unit are small areas of Leckman fine sandy loam, Terada fine sandy loam and Kandaly loamy fine sand.

Rock outcrop is a hard sandstone.

Spool is a shallow, well drained residual soil. Typically, it is brown loamy fine sand 15 inches thick underlain by hard sandstone.

Permeability is rapid. Reaction is neutral or mildly alkaline. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium and the water erosion hazard is moderate to severe. The wind erosion hazard is severe.

Huguston is a shallow, well drained residual soil. Typically, it is a light brownish gray fine sandy loam 16 inches thick underlain by soft calcareous sandstone.

Permeability is moderately rapid. Reaction is moderately alkaline. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid and the water erosion hazard is severe. The wind erosion hazard is severe.

Native vegetation on the Spool soils is mainly juniper. Native vegetation on the Huguston soils is mainly big sagebrush, rabbitbrush, juniper, needleandthread, bluebunch wheatgrass and needleleaf sedge. The potential production under good range management in an average year is 450 lbs. per acre air dry. These soils are rangeland and are used for grazing by cattle and sheep and for wildlife habitat.

Capability unit: VIIs83 dryland.

Range sites: Spool soils - Shallow Breaks 7-9" P.Z.
Huguston soils - Shallow Breaks 7-9" P.Z.
Rock outcrop - None

Type location: Sec. 7, T 17N., R. 104W., Sweetwater County, Wyoming.

This soil description is tentative and subject to revision.

461 Rock outcrop

These areas are mostly bare bedrock exposures of sandstone and shale. The main areas are associated with prominante escarpments. The terrain is sloping to vertical with a local relief of 50 to 500 feet. Areas are irregular in shape and 20 to 500 acres in size. A few thinnly scattered trees and shrubs occur. Elevation is 6,000 to 8,000 feet. The average annual precipitation ranges from 7 to 14 inches. The average annual air temperature ranges from 40 to 44 degrees F. and the frost-free season averages from 60 to 100 days.

Included in mapping are small areas of shallow loamy fine sand on benches and deep loamy fine sand soils in narrow draws and toeslopes making up about 10 percent of the total acreage.

Many of these areas have a high scenic value. They also provide some wildlife habitat for deer and nesting sites for raptors.

Capability class: 8S

Range site: none

466 Huguston-Terada-Rock outcrop complex, 6 to 30 percent slopes

This map unit is on rolling to hilly erosional uplands. Elevation is 6000 to 7200 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 40 to 45 degrees F., and the frost-free season is 80 to 110 days.

This unit is 40 percent Huguston fine sandy loam, 30 percent Terada fine sandy loam and 10 percent Rock outcrop. Included in this unit are small areas of Leckman fine sandy loam in draws and on toe slopes, Kandaly fine sand as small dunes, Wintin channery sandy loam on ridges and hogbacks totaling about 20 percent. the percentages vary from one area to another.

The Huguston soil is shallow, well drained soil formed in residuum from sandstone. Typically, it has a surface layer of light brownish gray fine sandy loam about 3 inches thick. The underlying material is light brownish gray fine sandy loam that grades to weathered calcareous sandstone at a depth of about 16 inches. Permeability is moderately rapid. The effective rooting depth is 10 to 20 inches. Available water capacity is very low. Surface runoff is medium and the hazard of water erosion is moderate. Wind erosion hazard is moderate. The native vegetation is mainly low sagebrush, low rabbitbrush, needleandthread, Indian ricegrass and thickspike wheatgrass.

The Terada soil is a moderately deep, well drained soil formed in residuum and localized alluvium over sandstone. Typically, the surface layer is light yellowish brown, moderately alkaline, sandy loam about 3 inches deep. The underlying material is yellowish brown and pale brown, strongly alkaline, sandy loam that grades to weathered calcareous sandstone at a depth of about 30 inches. Permeability is moderately rapid. The effective rooting depth is 20 to

466 Huguston-Terada-Rock outcrop complex (cont.)

40 inches. Available water capacity is low. Surface runoff is medium and the hazard of water erosion is moderate. Wind erosion hazard is moderate. The native vegetation is mainly big sagebrush, needleandthread, thickspike wheatgrass and shadscale.

The Rock outcrop areas are flat to verticle soft sandstones or shales with minor cherty inclusions in some units.

This unit is used mainly for grazing by cattle and sheep. It is also used for wildlife habitat supporting mainly antelope, rabbits and sage grouse. Some areas have been utilized for urban development - the main limitations for this are slope and shallow depth to rock.

Capability subclass: 7E

Range sites: Huguston - Shallow Sandy 7-9" P.Z.
Terada - Sandy 7-9" P.Z.
Rock outcrop -none

Type location: Section 14, T19N, R100W; Black Butte Mine area.

This soil description is tentative and subject to revision.

467 Horsley-Huguston-Rock outcrop complex, 8 to 30 percent slopes

This map unit is on hilly residual uplands. Slopes are irregular and 200 to 500 feet long. Elevation is 6,000 to 7,200 feet. The average annual precipitation is 7 to 9 inches. The average annual air temperature is 40 to 45 degrees F. and the frost-free season is 60 to 90 days. Native vegetation is shrubs, forbs and grasses.

This unit is about 35 percent Horsley loam, 20 percent Huguston fine sandy loam and 20 percent Rock outcrop. These soils are so intricately intermingled it was not practical to map them separately.

Included with these soils are lesser areas of Haterton loam, Kandaly loamy fine sand, Teagulf fine sandy loam, Wint channery sandy loam and Youjay loam. These inclusions make up about 25 percent of the total acreage.

The Horsley soil is very shallow and well drained. It formed in residuum from shale. Typically it is light brownish gray, strongly alkaline shaly loam about 5 inches deep to soft shale bedrock.

Permeability of the Horsley soil is moderate above the bedrock. Available water capacity is very low. Effective rooting depth is 4 to 10 inches.

The Huguston soil is shallow and well drained. It formed in residuum from sandstone. Typically it is light gray and very pale brown, strongly alkaline fine sandy loam about 14 inches deep to sandstone bedrock.

Permeability of the Huguston soil is moderately rapid above the bedrock. Available water capacity is very low. Effective rooting depth is 10 to 20 inches.

Rock outcrop is exposed sandstone and shale bedrock on ridge crests and shoulders of slopes.

Runoff on this unit is medium to rapid and the water erosion hazard is moderate to severe. The wind erosion hazard is moderate.

This unit is used mainly for grazing.

The potential plant community on the Horsley soil is mainly Gardner saltbush, thickspike wheatgrass, Indian ricegrass and bottlebrush squirreltail. If the vegetation deteriorates from abuse forbs increase and grasses decrease. Under ~~fur~~ further deterioration annual weeds invade. The potential plant community produces about 200 pounds of air dry vegetation per acre in normal years but may vary from 150 to 300 pounds.

The potential plant community on the Huguston soil is mainly needleandthread, galleta, Indian ricegrass, thickspike wheatgrass, low rabbitbrush and big sagebrush. If the vegetation deteriorates from abuse forbs and shrubs increase. Under furtheer deterioration annual weeds invade. The potential plant community produces about 350 pounds of air dry vegetation per acre in normal years but may vary from 200 to 450 pounds.

Capability classes: Horsley - 7S
Huguston - 7E
Rock outcrop - 8S

Range sites: Horsley - Shale 7-9" GR
Huguston - Shallow Sandy 7-9" GR
Rock outcrop - none

This soil description is tentative and subject to revision.

16/18

486 Stansbury(P)-Wint(P)-Huguston complex, 8 to 30 percent slopes

This map unit occurs on rolling and hilly erosional uplands associated with the Rock Springs Uplift of central Sweetwater County. Elevation is 6400 to 7000 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 42 to 45 degrees F., and the average frost-free season is 80 to 110 days.

This unit is 40 percent Stansbury channery loam, 20 percent Wint channery sandy loam and 20 percent Huguston fine sandy loam. Included in this unit are small areas of Rock outcrop and Horsley loam on ridge crests and Leckman fine sandy loam in draw bottoms that total about 20 percent of the map units. The percentage varies from one area to another.

The Stansbury is a deep, well drained soil formed in residuum derived dominantly from sedimentary rocks. Typically, the surface layer is pale brown and very pale brown, mottled, channery clay loam about 6 inches thick. The underlying material is stratified extremely flaggy loam (fractured bedrock) and extremely shaley clay loam to about 50 inches, underlain by shale. The native vegetation is mainly bud sagewort, Gardner saltbush, shadscale, low rabbitbrush, bottlebrush squirreltail and greasewood. Permeability is moderate. Available water capacity is 4 to 6 inches. Effective rooting depth is 40 inches or more. Runoff is rapid and the hazard of water erosion is severe. The hazard of soil blowing is slight.

Wint is a shallow, somewhat excessively drained soil formed in residuum derived dominantly from sandstone. Typically, the surface layer is pale brown channery sandy loam about 10 inches thick, underlain by sandstone. The native vegetation is mainly bluebunch wheatgrass, low sagebrush, golden weed, phlox and nailwort.

486 (cont.)

Permeability is moderately rapid. Available water capacity is 0.5 to 1.5 inches. Effective rooting depth is 6 to 20 inches. Runoff is rapid and the hazard of water erosion is severe. The hazard of soil blowing is slight.

Huguston is a shallow, well drained soil formed in residuum derived dominantly from sandstone. Typically, the profile is light brownish gray fine sandy loam about 18 inches deep, underlain by sandstone. The native vegetation is mainly big sagebrush, needleandthread, Indian ricegrass and galleta. Permeability is moderately rapid. Available water capacity is 1.5 to 3 inches. Effective rooting depth is 10 to 20 inches. Runoff is medium and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

These soils are used mainly for livestock grazing. Overgrazing should be avoided as it kills out desirable plants, decreases carrying capacity and increases erosion. They are also used for wildlife habitat - mainly antelope.

Capability subclass: 7E

Range site: Stansbury - Saline Upland 7-9" P.Z.
Wint - Very Shallow 7-9" P.Z.
Huguston - Shallow Sandy 7-9" P.Z.

Type location:

This soil description is tentative and subject to revision.

818--Firehole-Jansley-Rock outcrop, 20 to 60 percent slopes. This map unit is on moderately steep and steep sideslopes and spurs. Slopes are irregular. The native vegetation is mainly sparse shrub grassland. Elevation is 6100 to 7000 feet. The average annual precipitation is about 7 to 9 inches, the average annual air temperature is 40 to 45 degrees F.

This unit is 40 percent Firehole channery loam, 20 to 60 percent slopes, 30 percent Jansley channery silty clay loam, 20 to 60 percent slopes, and 15 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Also included are small areas of Buckboard and Haterton soils on convex or plane surfaces and Bittercreek and Sagecreek soils in small swales. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Firehole soil is very shallow and well drained. It formed in residuum derived dominantly from sandstone or sandy shale. Typically, the surface layer is very pale brown channery loam about 1 inch thick. The subsurface layer is very pale brown very channery loam about 4 inches thick. The substratum is very pale brown very channery loam about 5 inches thick over hard calcareous sandstone. Depth to hard sedimentary bedrock ranges from 6 to 20 inches.

Permeability of the Firehole soil is moderate. Available water capacity is about 0.6 to 1.7 inches. Effective rooting depth is 6 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate to severe. The hazard of soil blowing is slight to moderate.

The Jansley soil is very shallow and well drained. It formed in residuum derived dominantly from shale. Typically, the surface layer is light yellowish brown channery silty clay loam about 3 inches thick. The subsoil is light yellowish brown channery silty clay loam about 5 inches thick. The substratum is very pale brown very channery silty clay loam about 2 inches thick over thin bedded soft shale. Depth to soft shale bedrock ranges from 6 to 20 inches.

Permeability of the Jansley soil is moderate. Available water capacity is about 0.3 to 2.2 inches. Effective rooting depth is 6 to 20 inches. Runoff is rapid, and the hazard of water erosion is severe. The hazard of soil blowing is moderate.

This unit is used for wildlife habitat and very limited livestock grazing.

The potential plant community on the Firehole soil is mainly bluebunch wheatgrass, bottlebrush squirreltail, and Indian ricegrass. The average annual production of air-dry vegetation ranges from 200 to 400 pounds per acre. The range site is Very Shallow 7-9" P.Z.

The potential plant community on the Jansley soil is mainly bluebunch wheatgrass, bottlebrush squirreltail, and Indian ricegrass. The average annual production of air-dry vegetation ranges from 200 to 400 pounds per acre. The range site is Very Shallow 7-9" P.Z.

Capability subclass: 7S

This soil description is tenative and subject to revision.

Appendix B
Curve Number Calculations

INDEX

	NO. OF PAGES
• Curve Number Calculations	3

Project: Bitter Creek Rehabilitation / Dead Horse Hydrology
Project #: 344.02.200
Client: Landmark Design, Inc., City of Rock Springs

Curve Number Calculations

Each individual areaand its assigned attributes were determined through the GIS map Dead Horse.mxd
W:\344 - General Misc\02.200 - 08 Bitter Creek - GJP\GIS\Dead Horse\Dead Horse.mxd

Sub-Basin	CN[1]
S1-1	87
S1-2	87
S1-3	86
S1-4	89
S1-5	89
S1-6[2]	90
S2-1	76
S2-2	85

$$CN_{weighted} = (1 - f) * CN_{open} + 98f$$

$CN_{weighted}$ = curve number based weighted according ratio of impervious area to pervious area
f = fraction of area which is impervious
CN_{open} = CN of open area.

