PRELIMINARY ENGINEERING REPORT
FOR WATER SYSTEM IMPROVEMENTS
FOR THE
TOWN OF WIGGINS, COLORADO

April 2016
Revision: 0
April 5, 2016

Mr. Paul Larino
Town Administrator
Town of Wiggins, Colorado
304 Central Avenue
Wiggins, CO 80654

RE: Preliminary Engineering Report for Water System Improvements

Dear Mr. Larino:

Enclosed is the Preliminary Engineering Report (PER) for the Town of Wiggins, Colorado (Town). The PER has been prepared in the format required by the United States Department of Agriculture (USDA) and can be used to accompany funding applications.

Feel free to call (303-586-5815) or email (johne@diamondbackeng.com) if you have any questions or concerns.

Sincerely,

John Enochs, PE
Project Manager

LMB
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SECTION 1.0  
PROJECT PLANNING  

A. Location  
The Town of Wiggins, Colorado (Town) is located approximately 70 miles northeast of Denver, Colorado, in Morgan County. The Town is located in Section 22, Township 3 North, Range 60 West of the 6th PM. The Town is located just south of Interstate 76, and is located approximately eight miles south of the South Platte River.  

The service area for the Town of Wiggins is shown on Figure 1. The service area is generally bounded by I-76 to the north and Highway 52 to the east. The western boundary generally consists of the flood control dike that was constructed to prevent flooding from Kiowa Creek.  

B. Environmental Resources Present  
The Town lies between elevations 4,540 and 4,560 feet above sea level (MSL), and the topography is relatively flat. As mentioned above, the Town is located near the Kiowa Creek, the Bijou Creek and the South Platte River. The location of these environmental resources are shown on Figure 1.  

The wetlands are shown on the National Wetlands Inventory (NWI) map on Figure 2. The wetlands shown on the map are not located near any proposed construction site, and will not be impacted by this proposed water improvement project. It should be noted that the NWI map shows the Towns wastewater treatment lagoons as wetlands, which is not correct. According to 33 CFR 328.3, waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the Clean Water Act are not designated as waters of the United States, and are not considered wetlands under the Corps of Engineer’s definition.  

According to the Federal Emergency Management Agency (FEMA), the Town is not in a special flood hazard area and the project will not encroach upon any 100 or 500-year floodplain, as shown on Figure 3.  

A search of the Colorado Historical Society’s Office of Archeological and Historic Preservation and the National Register of Historic Places yields one building in Wiggins that is listed on the National Register. This building is the Old Trail School located at 421 High Street, Wiggins, CO.
80654. The Old Trail School should not be impacted by this proposed water improvement project; however, this will be closely examined during the design and construction phase to ensure that any potential impact is either avoided or mitigated. The information regarding the Old Trail School is located in Appendix A.

The Colorado Natural Heritage Program should be contacted to determine if any threatened or endangered (T&E) plant or invertebrate species might be impacted. Several threatened and endangered species of concern could potentially exist in the area. State species of special concern are included in Appendix A, and it will need to be determined prior to construction if any are located near the project site.

C. Population Trends
According to the US Census Bureau, the population in 2000 was 838, while the population in 2010 was 893. This represents an annual growth rate of approximately 0.7%. Town staff currently estimates the existing population at 900.

The Colorado Department of Local Affairs (DOLA) currently estimates the population of Morgan County to be 28,797 and predicts that the 2040 population of the County to be 39,017. This represents a 1.2% annual growth rate. DOLA also estimates that there are 2.65 people per household. In addition, DOLA has estimated the growth in the Town of Wiggins from 2010 to 2014 to be zero, as seen in Table 1 obtained from DOLA.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MORGAN COUNTY</td>
<td>28,196</td>
<td>28,449</td>
<td>28,295</td>
<td>28,317</td>
<td>28,254</td>
<td>58</td>
<td>0.10%</td>
</tr>
<tr>
<td>Brush</td>
<td>5,468</td>
<td>5,511</td>
<td>5,473</td>
<td>5,463</td>
<td>5,436</td>
<td>-32</td>
<td>-0.10%</td>
</tr>
<tr>
<td>Fort Morgan</td>
<td>11,328</td>
<td>11,422</td>
<td>11,345</td>
<td>11,323</td>
<td>11,264</td>
<td>-64</td>
<td>-0.10%</td>
</tr>
<tr>
<td>Hillrose</td>
<td>264</td>
<td>266</td>
<td>265</td>
<td>264</td>
<td>263</td>
<td>-1</td>
<td>-0.10%</td>
</tr>
<tr>
<td>Log Lane Village</td>
<td>874</td>
<td>881</td>
<td>875</td>
<td>873</td>
<td>868</td>
<td>-6</td>
<td>-0.20%</td>
</tr>
<tr>
<td>Unincorp. Area</td>
<td>9,368</td>
<td>9,463</td>
<td>9,437</td>
<td>9,496</td>
<td>9,530</td>
<td>162</td>
<td>0.40%</td>
</tr>
<tr>
<td>Wiggins</td>
<td>894</td>
<td>906</td>
<td>900</td>
<td>898</td>
<td>893</td>
<td>-1</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

Notes:
1. State Demography Office (SDO)

While the Town has not recently seen much growth, the Town is currently in negotiations with two industries and two housing developers. The two developers are planning to build
approximately 520 homes, with 36 homes being built in the next two years. One industry, Industry “A”, has estimated that they will bring 40 new jobs to Town within the next year, and up to 200 jobs within three years. The other industry, Industry “B”, has indicated that they will bring 25 new jobs to Town within the next year, and up to 45 total jobs within five years. Appendix B contains the preliminary planning documents for the industries and housing developments. Should these new jobs come to Town, it will bring additional family members to Town, thereby increasing the population rapidly. In addition, Morgan County is experiencing a severe housing shortage, as indicated in the Northeast Colorado Housing Needs Assessment, prepared by Colorado Center for Community Development and DOLA (located in Appendix C).

For the purposes of this Preliminary Engineering Report (PER), it is estimated that each job will bring 2.65 people to town, as Morgan County currently estimates that there are 2.65 people per household. The near term population projection, including the next five years, includes the following assumptions:

- 245 new jobs from Industry A and B. Each job brings 2.65 people per home – total of 650 people.
- New residential developers plan to build approximately 520 new homes. Assume each home has 2.65 people – total of 1,380 people.
- Of the 1,380 people, 650 people are associated with the 245 new jobs.
- Due to the severe housing shortage in Morgan County, the remaining 730 people will live in Wiggins and work in Brighton, Denver, Fort Morgan, or Brush.

It is estimated that the population in 2020 will be 2,280 people (900 existing + 1,380 new residents), with full buildout of the two new residential developments.

