TABLE OF CONTENTS

Executive Summary ................................................................. 1
Chapter 1 - Introduction .......................................................... 2
Chapter 2 - Topography ............................................................ 3
Chapter 3 - Drainage ............................................................... 5
Chapter 4 - Wildlife ................................................................. 8
Chapter 5 - Water ................................................................. 10
Chapter 6 - Wastewater ........................................................... 16
Chapter 7 - Soils ................................................................. 21
Chapter 8 - Access ................................................................. 22
Chapter 9 - Right-of-Way .......................................................... 26
Chapter 10 - Findings .............................................................. 27
Appendix

TABLE OF FIGURES

Figure 2-1: Project Location/ Topography
Figure 3-1: Existing Drainage Features
Figure 5-1: Preferred Water System Alternative
Figure 6-1: Preferred Wastewater System Alternative
Figure 8-1: Preferred Access Alternatives
EXECUTIVE SUMMARY

The I-80 East Interchange Feasibility Study study area is located to the east of Green River City and consists of approximately 110 acres of land to the northeast and 70 acres of land to the southwest of the I-80 East interchange. The land is lightly vegetated and sloping at grades 0-20%. These slopes facilitate natural drainage in the area that flows generally north to south, from the bluffs to the Green River. A drainage system consistent with regulations for a Class 1 water source will need to be installed to drain the area.

The area is used by the Sublette antelope herd as a severe weather relief range. The BLM might impose title encumbrances with the sale of the property, to protect the integrity of the relief range. State agencies should be coordinated with during the planning phases of each development in the area to ensure proper mitigation measures are installed.

Infrastructure for the area can be installed for approximately $10 million. Infrastructure costs include a water system, wastewater system and a roadway system that includes access the edge of the north and south sides of the study area.

A preliminary soils investigation was performed for the study. It shows soils in the area to have a moderate to high potential for expansion and swelling. Measures should be taken during the design process to ensure proper design and installation of foundations and fill materials.

The study area is developable under the circumstances described in the individual chapters of this report.
CHAPTER 1

INTRODUCTION

The City of Green River is a traditional mid-western community located in the Interstate 80 corridor. It is home to approximately 14,000 people. The nearest city to Green River is Rock Springs, located 11 miles to the east also along I-80. Although Green River has incorporated all of the amenities of modern life, the railroad is still a major presence. Mining, particularly of trona, is the major industry in the area.

As its population grows, the city would like to encourage other industries to develop in the area. This feasibility study researches the possibilities for developing the area just east of the I-80 east interchange. The following chapters in this study address the general lay of the land, existing conditions, possible development restrictions, budgetary costs to install infrastructure and property ownership.

The purpose of this study is to investigate the feasibility of as many aspects of the study area as possible and to present the findings in a clear and concise manner. A steering committee, comprised of city staff and various agency members, was formed to provide periodic review, input and direction as the project progressed.

A summary of the findings are presented at the end of the study in a separate chapter. No conclusions have been drawn as to whether the city should or should not develop the land. However, the City of Green River can use the assembled data to help determine future plans for the area and the city.
CHAPTER 2
TOPOGRAPHY

The study area is comprised of two general areas. The north side of the study area is located northeast of and adjacent to Interstate 80 (I-80) east interchange in Green River, Wyoming as shown in Figure 2-1. The south side is located southeast of and adjacent to the interchange.

Generally, the study area is open land covered with brush and light vegetation. For the north side parcel (approximately 113 acres), bluffs create a natural boundary to the north, while I-80 provides a boundary to the south. Adjacent land to the east and west is also open space similar to the study parcel. The south side parcel (approximately 70 acres) is bounded on the north by I-80 and on the east, by the Green River. South and west of the property lies the railroad.

The area slopes generally southward at grades from 0 to 20%. Natural drainage features in the area include several small ravines that have traditionally carried runoff from the bluffs to Bitter Creek or the river. Much of the north side’s drainage collects in a large ravine at the southwest corner of the study area and crosses under the I-80 interchange in a system of culverts. The south side drains in sheet flow and smaller ravines toward the railroad and river. Contours for the area are illustrated in Chapter 3, Figure 3-1.

An evaluation of the topographic features in the area, including drainage and slope, indicates that approximately 85% (96 acres) of the north side and 95% (67 acres) of the south side of the study area could be developed for commercial use.
CHAPTER 3
DRAINAGE

Currently, drainage runoff collects in a series of natural ditches and ravines. A network of culverts allows flows to pass under the freeway and outlet into Bitter Creek. Eventually, study area drainage water empties into the Green River (see Figure 3-1). Just as construction of I-80 required culverts to be installed to perpetuate existing drainage patterns, development of the study area will require measures be taken to ensure not only that drainage flows can continue to reach the Green River, but also that the pollution prevention measures be implemented in accordance with the latest regulations.

Impacts
Development of the area will replace existing open space with buildings, paved roadways and parking lots. Less permeable surfaces such as asphalt, wood and metal will replace soil and allow less drainage water to soak in to the ground. In this manner, not only flow rates will be increased but also sediment and debris in the drainage waters. A further impact will be the introduction of spilled oils that, if not properly mitigated, could have both visual and biological impacts downstream.