- Coverage was determined to be good or fair because of a grass understory and therefore CN for good and fair cover were taken from "Sagebrush with grass understory" (TR-55)
- Poor coverage was taken from Desert Shrub category because Desert shrub is what most of the plants would be

1. Computed Curve Number for each sub-basin from calculations below
2. S1-6 was altered due to the data request by FEMA dated August 2010; however, the new sub-basins S1-6A and S1-6B have similar characteristics to the original S1-6 and therefore the CN was assumed to the same for the new sub-basins.

Fraction Impervious

Open	Commercial	School	0.125-Res	0.25-Res	0.2-Res	Industrial
0	0.85	0.55	0.65	0.38	0.51	0.72

Open Space CN's

	Vegitative Cover		
Soil	poor	fair	good
C	85	63	47
D	88	70	55

Urban CN's

	Vegetative Cover		
Soil	poor	good	Impervious
C	85	74	98
D	88	80	

Sub-Basin	NRCS_Code	Soil Type	Veg. Cover	Landuse	Segment Area (acres)	Area Impervious (acres)	$CN_{weighted}$	(Frac. Area) Segment / Total Area	$CN_{weighted}$*(Frac. Area)
S1-1	455	C	Poor	Open	221.5579	0.000	85	0.130	11.0128
S1-1		D	Poor	Open	6.6873	0.000	88	0.004	0.3441
S1-1	486	C	Poor	Open	118.2459	0.000	85	0.069	5.8775
S1-1	458	D	Poor	Open	501.4240	0.000	88	0.293	25.8035
S1-1	466	D	Poor	Open	164.3471	0.000	88	0.096	8.4574
S1-1	459	D	Poor	Open	18.1344	0.000	88	0.011	0.9332
S1-1	818	D	Poor	Open	37.9033	0.000	88	0.022	1.9505
S1-1	452	D	Poor	Open	36.6017	0.000	88	0.021	1.8835
S1-1	467	D	Poor	Open	21.1452	0.000	88	0.012	1.0881
S1-1	436	C	Poor	Open	41.2072	0.000	85	0.024	2.0483
S1-1	459	D	Poor	Open	24.7009	0.000	88	0.014	1.2711
S1-1	818	D	Poor	Open	477.2874	0.000	88	0.279	24.5614
S1-1	405	D	Poor	Open	7.4548	0.000	88	0.004	0.3836
S1-1	455	C	Poor	Open	32.6790	0.000	85	0.019	1.6243
S1-1	466	D	Poor	Open	0.0117	0.000	88	0.000	0.0006
S1-1	818	D	Poor	Open	0.0046	0.000	88	0.000	0.0002
S1-1	466	D	Poor	Open	0.0252	0.000	88	0.000	0.0013
S1-1	458	D	Poor	Open	0.6250	0.000	88	0.000	0.0322
S1-1	458	D	Poor	Open	0.0072	0.000	88	0.000	0.0004
				Totals =	1710.0496	0.000		1.000	87.2742
S1-2	455	C	Poor	Open	74.1908	0.000	85	0.129	10.9321
S1-2		D	Poor	Open	5.9620	0.000	88	0.010	0.9095
S1-2	486	C	Poor	Open	150.6221	0.000	85	0.261	22.1943
S1-2	466	D	Poor	Open	0.0202	0.000	88	0.000	0.0031
S1-2	818	D	Poor	Open	105.4336	0.000	88	0.183	16.0840
S1-2	459	D	Poor	Open	195.9676	0.000	88	0.340	29.8951
S1-2	486	C	Poor	Open	36.3832	0.000	85	0.063	5.3611
S1-2	151	D	Poor	Open	7.1758	0.000	88	0.012	1.0947
S1-2	455	C	Poor	Industrial	0.0093	0.007	96.05	0.000	0.0016
S1-2	459	D	Poor	Industrial	1.0899	0.785	96.5	0.002	0.1823
				Totals =	576.8546	0.791		1.000	86.6578
S1-3	455	C	Poor	Open	38.1611	0.000	85	0.137	11.6437
S1-3		D	Poor	Open	2.3050	0.000	88	0.008	0.7281
S1-3	459	D	Poor	Open	66.5064	0.000	88	0.239	21.0086
S1-3	486	C	Poor	Open	135.1599	0.000	85	0.485	41.2399
S1-3	452	D	Poor	Open	15.8967	0.000	88	0.057	5.0216
S1-3	455	C	Good	0.125-Res	10.9103	7.092	83.12	0.039	3.2553
S1-3	455	C	Poor	Industrial	1.6564	1.193	96.05	0.006	0.5711
S1-3	455	C	Poor	Industrial	0.0038	0.003	96.05	0.000	0.0013
S1-3	459	D	Poor	Industrial	5.2956	3.813	96.5	0.019	1.8344
S1-3	459	D	Poor	Industrial	2.6344	1.897	96.5	0.009	0.9126
S1-3	452	D	Good	0.25-Res	0.0458	0.017	89.18	0.000	0.0147
S1-3	452	D	Poor	Open	0.0005	0.000	88	0.000	0.0001
S1-3	459	D	Poor	Open	0.0038	0.000	88	0.000	0.0012
				Totals =	278.5797	14.014		1.000	86.2325
S1-4	452	D	Poor	Open	3.0737	0.000	88	0.033	2.9191
S1-4	455	C	Poor	Open	13.5692	0.000	85	0.146	12.4474
S1-4	486	C	Poor	Open	0.0004	0.000	85	0.000	0.0003
S1-4		D	Good	0.25-Res	0.0097	0.004	89.18	0.000	0.0093
S1-4	452	D	Good	Industrial	1.5847	1.141	95.3	0.017	1.6299
S1-4	452	D	Good	0.125-Res	18.1790	11.816	86.84	0.196	17.0370
S1-4	452	D	Good	0.25-Res	2.0556	0.781	89.18	0.022	1.9784
S1-4	452	D	Good	0.25-Res	1.0632	0.404	89.18	0.011	1.0233
S1-4	452	D	Good	Commercial	3.7207	3.163	89.9	0.040	3.6098
S1-4	452	D	Good	0.125-Res	7.4153	4.820	86.84	0.080	6.9495
S1-4	455	C	Good	Industrial	22.9428	16.519	94.4	0.248	23.3734
S1-4	455	C	Good	0.125-Res	4.5719	2.972	83.12	0.049	4.1012
S1-4	455	C	Good	0.25-Res	11.7630	4.470	86.24	0.127	10.9479
S1-4	455	C	Good	0.25-Res	0.3274	0.124	86.24	0.004	0.3047
S1-4	455	C	Good	Commercial	0.5851	0.497	87.2	0.006	0.5506

Sub-Basin	NRCS_Code	Soil Type	Veg. Cover	Landuse	Segment Area (acres)	Area Impervious (acres)	$CN_{weighted}$	(Frac. Area) Segment / Total Area	$CN_{weighted}$*(Frac. Area)
S1-4	455	C	Good	0.125-Res	1.2773	0.830	83.12	0.014	1.1458
S1-4	486	C	Poor	Industrial	0.5130	0.369	96.05	0.006	0.5317
S1-4	452	D	Good	0.25-Res	0.0044	0.002	89.18	0.000	0.0042
S1-4	455	C	Good	0.25-Res	0.0044	0.002	86.24	0.000	0.0041
				Totals =	92.6607	47.914		1.000	88.5677
S1-5	452	D	Poor	Open	0.0249	0.000	88	0.000	0.0155
S1-5	455	C	Poor	Open	0.4447	0.000	85	0.003	0.2677
S1-5	459	D	Poor	Open	5.2626	0.000	88	0.037	3.2789
S1-5	486	C	Poor	Open	15.4963	0.000	85	0.110	9.3260
S1-5	452	D	Poor	Open	8.9631	0.000	88	0.063	5.5846
S1-5	452	D	Good	Industrial	10.3265	7.435	95.3	0.073	6.9677
S1-5	452	D	Good	0.125-Res	24.0213	15.614	86.84	0.170	14.7695
S1-5	455	C	Good	Industrial	6.8690	4.946	94.4	0.049	4.5911
S1-5	455	C	Good	Industrial	2.1853	1.573	94.4	0.015	1.4606
S1-5	455	C	Good	0.125-Res	21.7508	14.138	83.12	0.154	12.8006
S1-5	459	D	Poor	Industrial	0.1792	0.129	96.5	0.001	0.1224
S1-5	459	D	Poor	Industrial	0.0976	0.070	96.5	0.001	0.0667
S1-5	486	C	Good	0.25-Res	10.0071	3.803	86.24	0.071	6.1103
S1-5	486	C	Poor	Industrial	14.4377	10.395	96.05	0.102	9.8184
S1-5	461	D	Poor	Industrial	8.1710	5.883	96.5	0.058	5.5828
S1-5	452	D	Good	0.25-Res	8.9102	3.386	89.18	0.063	5.6261
S1-5	452	D	Poor	Industrial	2.6978	1.942	96.5	0.019	1.8433
S1-5	452	D	Good	0.2-Res	1.3892	0.708	92.96	0.010	0.9143
S1-5	459	D	Poor	Open	0.0038	0.000	88	0.000	0.0024
S1-5	455	C	Poor	Industrial	0.0000	0.000	96.05	0.000	0.0000
				Totals =	141.2382	70.023		1.000	89.1488
S1-6		D	Poor	Open	1.5144	0.000	88	0.005	0.4066
S1-6	452	D	Good	Commercial	0.4004	0.340	89.9	0.001	0.1098
S1-6	455	C	Good	Commercial	0.7124	0.606	87.2	0.002	0.1895
S1-6	452	D	Poor	Open	0.2376	0.000	88	0.001	0.0638
S1-6	0	D	Poor	Open	6.9393	0.000	88	0.021	1.8630
S1-6		D	Good	0.25-Res	0.0136	0.005	89.18	0.000	0.0037
S1-6		D	Poor	Open	1.1823	0.000	88	0.004	0.3174
S1-6		D	Good	School	0.4303	0.237	91.7	0.001	0.1204
S1-6		D	Good	0.2-Res	0.0115	0.006	92.96	0.000	0.0033
S1-6	452	D	Good	0.125-Res	6.7799	4.407	86.84	0.021	1.7962
S1-6	452	D	Good	Commercial	18.6321	15.837	89.9	0.057	5.1101
S1-6	455	C	Good	Industrial	3.0138	2.170	94.4	0.009	0.8680
S1-6	455	C	Good	0.125-Res	6.9111	4.492	83.12	0.021	1.7525
S1-6	455	C	Good	Commercial	21.6014	18.361	87.2	0.066	5.7465
S1-6	455	C	Good	School	1.0953	0.602	89.6	0.003	0.2994
S1-6	455	C	Good	0.2-Res	1.5227	0.777	91.28	0.005	0.4240
S1-6	486	C	Good	0.25-Res	0.2448	0.093	86.24	0.001	0.0644
S1-6	461	D	Poor	Industrial	5.0945	3.668	96.5	0.016	1.4998
S1-6	461	D	Good	0.2-Res	0.0634	0.032	92.96	0.000	0.0180
S1-6	452	D	Good	0.25-Res	97.2641	36.960	89.18	0.297	26.4623
S1-6	452	D	Good	School	1.6341	0.899	91.7	0.005	0.4571
S1-6	452	D	Poor	Open	5.3453	0.000	88	0.016	1.4350
S1-6	452	D	Poor	Industrial	13.4596	9.691	96.5	0.041	3.9625
S1-6	452	D	Good	Commercial	0.5762	0.490	89.9	0.002	0.1580
S1-6	452	D	Good	School	15.1204	8.316	91.7	0.046	4.2300
S1-6	452	D	Good	0.2-Res	111.7488	56.992	92.96	0.341	31.6918
S1-6	0	D	Good	Commercial	0.2401	0.204	89.9	0.001	0.0659
S1-6	0	D	Good	School	0.3374	0.186	91.7	0.001	0.0944
S1-6	455	C	Poor	Industrial	0.0042	0.003	96.05	0.000	0.0012
S1-6	455	C	Good	Commercial	0.0020	0.002	87.2	0.000	0.0005
S1-6	452	D	Good	Open	5.5416	0.000	55	0.017	0.9298
S1-6	452	D	Good	Industrial	0.0706	0.051	95.3	0.000	0.0205
S1-6	452	D	Good	Commercial	0.0082	0.007	89.9	0.000	0.0022
S1-6	452	D	Good	0.125-Res	0.0343	0.022	86.84	0.000	0.0091
				Totals =	327.7877	165.456		1.000	90.1767
S2-1	455	C	Poor	Open	16.4888	0.000	85	0.017	1.4186
S2-1		D	Poor	Open	0.5041	0.000	88	0.001	0.0449
S2-1	486	C	Poor	Open	0.1655	0.000	85	0.000	0.0142
S2-1	458	D	Poor	Open	12.8058	0.000	88	0.013	1.1406
S2-1	451	D	Poor	Open	0.1772	0.000	88	0.000	0.0158
S2-1	451	D	Poor	Open	4.5982	0.000	88	0.005	0.4095
S2-1	486	C	Poor	Open	395.2968	0.000	85	0.400	34.0078
S2-1	458	D	Poor	Open	139.4061	0.000	88	0.141	12.4166
S2-1		D	Fair	Open	1.5276	0.000	70	0.002	0.1082
S2-1		D	Good	Open	0.0103	0.000	55	0.000	0.0006
S2-1	458	D	Good	Open	14.6699	0.000	55	0.015	0.8166
S2-1	451	D	Good	Open	0.2949	0.000	55	0.000	0.0164
S2-1	451	D	Good	Open	16.0357	0.000	55	0.016	0.8927
S2-1	486	C	Good	Open	122.5828	0.000	47	0.124	5.8313
S2-1	458	D	Fair	Open	154.3459	0.000	70	0.156	10.9353
S2-1	458	D	Good	Open	1.1202	0.000	55	0.001	0.0624
S2-1	486	C	Fair	Open	10.3819	0.000	63	0.011	0.6620
S2-1	455	C	Fair	Open	6.1701	0.000	63	0.006	0.3934
S2-1	486	C	Fair	Open	33.8001	0.000	63	0.034	2.1552
S2-1	458	D	Poor	Open	21.1955	0.000	88	0.021	1.8878
S2-1	486	C	Poor	Open	28.5473	0.000	85	0.029	2.4560
S2-1	451	D	Good	Open	0.0017	0.000	55	0.000	0.0001
S2-1	451	D	Fair	Open	7.8822	0.000	70	0.008	0.5584
S2-1	486	C	Fair	Open	0.0053	0.000	63	0.000	0.0003
				Totals =	988.0140	0.000		1.000	76.2448
S2-2	452	D	Poor	Open	2.9122	0.000	88	0.005	0.4064
S2-2		D	Poor	Open	0.7322	0.000	88	0.001	0.1022
S2-2	455	C	Poor	Open	64.7181	0.000	85	0.103	8.7234