In order to conservatively estimate population growth for the purposes of water and wastewater infrastructure planning, it is assumed that the annual growth rate over the next 30 years will be 2%. This is slightly more than Morgan County’s estimated annual growth rate of 1.2%, and will ensure conservative water demand projections. Due to the job projections over the next five years, the population projection for the Town of Wiggins is greater than 2%. However, in years 5 through 30, the population projections follow 2% growth per year. The population projections through year 2045 can be seen in Table 2.
Table 2: Population Projections for Wiggins, CO
Years 2016 – 2045

<table>
<thead>
<tr>
<th>Year</th>
<th>Population (2% Annual Growth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>900</td>
</tr>
<tr>
<td>2020</td>
<td>2280</td>
</tr>
<tr>
<td>2025</td>
<td>2571</td>
</tr>
<tr>
<td>2030</td>
<td>2841</td>
</tr>
<tr>
<td>2035</td>
<td>3140</td>
</tr>
<tr>
<td>2040</td>
<td>3470</td>
</tr>
<tr>
<td>2045</td>
<td>3835</td>
</tr>
</tbody>
</table>

Notes:
1. 2020 population projections based on full buildout of 2 residential developments and nearly 250 new industrial jobs.

D. Community Engagement

The Town of Wiggins is proactive in their planning of infrastructure that will be needed to serve existing and future development. Perhaps more importantly though, the Town recognizes that much of the existing infrastructure needs repair and/or replacement to adequately serve the existing customers. The Town anticipates having a public hearing regarding all water system improvements and potential impact on water bills, if any. The public will be encouraged to bring their concerns and comments to the meetings. It is anticipated that several council meetings and possibly public hearings will be necessary to properly inform the public and residents of the proposed water projects. The process is ongoing and the Town staff plans to keep the community informed and engaged throughout planning, design and construction.
SECTION 2.0
EXISTING FACILITIES

a. Location Map

The Town’s existing water facilities are primarily split into two locations; (1) inside Town limits and (2) approximately seven miles north of Town at the reverse osmosis (RO) water treatment plant (WTP). The infrastructure in Town includes three “Kiowa Bijou” wells, three “Thomas” wells, one at-grade 500,000-gallon storage tank, and various distribution lines. Approximately seven miles north of Town, there are two “South Platte” wells, a reverse osmosis water treatment plant and a 50,000-gallon storage tank. The location of the existing facilities is shown in Figure 4.

Currently, there are six wells (Kiowa Bijou wells and Thomas wells) located in the Kiowa Bijou Basin which are permitted for municipal use. Three wells (Well 1418, Well 14465 and Well 14466) are located in Town and are housed within a single well house near the intersection of Main Street and County Road P. The well house was constructed in the mid-1970s, and is showing signs of age. Well 1418 has an annual appropriation of 170.3 AF, while Well 14465 and 14466 have a combined annual appropriation of 200 AF. There are three other wells located in Town (Well 436, Well 435 and Well 6798), considered to be the “Thomas” wells, and have a combined annual appropriation of 113.1 acre-feet. The Thomas wells have not been connected to the municipal system yet, but could be connected in the future if two of the three wells are redrilled. The total appropriation from the Kiowa Bijou wells is 483.3 AF per year, including the Thomas wells.

In 2008, the City drilled two wells (Well 75611 and Well 75611) approximately seven miles north of Town. The two wells were constructed in the South Platte River Alluvial Aquifer. They are both located inside of the reverse osmosis building. These wells were built at the time the RO treatment system was constructed. Wells 75611 and 75612 were constructed in 2011 and drilled to a depth of 170 feet. The two wells combined have a total annual appropriation of 590 AF from the South Platte Alluvial Aquifer. Table 3 contains a summary of the various municipal wells owned by the Town of Wiggins.
Table 3: Summary of Municipal Wells  
Town of Wiggins, CO

<table>
<thead>
<tr>
<th>Permit Number</th>
<th>Location</th>
<th>Maximum Annual Appropriation (acre-feet)</th>
<th>Maximum Pumping Rate (GPM)</th>
<th>Static Water Level (feet)</th>
<th>Total Depth (feet)</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>436-RFP</td>
<td>Thomas (Kiowa Bijou)</td>
<td>113</td>
<td>1700</td>
<td></td>
<td></td>
<td>Other wells used as alternate points of diversion include 435-R and 6798-F. Combined annual appropriation of 113.1 acre-feet. Well 436-RFP has a maximum annual appropriation of 48.8 AF.</td>
</tr>
<tr>
<td>1418-RFP</td>
<td>Town (Kiowa Bijou)</td>
<td>170.3</td>
<td>1400</td>
<td>135</td>
<td>150</td>
<td>N/A</td>
</tr>
<tr>
<td>14465-FP</td>
<td>Town (Kiowa Bijou)</td>
<td>200</td>
<td>250</td>
<td>82</td>
<td>175</td>
<td>This well, with Well Permit No. 14466-FP cannot withdraw more than 200 AF combined total annually.</td>
</tr>
<tr>
<td>14466-FP</td>
<td>Town (Kiowa Bijou)</td>
<td>200</td>
<td>300</td>
<td>82</td>
<td>175</td>
<td>This well, with Well Permit No. 14465-FP cannot withdraw more than 200 AF combined total annually.</td>
</tr>
<tr>
<td>75612-F</td>
<td>RO WTP (South Platte)</td>
<td>590</td>
<td>1000</td>
<td>14.7</td>
<td>152</td>
<td>This well, with Well Permit No. 75611-F cannot withdraw more than 590 AF combined total annually (per decree 11CA131 pg. 12, Section 10.3).</td>
</tr>
<tr>
<td>75611-F</td>
<td>RO WTP (South Platte)</td>
<td>590</td>
<td>850</td>
<td>13</td>
<td>153</td>
<td>This well, with Well Permit No. 75612-F cannot withdraw more than 590 AF combined total annually (per decree 11CA131 pg. 12, Section 10.3).</td>
</tr>
</tbody>
</table>

In the spring of 2015, the City pulled raw water samples from wells 14465 (Kiowa Bijou), 1418 (Kiowa Bijou) and 75611 (South Platte), in order to better understand the raw water quality, and the results are shown in Table 4. The full laboratory analysis is contained in Appendix D.
Table 4: Raw Water Analysis for Various Wells
March 2015