Restrictions
Because the Green River is classified as a Class 1 water source, the highest classification that includes drinking water use, strict regulations exist to protect water quality. These regulations will include best management practices (BMPs) to maintain existing water quality and uses during and after construction of any new development. Some items that may require BMPs to be implemented include, but are not limited to settlable solids, floating and suspended solids, taste, odor, color, protection of aquatic life, turbidity, depletion of dissolved oxygen, oil and grease, salinity, and biological hazards to aquatic communities including herbicides and pesticides.
Mitigation

Careful planning can help with pollution prevention, control and mitigation. Regulations should be in place and strictly enforced requiring future developments to provide storm drain studies for their developments. Each study should include existing conditions, flow calculations, and treatment plans. Furthermore, many cities have found it in their best interest to require individual developments to treat runoff onsite, before it is released into the public drainage system. This practice allows the city to minimize its own drainage facilities and any subsequent maintenance.

As plans are designed for public and private facilities in the area, transmission and storage systems should be sized for future flow requirements. They should also include all necessary treatment facilities required under current state regulations to protect the integrity of the Green River. Required measures could include a detention system, oil skimmers and overflow systems.
One Hundred and thirteen acres of the project area, located on the north side of I-80, lie within a winter/severe weather relief range for pronghorn antelope of the Sublette herd, as indicated by the Wyoming Game and Fish Department (WGFD). Since I-80 serves as a permanent migratory boundary for the herd, the approximately 70 acres of project area south of I-80 are not considered winter range for the herd. There is no further information available to indicate any wildlife impacts on the south 70 acres.

According to the "Flaming Gorge/White Mountain Resource Exchange" proposal by Union Pacific Resources, the Sublette herd is the largest herd of migrating pronghorn antelope in the world. It is the opinion of the WGFD that the project area lies in a crucial last refuge, for the herd, under severe weather conditions. However, during most winters, few animals will use the area. The WGFD will provide the Bureau of Land Management with similar comments if development proceeds in the area. For more detailed information about the WGFD's opinion, refer to the letter dated October 22, 2004 found in the appendix.

The cliffs to the north of the study area have also historically been home to raptor nesting. However, other raptor nests located in close proximity to I-80 have been observed and no adverse effects have been found.

IMPACTS
When considering impacts to the area, it is important to remember that winter range provides several benefits to animals and once lost, it cannot be replaced. Aside from the open space that this area provides, the bluffs on the north side provide shelter from the snow. Its southern exposure ensures shallower snow depths that allow the antelope to find food protruding above the snow level.
Each of these benefits will be reduced by development in the area. Food sources will diminish as vegetation is removed during new construction. Available open space will be reduced as infrastructure is installed. Likewise, the benefit of shelter is reduced as the open space is reduced.

**Mitigation**

Although impacts to the winter/severe weather refuge area are inevitable if development occurs, there are mitigation measures that can be taken to minimize the impacts it will have. As an example, if a development being considered for the area includes fencing along the boundary of the property, breaks in the fence could be installed to allow the antelope access to the remaining open spaces in the development.

Furthermore, planned open spaces could be incorporated into future developments. Planned open spaces could include vegetation that is a food source for the animals, which would help mitigate food sources lost to construction as well as provide areas of refuge for the animals. One thing to consider with regards to loss of open space for the Sublette herd is that antelope can inhabit slopes that are considered too steep for development and would therefore have some undisturbed winter range outside any future development.

Finally, the WGFD has requested that it be coordinated with in conjunction with any new development in the area so that it can provide more detailed evaluation and comment on effective mitigation. Any new development will need to be considered more closely than the scope of this study allows. At that time, more project specific mitigation measures can be considered. Furthermore, the BLM may include some title encumbrances with the sale of the property to ensure that mitigation measures are installed with any future development.

Data supporting this wildlife analysis can be found in the Appendix in the form of letters and telephone correspondence records.
Culinary water for the Cities of Green River and Rock Springs and other parts of Sweetwater County is provided by the Joint Powers Water Board (JPWB). JPWB owns and operates a water treatment plant in Green River which diverts water from the Green River for treatment. This treated water is pumped into facilities operated separately by Green River and Rock Springs. All water facilities including tanks, pumps, transmission lines and distribution lines are owned by the JPWB. They are leased to and operated by the individual cities. All new construction has to meet the standards and requirements of the JPWB. These standards include materials of construction, methods of construction, and sizing to meet future needs. Master planning for future water needs is the responsibility of the JPWB in cooperation with Green River, Rock Springs and Sweetwater County.

Existing Facilities
Green River City's water system extends throughout the developed areas of the City and includes tanks, pumps, and distribution lines. There are no existing Green River facilities located near the study area. The closest Green River City facilities are located at 5th East and Flaming Gorge Way.

Rock Springs City also obtains its water from the JPWB and they control two transmission lines through Green River City. One is a 30 inch cement mortar lined steel pipe that threads through town, crosses under I-80 at the cemetery grade separation and travels along the north side of I-80 to Rock Springs. This line passes through the north study area.

A 20 inch steel line runs through Green River, along the south side of I-80 and through the south study area towards Rock Springs. The 20 and 30 inch lines connect to the east of the study area with an 18 inch ductile iron line that was installed in a bore under I-80. From this
point west, to approximately 5th East in Green River, the 20 inch line is currently capped at each end and out of service. From the treatment plant to 5th East, the 20 inch line is in service and used by several businesses. Although it currently serves only users in Green River and is maintained by Green River City, it is still considered a Rock Springs facility. There are plans within the next five years to rehabilitate the inactive line and return it to service for Rock Springs.