Sub-Basin	NRCS_Code	Soil Type	Veg. Cover	Landuse	Segment Area (acres)	Area Impervious (acres)	$CN_{weighted}$	(Frac. Area) Segment / Total Area	$CN_{weighted}$*(Frac. Area)
S2-2	401	D	Poor	Open	76.0999	0.000	88	0.121	10.6195
S2-2	401	D	Poor	Open	5.1124	0.000	88	0.008	0.7134
S2-2	467	D	Poor	Open	84.6020	0.000	88	0.134	11.8060
S2-2	486	C	Poor	Open	7.6857	0.000	85	0.012	1.0360
S2-2	126	D	Poor	Open	7.5818	0.000	88	0.012	1.0580
S2-2	486	C	Poor	Open	72.6935	0.000	85	0.115	9.7984
S2-2	401	D	Poor	Open	71.5087	0.000	88	0.113	9.9788
S2-2	466	D	Poor	Open	10.9511	0.000	88	0.017	1.5282
S2-2	451	D	Poor	Open	9.5089	0.000	88	0.015	1.3269
S2-2	458	D	Poor	Open	32.8970	0.000	88	0.052	4.5907
S2-2	451	D	Poor	Open	5.9715	0.000	88	0.009	0.8333
S2-2	436	C	Poor	Open	8.7340	0.000	85	0.014	1.1773
S2-2	451	D	Poor	Open	0.2270	0.000	88	0.000	0.0317
S2-2	486	C	Poor	Open	112.0304	0.000	85	0.178	15.1006
S2-2	401	D	Fair	Open	0.9419	0.000	70	0.001	0.1046
S2-2	467	D	Fair	Open	10.0627	0.000	70	0.016	1.1170
S2-2	126	D	Fair	Open	0.5336	0.000	70	0.001	0.0592
S2-2	486	C	Fair	Open	0.0059	0.000	63	0.000	0.0006
S2-2	486	C	Fair	Open	13.0235	0.000	63	0.021	1.3011
S2-2	401	D	Fair	Open	9.3769	0.000	70	0.015	1.0409
S2-2	466	D	Fair	Open	9.1713	0.000	70	0.015	1.0180
S2-2	451	D	Fair	Open	4.5997	0.000	70	0.007	0.5106
S2-2	458	D	Good	Open	0.3423	0.000	55	0.001	0.0299
S2-2	451	D	Good	Open	0.0019	0.000	55	0.000	0.0002
S2-2	486	C	Fair	Open	3.2390	0.000	63	0.005	0.3236
S2-2	452	D	Good	0.25-Res	2.6778	1.018	89.18	0.004	0.3787
S2-2	455	C	Good	0.25-Res	0.5493	0.209	86.24	0.001	0.0751
S2-2	455	C	Good	0.125-Res	2.0908	1.359	83.12	0.003	0.2756
S2-2	401	D	Poor	Open	0.0036	0.000	88	0.000	0.0005
S2-2	451	D	Poor	Open	0.0019	0.000	88	0.000	0.0003
S2-2	126	D	Fair	Open	0.0052	0.000	70	0.000	0.0006
S2-2	451	D	Fair	Open	0.0168	0.000	70	0.000	0.0019
				Totals =	630.6106	2.585		1.000	85.0689

To calculate $CN_{weighted,}$ a macro function was used. The function calls for:
WCN(Soil, Cover, Land, CPO, DPO, CFO, DFO, CGO, DGO, CPU, DPU, CGU, DGU, fO, fI, fCom, fS, f8R, f4R, f2R)
Soil = Hydrologic Soil Type (A, B, C, D)
Cover = Vegetative Cover (Poor, Fair, Good)
Land = Land use
C = Soil Type C
D = Soil Type D
P = poor cover
F = fair cover
G = good cover
O = Open Space
Com = Commercial
I = Industrial
S = School / Church Area where there are larger amounts of open space.
8R = 1/8 acre residential
4R = 1/4 acre residential
2R = 0.2 acre residential
U = Urban areas
f = fraction impervious

Appendix C
Lag Time Calculations

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• Lag Time Calculations	1

Project: Bitter Creek Rehabilitation / Dead Horse Hydrology
Project #: 344.02.200
Client: Landmark Design, Inc., City of Rock Springs

Lag Time (t_{lag}) Calculations

Sub-Basin	t_{lag} (min)*
S1-1	94.5
S1-2	59.5
S1-3	45.2
S1-4	17.0
S1-5	22.0
S1-6	33.9
S2-1	88.8
S2-2	61.1

*Computed t_{lag} for each sub-basin computed by the following calculations

Reference: Simas and Hawkins, Lag time characteristics for small watersheds in the U.S.

Sub-Basin	Max Elevation (ft)	Min Elevation (ft)	Area (acre)	Length (ft)	CN	Width (ft)	Slope	S_{nat} (in)	t_{lag} (hr)	t_{lag} (min)
S1-1	7000	6420	1710	13025	87.0	5719	0.045	1.50	1.57	94.5
S1-2	6820	6360	577	9320	87.0	2697	0.049	1.49	0.99	59.5
S1-3	6760	6330	279	7100	86.0	1712	0.061	1.63	0.75	45.2
S1-4 to S1-6	Simas and Hawkins method was not applicable because it is a developed area									
S2-1	6920	6410	988	12680	76.0	3394	0.040	3.16	1.48	88.8
S2-2	6800	6360	631	11280	85.0	2437	0.039	1.76	1.02	61.1

$$t_{lag} = 0.0051 * width^{0.594} * slope^{-0.150} * S_{nat}^{0.313}$$

$$S_{nat} = \frac{1000}{CN} - 10$$

$$width = \frac{Area}{Length}$$

Where *width* is in feet, *slope* is a decimal fraction determined by the change in elevation divided by the length, and S_{nat} is in inches.

Lag Time calcs for S1-4 - S1-6 based on TR-55

	SHEET FLOW						SHALLOW CONCENTRATED FLOW				CHANNEL FLOW					Totals	
Sub-basin	L (ft)	S (ft/ft)	n	P2	Tt (hrs)	Tt (min)	L (ft)	S (ft/ft)	V (fps)	T (min)	L (ft)	S (ft/ft)	N	V (fps)	T (min)	t_c (min)	t_{lag} (min)
S1-4	260	0.077	0.13	0.9	0.34	20.65					3400	0.039412	0.025	7.43	7.62	28.27	17.0
S1-5	300	0.080	0.13	0.9	0.38	22.79	1050	0.088	4.6	3.80	3800	0.028421	0.025	6.31	10.03	36.63	22.0
S1-6B	300	0.080	0.15	0.9	0.43	25.55	6620	0.041	4.1	26.91	1520	0.007895	0.013	6.40	3.96	56.42	33.9
S1-6A	300	0.307	0.15	0.9	0.25	14.92	600	0.023	3.5	2.86	1779	0.0112	0.04	2.48	11.97	29.75	17.9

Reach Information

Reach	Length (ft)	Slope (ft/ft)	Manning's n	Width	Side Slope (xH:1V)
R1-2	4300	0.0140	0.025	10	0.5
R1-3	2050	0.0146	0.025	10	0.5
R1-4	1720	0.0128	0.025	10	0.5
R1-5	1430	0.0112	0.025	10	0.5
R1-6	5510	0.0080	0.025	10	0.5
R2-2	2990	0.0167	0.025	10	0.5

Appendix D
HEC-HMS Information

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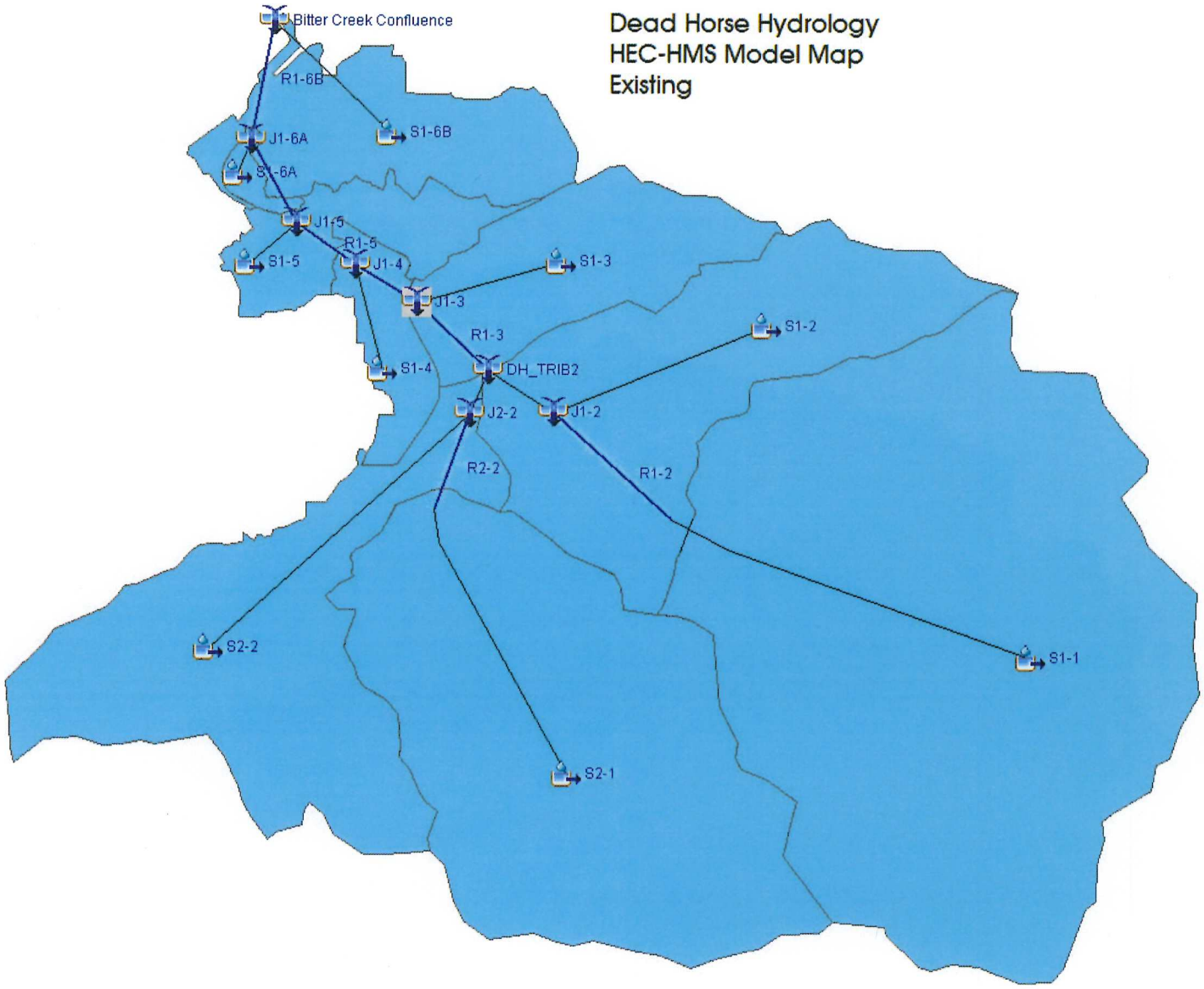
• HEC-HMS Model Ouput (Detained Conditions)	3

Dead Horse Hydrology
HEC-HMS Model Map
Existing



Dead Horse Canyon Hydrology HEC-HMS (Existing) Input

Basin: Dead Horse
Description: Dead Horse and Trib 2
Last Modified Date: 28 October 2010
Last Modified Time: 19:54:24
Version: 3.4
Unit System: English
Missing Flow To Zero: No
Enable Flow Ratio: No
Allow Blending: No
Compute Local Flow At Junctions: No

Enable Sediment Routing: No

Enable Quality Routing: No
End:

Subbasin: S1-1
Description: DH
Canvas X: 2875189.4009464444
Canvas Y: 715257.0891562529
Area: 2.672
Downstream: R1-2

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 87

Transform: SCS
Lag: 94.5
Unitgraph Type: STANDARD

Baseflow: None
End:

Reach: R1-2
Description: Reach from S1-1
Canvas X: 2867214.941480087
Canvas Y: 720515.1183843003
From Canvas X: 2870407.295779084
From Canvas Y: 718086.1672250701
Downstream: J1-2

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 4300
Energy Slope: 0.0140
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S1-2
Description: DH
Canvas X: 2871455.332362475
Canvas Y: 721766.7683799877
Area: 0.901
Downstream: J1-2