<table>
<thead>
<tr>
<th>Test</th>
<th>Well 14465 Shallow</th>
<th>Well 1418 Deep</th>
<th>Well 75611 North</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia Nitrogen</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
<td>&lt;0.03</td>
<td>mg/L</td>
</tr>
<tr>
<td>Bicarbonate</td>
<td>287.6</td>
<td>259.2</td>
<td>288.3</td>
<td>mg/L</td>
</tr>
<tr>
<td>Carbonate</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>&lt;0.1</td>
<td>mg/L</td>
</tr>
<tr>
<td>Chloride</td>
<td>22.18</td>
<td>18.45</td>
<td>93.73</td>
<td>mg/L</td>
</tr>
<tr>
<td>Fluoride</td>
<td>0.90</td>
<td>0.92</td>
<td>0.43</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrate Nitrogen</td>
<td>14.49</td>
<td>9.19</td>
<td>3.27</td>
<td>mg/L</td>
</tr>
<tr>
<td>pH</td>
<td>7.41</td>
<td>7.61</td>
<td>7.59</td>
<td>units</td>
</tr>
<tr>
<td>Phosphorus - Total</td>
<td>0.04</td>
<td>0.02</td>
<td>0.07</td>
<td>mg/L</td>
</tr>
<tr>
<td>Specific Conductance</td>
<td>1234</td>
<td>1030</td>
<td>1427</td>
<td>umhos/cm@25 C</td>
</tr>
<tr>
<td>Sulfate</td>
<td>321.86</td>
<td>251.45</td>
<td>365.68</td>
<td>mg/L</td>
</tr>
<tr>
<td>Sulfide as H2S</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>&lt;0.01</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Alkalinity (as CaCO3)</td>
<td>235.7</td>
<td>212.5</td>
<td>236.3</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Dissolved Solids</td>
<td>840</td>
<td>654</td>
<td>904</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.2</td>
<td>1</td>
<td>1.5</td>
<td>mg/L</td>
</tr>
<tr>
<td>Dissolved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>0.007</td>
<td>0.005</td>
<td>&lt;0.005</td>
<td>mg/L</td>
</tr>
<tr>
<td>Silica (as SiO2)</td>
<td>6.8</td>
<td>6.5</td>
<td>7.2</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barium</td>
<td>0.0074</td>
<td>0.0107</td>
<td>0.0212</td>
<td>mg/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>140.9</td>
<td>116</td>
<td>127.6</td>
<td>mg/L</td>
</tr>
<tr>
<td>Iron</td>
<td>0.054</td>
<td>0.045</td>
<td>0.02</td>
<td>mg/L</td>
</tr>
<tr>
<td>Magnesium</td>
<td>21.1</td>
<td>17.7</td>
<td>30.8</td>
<td>mg/L</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.1031</td>
<td>0.4338</td>
<td>0.009</td>
<td>mg/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>8.9</td>
<td>7.8</td>
<td>6.3</td>
<td>mg/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>82.5</td>
<td>74.6</td>
<td>127.1</td>
<td>mg/L</td>
</tr>
<tr>
<td>Strontium</td>
<td>1.241</td>
<td>1.047</td>
<td>0.799</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

b. History

The Town has water rights which permit them to pull 483.4 acre-feet (AF) of water per year from the Kiowa Bijou basin and 590 AF from the South Platte Alluvial wells. Over the last several years, the Kiowa Bijou basin has been depleted, and the Town has had problems supplying peak demand using just the Kiowa Bijou wells. The Town is able to pump between 180 gpm and 480 gpm from the Kiowa Bijou wells, depending upon the aquifer level. In addition, the Kiowa Bijou wells have nitrate concentrations over the Maximum Contaminant Level (MCL) and manganese concentrations above the recommended MCL. The declining aquifer, failure to meet peak demands, and elevated concentrations of nitrate, prompted the Town to drill the two South Platte wells in 2008 and construct the reverse osmosis system. The reverse osmosis system also contains three macrolite filters, which serve to filter the water prior to the reverse osmosis system.
The City currently disinfects the drinking water using sodium hypochlorite, which is located in the RO building. The Town doses adequate sodium hypochlorite at the RO building to maintain the required residual after blending water with the Kiowa Bijou wells in Town. Near the Kiowa Bijou wells is a small blending vault, containing a Cla-Val blending valve. The Town manually adjusts the blend ratio, but does not have any online analyzers to determine nitrate, iron, manganese or chlorine residual in the blended water.

The Town’s distribution system is comprised of a 5,000-gallon pressure tank, a 500,000-gallon storage tank, four transmission pumps (two of which are typically used), three distribution pumps, and distribution piping of various sizes. The 5,000-gallon pressure tank is located in the building with the three Kiowa Bijou wells, and is used to maintain pressure to feed the above grade 500,000-gallon storage tank. The 500,000-gallon storage tank is used to provide pressure throughout Town.

c. Condition of Existing Facilities

The Town of Wiggins has various pieces that make up its water system, some of which date back to the 1970s. In 2008, the Town secured additional water supplies, through the South Platte Alluvial Aquifer wells, but has not been able to operate the facilities efficiently due to the age of the existing equipment and lack of monitoring equipment in Town.

The Town currently has multiple deficiencies, many of which lead to unreliable water supply. The following items will be addressed as part of this PER, and Opinions of Probable Construction Costs (OPCCs) are provided in Appendix E.

i. Booster Pumps and Elevated Storage

The Town currently has three booster pumps, which deliver water from the existing 500,000-gallon ground storage tank to the distribution system. The booster pumps were recently installed. Should new booster pumps be necessary, it is important to consider additional storage and operational sequence at the same time.

The Town currently has no elevated storage, and thus is entirely dependent on the three booster pumps for pressure and flow. When fire flows are needed, the three distribution pumps shut off and one high flow pump turns on with power from a standby generator. There is a significant drop in pressure throughout Town when the high flow pump turns
Elevated storage is typically recommended to provide reliable water service and fire flow. Having an elevated storage tank reduces wear and tear on the booster pumps and provides available storage for all flow conditions even during power outages. Booster pump stations generally operate on system pressures. They run when there is demand on the system evidenced by a drop in the booster pump station discharge line pressure. This control logic will change when an elevated storage tank is installed. The booster pump station will operate when the tank level drops below a certain set point. This reduces the amount of off and on cycles the booster pumps experience, thereby decreasing overall electrical costs.