Service Options
Several options have been identified to deliver water to both the north and south portions of the study area. They were developed through research and discussions with city and JWPB staff. Three main options are identified in the following paragraphs.

Option 1
This option requires constructing a new tank above the cemetery and a transmission line from the tank to the east along I-80 to the study area (see Figure 5-1). Water would be supplied to the tank from a booster pump and transmission line at approximately 50 East 5th North. The existing booster pump and 4 inch line to the cemetery would need to be up-graded to meet the minimum requirements of JPWB and the future demands of the areas to be served. The south portion of the study area would be served by a new line bored under I-80 connecting the two sites. This line would also loop back to approximately 5th East and Flaming Gorge Way. A pressure reducing station would need to be constructed on the south side of I-80 to serve both the high and low areas and to bring the pressures back to operating levels within the city limits. Some up-sizing of existing distribution lines might be necessary near the booster station to provide the necessary water supply without diminishing pressures in the existing system.

During the study, the steering committee selected Option 1 as the preferred alternative. Several reasons played a role in its selection. First, all of the facilities would be controlled by Green River City and not by Rock Springs. Second, it would open up several other areas for potential development including the area north of I-80 between the cemetery and the study
area, the area east of the study area toward Rock Springs, areas south of I-80 that are east and west of the study area, and the bench areas south of I-80 between the cemetery and the interchange. The looped system would help maintain water quality in the distribution system.

Option 2
This option includes constructing new lines that connect to the 18 inch ductile iron line that connects the 30 inch and 20 inch Rock Springs transmission lines. This connection would supply water to a tank constructed north of the study area. An additional line would be installed in a bore under I-80 to serve the south side of the study area.

This option was not selected for in-depth analysis because the water needed would have to be purchased from Rock Springs and would be delivered from transmission lines not under Green River City control. This option could not be expanded to serve as many additional areas as Option 1. Maintaining water quality was also a consideration because water would be stagnant in the tank for long periods without circulation.

Option 3
Under this option, a connection to the 18 inch ductile iron line would be made on both sides of the freeway to serve both sides of the study area. A specialty pressure regulating structure would need to be designed at both connections to provide adequate flows without wildly varying pressures. These types of facilities are difficult to design and maintain for low flow applications. Development in these areas would likely require low flows in the initial stages if not for many years.

This option was also not selected for in-depth analysis due to the difficulties of maintaining the required pressure regulating structure and for the same reasons Option 2 was not considered.

Facility Sizing
In order to prepare budgetary cost estimates, preliminary pipes sizes were defined for the preferred alternative. Facilities were sized to accommodate reasonable future requirements.
The sizes defined in this study are preliminary in nature and will need to be finalized during project design and approved by JPWB prior to construction.

Sizes are based on State of Wyoming, JPWB, and International Fire Code sizing standards and include the following:

- Maximum fire flows of 3000 gpm for four hours (Type V-B Construction, 13,400 sf without fire sprinklers, 51,500 sf with fire sprinklers).
- Fire flow storage of 720,000 gallons (3000 gpm for four hours).
- Peak day outdoor demand of 2.80 gpm per irrigated acre.
- Peak day indoor demand of 0.56 gpm per residential connection.
- Peak day demand of 0.91 gpm per Equivalent Residential Connection (ERC) (one residence with 1/8 acre of irrigated land).
- Storage volume of 468 gallons per irrigated acre (25% of peak day usage).
- Storage volume of 200 gallons per residential connection (25% of peak day usage).
- Storage Volume of 256 gallons per ERC.
- Expected average density of 5 ERC's per acre for highway commercial.
- ERC density of industrial is typically less than commercial with isolated exceptions.
- 20% of buildable area is assumed to be roadways.

At full buildout (96 acres), the north side of the study area would require approximately 350 gpm water supply on a peak day. It would also require approximately 125,000 gallons of water storage. The south side would require approximately 250 gpm supply and 90,000 gallons of storage capacity. Construction of a 1 million gallon storage tank would supply the fire flow and peak day requirements of both the north and south sides plus an additional 122 ERC's. However, these values could vary widely from this study depending on the size and type of the facilities actually constructed. For example, less fire flow storage required for a sprinkled building under 47,400 sf would increase the available ERC storage capacity by 91 ERC's.

Pipelines and pumps were sized to supply the peak day requirements in addition to fire flow requirements. Water flow velocities were maintained below 5 feet per second during peak day and peak hour operations and pressures were maintained at 20 psi during fire flow
Wastewater collection and treatment for Green River City is provided by the city. The city owns and operates a wastewater treatment plant, many miles of collection lines and several lift stations. Master planning for future wastewater needs is the responsibility of Green River City.

Existing Facilities
Green River City’s wastewater collection system extends throughout the developed areas of the city and includes lift stations, manholes, and collection lines. There are no existing Green River facilities located near the study area. The closest facilities are located at 5th East and Flaming Gorge Way.

All of Green River City north of the Green River is served by collection lines that carry wastewater under the railroad tracks to a lift station on the north bank of the river. A lift station pumps the wastewater under the river to the treatment plant. There are several locations where 12 inch sewer lines running under the railroad tracks are over 80 years old. It is very difficult to maintain and service these lines and their physical conditions are unknown. The potential for problems in these lines is great while service and repair options are limited. All wastewater generated in the study area would need to be brought across the river to the treatment plant and would likely need to flow through these aging lines to the lift station. Analyzing this issue was not part of the scope of this study, but is identified here because the preferred alternative to service the study area could also address this potential problem.