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 87

Transform: SCS
Lag: 59.5
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-2
Canvas X: 2867214.941480087
Canvas Y: 720515.1183843003
Downstream: DH_TRIB2
End:

Subbasin: S2-1
Description: Trib 2
Canvas X: 2867429.646522194
Canvas Y: 714283.0614042549
Area: 1.544
Downstream: R2-2

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 76

Transform: SCS
Lag: 88.8
Unitgraph Type: STANDARD

Baseflow: None
End:

Reach: R2-2
Canvas X: 2865685.8309319913
Canvas Y: 720246.6602186628
From Canvas X: 2865865.2938919733
From Canvas Y: 719097.26977986
Downstream: J2-2

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 2990

Energy Slope: 0.0167
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S2-2
Description: Trib 2
Canvas X: 2861989.204266951
Canvas Y: 716135.4586005338
Area: 0.985
Downstream: J2-2

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 85

Transform: SCS
Lag: 61.1
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J2-2
Canvas X: 2865685.8309319913
Canvas Y: 720246.6602186628
Downstream: DH_TRIB2
End:

Junction: DH_TRIB2
Canvas X: 2866108.5746272225
Canvas Y: 721188.5590773483
Downstream: R1-3
End:

Reach: R1-3
Canvas X: 2865133.0643278733
Canvas Y: 722354.0828968632
From Canvas X: 2866108.5746272225
From Canvas Y: 721188.5590773483
Downstream: J1-3

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 2050
Energy Slope: 0.0146
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None

End:

Subbasin: S1-3
Description: DH
Canvas X: 2867494.5817056606
Canvas Y: 723081.7787639699
Area: 0.435
Downstream: J1-3

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 86

Transform: SCS
Lag: 45.2
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-3
Canvas X: 2865133.0643278733
Canvas Y: 722354.0828968632
Downstream: R1-4
End:

Reach: R1-4
Canvas X: 2863751.1478175777
Canvas Y: 723252.3286285553
From Canvas X: 2865133.0643278733
From Canvas Y: 722354.0828968632
Downstream: J1-4

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1720
Energy Slope: 0.0128
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S1-4
Description: DH
Canvas X: 2864511.2018982405
Canvas Y: 721248.5496886269
Area: 0.145
Downstream: J1-4

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 89

Transform: SCS
Lag: 17.0
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-4
Canvas X: 2863751.1478175777
Canvas Y: 723252.3286285553
Downstream: R1-5
End:

Reach: R1-5
Canvas X: 2863102.1429618294
Canvas Y: 724146.8878360952
From Canvas X: 2863751.1478175777
From Canvas Y: 723252.3286285553
Downstream: J1-5

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1430
Energy Slope: 0.0112
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S1-5
Description: DH
Canvas X: 2862196.491743495
Canvas Y: 722803.2057627093
Area: 0.22
Downstream: J1-5

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 89

Transform: SCS
Lag: 22.0
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-5
Canvas X: 2863102.1429618294

Canvas Y: 724146.8878360952
Downstream: R1-6A
End:

Reach: R1-6A
Canvas X: 2862715.7413405497
Canvas Y: 725145.8258033062
From Canvas X: 2863102.1429618294
From Canvas Y: 724146.8878360952
Downstream: J1-6A

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1800
Energy Slope: 0.008
Shape: Trapezoid
Mannings n: 0.04
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S1-6A
Description: New for Gobel Street Culvert
Canvas X: 2864139.095230921
Canvas Y: 725219.4475562563
Area: 0.03
Downstream: J1-6A

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 90

Transform: SCS
Lag: 17.9
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-6A
Canvas X: 2862715.7413405497
Canvas Y: 725145.8258033062
Downstream: R1-6B
End:

Reach: R1-6B
Canvas X: 2862234.8318448714
Canvas Y: 727270.098097561
From Canvas X: 2862715.7413405497
From Canvas Y: 725145.8258033062
Downstream: Bitter Creek Confluence

Route: Kinematic Wave
Channel: Kinematic Wave

Length: 2300
Energy Slope: 0.0080
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: Bitter Creek Confluence
Canvas X: 2862234.8318448714
Canvas Y: 727270.098097561
End:

Subbasin: S1-6B
Description: DH
Canvas X: 2866653.1724891984
Canvas Y: 725048.8200919393
Area: 0.42
Downstream: Bitter Creek Confluence

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 90

Transform: SCS
Lag: 33.9
Unitgraph Type: STANDARD

Baseflow: None
End:

Basin Schematic Properties:
Last View N: 5000.0
Last View S: -5000.0
Last View W: -5000.0
Last View E: 5000.0
Maximum View N: 727501.7218977137
Maximum View S: 710642.3404721094
Maximum View W: 2857786.7717774143
Maximum View E: 2878663.433261904
Extent Method: Elements
Buffer: 0
Draw Icons: Yes
Draw Icon Labels: Yes
Draw Map Objects: No
Draw Gridlines: No
Draw Flow Direction: No
Fix Element Locations: No
Fix Hydrologic Order: No
Map: hec.map.aishape.AiShapeMap
Map File Name: maps\Sub_Basins DH.shp
Map Shown: Yes
End:

Project: DHGobalWODet Simulation Run: 24-hr

Start of Run: 01Jan2000, 00:00
End of Run: 03Jan2000, 00:00
Compute Time: 28Oct2010, 13:54:30

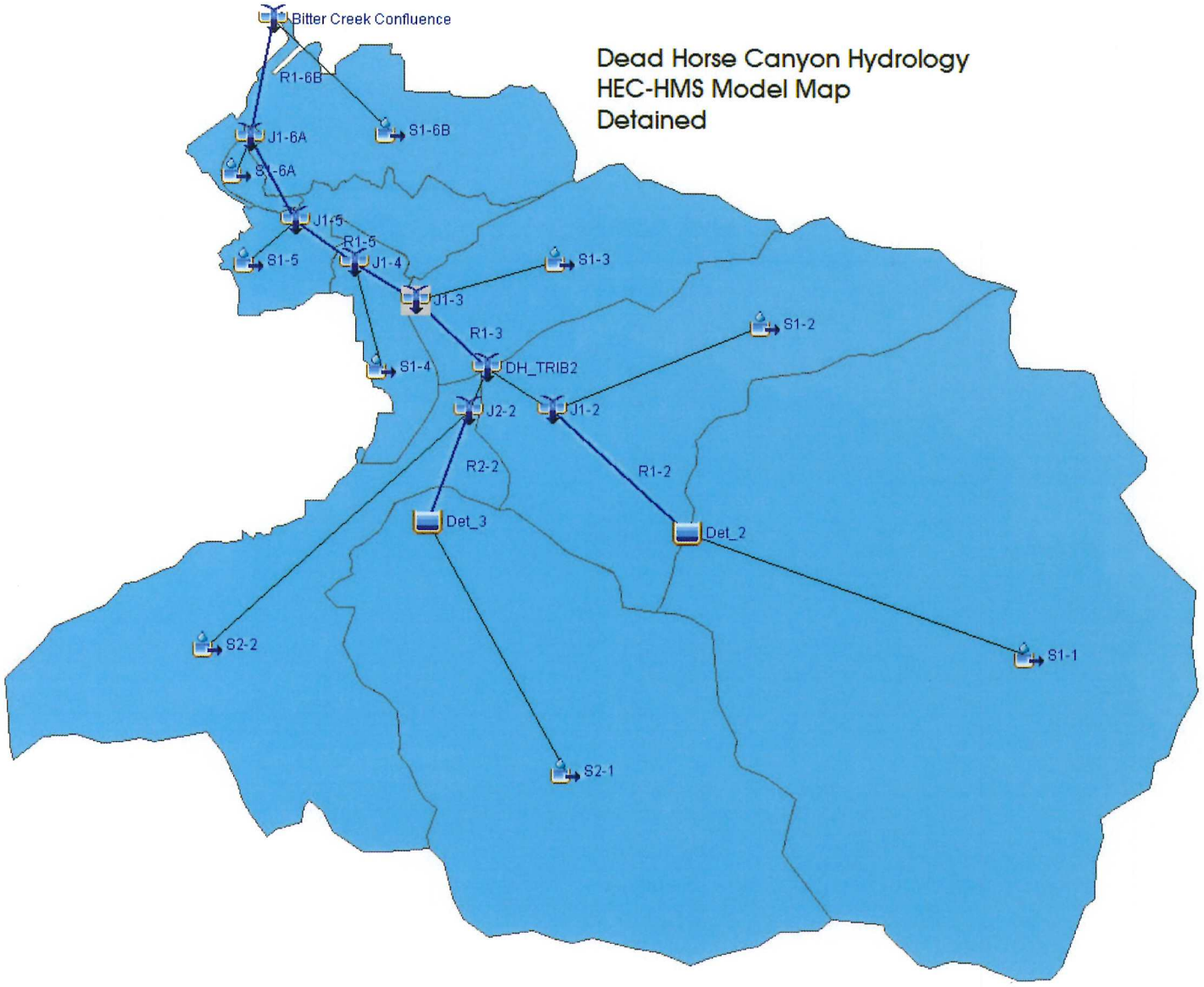
Basin Model: Dead Horse
Meteorologic Model: 24-hr
Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
S1-1	2.672	335.2	01Jan2000, 13:04	1.23
R1-2	2.672	335.1	01Jan2000, 13:07	1.23
S1-2	0.901	128.1	01Jan2000, 12:29	1.23
J1-2	3.573	451.2	01Jan2000, 12:54	1.23
S2-1	1.544	94.6	01Jan2000, 13:22	0.63
R2-2	1.544	94.6	01Jan2000, 13:26	0.63
S2-2	0.985	124.3	01Jan2000, 12:32	1.10
J2-2	2.529	207.1	01Jan2000, 12:52	0.82
DH_TRIB2	6.102	658.3	01Jan2000, 12:54	1.06
R1-3	6.102	658.3	01Jan2000, 12:55	1.06
S1-3	0.435	61.5	01Jan2000, 12:19	1.16
J1-3	6.537	710.3	01Jan2000, 12:50	1.06
R1-4	6.537	710.3	01Jan2000, 12:51	1.06
S1-4	0.145	25.4	01Jan2000, 12:03	1.37
J1-4	6.682	725.3	01Jan2000, 12:51	1.07
R1-5	6.682	725.2	01Jan2000, 12:52	1.07
S1-5	0.220	38.2	01Jan2000, 12:04	1.37
J1-5	6.902	748.8	01Jan2000, 12:51	1.08
R1-6A	6.902	748.8	01Jan2000, 12:54	1.08
S1-6A	0.030	5.5	01Jan2000, 12:03	1.44
J1-6A	6.932	752.0	01Jan2000, 12:54	1.08
R1-6B	6.932	752.0	01Jan2000, 12:55	1.08
Bitter Creek Confluence	7.352	805.0	01Jan2000, 12:49	1.10
S1-6B	0.420	74.7	01Jan2000, 12:08	1.44

Project: DHGobalWODet Simulation Run: 500yr 24hr

Start of Run: 01Jan2000, 00:00 Basin Model: Dead Horse
End of Run: 03Jan2000, 00:00 Meteorologic Model: 500 YR 24 HR
Compute Time: 28Oct2010, 14:13:45 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
S1-1	2.672	697.6	01Jan2000, 12:56	2.55
R1-2	2.672	697.6	01Jan2000, 12:58	2.55
S1-2	0.901	263.3	01Jan2000, 12:23	2.55
J1-2	3.573	940.6	01Jan2000, 12:46	2.55
S2-1	1.544	263.9	01Jan2000, 13:03	1.66
R2-2	1.544	263.9	01Jan2000, 13:06	1.66
S2-2	0.985	267.9	01Jan2000, 12:26	2.37
J2-2	2.529	514.6	01Jan2000, 12:43	1.94
DH_TRIB2	6.102	1454.9	01Jan2000, 12:45	2.29
R1-3	6.102	1454.9	01Jan2000, 12:46	2.29
S1-3	0.435	127.9	01Jan2000, 12:13	2.46
J1-3	6.537	1567.6	01Jan2000, 12:41	2.30
R1-4	6.537	1567.6	01Jan2000, 12:42	2.30
S1-4	0.145	48.7	01Jan2000, 11:09	2.73
J1-4	6.682	1596.0	01Jan2000, 12:42	2.31
R1-5	6.682	1596.0	01Jan2000, 12:42	2.31
S1-5	0.220	72.9	01Jan2000, 11:15	2.73
J1-5	6.902	1642.2	01Jan2000, 12:41	2.33
R1-6A	6.902	1642.2	01Jan2000, 12:43	2.33
S1-6A	0.030	10.4	01Jan2000, 11:09	2.82
J1-6A	6.932	1648.2	01Jan2000, 12:42	2.33
R1-6B	6.932	1648.2	01Jan2000, 12:44	2.33
Bitter Creek Confluence	7.352	1759.7	01Jan2000, 12:36	2.36
S1-6B	0.420	141.2	01Jan2000, 12:05	2.82


Dead Horse Canyon Hydrology
HEC-HMS Model Map
Detained
Bitter Creek Confluence
R1-6B
S1-6B
J1-6A
S1-6A
J1-5
R1-5
S1-5
J1-4
S1-3
J1-3
S1-2
R1-3
S1-4
DH_TRIB2
J2-2
J1-2
R2-2
R1-2
Det_3
Det_2
S2-2
S1-1
S2-1

Dead Horse Canyon Hydrology HEC-HMS Model (Detained) Input

Basin: Dead Horse
    Description: Dead Horse and Trib 2
    Last Modified Date: 22 October 2010
    Last Modified Time: 16:46:59
    Version: 3.4
    Unit System: English
    Missing Flow To Zero: No
    Enable Flow Ratio: No
    Allow Blending: No
    Compute Local Flow At Junctions: No