The projected near term water demand includes an average daily demand of 365,000 gpd and a maximum daily demand of 1,095,000 gpd (760 gpm). The Town currently has several large industrial buildings, and is in negotiations with two new industries to move to Town. Typical fire flow requirements for an industrial building are 2,000 to 3,500 gpm (depending upon whether or not the buildings have sprinkler systems). In order to provide water during high flow conditions (assuming 3,500 gpm for three hours plus maximum daily demand for three hours) the Town would need to reliably provide 4,260 gpm. In order to provide 4,260 gpm, the Town would need a combination of new elevated storage and new booster pumps. It is recommended that the Town construct a 500,000-gallon elevated storage tank at the existing 500,000 storage tank site. A new 500,000-gallon elevated storage tank, coupled with the existing 500,000-gallon tank, will provide storage for nearly 2.7 days demand at average daily flow for the near term projections (0 to 5 years). During high flow conditions, an elevated storage tank will provide 1,500 gpm (assuming a 12” discharge pipe), while three 1,000 gpm booster pumps would be able to provide the remaining 2,760 gpm. The existing booster pumps and building will be utilized to meet these demands. If the existing pumps cannot be used, design and construction of a new booster pump station with three 1,000 gpm pumps; two duty and one standby would be required. Because the Kiowa Bijou pumping
rates vary significantly, it is critical for the Town to have adequate water in elevated storage to provide water during high flow conditions.

It should be noted that the design of the new elevated 500,000-gallon storage tank will include a bypass around the existing 500,000-gallon storage tank; as during low demand periods (i.e. winter months) the existing 500,000-gallon storage tank could be bypassed such that the water supply does not become stagnant and maintains the required chlorine residual. In addition, the Town would be able to fluctuate the level in the existing 500,000-gallon storage tank to ensure that the water was not stagnant, but that the Town has adequate storage during both winter and summer months, when the demand varies significantly.

ii. Water Meters

The Town of Wiggins has 346 residential customers and nine commercial/industrial customers. The Town currently has some water meters, but they have reached the end of their useful lives and are in need of replacement. The digital readouts from the meters need to be manually read and have provided many false readings in the past.

As part of this project, the Town plans to install new automated meters. These new devices will allow for more accurate and faster collection of water usage readings than the current manual method, and improve safety conditions for Town staff. Currently, Town staff must open every meter box to obtain a reading. The accuracy of the existing meters is questionable. Introducing automatic meter reading will allow the Town staff to collect the data using a drive-by receiver. New meters will also provide accurate readings.

iii. Distribution System Improvements

The Town has limited maps, inaccurate data on the existing distribution system, and is in desperate need of an accurate water distribution map. On several occasions, the Town has responded to line breaks, only to discover that the valves on the maps are not correct, or the size and material of the piping is incorrect. This results in frustrated employees and disgruntled customers, as the repairs take much longer than necessary. In addition, emergency response time is increased dramatically since it is not known where valves and piping are located.
During the design of this project, survey crews will locate, survey and determine the size and material of all of the water distribution piping. An accurate water distribution map, using GIS, will be prepared with sizes and locations of distribution piping, hydrants, and valves. This will be a critical component during design and for construction, as many of the planned improvements tie into and/or depend upon existing infrastructure.

The Town also plans to loop the entire water distribution system, as there are currently many dead ends throughout the system. In addition, undersized piping (2” and 4” diameter) will be replaced with 8” lines. Dead ends can lead to low pressure, inadequate fire flow, and stagnant water. The looped water system will provide a more reliable water system for customers. The Town plans to extend its distribution system south to the proposed Town park, as well as extend the distribution loop east to the industrial park. The estimated distribution piping needed to provide a looped and properly sized system is approximately 21,000 lineal feet of pipe.

d. Financial Status of Any Existing Facilities
The Town has a significant amount of debt remaining from water lease-purchase agreements and the existing RO system that was constructed in 2011. In 2009, the Town entered into a $500,000 water rights lease-purchase agreement with a private party. The agreement requires annual payments of $42,125 for a period of twenty years. The lease bears interest at 5.75% per annum.

In 2011, the Town received a $3,327,000 USDA Rural Utilities loan and a $2,252,000 USDA Rural Utilities grant to help fund a $5,700,000 project to improve the Town's water system, with the remaining $121,000 to be provided by the Town. The loan amount is $3,327,000, and requires semi-annual payments of $63,313 beginning in May of 2012 through November of 2051 with interest at an effective rate of approximately 2.25%. The Town must maintain an operations and maintenance reserve of $12,662 annually beginning in 2012, with a maximum of $126,626. An additional reserve is required for short lived assets in the amount of $1,952 annually. The Town has funded these reserves through restrictions of its cash balances in the Water Fund, in the amount of $43,842 as of December 31, 2014.

In 2013, the Town received an additional $549,000 USDA Rural Utilities loan and an additional $153,853 USDA Rural Utilities Grant to help fund cost overruns on the water project. The loan
amount of $549,000 requires semi-annual payments of $10,223 beginning in February 2014 through August 2053 with interest at an effective rate of approximately 2.125%.

According to the 2015 Budget, the Town had an annual debt service amount of nearly $200,000, with $147,072.00 due to USDA for the loan payment for the existing RO system. The operations cost for 2015 is estimated to be $98,200, with $52,000 of that dedicated to utilities and $34,000 dedicated to treatment/operating supplies. Typically, the actual operations costs for the Town range from $100,000 to $150,000 per year. The 2016 O&M budget includes approximately $250,000 for new distribution piping and equipment replacement.

According to a 2013 Water Rate Study, the Town has 364 residential customers and nine commercial taps. The Town currently has a base fee of $69.50 per month and $3.20 per thousand gallons for a usage fee. The Town’s tap fee is currently $11,000.00.

The Town of Wiggins Budget (years 2015 and 2016), the 2013 Water Rate Study, and the Financial Statements with the Independent Auditors’ Report for the year ended December 31, 2014 have been included in Appendix F.

The Town plans to fund water system improvements using a combination of grants and low interest loans. The Town may need to phase the various portions of the project as grant monies become available. The debt payments will be funded by tap fees collected from the proposed 520 new homes, as well as the base and user fees paid by new customers.

e. **Water Audits**

No water audits have been conducted for the Town of Wiggins.
SECTION 3.0
NEED FOR PROJECT

a. Health, Sanitation and Security

This project is driven by the Town’s ability to provide safe and reliable drinking water to all customers, both in the near term and long term planning periods. Over the last ten years, the water level in the Kiowa Bijou aquifer fluctuated greatly, and the Town had trouble meeting the peak water demands using just the Kiowa Bijou wells. As a result, the Town drilled the South Platte Alluvium wells and installed the RO treatment system. The RO system treats high quality raw water that would likely meet drinking water standards without needing much, if any, treatment. The Town does not have any means to treat the Kiowa Bijou water however, which often sees nitrate levels above the MCL of 10 mg/L. The Town does not need to augment any water from the Kiowa Bijou wells, but is required to augment all water from the South Platte Alluvial wells. Therefore, the Town would like to maximize the amount of water pumped from the Kiowa Bijou wells, as it would benefit the Town in augmentation expenses and energy costs (both from the RO system and transmission pumps).