Service Options
Several options were identified to collect wastewater from the study area. However, after discussions with city staff and the steering committee, four main options were identified.
There were some similarities between all options discussed. All options would require a bore under the freeway to get the wastewater from the north side to the treatment plant. The eastern portion of the north side is lower in elevation than the western portion necessitating the construction of a lift station in this area. The existing lift station would need to be upgraded to meet any additional flows created by development.

**Option 1**
This option consists of constructing a collection line from the north side, under the freeway and down the I-80 on-ramp into Green River near the Intersection of 7th East and Flaming Gorge Way. From this point a new 18 inch line would be bored under the railroad yard to the existing lift station. The majority of the flow from the north part of town could be redirected to this new crossing allow the city to abandon the old 12 inch crossing.

Option 1 was originally the preferred alternative, but was dropped because of limitations by the Wyoming Department Of Transportation on allowing utilities within the freeway right-of-way. WYDOT will allow the freeway right-of-way to be crossed, but will not allow parallel installations within the right-of-way. This option would only require one lift station, but will not accommodate service to the south side of the study area.

**Option 2**
This option requires bringing collection lines under the freeway to the south side of the study area, crossing the railroad right-of-way with a bore and constructing a lift station to pump the wastewater to the existing lift station. This alternative was not selected for in-depth analysis because the area between the river and the railroad tracks was too restrictive for the required facilities.

**Option 3**
This option includes bringing collection lines under the freeway to the south side, crossing the railroad right-of-way with a bore, and constructing a lift station to pump the wastewater under
the river to the waste water treatment facility. It was not selected for further analysis because of the problems and costs associated with boring under the river.

Option 4
The option selected as the preferred alternative is a combination of Options 1 and 2. It includes bringing the collection lines under the freeway to the south side, constructing a lift station to pump the wastewater west to approximately 7th East and Flaming Gorge Way and crossing the railroad right-of-way with a bore to the existing lift station (see Figure 6-1). The majority of the flow from the north part of town could be redirected to this new crossing allowing the city to abandon the old 12 inch crossing. This option would serve both sides of the study area.

Facility Sizing
Proposed facilities have been preliminarily sized in order to complete cost estimates for this study. Facilities were sized to accommodate reasonable future requirements. The sizing in this study is preliminary in nature and would need to be finalized during project design. Sizing is based on State of Wyoming sizing standards and includes the following.

- Average day indoor water demand of 0.28 gpm per equivalent residential connection (ERC).
- 90 percent of indoor demand is returned to wastewater system.
- Collection lines are sized for a peaking factor of 4 times the average flow.
- Expected average density of 5 ERC's per acre for highway commercial.
- ERC density of industrial is typically less than commercial with isolated exceptions.
- 20% of buildable area is assumed to be roadways.

At full buildout of 96 acres, the north side would produce approximately 136 gpm of wastewater on a peak day. The south side would produce approximately 78 gpm of wastewater. Combined with a peaking factor of 4, the pipe would need to handle 856 gpm flows. A 12 inch pipe at minimum slope could handle 712 gpm. However, with a slope of 0.4%, it would handle 1,000 gpm. The topographical relief in the area should allow for a
minimum slope of 0.5% or better. Therefore a 12 inch line is adequate for the lower sections of the collection system. By comparison most of the northern sections of town are served by a single 12 inch line. As the lines extend into the study area, the size can be reduced to 10 and 8 inches as required. All pressure lines are sized to maintain a minimum of 2 feet per second velocity with 8 inch lines being adequate.

Cost Estimate
It is estimated to cost approximately $2.2 million to complete the wastewater system improvements proposed in the preferred alternative. Table 6-1 is an itemized breakdown of the proposed facilities and anticipated costs. Included with the estimate is the current Construction Cost Index (CCI) for the proposed facilities. This can be used as an index to approximate future costs.

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
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<td>3,700</td>
<td>$92,500</td>
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<td>Driving 20&quot; casing</td>
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<td>$480</td>
<td>400</td>
<td>$192,000</td>
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<tr>
<td>Driving 24&quot; casing</td>
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<td>$150,000</td>
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<tr>
<td>Lift Station (Larger)</td>
<td>Lump Sum</td>
<td>$350,000</td>
<td>1</td>
<td>$350,000</td>
</tr>
</tbody>
</table>

|                                      |         |            |          |        |
|                                      | Cost    | Contingencies (15%) | $253,320 |
|                                      | $1,688,800 | Engineering Design (10%) | $168,880 |
|                                      | $168,880 | Construction Engineering (10%) | $168,880 |

Total Budgetary Estimate $2,279,880

Notes:
1. Estimate does not include Right-of-Way acquisition.
2. Driving estimates are based on driving through cobbles and boulders.
3. If conditions are good for traditional boring then costs can be cut in half for a savings of $440,000.
CHAPTER 7

SOILS

As part of this study, a preliminary geotechnical investigation and analysis was performed by Inberg-Miller Engineers. The results of the investigation show soils in the area with a moderate to high potential for expansion and settling. As a result, Inberg-Miller recommends that more detailed and site specific investigations be performed to determine foundation designs and fill requirements as development occurs.