    Enable Sediment Routing: No

    Enable Quality Routing: No
End:

Subbasin: S1-4
    Description: DH
    Canvas X: 2864511.2018982405
    Canvas Y: 721248.5496886269
    Area: 0.145
    Downstream: J1-4

    Canopy: None

    Surface: None

    LossRate: SCS
    Percent Impervious Area: 0.0
    Curve Number: 89

    Transform: SCS
    Lag: 17.0
    Unitgraph Type: STANDARD

    Baseflow: None
End:

Subbasin: S1-3
    Description: DH
    Canvas X: 2867494.5817056606
    Canvas Y: 723081.7787639699
    Area: 0.435
    Downstream: J1-3

    Canopy: None

    Surface: None

    LossRate: SCS
    Percent Impervious Area: 0.0
    Curve Number: 86

    Transform: SCS
    Lag: 45.2
    Unitgraph Type: STANDARD

    Baseflow: None

End:

Subbasin: S1-2
    Description: DH
    Canvas X: 2871455.332362475
    Canvas Y: 721766.7683799877
    Area: 0.901
    Downstream: J1-2

    Canopy: None

    Surface: None

    LossRate: SCS
    Percent Impervious Area: 0.0
    Curve Number: 87

    Transform: SCS
    Lag: 59.5
    Unitgraph Type: STANDARD

    Baseflow: None
End:

Subbasin: S1-1
    Description: DH
    Canvas X: 2875189.4009464444
    Canvas Y: 715257.0891562529
    Area: 2.672
    Downstream: Det_2

    Canopy: None

    Surface: None

    LossRate: SCS
    Percent Impervious Area: 0.0
    Curve Number: 87

    Transform: SCS
    Lag: 94.5
    Unitgraph Type: STANDARD

    Baseflow: None
End:

Reservoir: Det_2
    Canvas X: 2870407.295779084
    Canvas Y: 718086.1672250701
    Downstream: R1-2

    Route: Modified Puls
    Routing Curve: Storage-Elevation-Outflow
    Initial Outflow Equals Inflow: Yes
    Storage-Outflow Table: Det_2
    Elevation-Storage Table: DET_2
    Primary Table: Storage-Outflow
End:

Reach: R1-2

Description: Reach from S1-1
Canvas X: 2867214.941480087
Canvas Y: 720515.1183843003
From Canvas X: 2870407.295779084
From Canvas Y: 718086.1672250701
Downstream: J1-2

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 4300
Energy Slope: 0.0140
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: J1-2
Canvas X: 2867214.941480087
Canvas Y: 720515.1183843003
Downstream: DH_TRIB2
End:

Subbasin: S2-2
Description: Trib 2
Canvas X: 2861989.204266951
Canvas Y: 716135.4586005338
Area: 0.985
Downstream: J2-2

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 85

Transform: SCS
Lag: 61.1
Unitgraph Type: STANDARD

Baseflow: None
End:

Subbasin: S2-1
Description: Trib 2
Canvas X: 2867429.646522194
Canvas Y: 714283.0614042549
Area: 1.544
Downstream: Det_3

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0

Curve Number: 76

Transform: SCS
Lag: 88.8
Unitgraph Type: STANDARD

Baseflow: None
End:

Reservoir: Det_3
Canvas X: 2865865.2938919733
Canvas Y: 719097.26977986
Downstream: R2-2

Route: Modified Puls
Routing Curve: Storage-Elevation-Outflow
Initial Outflow Equals Inflow: Yes
Storage-Outflow Table: Det_3
Elevation-Storage Table: DET_3
Primary Table: Storage-Outflow
End:

Reach: R2-2
Canvas X: 2865685.8309319913
Canvas Y: 720246.6602186628
From Canvas X: 2865865.2938919733
From Canvas Y: 719097.26977986
Downstream: J2-2

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 2990
Energy Slope: 0.0167
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: J2-2
Canvas X: 2865685.8309319913
Canvas Y: 720246.6602186628
Downstream: DH_TRIB2
End:

Junction: DH_TRIB2
Canvas X: 2866108.5746272225
Canvas Y: 721188.5590773483
Downstream: R1-3
End:

Reach: R1-3
Canvas X: 2865133.0643278733
Canvas Y: 722354.0828968632
From Canvas X: 2866108.5746272225
From Canvas Y: 721188.5590773483
Downstream: J1-3

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 2050
Energy Slope: 0.0146
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: J1-3
Canvas X: 2865133.0643278733
Canvas Y: 722354.0828968632
Downstream: R1-4
End:

Reach: R1-4
Canvas X: 2863751.1478175777
Canvas Y: 723252.3286285553
From Canvas X: 2865133.0643278733
From Canvas Y: 722354.0828968632
Downstream: J1-4

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1720
Energy Slope: 0.0128
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: J1-4
Canvas X: 2863751.1478175777
Canvas Y: 723252.3286285553
Downstream: R1-5
End:

Reach: R1-5
Canvas X: 2863102.1429618294
Canvas Y: 724146.8878360952
From Canvas X: 2863751.1478175777
From Canvas Y: 723252.3286285553
Downstream: J1-5

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1430
Energy Slope: 0.0112
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None

End:

Subbasin: S1-5
Description: DH
Canvas X: 2862196.491743495
Canvas Y: 722803.2057627093
Area: 0.22
Downstream: J1-5

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 89

Transform: SCS
Lag: 22.0
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-5
Canvas X: 2863102.1429618294
Canvas Y: 724146.8878360952
Downstream: R1-6A
End:

Reach: R1-6A
Canvas X: 2862715.7413405497
Canvas Y: 725145.8258033062
From Canvas X: 2863102.1429618294
From Canvas Y: 724146.8878360952
Downstream: J1-6A

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 1800
Energy Slope: 0.008
Shape: Trapezoid
Mannings n: 0.04
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Subbasin: S1-6A
Description: New for Gobel Street Culvert
Canvas X: 2864139.095230921
Canvas Y: 725219.4475562563
Area: 0.03
Downstream: J1-6A

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 90

Transform: SCS
Lag: 17.9
Unitgraph Type: STANDARD

Baseflow: None
End:

Junction: J1-6A
Canvas X: 2862715.7413405497
Canvas Y: 725145.8258033062
Downstream: R1-6B
End:

Reach: R1-6B
Canvas X: 2862234.8318448714
Canvas Y: 727270.098097561
From Canvas X: 2862715.7413405497
From Canvas Y: 725145.8258033062
Downstream: Bitter Creek Confluence

Route: Kinematic Wave
Channel: Kinematic Wave
Length: 2300
Energy Slope: 0.0080
Shape: Trapezoid
Mannings n: 0.016
Number of Increments: 2
Width: 10
Side Slope: 0.5
Channel Loss: None
End:

Junction: Bitter Creek Confluence
Canvas X: 2862234.8318448714
Canvas Y: 727270.098097561
End:

Subbasin: S1-6B
Description: DH
Canvas X: 2866653.1724891984
Canvas Y: 725048.8200919393
Area: 0.42
Downstream: Bitter Creek Confluence

Canopy: None

Surface: None

LossRate: SCS
Percent Impervious Area: 0.0
Curve Number: 90

Transform: SCS
Lag: 33.9
Unitgraph Type: STANDARD

Baseflow: None
End:

Basin Schematic Properties:
Last View N: 5000.0
Last View S: -5000.0
Last View W: -5000.0
Last View E: 5000.0
Maximum View N: 727501.7218977137
Maximum View S: 710642.3404721094
Maximum View W: 2857786.7717774143
Maximum View E: 2878663.433261904
Extent Method: Elements
Buffer: 0
Draw Icons: Yes
Draw Icon Labels: Yes
Draw Map Objects: No
Draw Gridlines: No
Draw Flow Direction: No
Fix Element Locations: No
Fix Hydrologic Order: No
Map: hec.map.aishape.AiShapeMap
Map File Name: maps\Sub_Basins DH.shp
Map Shown: Yes
End:

Project: DHGobelUpdate Simulation Run: 24-hr

Start of Run: 01Jan2000, 00:00 Basin Model: Dead Horse
End of Run: 03Jan2000, 00:00 Meteorologic Model: 24-hr
Compute Time: 28Oct2010, 14:58:14 Control Specifications: Control 1

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
S1-4	0.145	25.4	01Jan2000, 12:03	1.37
S1-3	0.435	61.5	01Jan2000, 12:19	1.16
S1-2	0.901	128.1	01Jan2000, 12:29	1.23
S1-1	2.672	335.2	01Jan2000, 13:04	1.23
Det_2	2.672	255.2	01Jan2000, 14:29	1.23
R1-2	2.672	255.2	01Jan2000, 14:33	1.23
J1-2	3.573	347.7	01Jan2000, 13:07	1.23
S2-2	0.985	124.3	01Jan2000, 12:32	1.10
S2-1	1.544	94.6	01Jan2000, 13:22	0.63
Det_3	1.544	47.3	01Jan2000, 17:24	0.63
R2-2	1.544	47.3	01Jan2000, 17:28	0.63
J2-2	2.529	154.9	01Jan2000, 12:37	0.82
DH_TRIB2	6.102	498.6	01Jan2000, 12:51	1.06
R1-3	6.102	498.6	01Jan2000, 12:53	1.06
J1-3	6.537	552.5	01Jan2000, 12:45	1.06
R1-4	6.537	552.5	01Jan2000, 12:46	1.06
J1-4	6.682	567.6	01Jan2000, 12:45	1.07
R1-5	6.682	567.6	01Jan2000, 12:46	1.07
S1-5	0.220	38.2	01Jan2000, 12:04	1.37
J1-5	6.902	592.0	01Jan2000, 12:42	1.08
R1-6A	6.902	592.0	01Jan2000, 12:45	1.08
S1-6A	0.030	5.5	01Jan2000, 12:03	1.44
J1-6A	6.932	595.3	01Jan2000, 12:44	1.08
R1-6B	6.932	595.3	01Jan2000, 12:46	1.08
Bitter Creek Confluence	7.352	655.9	01Jan2000, 12:30	1.10
S1-6B	0.420	74.7	01Jan2000, 12:08	1.44

Project: DHGobelUpdate
Simulation Run: 24-hr Reservoir: Det_2

Start of Run:	01Jan2000, 00:00	Basin Model:	Dead Horse
End of Run:	03Jan2000, 00:00	Meteorologic Model:	24-hr
Compute Time:	28Oct2010, 18:14:34	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	335.2 (CFS)	Date/Time of Peak Inflow :	01Jan2000, 13:04
Peak Outflow :	255.2 (CFS)	Date/Time of Peak Outflow :	01Jan2000, 14:29
Total Inflow :	1.23 (IN)	Peak Storage :	18.9 (AC-FT)
Total Outflow :	1.23 (IN)	Peak Elevation :	6438.4 (FT)

Project: DHGobelUpdate
Simulation Run: 24-hr Reservoir: Det_3

Start of Run:	01Jan2000, 00:00	Basin Model:	Dead Horse
End of Run:	03Jan2000, 00:00	Meteorologic Model:	24-hr
Compute Time:	28Oct2010, 18:14:34	Control Specifications:	Control 1

Volume Units: IN

Computed Results

Peak Inflow :	94.6 (CFS)	Date/Time of Peak Inflow :	01Jan2000, 13:22
Peak Outflow :	47.3 (CFS)	Date/Time of Peak Outflow :	01Jan2000, 17:24
Total Inflow :	0.63 (IN)	Peak Storage :	14.2 (AC-FT)
Total Outflow :	0.63 (IN)	Peak Elevation :	6429.9 (FT)

Appendix E
DETENTION INFORMATION

INDEX

NO. OF PAGES

- See FEMA CLOMR Bitter Creek and Dead Horse Canyon Creek: Response to April 21, 2010 FEMA Letter for updated detention information.

Appendix F

USGS Peak Flow Regression Equation Calculations

INDEX

	NO. OF PAGES
• Regression Equation Sample Calculations	1
• Regression Equation Calculations	2

HANSEN ALLEN & LUCE inc ENGINEERS

PROJECT Dead Horse Hydrology
FEATURE Estimating Peak Flow
PROJECT NO 344.02.200

COMPUTED TGA
CHECKED
DATE 7/20/09

Determine estimate of peak flow from sub-basins on Dead Horse Canyon Creek from sub-basin S1-1.