In order to provide the Town with drinking water that consistently meets the Safe Drinking Water Regulations, the Town is using approximately 79% from the South Platte Alluvial wells and 21% from the Kiowa Bijou wells. The Town treats approximately 60% of the water pumped from the South Platte Alluvial wells through the RO system, and disinfects the treated water prior to pumping it to Town to blend it with water from the Kiowa Bijou wells. This project is driven by the need to maximize the water pumped from the Kiowa Bijou wells (to reduce augmentation and energy costs) while increasing the level of redundancy and operational flexibility by having the ability to treat both water sources.

In October 2011, the Town was issued a Discharge Permit (No. CO0048853) for the RO water treatment facility. The permit seare forth the parameters in which the water treatment plant can discharge the RO brine to an unnamed tributary to the South Platte River. It recently came to the attention of the Town that the RO WTP was not meeting the discharge permit due to the results of the Whole Effluent Toxicity (WET) tests, and therefore the Town reported chronic WET test failures of Ceriodaphia dubia under CDPS Permit No. CO0048853. Violations in subsequent quarters resulted in accelerated testing, WET limit violations, automatic compliance response reporting and ultimately a Toxicty Reduction Evaluation (TRE). On January 18, 2016, RH
Water and Wastewater, Inc. (the Town’s operator in responsible charge [ORC]) submitted a report to the Colorado Department of Health and Environment (CDPHE) regarding the Toxicity Reduction Evaluation. A response from the CDPHE regarding the TRE has not yet been received by the Town.

The existing water system facilities are secured by fences and locked at all times. The Town has three staff members that inspect the water facilities on a daily basis.

b. Aging Infrastructure
As mentioned in Section 1.C above, the Town has several portions of the water system that were installed or constructed in the 1970s and are nearing their useful life. Specifically, many of the distribution pipes are over 40 years old, undersized, and need to be replaced. In addition, the high flow pump which operates in emergency events, was installed in the 1980’s, doesn’t function properly, and is hard to maintain since replacement parts are becoming hard to locate.

c. Reasonable Growth
As mentioned above in Section 1.0, the Town of Wiggins is projecting 2% annual growth, which is just slightly higher than Morgan County’s annual growth projection of 1.2%. The Town is, however, projecting significant growth in the next five years. This is due to current negotiations with two industries and two residential developers. Appendix B contains information from the industries and developer, which support a growth rate higher than 2% per year for the next five years.

The Town pumping records indicate that in 2013, the average daily (AD) water demand or the complete system was 104,500 gallons per day (gpd). In 2014, the AD water demand was 124,800 gpd and the maximum day (MD) demand for 2014 was 298,000 gpd. This indicates a maximum day peaking factor of 2.39, which is considered relatively low for industry standards. In an effort to conservatively project maximum day water demand, a peaking factor of 3.0 will be used.

Figure 5 shows the projected future growth areas for the Town of Wiggins. As seen in the figure, the Town has identified 180 acres of residential development, 120 acres of commercial/multifamily housing, 80 acres of commercial developments, and 160 acres of industrial developments. For the purposes of projecting near term water demand (0-5 years), the following assumptions have been made:
• All 180 acres of residential land will be developed, yielding over 500 new homes.
• 25% of the 80-acre commercial land will be developed (800 gallons per acre water demand).
• 25% of the 160-acre industrial land will be developed (800 gallons per acre water demand).
• 0% of the 120-acre commercial/multifamily land will be developed.
• The residential land that has been identified will be more than adequate to provide housing for the population growth expected in the next five years.

Table 5, seen below, summarizes the parcels of land to be used for near term developments, including those which will develop in the next five years.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area (Acre)</th>
<th>Res. Units Per Acre</th>
<th>Person Per Unit</th>
<th>Gallon Per Capita Per Day (gpcd)</th>
<th>Gallon Per Acre Per Day</th>
<th>Avg. Day Demand (gal)</th>
<th>Max. Day Demand (gal.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential - Single Family</td>
<td>70</td>
<td>4.25</td>
<td>2.65</td>
<td>140</td>
<td>-</td>
<td>110,400</td>
<td>331,200</td>
</tr>
<tr>
<td>(Thomas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential - Single Family</td>
<td>110</td>
<td>2</td>
<td>2.65</td>
<td>140</td>
<td>-</td>
<td>81,620</td>
<td>244,860</td>
</tr>
<tr>
<td>(GDM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Heavy/Light Commercial</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>16,000</td>
<td>48,000</td>
</tr>
<tr>
<td>Future Heavy/Light Industrial</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>32,000</td>
<td>96,000</td>
</tr>
<tr>
<td>Future Multi Family/Commerical</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>240,020</td>
<td>720,100</td>
</tr>
<tr>
<td>Current Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>125,000</td>
<td>375,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>365,000</td>
<td>1,095,000</td>
</tr>
</tbody>
</table>

For the purposed of projecting long term water demand (5-30 years), the following assumptions have been made:

• All 180 acres of residential will be developed, yielding over 500 new homes.
• 100% of the 80-acre commercial land will be developed (800 gallons per acre water demand).
• 100% of the 160-acre industrial land will be developed (800 gallons per acre water demand).
• 100% of the 120-acre commercial/multifamily land will be developed.
• The Town will identify an additional 200 acres of residential land that will provide adequate housing for the population growth expected in the next five to 30 years.

Table 6, seen below, summarizes the parcels of land that may be used for long term developments, including those which may develop in the next 30 years.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Area (Acre)</th>
<th>Res. Units Per Acre</th>
<th>Person Per Unit</th>
<th>Gallon Per Capita Per Day (gpcd)</th>
<th>Gallon Per Acre Per Day</th>
<th>Avg. Day Demand (gal)</th>
<th>Max. Day Demand (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential - Single Family</td>
<td>70</td>
<td>4.25</td>
<td>2.65</td>
<td>140</td>
<td>110,373</td>
<td>331,118</td>
<td></td>
</tr>
<tr>
<td>(Thomas)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential - Single Family</td>
<td>110</td>
<td>2</td>
<td>2.65</td>
<td>140</td>
<td>81,620</td>
<td>244,860</td>
<td></td>
</tr>
<tr>
<td>(GDM)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Future Residential</td>
<td>200</td>
<td>3</td>
<td>2.65</td>
<td>140</td>
<td>222,600</td>
<td>667,800</td>
<td></td>
</tr>
<tr>
<td>Future Heavy/Light Commercial</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>64,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>192,000</td>
<td></td>
</tr>
<tr>
<td>Future Heavy/Light Industrial</td>
<td>160</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>128,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>384,000</td>
<td></td>
</tr>
<tr>
<td>Future Multi Family/Commercial</td>
<td>120</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>800</td>
<td>96,000</td>
<td></td>
</tr>
<tr>
<td>Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>288,000</td>
<td></td>
</tr>
<tr>
<td>Subtotal (excluding infill)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>702,593</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,107,778</td>
<td></td>
</tr>
<tr>
<td>Current Demand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>125,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>375,000</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>827,600</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,482,800</td>
<td></td>
</tr>
</tbody>
</table>