The geotechnical report indicates that construction in the study area may be more expensive than typical construction for several reasons. First, typical foundations, such as spread footings, should only be used where further investigation indicates they can be used or where differential movement is not a concern for the structure. In this area, deep foundations will provide greater resistance to differential movement.

Second, paved areas may require protection against swelling and frost heave. Some recommended solutions are over-excavating the existing soils and replacing them with imported engineered fill or placing geotextile fabrics and raising the site grade with imported material. In addition, heavy equipment with rock digging capabilities might be required for excavation in some areas.

Finally, the report indicates that it may be necessary to require cut and fill slopes in the area to be no steeper than 3.5:1 horizontal to vertical during and after construction including trenching. As determined by further investigations, trenches might also need to be over excavated and backfilled with imported fill to avoid pipeline damage.

For more detailed information, a copy of the main body of the geotechnical report has been included in the appendix.
CHAPTER 8

ACCESS

In order to access the study area, a roadway system will need to be installed. There are currently no maintained access routes to the property, but the study area is directly adjacent to a major interchange on I-80.

Existing Facilities
The old Lincoln Highway lies on the north side of the study area. The highway is not a maintained facility and appears to be used occasionally for livestock herding and agricultural purposes. It extends as a dirt road eastward toward Rock Springs and westward toward the cemetery. The Lincoln Highway is eligible for the National Register of Historic Places and it is possible that the highway has historic value. If design progresses in the area, an archaeologist or historian should further review the parcel to determine its significance as well as other archaeological resources in the area. A letter from WYDOT’s regional archaeologist is included in the appendix for reference.

The nearest maintained transportation facility to the study area is Interstate 80, which is owned by the Wyoming Department of Transportation (WYDOT). A major interchange exists directly west of the study area which provides access from I-80 to the City of Green River. Currently, there is no access from the interchange to the study area.

Access Options
Three options were considered for providing access to the study area. Each of the alternatives was discussed with the steering committee and WYDOT. As a result Option 2 was chosen as the preferred alternative. The three alternatives are described below.
Option 1
This alternative consists of modifying the existing interchange to provide access to both the north and south sides of the study area by reconfiguring the ramps and the underpass to a diamond configuration. WYDOT has indicated that they are hesitant to pursue this alternative until there are existing developments in the area that increase the traffic demand on the interchange. Therefore, without funding and support, Option 1 was not evaluated further.

Option 2
This option requires a temporary access to be built for the north side of the study area until a full interchange modification is warranted. It would connect to the westbound off ramp near the underpass. A permanent access would be constructed on the south side that would run parallel to the freeway tying into East Flaming Gorge Way at approximately 700 East. As development occurs, the interchange will be evaluated and funding assistance would be sought by the city to construct appropriate interchange modifications. It is anticipated, at this time, that a properly designed diamond interchange would provide adequate access at this location in the future. This alternative was selected by the steering committee as the preferred alternative. Figure 8-1 illustrates this alternative. More detailed information on WYDOT policies concerning interchange modifications can be found in the appendix.

Option 3
This alternative requires providing access to the north side by constructing a road north of I-80 from the west side of the study area, parallel to the freeway and connecting to existing local roads on the west side of town. The south side access would be the same as Option 2. This alternative was not selected to receive in-depth evaluation. It was felt by the steering committee that the northern access route provided in this option would not provide an attractive access alternative for consumers and that a direct connection to the I-80 east interchange was necessary for commercial development in the area.
Facility Sizes

Roadways have been sized during the study process in order to prepare budgetary cost estimates. Each roadway facility has been sized to accommodate reasonable future traffic demands based on recent traffic counts taken at the interchange and future land use projections.

It is anticipated that the temporary northern access, the southern access and the interior roadways for the study area will be 66' wide facilities. Typical sections for each roadway will include curb, gutter, parkstrip and sidewalk.

Interchange modifications have been estimated to require 30' wide ramps and a 5 lane roadway section under the freeway. Ramps would not include curb, gutter or sidewalk, but the 5 lane section would.

Cost Estimate

Cost estimates have been prepared for each segment of the preferred alternative. A summary of the costs is provided below, while the detailed cost estimates for each segment can be found in the appendix. Cost estimates for segments of roadway through the north and south sides have also been included for reference.

<table>
<thead>
<tr>
<th>Segment</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Temporary Northern Access</td>
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<tr>
<td>Southern Access</td>
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<td>Interchange Modifications</td>
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<td><strong>Total Roadway Facility Costs</strong></td>
<td><strong>$5,454,486</strong></td>
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<table>
<thead>
<tr>
<th>Segment</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Northern Interior Roadway</td>
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<tr>
<td>Southern Interior Roadway</td>
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<tr>
<td><strong>Possible Additional Costs</strong></td>
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</table>
A right-of-way investigation was not part of the scope of this study. However, information obtained during the study indicates that the north side of the study area is currently under the ownership of the Bureau of Land Management. The south side is privately owned and was included in this study, for information only, at the request of the city. A full right-of-way investigation will need to be performed in order to accurately depict rights-of-way surrounding the study area.
CHAPTER 10

FINDINGS

It is evident that the study area is developable under the following conditions and circumstances.

1. Approximately 96 acres on the north side and 67 acres on the south side of the study area are developable.

2. A drainage system will need to be installed that meets current standards and regulations for a Class 1 water source. A portion of the trunkline will need to be installed before development can occur, but individual developments can be held responsible for drainage from their respective properties.