GIVEN: Area = 1,710 acres
Lat = 41.572°
Peak Flow regression Equation from:
USGS, 2003, Peak-Flow Characteristics of Wyoming Streams, Water-Resources Investigations Report 03-4107, Cheyenne, Wyoming (pg 28)

FIND: Q_{100}

Equation for region 6 — 100yr Stream Peak Flow

$$Q_{100} = 394(Area^{0.489})[(Lat-40)^{-1.47}]$$

Q_{100} is in cfs
Area is in mi^2
Lat is in decimal degrees

($1 mi^2 = 640 acres$)

$$Area = (1,710 acres)\left(\frac{1 mi^2}{640 acres}\right) = 2.67 mi^2$$

$$Q_{100} = 394(2.67 mi^2)^{0.489}[(41.572°-40°)^{-1.47}] = 328 cfs$$

95% prediction interval factor

Lower	Upper
0.304	3.29

Lower
$(328 cfs)(0.304) = 100 cfs$

Upper
$(328 cfs)(3.29) = 1,079 cfs$

HEC-HMS - Hydrology output predictions

100yr 3HR = 1.3in
ARC II CN's $Q_{100} = 250 cfs$
ARC III CN's $Q_{100} = 473 cfs$

100yr 24-Hr = 2.9in
ARC II $Q_{100} = 335 cfs$
ARC III $= Q_{100} = 482 cfs$

500yr Peak Flow

$$Q_{500} = 719(Area^{0.459})[(Lat-40)^{-1.44}]$$
$$= 719(2.67 mi^2)^{0.459}[(41.572°-40°)^{-1.44}] = 575 cfs$$

Dead Horse Hydrology
Project #: 344.02.200

Comparison of regression annalysis of area performed by USGS in Report 03-4107 with HecHMS model prepared by HAL
100-yr Peak Storm Runoff Flow

	Area (acres)
S1-1	1710.05
S1-2	576.85
S1-3	278.58
S2-1	988.01
S2-2	630.61

	Contributing Area		Latitude of Outlet	Q_{100}
ID	(acres)	($mi^{2)}$	(degrees)	(cfs)
S1-1	1710.05	2.67	41.572	328
J1-2	2286.90	3.57	41.575	377
J1-3	4184.10	6.54	41.583	502
DH_TRIB2	3905.52	6.10	41.575	489
S2-1	988.01	1.54	41.569	251
J2-2	1618.62	2.53	41.575	318

95% prediction interval factor	
lower	upper
0.304	3.29
(cfs)	(cfs)
100	1078
115	1239
153	1653
149	1610
76	827
97	1047

Average standard error of of prediction	
SE_p =	0.63
lower	upper
(cfs)	(cfs)
121	534
139	614
186	819
181	798
93	410
118	518

HEC-HMS
100yr
(cfs)
335
451
710
658
95
207

Dead Horse Hydrology
Project #: 344.02.200

Comparison of regression annalysis of area performed by USGS in Report 03-4107 with HecHMS model prepared by HAL
500-yr peak Storm Runoff Flow

	Area (acres)
S1-1	1710.05
S1-2	576.85
S1-3	278.58
S2-1	988.01
S2-2	630.61

	Contributing Area		Latitude of Outlet	Q_{500}	95% prediction interval factor		Average standard error of of prediction		HEC-HMS
					lower	upper	SE_p =	0.73	
					0.261	3.83	lower	upper	500yr
ID	(acres)	(mi^2)	(degrees)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
S1-1	1710.05	2.67	41.572	575	150	2204	155	995	698
J1-2	2286.90	3.57	41.575	656	171	2511	177	1,134	941
J1-3	4184.10	6.54	41.583	859	224	3288	232	1,485	1568
DH_TRIB2	3905.52	6.10	41.575	838	219	3210	226	1,450	1455
S2-1	988.01	1.54	41.569	449	117	1718	121	776	264
J2-2	1618.62	2.53	41.575	559	146	2143	151	968	515

Appendix 5

Wetland and Vegetation Resources Update

2010 WETLAND ASSESSMENT
FOR
CITY OF ROCK SPRINGS
BITTER CREEK

Prepared for:

City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Landmark Design Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Prepared by:

BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

October 21, 2010

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INTRODUCTION

The following report is for detailed wetland delineation on the Dead Horse Canyon Creek Levee Project for the City of Rock Springs Bitter Creek Project in Rock Springs, Wyoming. Landmark Designs, Inc. (LDI) requested BKS Environmental Associates, Inc. (BKS) conduct detailed wetland delineation for the project area on September 28, 2010. BKS conducted the detailed wetland delineation for Dead Horse Canyon Creek on October 5, 2010. The analysis for the wetland report will be incorporated into the Environmental Assessment (EA) that LDI composed for the City of Rock Springs Bitter Creek Project EA as required by the Wyoming Department of Environmental Quality (WDEQ)/ Abandoned Mine Land (AML).

The project area for Dead Horse Canyon Creek encompasses the two proposed levees. The project area runs from Massachusetts Avenue to the confluence of Bitter Creek. The first proposed levee, Levee A, runs between Massachusetts Avenue to 2nd Street and the second proposed levee, Levee B, runs between the Union Pacific Rail Road (UPRR) crossing to Pearl Street.

In 2008 and 2009, BKS conducted wetland delineations on Bitter Creek for LDI for part of the Bitter Creek Project. The wetlands along Dead Horse Canyon Creek are located near the confluence of Bitter Creek and could fall under Nation Wide Permit (NWP) 43- Stormwater Management Facilities. NWP 43 has a 0.5 acre and 300 feet limit on wetland disturbance. Authorization for the Dead Horse Canyon Creek Project lies under the jurisdiction and decision making of the United States Army Corp of Engineers (USACE) in Wyoming.

METHODOLOGY

The wetland survey was conducted in accordance with the 1987 USACE Wetland Delineation Manual and the Arid West Supplement. Other waters of the United States (OWUS) were also assessed during the survey. Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as intrusive soil sampling to determine the presence of hydric soil indicators. Arid West Supplement, Version 2.0 September 2008, Wetland Determination Data Forms were utilized for each observation point. Vegetation, soils, and hydrology were evaluated throughout the drainage to determine wetland boundaries. GPS points, using a Garmin Geo XT with sub-meter accuracy, were taken at each wetland observation point and photo points. BKS provided drafting services for the project. Appendix A, shows the areas delineated and the levee locations. Appendix C includes photographs at each wetland point and Appendix D includes the wetland data forms.

Soils information for the project area was unavailable for Sweetwater County, Wyoming on the NRCS website. The majority of the soils for Sweetwater County have not yet been mapped (NRCS 2008). Some of the soils within the drainage were alkaline.

United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping was checked and no NWI mapping occurs on Dead Horse Canyon Creek. Color infrared (CIR) photography was used as a base map for the wetland delineation as well as a 2-foot contour map of the project area.

Wetland indicator categories were identified for each dominant plant species observed using the National List of Plant Species that Occur in Wetlands, 1988 National Summary. Region 9 indicator categories were utilized for the project area. Appendix C provides a table of all species observed in the project area and associated indicator status.

RESULTS

The project area for the delineations was located along Dead Horse Canyon Creek between Massachusetts Avenue to the confluence of Bitter Creek, which encompasses the two proposed levee locations. BKS located one wetland at the confluence of Bitter Creek and Dead Horse Canyon Creek. The wetland was determined as Palustrine Emergent Wetland (PEM) and was 0.0092 acres and 67.60 feet long. The PEM wetland had hydrophytic vegetation, hydric soils, and hydrology present. The wetland is located at waypoint WET3. The dominant hydrophytic vegetation present was: *Typha latifolia* (common cattail), *Elaeagnus angustifolia* (Russian olive), and *Salix exigua* (narrowleaf willow). Hydric soils were present and had the Redox Dark Surface hydric soil indicator. The hydrology present was surface water and drainage patterns. Table 1, shows the results of the wetland survey points in the project area.

All other areas within the Dead Horse Canyon Creek drainage were comprised of upland vegetation and dry soils. The dominant upland vegetation at Levee A was *Agrpopyron cristatum* (crested wheatgrass) and *Grindelia squarrosa* (curlycup gumweed). Wetland points WET1, WET5, and WET6 are in the boundary of Levee A. There were drainage patterns within most of the drainage; however that is only a secondary indicator of hydrology and is not sufficient alone to distinguish it as a wetland. No wetland points fall within Levee B, however, Levee B was concrete lined and had only about one inch of soil present atop the concrete. The dominant vegetation growing in Levee B was crested wheatgrass, *Elymus cinereus* (basin wildrye), and *Ulmus pumila* (Siberian elm). These plants are all upland plant species, no wetland characteristics were present. Wetland points 3.5 and 4 represent the PEM boundary near the confluence of Bitter Creek. Both points 3.5 and 4 had hydrophytic vegetation present but the soils and hydrology were characterized as non-wetland. The dominant herb stratum species included *Lepidium latifolium* (broadleaved pepperweed), and *Elymus smithii* (western wheatgrass). Both points also had narrowleaf willow present.

TABLE 1: SUMMARY OF WETLANDS WITHIN THE PROJECT AREA

Map and Plot ID (no Data Form if italicized)	Legal Description	Photo #	Delineation Designation	Cowardin Classification	Total Acreage of Cowardin Classification	Geomorphic Setting	Location along Dead Horse Canyon Creek	Jurisdictional Recommendation
WET1	T19N R105W Sec. 35	1 and 2	Non-wetland	--	--	Drainage bottom	Levee B	--
WET2	T19N R105W Sec. 35	3 and 4	Non-wetland	--	--	Drainage bottom	Levee B	--
WET3	T19N R105W Sec. 35	8 and 9	Wetland	PEM	--	Drainage bottom	Dead Horse Canyon Creek	Jurisdictional
WET3.5	T19N R105W Sec. 35	8 and 9	Non-wetland	--	--	Upper banks	Dead Horse Canyon Creek	--
WET4	T19N R105W Sec. 26	10 and 11	Non-wetland	--	--	Drainage bottom	Dead Horse Canyon Creek	--
WET5	T19N R105W Sec. 19	12 and 13	Non-wetland	--	--	Drainage bottom	Levee A	--
WET6	T19N R105W Sec. 19	24 and 25	Non-wetland	--	--	Drainage bottom	Levee A	--

DISCUSSION / CONCLUSION

BKS conducted the 2010 Dead Horse Canyon Creek detailed delineation at the request of LDI to determine if wetlands were present within the proposed levees on Dead Horse Canyon Creek. BKS found that no wetlands were present within the proposed levee areas. The creek bottom in the levee area had drainage patterns present but no other indicator of hydrology, the soils were dry, and the dominant vegetation was upland. Only one wetland was found, located outside the proposed levee areas, at the confluence of Dead Horse Canyon Creek and Bitter Creek, the PEM wetland is 0.0092 acres and 67.6 feet long.

Final authority of wetland jurisdiction lies with the USACE.

REFERENCES

Dorn, R.D. 2001. Vascular Plants of Wyoming. 3rd Edition. Mountain West Publishing, Cheyenne, Wyoming. 289 pp.

U.S. Army Corps of Engineers Wyoming Regulatory office. https://www.nwo.usace.army.mil/html/od-rwy/nwpermits.htm Accessed October 2010.

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U.S. Department of Agriculture. Natural Resource Conservation District. http://plants.usda.gov/index.html. Accessed October 2010.

U.S. Fish and Wildlife Service. 1988. National List of Vascular Plant Species that Occur in Wetlands: 1988 National Summary.

APPENDIX A

MAPS

Project Area Map 1 of 2: Map of the Dead Horse Canyon Creek Project
Project Area Map 2 of 2: Map of the Dead Horse Canyon Creek Project

Landmark Designs Inc &
The City of Rock Springs
Dead Horse Canyon Creek
Wetland Delineation

Map 1 of 2: Levee A

Created by: BKS- Cindy Adams
Created on: October 11, 2010
Projection: NAD 83 UTM Z12

N

0 100 200 400 600

Feet

1 inch = 300 feet

Legend

- Photo Points
- Delineated Points
- Levee A
- Levee B
- PEM Wetland Boundary
- Sections
- TWN / RNG

Landmark Designs Inc &
The City of Rock Springs
Dead Horse Canyon Creek
Wetland Delineation

Map 2 of 2: Levee B

Created by: BKS- Cindy Adams
Created on: October 11, 2010
Projection: NAD 83 UTM Z12

N

0 100 200 400 600

Feet

1 inch = 300 feet

Legend

- Photo Points
- Delineated Points
- Levee A
- Levee B
- PEM Wetland Boundary
- Sections
- TWN / RNG

APPENDIX B

PHOTOS

Photo 1: Facing upstream at WET1

Photo 2: Facing downstream at WET1

Photo 3: Upstream at WET2

Photo 4: Downstream at WET2

Photo 8 upstream at WET3 and WET3.5

Photo 9 downstream at WET3 and WET3.5

Photo 10, upstream at WET4

Photo 11, downstream at WET4

Photo 12, downstream at WET5

Photo 13, downstream at WET5

Photo 24, upstream at WET6

Photo 25, downstream at WET6

L1- Photo downstream

L2- Facing Downstream

L3- Facing downstream

L4- Facing Downstream

L5- Facing Downstream

L6- Facing downstream

L7- Facing Downstream

L8- Facing downstream

L9- Facing Downstream

APPENDIX C

PLANT LIST FOR PROJECT AREA

Dead Horse Canyon Creek

Plant Species List for the Dead Horse Canyon Creek Wetland		
Common Name	**Scientific Name**	**Indicator Status**
Agropyron cristatum	Crested wheatgrass	UPL
Bromus inermis	smooth brome	UPL
Bromus tectorum	cheatgrass	UPL
Chrysothamnus viscidiflorus	Sticky-leaved rabbitbrush	UPL
Elaeagnus angustifolia	Russian olive	FAC
Elymus cinereus	Basin wildrye	UPL
Elymus hispidus	Intermediate wheatgrass	FAC
Elymus smithii	western wheatgrass	UPL
Elymus trachycaulus	Slender wheatgrass	UPL
Grindelia squarrosa	Curlycup gumweed	FACU
Poa pratensis	Kentucky bluegrass	FACU
Rumex salicifolius	Willow dock	FACW
Tamarix ramosissima	tamrisk / saltcedar	FACW
Tragopogon dubius	Western salsify	UPL
Typha latifolia	common cattail	OBL
Ulmus pumila	Siberian elm	UPL
Salix exigua	narrowleaf willow	OBL
Lepidium latifolium	broadleaved pepperweed	FAC
Symphyotrichum spathulatum	western mountain aster	FAC

*If not listed in the 1988 wetland species list, then the indicator status was assumed upland (UPL).