The following table, Table 7, shows the near term and long term demand projections for average day demand, maximum day demand and peak hour demand. The maximum day demand was determined using a peaking factor of 3.0, which is just slightly higher than the historical average of the maximum day demand from 2014 of 2.4. The peak hour demand has been determined using a 1.7 peaking factor of the maximum day demand, which is considered to be an industry standard.
The Wiggins School District has one school that serves children in kindergarten through twelfth grade. The School District is planning to increase the size of the buildings and will likely be served by the new distribution piping. The building issue will likely be included in the November 2016 bond election.

d. **Design Criteria**

The design criteria for the water system improvements includes existing demands plus the projected demands for the various residential and industrial developments that are currently under negotiations. The water system improvements necessary to meet both the existing and near term demands assume that much of the existing infrastructure will be used, additional equipment will be needed to treat both the Kiowa Bijou wells, as well as equipment to optimize the system for water efficiency, redundancy, and operational flexibility.

The existing RO skids each have a raw water capacity of 285 gpm, which results in permeate production of approximately 225 gpm per skid. Therefore, one RO skid is capable of providing water during average day demand, while two skids are needed to provide maximum day demand. For the projected near term average day demand of 282 gpm, two 225 gpm skids will be necessary, and a third will be provided to help meet maximum day demand and provide much needed redundancy. Computer modeling using a raw water nitrate concentration of 14.5 mg/L, predicts that during maximum day demand, two skids will be used to produce 450 gpm, and 397 gpm can be bypassed, yielding a total of 847 gpm finished water having a nitrate concentration of 7.2 mg/L. Manufacturer’s data and computer modeling for the RO system can be found in Appendix G.

### Table 7: Future Water Demand Projection (Existing, Near Term, and Long Term Projections)

<table>
<thead>
<tr>
<th>Planning Period</th>
<th>Average Day Demand (gal)</th>
<th>Average Day Demand (gpm)</th>
<th>% Growth</th>
<th>Maximum Day Demand (gal)</th>
<th>Maximum Day Demand (gpm)</th>
<th>Peak Hour Demand (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>125,000</td>
<td>87</td>
<td>-</td>
<td>375,000</td>
<td>260</td>
<td>405</td>
</tr>
<tr>
<td>Near Term Demands</td>
<td>365,000</td>
<td>253</td>
<td>192%</td>
<td>1,095,000</td>
<td>760</td>
<td>1,445</td>
</tr>
<tr>
<td>Long Term Demands</td>
<td>827,600</td>
<td>575</td>
<td>562%</td>
<td>2,483,000</td>
<td>1,724</td>
<td>3,276</td>
</tr>
</tbody>
</table>
After speaking with the filter manufacturer, it appears that the existing pretreatment filters are undersized. The pretreatment filters were installed for manganese removal. The filters were originally intended to contain greensand, but the media was changed to macrolite after the hydraulic loading for greensand was determined to be too large for the filters to handle. The RO design will include investigating the need for manganese removal prior to RO treatment. If prefiltration is determined to be necessary, manganese would need to be removed from the Kiowa Bijou well water. Both greensand and pyrolucite can be used to treat the manganese, but the filters would need to be replaced with larger filters, as the existing size of the filters are too small and the hydraulic loading would be too high. If determined to be necessary, three new 10-foot diameter filter skids will be required, as the existing filters are not sized to accommodate the additional flow. If prefiltration is not necessary, the existing filters can treat a portion of the bypass water to reduce the manganese.

In order to provide treated drinking water for the near term maximum day demand, the Town needs to provide approximately 850 gpm. In order to do this, it is assumed that two of three RO skids would run to provide 450 gpm (53%), and 400 gpm (47%) could bypass the RO skids. This ratio could very well be optimized depending on which water source is used and while using online nitrate analyzers.
SECTION 4.0
ALTERNATIVES CONSIDERED

Alternative No. 1 – No Action

a. Description
The “No Action” alternative entails leaving the water system as it currently is, and not make any improvements to the treatment capabilities or operations. Although the Town is currently able to provide safe and adequate drinking water to their customers, this is not considered to be a viable option due to the lack of redundancy and the inability to treat water that does not need to be augmented. In dry years, the Kiowa Bijou wells were not able to provide enough water to supply peak flow conditions. In addition, the Town only has one 10” pipeline from the Town wells located north of Town. Should a portion of the line need to be repaired or replaced, the Town needs to be able to supply safe drinking water to the Town using only the Kiowa Bijou wells. Currently, the Kiowa Bijou wells are above the MCL for nitrate, and the Town does not have any means of treating the water. In addition, the only means of disinfection is located at the RO building. Should the Town not be able to deliver water from the northern wells, the Town does not have the ability to disinfect water from the Kiowa Bijou wells. The Town has no elevated storage, and thus struggles to provide adequate flow and pressure during high flow conditions.

Alternative No. 2 – Blending Station

a. Description
Alternative No. 2 includes installing a new blending station and disinfection system in Town near the existing 500,000-gallon storage tank. Currently, the Town disinfects using sodium hypochlorite at the RO building. The Town doses the chlorine at a level in which they can blend water from the Kiowa Bijou wells (~20%) in Town, and maintain and adequate chlorine residual throughout Town. In addition, the Town currently blends a portion of the Kiowa Bijou wells with the South Platte Alluvial wells at a blending station in Town near the 500,000-gallon storage tank. This option includes moving the disinfection system into Town and installing two online nitrate monitors (one on the Kiowa Bijou pipeline and one on the pipeline to distribution). This would essentially provide the Town with a more sophisticated blending station, thereby increasing efficiencies and operational flexibility.
b. **Design Criteria**

All improvement for Alternative No 2. would be designed and constructed using the Colorado Department of Public Health and Environment (CDPHE) – Water Quality Control Division (WQCD) Design Criteria for Potable Water System.

The components of Alternative 2 include the following:

- New building located on Town property
- Relocate existing disinfection dosing system to new building
- Install modulating valve network such that water can be blended and monitored from both well fields.
- Install two online nitrate analyzers and chlorine injection port

c. **Map**

The location of the new blending station is shown on Figure 6, and will be located on Town owned property. Figure 7 shows the process schematic for the blending alternative.