3. Some title restrictions could be imposed by the BLM at the time of the sale to protect the area for use as a severe weather relief range for the Sublette antelope herd.

4. Costs for installing the necessary infrastructure are as follows.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Cost</th>
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<tbody>
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</tr>
<tr>
<td>Roadway System</td>
<td>$5,454,488</td>
</tr>
<tr>
<td><strong>Budgetary Infrastructure Costs</strong></td>
<td><strong>$10,320,561</strong></td>
</tr>
</tbody>
</table>

5. Further geotechnical investigation should be performed for each individual facility to be installed to ensure proper foundation and fill design.

6. An archaeological review of the area should be performed.
Appendix
MEMORANDUM

TO: Horrocks Engineers

FROM: Grant Frost

SUBJECT: Green River City Feasibility Study

This is in response to your request for information and comments about the proposed expansion.

The project area (T18N R107W sec 24) that lies north of I-80 is within crucial winter/severe winter relief range for pronghorn of the Sublette herd. Pronghorn from as far away as Grand Teton National Park have been known to winter in the area, especially during severe winters. Literally thousands of antelope have been documented along the base of White Mountain under severe conditions. During most winters, few animals will use this area, but this does not diminish the importance of the area for pronghorn in severe conditions. With I-80 acting as a permanent barrier to any migration further south, these slopes are a last refuge for this herd.

In the “Flaming Gorge/White Mountain Resource Exchange” proposal by Union Pacific Resources, Goal #3 in the Summary states: “Important wildlife habitats and open space within the FGNRA and near the cities of Rock Springs and Green River will be protected.”

Elsewhere in the document it states, “These lands are important for their big game migration corridors and wildlife habitat, particularly for the Sublette antelope herd, the largest herd of migrating pronghorn antelope in the world. Both the Green River parcel and White Mountain lands are within significant view sheds for their adjacent cities and provide important open space characteristics for the communities of Sweetwater County.” And, “Preserving crucial winter range and migratory corridors for these animals can help to increase protection for the herd and encourage wildlife-based tourism in Sweetwater County.”

The WGFD has no authority to prevent development such as proposed. However, this type and placement of project is becoming more commonly proposed within the district, and the cumulative impacts would eventually impact the Sublette pronghorn herd.

This would be the same comment that would be provided to the BLM if this project were to go forward to that stage. I thank you for the chance to state our position, and welcome your call or letter if you wish to talk or get clarifications.

Grant Frost (307) 875-3223
After receiving Grant's comments about the area I called him to discuss the comments and possible mitigation measures that could be taken if the city decided to develop the area. During the call, the following was discussed:

Since this is a feasibility study I asked Grant if, in the case that the City decided to develop the area, there were measures that could be taken to mitigate or offset the impacts mentioned in his letter regarding the Pronghorn antelope herd.

Grant said that this area is the last resort winter range of the Pronghorn herd, as mentioned in his letter. Some of the reasons for the herd migrating to this area are its southern exposure, open space and winter food supply.

An important item to consider is that winter range cannot be replaced. If the area is developed the winter range will be disturbed. The extent of disturbance will be determined by the development. Certain measures can be taken to lessen the impacts to the herd and even to allow the herd to continue to use the area to a limited extent.

For example, if the area is developed it will infringe upon the amount of open space available to the antelope. If the area is fenced, breaks in the fence can be installed so that the herd can pass easily through the fence and at least access the remaining available open space. Further, certain winter activities could be limited by city regulation to lessen daytime impacts to the herd.
Grant also mentioned that the antelope use the area because the southern exposure provides for thinner snow cover and therefore more possibilities of food/vegetation sticking above the snow surface. In order to help mitigate disturbance to this winter food source, it may be possible to provide vegetated areas in a new development that would provide food for the herd.

Finally, the antelope can inhabit slopes higher up or steeper than is reasonable for development. It would seem that some of the existing winter range habitat is undevelopable and that the herd would continue to have some undisturbed winter range above any development that occurred. However, a large amount of the existing open space would most likely be lost. Therefore, planned open spaces in the development may help to offset some of the open space impacts.

The Wyoming Game and Fish Department would like to have input on the design of future developments in this area.
After speaking with BLM (Patricia Hamilton), I called the WGFD to verify that there were no raptor concerns in feasibility study area.

Since Patricia mentioned raptor environments in my conversation with her, I asked Bill if there might be any concerns in the study area that were not covered in the letter I had received from them concerning the feasibility study.

Bill said in the lower, flatter areas encompassed by the study, it was highly unlikely that there would be any raptor environments disturbed by development. He said he did not know of any concerns about raptor environments in the area of interest.
I called Patricia to discuss any Land Use Restrictions that might be imposed upon the study area property as conditions to the sale of the land:

Patricia said that the Bureau of Land Management (BLM) imposes no restrictions in land use with the sale of property unless there are concerns from the Wyoming Game and Fish Department. Under other conditions, such as lease or easement, the BLM would consider imposing restrictions for other reasons.

I passed on to Patricia, the information about the Sublette herd that the WGFD had submitted to me in the form of a letter. She did not specifically mention restrictions that would apply, but said that if, for instance, there were Raptor concerns, that restrictions in activity could apply during critical periods such as egg laying or birthing. I suggested that the WGFD had not mentioned any concern with Raptor environments in the area. Patricia thought that since the original application submitted to the BLM, from Green River, had been trimmed from 250 acres to 113 acres, maybe any area with raptor environments had been excluded. I agreed, since the plateau and cliff areas had been eliminated from the application. I told Patricia that I would forward the WGFD comment to her so that she could review them and provide more specific information where possible.