APPENDIX D

Wetland Determination Data Forms
Arid West Region

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs, Inc State: Wyoming Sampling Point: WET1

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 35 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648679.52 Long: 4605449.21 Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	____	No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes	____	No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P1 Upstream
P2 Downstream

VEGETATION

Tree Stratum (Plot Size: 15 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ulmus pumila*	100	X	UPL
2.			
3.			
4.			
Total Cover:	100		

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
Total Cover:			

Herb Stratum (Plot size: 5 feet)			
1. *Elymus smithii*	10		UPL
2. *Agropyron cristatum*	80	X	UPL
3. *Rumex salicifolius*	10		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	100		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	10	x4=	40	
UPL species	190	x5=	950	
Column Totals:	100	(A)	990	(B)

Prevalence Index = B/A = 9.9

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophytic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Elymus cinereus (Basin wildrye) was in the area but not within the 5' herb stratum. There was about 5% litter present.

SOIL Sampling Point WET1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 3/1	100					SL	
4-10	10YR 4/2	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
There are rocks in the soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
There is a defined smaller draining within the drainage and the bottom is litter and bare ground. The smaller channel is about one foot wide.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET2

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 35 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648722.065 Long: 4605608.255 Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	____	No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes	____	No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P3 Upstream
P4 Downstream
Similar to WET1

VEGETATION

Tree Stratum (Plot size: 15)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Ulmus pumila*	100	X	UPL
2.			
3.			
4.			
Total Cover:			

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
Total Cover:			

Herb Stratum (Plot size: 5 feet)			
1. *Elymus cinerus*	30	X	NL
2. *Agropyron cristatum*	75	X	UPL
3. *Tragopogon dubius*	1		UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	106		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species	176	x5=	880
Column Totals:	176 (A)		880 (B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%
____ Prevalence Index is ≤ 3.0[1]
____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)
____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	2.5Y 4/2	100					SL	
4-7	7.5YR 4/2	100					SL	Sandy with small pebbles present

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

There is a defined smaller draining within the drainage and the bottom is litter and bare ground. The smaller channel is about one foot wide.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET3

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 26 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648857.292 Long: 4606066.741 Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		
Hydric Soil Present?	Yes	X	No	Is the Sampled Area Within a Wetland	Yes X No
Wetland Hydrology Present	Yes	X	No		

Remarks:
P8Upstream
P9 Downstream

VEGETATION

Tree Stratum (Plot size:15 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Elaeagnus angustifolia*	2	X	FAC
2.			
3.			
4.			
Total Cover:	2		

Sapling/Shrub Stratum (Plot size:10 feet)			
1. *Salix exigua*	20	X	OBL
2.			
3.			
4.			
5.			
Total Cover:	20		

Herb Stratum (Plot size: 5 feet)			
1. *Elymus smithii*	5		UPL
2. *Lepidium latifolium*	10		FAC
3. *Rumex salicifolius*	2		FACU
4. *Typha latifolia*	80	X	OBL
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	97		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 3 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:	
OBL species	100	x1=	100
FACW species		x2=	
FAC species	12	x3=	36
FACU species	2	x4=	8
UPL species	5	x5=	25
Column Totals:	119 (A)		169 (B)

Prevalence Index = B/A = 1.42

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is $\leq 3.0^1$

___ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL Sampling Point WET3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 5/3	98	10YR2/1	2	D	RC	C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		1 cm Muck (A9) (LRR C)
	Histic Epipedon (A2)		Stripped Matrix (S6)		2 cm Muck (A10) (LRR B)
	Black Histic (A3)		Loamy Mucky Mineral (F1)		Reduced Vertic (F18)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Red Parent Material (TF2)
	Stratified Layers (A5) (LRR C)		Depleted Matirx (F3)		Other (Explain in Remarks)
	1 cm Muck (A9) (LRR D)	X	Redox Dark Surface (F6)		
	Depleted Below Dark Surface (A11)		Depleted Dark Surface (F7)		
	Thick Dark Surface (A12)		Redox Depressions (F8)		
	Sandy Mucky Mineral (S1)		Vernal Pools (F9)		
	Sandy Gleyed Matrix (S4)				

Indicators for Problematic Hydric Soils[3]:

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soils Present? Yes: X No:

Remarks:
There are rocks in the soil.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

X	Surface Water (A1)		Salt Crusts (B11)		Water Marks (B1) (Riverine)
	High Water Table (A2)		Biotic Crust (B12)		Sediment Deposits (B2) (Riverine)
	Saturation (A3)		Aquatic Invertebrates (B13)		Drift Deposits (B3) (Riverine)
	Water Marks (B1) (Nonriverine)		Hydrogen Sulfide Oder (C1)	X	Drainage Patterns (B10)
	Sediment Deposits (B2) (Nonriverine)		Oxidized Rhizospheres along Living Roots (C3)		Dry-Season Water Table (C2)
	Drift Deposits (B3) (Nonriverine)		Presence of Reduced Iron (C4)		Thin Muck Surface (C7)
	Surface Soil Cracks (B6)		Recent Iron Reduction in Plowed Soil (C6)		Crayfish Burrows (C8)
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remark)		Saturation Visible on Aerial Imagery (C9)
	Water Stained Leaves (B9)				Shallow Aquitard (D3)
					FAC-Neutral Test (D5)

Secondary Indicators (2 or more required)

Field Observations:

Surface Water Present?	Yes	X	No		Depth (inches):	6
Water Table Present?	Yes		No		Depth (inches):	
Saturation Present? (includes capillary fringe)	Yes		No		Depth (inches):	

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek | City/County: Rock Springs / Sweetwater County | Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs | State: Wyoming | Sampling Point: WET3.5

Investigator(s): Cindy Adams and Travis Nitsch | Section, Township, Range: Section 26 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom | Local relief (concave, convex, none): Convex | Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) | Lat: 648857.292 | Long: 4606066.741 | Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland? Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
Same photos as waypoint WET3
On the upper bank, outside of the wetland.

VEGETATION

Tree Stratum (Plot size: 15 feet)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Elaeagnus angustifolia*	30	X	FAC
2.			
3.			
4.			
Total Cover:	30		

Sapling/Shrub Stratum (Plot size: 10 feet)			
1. *Salix exigua*	20	X	OBL
2. *Chrysothamnus viscidiflorus*	7		UPL
3.			
4.			
5.			
Total Cover:	27		

Herb Stratum (Plot size: 5 feet)			
1. *Lepidium latifolium*	50	X	FAC
2. *Agropyron cristatum*	15		UPL
3. *Grindelia squarrosa*	10		FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	75		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 5 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index Worksheet: For Herb stratum

Total % Cover of:		Multiply by:	
OBL species		x1=	
FACW species		x2=	
FAC species		x3=	
FACU species		x4=	
UPL species		x5=	
Column Totals:	(A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

Prevalence Index is ≤ 3.0[1]

Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
The prevalence calculation of the herb stratum was 3.53, which leans toward no wetland present. This point is the wetland boundary.

SOIL Sampling Point WET3.5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/3	100					C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches):

Hydric Soils Present? Yes: No: X

Remarks:
Salt present in the soils

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches): ___		
Water Table Present?	Yes ___	No X	Depth (inches): ___		
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___	Wetland Hydrology Present?	Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET4

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 26 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648860.066 Long: 4606053.914 Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	X	No		Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes		No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P10 Upstream
P11 Downstream
Chrysothamnus viscidiflorus on drainage terrace.

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum (Plot size: 10 feet)			
1. *Salix exigua*	45	X	OBL
2. *Tamarix ramosissima*	5		FACW
3.			
4.			
5.			
Total Cover:	50		
Herb Stratum (Plot size: 5 feet)			
1. *Elymus smithii*	40	X	UPL
2. *Lepidum latifolium*	30	X	FAC
3. *Rumex salicifolius*	5		FACU
4. *Symphyotrichum spathulatum*	5		FAC
5.			
6.			
7.			
8.			
9.			
10.			
Total Cover:	80		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 66.67 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species	45	x1=	45	
FACW species	5	x2=	10	
FAC species	35	x3=	105	
FACU species	5	x4=	20	
UPL species	40	x5=	200	
Column Totals:	130	(A)	380	(B)

Prevalence Index = B/A = 2.92

Hydrophytic Vegetation Indicators

X Dominance Test is > 50%

X Prevalence Index is $\leq 3.0^1$

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes X No ____

Remarks: There was about 30% litter in the area.

US Army Corps of Engineers Arid West-Version 2.0

SOIL Sampling Point WET4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 5/3	100					SL	
6-10	10YR 6/6	100					C	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
There are rocks in the soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	___	No	X	Depth (inches):	___
Water Table Present?	Yes	___	No	X	Depth (inches):	___
Saturation Present? (includes capillary fringe)	Yes	___	No	X	Depth (inches):	___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
There is a defined smaller draining within the drainage and the bottom is litter and bare ground. The smaller channel is about one foot wide.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET5

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 35 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648600.468 Long: 4605328.439 Datum: UTM NAD 1983, Zone 12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	____	No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes	____	No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P12 Upstream
P13 Downstream

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			
Sapling/Shrub Stratum (Plot size: 10 feet)			
1. *Ulmus pumila*	5		UPL
2.			
3.			
4.			
5.			
Total Cover:	5		
Herb Stratum (Plot size: 5 feet)			
1. *Elymus trachycaulus*	10	X	UPL
2. *Agropyron cristatum*	30	X	UPL
3. *Rumex salicifolius*	2		FACU
4. *Grindelia squarrosa*	10	X	UPL
5. *Bromus tectorum*	5		UPL
6. *Poa pratensis*	5		FACU
7.			
8.			
9.			
10.			
Total Cover:	62		
Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species	7	x4=	28	
UPL species	60	x5=	300	
Column Totals:	67	(A)	328	(B)

Prevalence Index = B/A = 4.90

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%

____ Prevalence Index is $\leq 3.0^1$

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:
Bottom of drainage is mostly bare ground at 30-50%.

SOIL Sampling Point WET5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	100					Loam	
3-7	10YR 7/6	100					SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
There are rocks in the soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:
There are old drift deposit near concrete dam approximately 10 feet from point.

WETLAND DETERMINATION DATA FORM-Arid West Region

Project/Site: Dead Horse Canyon Creek City/County: Rock Springs / Sweetwater County Sampling Date: October 5, 2010

Applicant/Owner: Landmark Designs State: Wyoming Sampling Point: WET6

Investigator(s): Cindy Adams and Travis Nitsch Section, Township, Range: Section 35 Township 19N Range 105W

Landform (hillslope, terrace, etc.) Drainage bottom Local relief (concave, convex, none): Convex Slope (%): 0%

Subregion (LRP): Interior Deserts (LRR D) Lat: 648895.507 Long: 4604999.938 Datum: UTM NAD 1983, Zone12

Soil Map Unit Name: Not mapped NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____ , Soil ____ , or Hydrology ____ Significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____ , Soil ____ , or Hydrology ____ Naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	____	No	X	Is the Sampled Area Within a Wetland Yes ____ No X
Hydric Soil Present?	Yes	____	No	X	
Wetland Hydrology Present	Yes		No	X	

Remarks:
P24 Upstream
P25 Downstream
Less defined channel. Vigorous salty soils, no salt crusts present.

VEGETATION

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
Total Cover:			

Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
Total Cover:			

Herb Stratum (Plot size: 5 feet)				
1.	*Grindelia squarrosa*	20	X	UPL
2.	*Agropyron cristatum*	40	X	UPL
3.	*Tragopogon dubius*	1		UPL
4.				
5.				
6.				
7.				
8.				
9.				
10.				
Total Cover:		61		

Woody Vine Stratum (Plot size:)			
1.			
2.			
3.			
Total Cover:			

% Bare Ground in Herb Stratum 40 % Cover of Biotic Crust 0

Dominance Test Worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index Worksheet:

Total % Cover of:		Multiply by:		
OBL species		x1=		
FACW species		x2=		
FAC species		x3=		
FACU species		x4=		
UPL species	61	x5=	305	
Column Totals:	61	(A)	305	(B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators

____ Dominance Test is > 50%

____ Prevalence Index is $\leq 3.0^1$

____ Morphological Adaptations[1] (Providing supporting data in Remarks or on a separate sheet)

____ Problematic Hydrophyic Vegetation (Explain)

[1]Indicators of hydric soils and wetland hydrology must be present

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL Sampling Point WET6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-0.50	Rocky							Rocks 2-6cm in size
0.5-8	10YR 4/3	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix. [2]Location: PL=Pore Lining, RC=Root Channel, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (LRR C)
- ___ 1 cm Muck (A9) (LRR D)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matirx (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (LRR C)
- ___ 2 cm Muck (A10) (LRR B)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soils Present? Yes: ___ No: X

Remarks:
There are rocks in the soil

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (any one indicator is sufficient)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (Nonriverine)
- ___ Sediment Deposits (B2) (Nonriverine)
- ___ Drift Deposits (B3) (Nonriverine)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water Stained Leaves (B9)
- ___ Salt Crusts (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Oder (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soil (C6)
- ___ Other (Explain in Remark)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (Riverine)
- ___ Sediment Deposits (B2) (Riverine)
- ___ Drift Deposits (B3) (Riverine)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Thin Muck Surface (C7)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspection), if available:

Remarks:

US Army Corps of Engineers Arid West-Version 2.0

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

REPLY TO
ATTENTION OF

October 25, 2010

Wyoming Regulatory Office

Ms. Jennifer Shields
City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Dear Ms. Shields:

This letter is in response to a request we received from Landmark Design Inc. on October 21, 2010, for a jurisdictional determination concerning an unnamed ephemeral tributary of Bitter Creek in Rock Springs known locally as Dead Horse Canyon. The study area is located in Sections 35 and 36, Township 19 North, Range 105 West, Sweetwater County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into waters of the United States in accordance with Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as streams, reservoirs, lakes and adjacent wetlands. The Corps regulations are published in the *Code of Federal Regulations* as 33 CFR Parts 320 through 332. Information on Section 404 program requirements in Wyoming can be obtained from our web site at https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm

We have reviewed a report prepared by BKS Environmental Associates, Inc. titled *2010 WETLAND ASSESSMENT, FOR CITY OF ROCK SPRINGS, DEAD HORSE CANYON CREEK LEVEE PROJECT, PART OF THE BITTER CREEK PROJECT* dated October 21, 2010. Based on documentation in the report, we have determined that methods used to identify wetlands are consistent with the *Corps of Engineers Wetland Delineation Manual* dated January 1987 and current supplements. Therefore, Maps 1 and 2 in the report provide an accurate depiction of wetland locations and boundaries in the study area.