Regardless of which treatment alternative is selected, it is likely that a new water treatment building, located in Town, will be necessary. Therefore, for Alternatives 2, 3 and 4, a new building is being proposed near the existing 500,000-gallon storage tank.

d. **Environmental Impacts**

There are minimal environmental impacts associated with this option, as the blending building would be located on property located in Town, which has already been disturbed. The Town is planning to purchase a six-acre parcel of land, which is where the existing 500,000-gallon storage tank is located. The Town currently leases the land, and plans to purchase it in the next few months. The six-acre parcel will be adequate for all of the water improvements planned for the Town.

e. **Land Requirements**

The land requirements for this option would be minimal, as only a small new building would be needed.
FIGURE 7
ALTERNATIVE 2 - NEW BLENDING STATION IN TOWN
f. **Potential Construction Problems**

There are no potential construction problems associated with this option, as there is only a small building, piping, valves and nitrate monitors. This option would not have any additional treatment associated with it, and thereby no need for new permits. Existing easements and rights-of-ways (ROWs) will be verified prior to design and construction.

The City has limited maps and inaccurate data on the existing distribution system. During the design of this project, survey crews will locate, survey and determine the size and material of all of the water distribution piping. An accurate water distribution map, using GIS, will be prepared with sizes and locations of distribution piping, hydrants, and valves. This will be a critical component during design and for construction, as much of the planned improvements tie into and/or depend upon existing infrastructure.

g. **Sustainability Considerations**

i. **Water and Energy Efficiency**

This option would increase both water efficiency as well as energy efficiency. The water efficiency would increase, as the Town would be able to use more of the Kiowa Bijou water, which they do not pay to augment. The online nitrate monitors would allow the Town to increase the amount of water supplied by the Kiowa Bijou wells, and blend that with water from the South Platte Alluvial wells, while ensuring that the ratio was kept well within the Safe Drinking Water Standards. By increasing the amount of water supplied by the Kiowa Bijou wells, the Town would increase their energy efficiency, as the RO units would likely run less, as well as the transmission pumps that pumps the water from the RO building into Town.

ii. **Green Infrastructure**

Green infrastructure would be implemented into this project as much as possible and economically feasible.

h. **Cost Estimates**

The Opinion of Probable Construction Cost (OPCC) for Alternative No. 2 is $2,099,000. The full OPCC can be seen in Appendix E. The Operation and Maintenance (O&M) costs for this alternative should not change significantly from what the Town currently experiences. The Town
would still operate the RO and disinfection systems at the current RO location and blend the treated water with water from the Kiowa Bijou wells. It may even be possible to reduce the O&M costs, as the Town would be able to optimize the blend ratio of the South Platte and Kiowa Bijou wells, thereby possibly decreasing the amount of water pumped and treated from the South Platte wells. The O&M cost estimate for the blending alternative is as seen in Table 8. It should be noted that $250,000 is included in the O&M cost estimate for capital improvements and equipment replacement. This value will likely change year to year, as revenue allows.

Table 8: Estimated O&M Costs for Alternative No. 2 – Blending Station

<table>
<thead>
<tr>
<th>O&amp;M Cost Estimate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)</td>
<td>$39,800</td>
</tr>
<tr>
<td>Administrative Costs (e.g. office supplies, printing, etc.)</td>
<td>$37,200</td>
</tr>
<tr>
<td>Energy Cost (Fuel and/or Electrical)</td>
<td>$43,125</td>
</tr>
<tr>
<td>Process Chemical</td>
<td>$34,000</td>
</tr>
<tr>
<td>Monitoring &amp; Testing (Contract Operator)</td>
<td>$3,300</td>
</tr>
<tr>
<td>Professional Services</td>
<td>$26,200</td>
</tr>
<tr>
<td>Maintenance (Plant)</td>
<td>$3,000</td>
</tr>
<tr>
<td>Capital Improvements/Equipment Replacement</td>
<td>$250,000</td>
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<tr>
<td>Miscellaneous</td>
<td>$2,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$438,625</strong></td>
</tr>
</tbody>
</table>

Alternative No. 3 – Relocate Existing Reverse Osmosis Equipment

a. Description

Alternative No. 3 includes relocating the RO equipment, including the pretreatment filters, clean in place (CIP) system, and disinfection system, to a new building located on Town property. As currently configured, the Town can only treat and disinfect water from the South Platte wells, and cannot treat or disinfect water from the Kiowa Bijou wells. In addition, there is only one 10” transmission main that delivers the water from the RO building to the Town. This leaves the Town in a vulnerable position, as the Town has no redundancy if the 10” pipeline breaks or needs repairs. In addition, the Town cannot treat or disinfect water from the Kiowa Bijou wells if the transmission pipe was out of service. By moving the RO system to a location in Town and making modifications to the piping network, the Town would be able to treat water from the South Platte wells, the Kiowa Bijou wells, or a combination of the two water sources. This would
allow the Town to maximize the amount of water supplied to distribution from the Kiowa Bijou wells, while minimizing treatment through monitored blending.

Should the RO equipment be moved, the RO concentrate (waste stream) will be discharged to the collection system to be treated at the wastewater treatment facility (WWTF). The State of Colorado has indicated that this is an acceptable option for disposal of the RO concentrate, as long as the WWTF continues to meet the required discharge permit. It is anticipated that a new wastewater treatment facility will be needed in Wiggins, and provisions will be included in the design of the WWTF to include the RO concentrate.

It should be noted that the Town is currently in violation of their discharge permit for the RO system. Should the RO system be located in town, near the collection system, the Town could apply for a modification in their discharge permit and would remedy the violations.

b. Design Criteria

All improvements for Alternative No 3. would be designed and constructed using the Colorado Department of Public Health and Environment (CDPHE) – Water Quality Control Division (WQCD) Design Criteria for Potable Water System.

The components of Alternative 3 include the following:

- New building located on Town property
- Relocate existing RO equipment (two 225 gpm skids) and CIP equipment to new building
- Add one additional 225 gpm RO skid to help provide for maximum day demand
- Evaluate the need for three 10-foot diameter pressure filters
- Install a new PLC to run whole system
- Relocate existing disinfection dosing system to new building
- Install two online nitrate analyzers; one on Kiowa Bijou pipeline and one on pipeline to distribution
- Install modulating valve network such that water can be blended and monitored from both well fields
- New sanitary sewer pipe to existing collection system for backwash water and RO concentrate
c. **Map**
The location of the new blending station is shown on Figure 6, and will be located on Town owned property. Figure 8 shows the process schematic for relocating the existing RO equipment to a new water treatment building located in Town.

d. **Environmental Impacts**
There are minimal environmental impacts associated with this option, as the blending building would be located on property located in Town, which has already been disturbed. The Town is planning to purchase a six-acre parcel of land, where the existing 500,000-gallon storage tank is located. The Town currently leases the land, and plans to purchase it in the next few months. The six-acre parcel will be adequate for all of the water improvements planned for the Town.