She also mentioned that the sale of the property included only the surface estate and not the mineral estate. The government retains all mineral estate rights. She said that the chances of such an area being developed for mining were very low, but that the government would retain the right to do so.
Finally, Patricia said that the sale of the property would include provisions to honor any existing rights-of-way and easements. Existing utilities would have to be protected.

In closing, I asked if there was a permit that would need to be acquired to perform a soils investigation on the property, including taking samples by boring. She said that would not be a problem and that Green River could enter the property for that reason with no problems.
Jim said that there is a historical raptor nest on the cliffs above the study area. However, he also said that raptor nests are found in other areas directly adjacent to the freeway and that no adverse affects have been noticed to the raptor environment due to development near their habitat. He said the raptor issue could probably be worked with.

Jim also mentioned the antelope herd and said that the last severe winter when animals used the study area for refuge was in 1986 or 87. Therefore all of the animals that would use the area now are probably new animals who are unfamiliar with the area. He said that the area between the cliffs and the freeway is tight and would make it difficult to mitigate and impacts, in which case the BLM might include title encumberances with the sale of the property.
### Preferred Water System Alternative

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
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<td>300</td>
<td>$120,000</td>
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<tr>
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<td>$65,100</td>
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<tr>
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<td>Lump Sum</td>
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<td>$15,000</td>
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**Construction Cost** $1,915,700

Contingencies (15%) $287,355

Engineering Design (10%) $191,570

Construction Engineering (10%) $191,570

**Total Budgetary Estimate** $2,566,195

**Notes:**
1. Estimate does not include Right-of-Way acquisition.
2. Driving estimates are based on driving through cobbles and boulders.
3. If conditions are good for traditional boring then costs can be cut in half for a savings of $180,000.

### Preferred Wastewater System Alternative

<table>
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<th>Item</th>
<th>Units</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
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<td>3,700</td>
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<td>10&quot; Trunkline</td>
<td>Lin Feet</td>
<td>$30</td>
<td>3,800</td>
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<td>18&quot; Trunkline</td>
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**Construction Cost** $1,607,500

Contingencies (15%) $241,125

Engineering Design (10%) $160,750

Construction Engineering (10%) $160,750

**Total Budgetary Estimate** $2,170,125

**Notes:**
1. Estimate does not include Right-of-Way acquisition.
2. Driving estimates are based on driving through cobbles and boulders.
3. If conditions are good for traditional boring then costs can be cut in half for a savings of $440,000.
## Temporary Northern Access

<table>
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<tr>
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<th>Units</th>
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<th>Cost</th>
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<td>Roadway Excavation</td>
<td>Cu. Yard</td>
<td>$7.00</td>
<td>4,100</td>
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<td>Granular Borrow</td>
<td>Cu. Yard</td>
<td>$12.50</td>
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<tr>
<td>Untreated Base Course</td>
<td>Cu. Yard</td>
<td>$16.00</td>
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<tr>
<td>Asphalt Concrete</td>
<td>Ton</td>
<td>$50.00</td>
<td>1,200</td>
<td>$60,000</td>
</tr>
<tr>
<td>Concrete Curb and Gutter</td>
<td>Lin. Foot</td>
<td>$12.50</td>
<td>2,000</td>
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</tr>
<tr>
<td>Concrete Sidewalk</td>
<td>Sq. Yard</td>
<td>$22.50</td>
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</tr>
</tbody>
</table>

**Construction Cost** $165,500

- Contingencies (15%) $24,825
- Engineering Design (10%) $16,550
- Construction Engineering (10%) $16,550

**Total Budgetary Estimate** $223,425

Notes:
1. Estimate does not include Right-of-Way acquisition.
2. All Quantities are based on a typical 66' roadway width.
3. Quantities are based on a roadway section of 4' - Asphalt, 6' - Base, 10' - Granular Borrow

## Southern Access

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Roadway Excavation (15% over-ex.)</td>
<td>Cu. Yard</td>
<td>$8.05</td>
<td>20,800</td>
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<td>Granular Borrow</td>
<td>Cu. Yard</td>
<td>$12.50</td>
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<tr>
<td>Untreated Base Course</td>
<td>Cu. Yard</td>
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<tr>
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<td>Ton</td>
<td>$50.00</td>
<td>5,700</td>
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<td>Lin. Foot</td>
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<td>Sq. Yard</td>
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**Construction Cost** $849,665

- Contingencies (15%) $127,450
- Engineering Design (10%) $84,967
- Construction Engineering (10%) $84,967

**Total Budgetary Estimate** $1,147,048

Notes:
1. Estimate does not include Right-of-Way acquisition.
2. All Quantities are based on a typical 66' roadway width.
3. Quantities are based on a roadway section of 4' - Asphalt, 6' - Base, 10' - Granular Borrow
## Budgetary Cost Estimates

### Interchange Modifications

<table>
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<th>Item</th>
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<td>Signalization</td>
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<tr>
<td>Culvert Modifications</td>
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**Construction Cost** $2,722,675