The wetland delineation results identify 0.01 acre of palustrine emergent wetland adjacent to Bitter Creek, which has already been defined as a water of the U.S. in previous correspondence to the City of Rock Springs dated September 16, 2009. The entire length of Dead Horse Canyon within the study area should be characterized as an upland swale because there are no wetlands and no clear evidence of a defined stream channel with an ordinary high water mark. **Therefore, Dead Horse Canyon does not contain any areas that meet the definition of waters of the United States as defined at 33 CFR Part 328.3(a).**

In the March 28, 2000, edition of the *Federal Register* (Vol. 65, No. 60), the Corps implemented an administrative appeals process for jurisdictional determinations. This letter serves as an approved jurisdictional determination. The property owner and other affected parties may appeal any determination to the Northwestern Division Appeals Officer, Mr. David Gesl, by obtaining a Notification of Administrative Appeal Options and Process (NAO) form at our web site. Section "D" of the NAO explains the procedures for appeal. The NAO form must be submitted to Mr. Gesl at the address shown on the NAO form prior to **December 24, 2010**, or forfeit the right to an administrative appeal.

As a result of this analysis, we have determined that Department of the Army authorization is not required for any ground disturbing activities in Dead Horse Canyon because it would not require any discharges of fill material into waters of the United States. This determination does not eliminate requirements to obtain any other applicable federal, state, tribal, or local permits.

Thank you for your interest in cooperating with requirements of the U.S. Army Corps of Engineers' regulatory program. Please contact Mr. Thomas Johnson at (307) 772-2300 and reference file NWO-2008-02866 if you have any questions.

Sincerely,

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

Copies Furnished:

Jan Striefel
Landmark Design Inc.
2834 Highland Drive
Salt Lake City, Utah 84106

Cindy L. Adams
BKS Environmental Associates, Inc.
P.O. Box 3017
Rock Springs, Wyoming 82902

Marcia Murdock
Wyoming Department of Environmental Quality
510 Meadowview Drive
Lander, Wyoming 82520

The Omaha District, Regulatory Branch, Wyoming Regulatory Office is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete a Customer Service Survey found on our web site at https://www.nwo.usace.army.mil/html/od-rwy/survey.htm Paper copies of the survey are also available upon request for those without Internet access.

Appendix 6

Wildlife Resources Update

WILDLIFE EVALUATION AMENDMENT

Bitter Creek Construction Project
Phase 1
Dead Horse Levee Improvements

Sweetwater County, Wyoming

Prepared for:

Landmark Design, Inc.
2384 Highland Drive
Salt Lake City, Utah 84106

Prime Contractor for:

City of Rock Springs
212 D Street
Rock Springs, Wyoming 82901

Prepared by:

Wyoming Wildlife Consultants, LLC
Post Office Box 893
Pinedale, WY 82941

October 2010

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Summary/Affected Habitat ..... Page 2

Wildlife Habitat ..... Page 3

Threatened and Endangered Species Evaluated ..... Page 4

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Anticipated Effects of the Proposed Project on Species Evaluated ..... Page 4

Site Assessment Results ..... Page 5

Potential Direct and Indirect Impacts ..... Page 5

Potential Cumulative Impacts ..... Page 5

Commitments ..... Page 6

Need for re-assessment ..... Page 6

Attachments

Appendix 1: Wildlife Survey and Assessment Map.

BACKGROUND

Threatened and endangered species are managed under the authority of the Endangered Species Act of 1973 (ESA), as amended, (50 CFR §402.13). The Endangered Species Act requires Federal agencies to ensure that all actions which they authorize, fund, or carry out are not likely to jeopardize the continued existence of any endangered or threatened species, or result in the destruction or adverse modification of their critical habitat.

In the Commitments section of the Wildlife Evaluation for the Bitter Creek Environmental Assessment, it states:
"If new information reveals effects that may impact threatened, endangered, or proposed species or their habitats in a manner or to an extent not considered in this evaluation; if the proposed action is subsequently modified in a manner that causes an effect that was not considered in this evaluation; or if a new species is listed or habitat identified that may be affected by the action, a revised wildlife evaluation should be prepared."

To ensure that there are no additional concerns to threatened or endangered species, critical habitat, or any effects not considered in the original evaluation, a Wildlife Evaluation Amendment for the inclusion of the Dead Horse Canyon Creek Levee Improvements to the Bitter Creek Environmental Assessment was necessary.

SUMMARY & AFFECTED HABITAT

The proposed action involves mechanical improvements of two stretches of the Dead Horse Canyon Creek Levee in the City of Rock Springs in Sweetwater County, Wyoming. This is an addition to the existing project plan.

The project addition includes two sections, one of approximately 0.15 mile and the other of approximately 0.5 mile length of Dead Horse Canyon Creek Levee. Very little wildlife habitat occurs within the two lengths of Dead Horse Canyon Creek Levee to be improved. The existing

levee is primarily composed of concrete sides and bottom in various stages of decay. Vegetation, including Siberian elm (*Ulmus pumila*), has taken hold in the levee, primarily in sediment deposits on top of the concrete and through cracks in the crumbling structure. Grasses, primarily crested wheatgrass (*Agropyron cristatum*), are the primary vegetative component surviving within the levee, with some weedy forbs present.

No negative impacts to wildlife or wildlife habitat are expected from the improvement of the Dead Horse Canyon Creek Levee. No water will be depleted from the Colorado River system; and riparian habitats will not be degraded as a result of implementation of this project. Dead Horse Canyon Creek Levee does not contain water outside of storm and flood events and there are no aquatic concerns associated with the addition of the improvements. The Dead Horse Canyon Creek Levee is downstream of the original project area covered by the Wildlife Evaluation, and concerns for water contamination are adequately addressed in that evaluation. There are no additional water contamination concerns for the Wildlife Evaluation Amendment.

WILDLIFE HABITAT

The Dead Horse Canyon Creek Levee improvements will be occurring along portions of the levee running through the City of Rock Springs. No critical wildlife habitat is identified within the city limits and no critical wildlife habitat occurs within a significant distance of the project addition. Remnant individuals of mule deer (*Odocoileus hemionus*) use the levee as a travel lane, however, no appreciable deer habitat occurs within the portions of the levee to be improved. Implementation of the levee improvements will not likely alter the qualities of the levee that provide safe and secretive passage for deer. Potential passerine habitat is marginal, and no migratory passerine birds were observed using the area.

THREATENED AND ENDANGERED SPECIES EVALUATED

Threatened and endangered species are adequately addressed in the original Wildlife Evaluation for the Bitter Creek Environmental Assessment. There are no additional concerns for threatened and endangered species, or their habitat, with the inclusion of the Dead Horse Canyon Creek Levee improvements.

WILDLIFE INVENTORY/SURVEYS CONDUCTED

Wyoming Wildlife Consultants, LLC was retained to determine if any wildlife concerns that were not addressed in the original project Wildlife Evaluation would occur with the inclusion of the Dead Horse Levee improvements. A site visit and assessment was performed on October 7th, 2010. Two biologists surveyed the two portions of the levee for wildlife habitat and signs of wildlife use.

ANTICIPATED EFFECTS OF THE PROPOSED PROJECT ON SPECIES EVALUATED

No specific species were evaluated for the Dead Horse Canyon Creek Levee amendment. The site assessment did not result in a need to re-evaluate any of the species covered in the Wildlife Evaluation for the rest of the project.

SITE ASSESMENT RESULTS

One location of deer scat was discovered in the length of levee to the north. A game trail showing low levels of use was observed running the length of the levee. Two doe mule deer and two fawns were observed in a portion of the levee several hundred meters south of the area where improvements will occur. English sparrows (*Passer domesticus*) were observed passing through the area. No other passerine birds were observed using the area during our site visit in October. Trees along the top of the levee were searched for bird nests; no nesting locations were observed within or directly adjacent to the project area.

POTENTIAL DIRECT AND INDIRECT IMPACTS

The vegetation occurring in the areas where the improvements will occur will be lost. Since the affected area does not contain functional wildlife habitat, no impacts to the viability of wildlife populations in the area are expected. No significant changes in abundance or breeding status of any vertebrate wildlife species in the area are expected as a result of this project amendment.

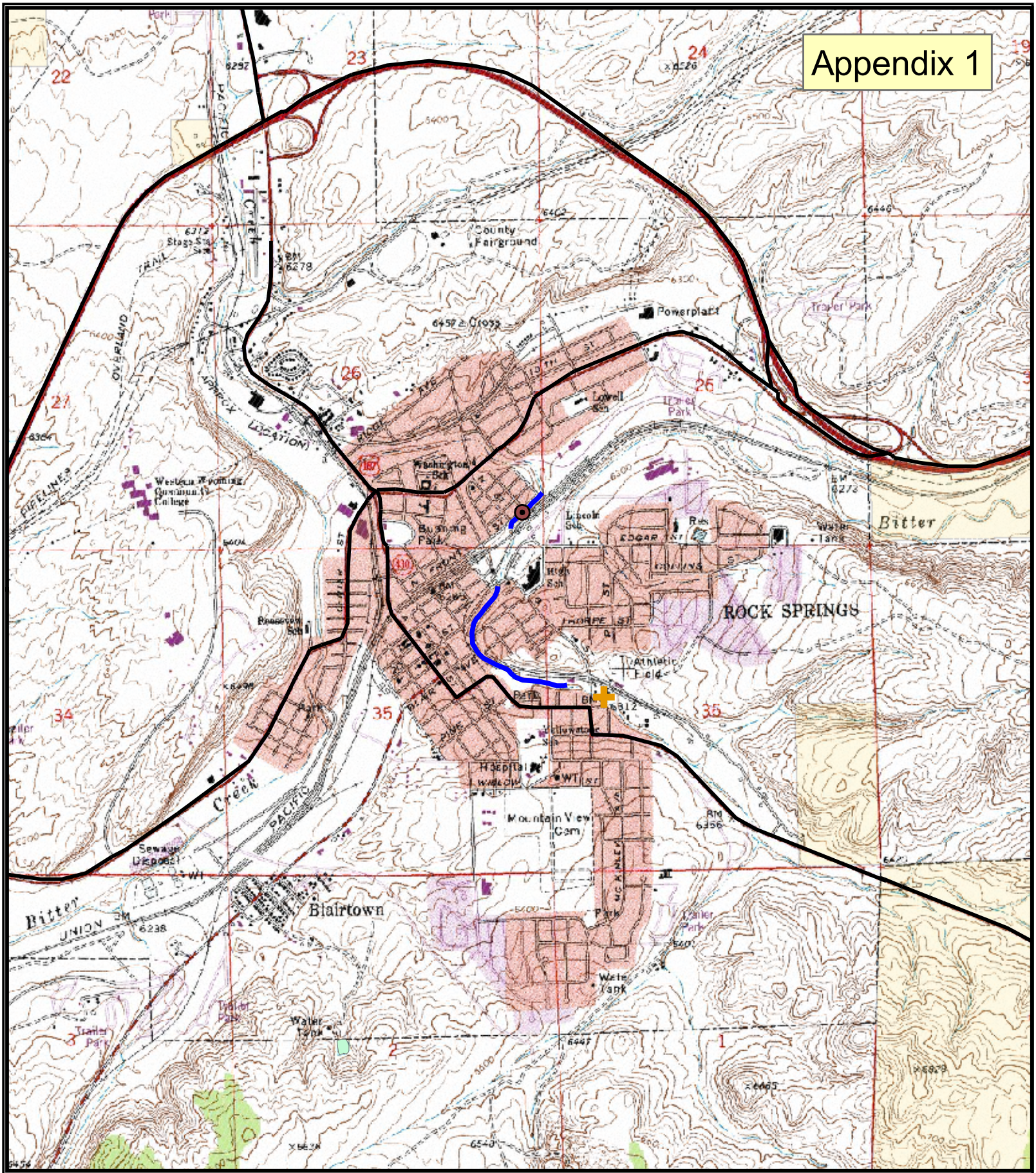
POTENTIAL CUMULATIVE IMPACTS

The two locations of the Dead Horse Levee improvements do not contain significant vegetation or wildlife habitat. As a result, no additional cumulative impacts are expected from the inclusion of the Dead Horse Levee improvements.

COMMITMENTS

Need for Re-assessment

The findings of this wildlife evaluation amendment are based on the best data and scientific information available at the time of preparation. If new information reveals effects that may impact threatened, endangered, or proposed species or their habitats in a manner or to an extent not considered in this evaluation; if the proposed action is subsequently modified in a manner that causes an effect that was not considered in this evaluation; or if a new species is listed or habitat identified that may be affected by the action, a revised wildlife evaluation should be prepared.



Wildlife Survey and Assessment Map

Wyoming Wildlife Consultants, LLC
201 West Pine Street
Post Office Box 893
Pinedale, WY 82941
Phone 307.367.2765