**Contingencies (20%)** $544,535

**Engineering Design (15%)** $408,401

**Construction Engineering (15%)** $408,401

**Total Budgetary Estimate** $4,084,013

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### Northern Interior Roadway

<table>
<thead>
<tr>
<th>Item</th>
<th>Units</th>
<th>Unit Price</th>
<th>Quantity</th>
<th>Cost</th>
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</thead>
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**Construction Cost** $918,175

**Contingencies (15%)** $137,726

**Engineering Design (10%)** $91,818

**Construction Engineering (10%)** $91,818

**Total Budgetary Estimate** $1,239,536

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**Notes:**

1. Estimate does not include Right-of-Way acquisition.
2. Quantities are based on a typical 30' wide ramp and a 70' wide 5 lane section under I-80.
3. Quantities are based on a roadway section of 8" - Asphalt, 12" - Base, 14" - Granular Borrow
### Southern Interior Roadway

<table>
<thead>
<tr>
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<th>Units</th>
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<th>Cost</th>
</tr>
</thead>
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<td>2,200</td>
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<tr>
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<td>Ton</td>
<td>$50.00</td>
<td>2,700</td>
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<td>Lin. Foot</td>
<td>$12.50</td>
<td>4,800</td>
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<td>Sq. Yard</td>
<td>$22.50</td>
<td>2,120</td>
<td>$47,700</td>
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<p>| | | | | |</p>
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<tr>
<td>Construction Engineering (10%)</td>
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**Total Budgetary Estimate** $540,422

### Notes:

1. Estimate does not include Right-of-Way acquisition.
2. Fill Quantities are based on a typical 66' roadway width.
3. Quantities are based on a roadway section of 4" - Asphalt, 6" - Base, 10" - Granular Borrow
I called John to ask him about pipe heave and problems that we will have with the pipes that we install. His main suggestion to prevent problems with the trenches and pipes was to take precautions to prevent water from entering the trenches during construction. Another concern is that a standard backhoe might not have the ability to dig in the hard clays and larger equipment with rock digging equipment might be required. Once the trench is dug, the top overburden soil will not have high strength to prevent collapsing on the trench and trench boxes or sloping the trenches out at the top might be required. Pipes should be installed in a manner that prevents leaking of water into the trench as the moisture could cause heave and pipe damage. To help prevent utility damage due to heave, each utility trench should be over excavated and backfilled with non-expansive soils. The amount of over excavation that is required will need to be determined by further geotechnical testing in the areas of the utility trenches, the more expansive the soils the more excavation that will be required. John also mentioned that he has seen much worse soils than those in the study area thereby implying development should be possible if the other locations could be developed.
Dear Brent:

Thanks for sending the information regarding the proposed developments for the City of Green River adjacent to I-80 East Interchange. I pulled some of our old engineering plans and looked at some other records as well. And yes, the Lincoln Highway did pass through the northern parcel as shown on the aerial photo. In fact, there may be two abandoned road grades in this area (as suggested by several linear features on the aerial photo). I found portions of one set of plans for the 1930s construction of U.S. 30 which suggests that the 1930s highway may have built on a slightly different alignment from the 1920s Lincoln Highway. It appears that the original entrance into Green River may have been on North 2nd St. When U.S. 30 was built in the 1930s, the entrance appears to have been changed to North 1st St. At this point it is very difficult to tell how much of the original alignment may have been destroyed by the 1930s construction.

I can certainly do a little more digging, but at this point it would probably be appropriate to have an archaeologist or historian to take a look at the parcel. The Lincoln Highway is eligible to the National Register of Historic Places, and it would be appropriate to determine if any remnants of the early version of the highway are preserved, and whether they retain sufficient integrity of location, setting, design, materials, workmanship, feeling, and association with the period of historic significance to contribute to the significance of the resource as a whole (I would be surprised if this would prove to be the case, but... hard to say from an aerial photograph).

I also did a file search for both parcels shown on the aerial photograph. Neither parcel has been surveyed for archaeological resources. Given the general location on a prominent bench above the Green River, there is a fair likelihood that some prehistoric sites may occur in the area being considered for development. I would also encourage the City of Green River to consult with the State Historic Preservation Office regarding appropriate strategies for the treatment of cultural resources in the area.
MEETING MINUTES

PROJECT: I-80 East Interchange Feasibility Study
MEETING DATE: Wednesday, November 17, 2004
TIME: 2 PM
LOCATION: Green River City Offices
ATTENDANCE: Steve Hortom
             Ron Mortimer
             Several others (unclear)
PREPARED BY: Brent Ventura

Action Items

Meeting Summary
As described to me by Ron Mortimer, the main focus of the meeting was transportation and access issues. It was discussed that a temporary access will need to be provided for development to begin. Furthermore, when development does occur the need for interchange modifications will exist. It is also possible that development might occur more readily on the south side if access was provided to that property.

As a result of the discussion, it was decided that a cost estimate should be made for the temporary access, the interior road, the interchange modifications and for the access road to the south property.

Cost estimates for installing water and wastewater infrastructure were presented to the committee. Even though it appears that it will be an expensive venture to develop the area, the committee felt like it was quality information and informative. They decided it was in the best interest of the City to continue the study and submit a final report covering all aspects as originally proposed.

Finally, it was discussed that the City had approved hiring a geotechnical firm to perform a soils study. The firm said they would be able to provide information within a month. The study will include 5 borings on the north side and 1 boring on the south side.