New water distribution piping and sanitary sewers piping would need to be constructed to/from the new building, but it is likely that existing easements and right-of-ways (ROW) would be used for all piping.

e. **Land Requirements**
The land requirements for this option would be minimal, as only a new building would be needed, and it will be constructed on land that is being purchased by the Town.

f. **Potential Construction Problems**
There are minimal potential construction problems associated with this option, as there is a new building, treatment equipment, piping, valves and nitrate monitors. This option would include new treatment equipment. Much of the new piping, both water and sanitary sewer, would be located on Town owned land, but existing easements and rights-of-ways (ROWs) will be verified prior to construction.

The City has limited maps and inaccurate data on the existing distribution system. During the design of this project, survey crews will locate, survey and determine the size and material of all of the water distribution piping. An accurate water distribution map, using GIS, will be prepared with sizes and locations of distribution piping, hydrants, and valves. This will be a critical component during design and for construction, as much of the planned improvements tie into and/or depend upon existing infrastructure.
FIGURE 8
ALTERNATIVE 3 - MOVE TREATMENT PLANT INTO TOWN
g. Sustainability Considerations

i. Water and Energy Efficiency

This option would increase both water efficiency as well as energy efficiency. The water efficiency would increase, as the Town would be able to use more of the Kiowa Bijou water, which they do not need to augment. The Town would be able to treat a portion or all of the Kiowa Bijou well water, thereby decreasing the amount of water needing to be pumped seven miles from the north wellfield.

ii. Green Infrastructure

Green infrastructure would be implemented into this project as much as possible and economically feasible.

h. Cost Estimates

The OPCC for Alternative No. 3 is $3,764,000. The full OPCC can be seen in Appendix E. The O&M costs for this alternative should not change significantly from what the Town currently experiences. The Town would still operate the RO system, just at a new location in Town, and blend the treated water with water from the Kiowa Bijou wells. It may even be possible to reduce the O&M costs, as the Town would be able to optimize the blend ratio of the South Platte and Kiowa Bijou wells, thereby possibly decreasing the amount of water pumped and treated from the South Platte wells. The O&M cost estimate for the relocating the RO system is as seen in Table 9. It should be noted that $250,000 is included in the OM cost estimate for capital improvements and equipment replacement. This value will likely change year to year, as revenue allows.
Table 9: Estimated O&M Costs for Alternative No. 3 – Relocate Existing Reverse Osmosis Equipment

<table>
<thead>
<tr>
<th>O&amp;M Cost Estimate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)</td>
<td>$39,800</td>
</tr>
<tr>
<td>Administrative Costs (e.g. office supplies, printing, etc.)</td>
<td>$37,200</td>
</tr>
<tr>
<td>Energy Cost (Fuel and/or Electrical)</td>
<td>$57,500</td>
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<tr>
<td>Process Chemical</td>
<td>$34,000</td>
</tr>
<tr>
<td>Monitoring &amp; Testing (Contract Operator)</td>
<td>$3,300</td>
</tr>
<tr>
<td>Professional Services</td>
<td>$26,200</td>
</tr>
<tr>
<td>Maintenance (Plant)</td>
<td>$3,000</td>
</tr>
<tr>
<td>Capital Improvements/Equipment Replacement</td>
<td>$250,000</td>
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<tr>
<td>Miscellaneous</td>
<td>$2,000</td>
</tr>
<tr>
<td>Total</td>
<td>$453,000</td>
</tr>
</tbody>
</table>

Alternative No. 4 – New Water Treatment Plant to Treat Kiowa Bijou Wells

a. Description

Option 4 is similar to Option 3, but consists of purchasing a new RO system to treat the Kiowa Bijou wells, while keeping the existing RO units as is to treat the water from the South Platte Alluvial wells. This option would include constructing a new water treatment plant near the Kiowa Bijou wells, on land owned by the Town. This would allow the Town to treat water from both well fields, while optimizing the blend/bypass ratios of both to increase efficiency while minimizing operational costs.

As mentioned above, there is only one 10” transmission main that delivers the water from the RO building to the Town. This leaves the Town in a vulnerable position, as the Town has no redundancy if the 10” pipeline breaks or needs repairs. In addition, the Town cannot treat or disinfect water from the Kiowa Bijou wells if the transmission pipe was out of service. By constructing a RO treatment plant in Town, and making modifications to the piping network, the Town would be able to treat water from the Kiowa Bijou wells. By having treatment at each well field, the Town would have 100% redundancy. The Town would be able to maximize the amount of water pumped from the Kiowa Bijou wells, while it is available, and would save augmentation and pumping costs. On the other hand, realizing that the Kiowa Bijou wells are not the long term water solution for the Town, leaving the existing RO system at the South Platte wells would ensure that the Town would be able to treat existing and future water sources near the South Platte River.
Should a new RO treatment plant be constructed, the RO concentrate will be discharged to the collection system to be treated at the WWTF. The State of Colorado has indicated that this is an acceptable option for disposal of the RO concentrate, such that the WWTF continues to meet the required discharge permit. Modifications, or potentially a new wastewater treatment facility, may be needed in Wiggins, and provisions will be included in the design of the WWTF to include the RO concentrate.

b. **Design Criteria**

All improvements for Alternative No 4. would be designed and constructed using the Colorado Department of Public Health and Environment (CDPHE) – Water Quality Control Division (WQCD) Design Criteria for Potable Water System.

The components of Alternative 4 include the following:

- New building located on Town property
- Three new 225 gpm RO skids and CIP equipment
- If necessary, install three 10-foot diameter pressure filters
- Install new PLC to run whole system
- New disinfection dosing system located in new building
- Install two online nitrate analyzers; one on Kiowa Bijou pipeline and one on pipeline to distribution
- Install modulating valve network such that water can be blended and monitored from both well fields.
- New sanitary sewer pipe to existing collection system for backwash water and RO concentrate

c. **Map**

The location of the new blending station is shown on Figure 6, and will be located on Town owned property. Figure 9 shows the process schematic for constructing a new RO water treatment plant, located in Town, to treat water from the Kiowa Bijou Wells.

d. **Environmental Impacts**

There are minimal environmental impacts associated with this option, as the blending building would be located on property located in Town, which has already been disturbed. The Town is planning to purchase a six-acre parcel of land, which is where the existing 500,000-gallon storage
FIGURE 9
ALTERNATIVE 4 - NEW RO PLANT @ SOUTH WELLS
tank is located. The Town currently leases the land, and plans to purchase it in the next few months. The six-acre parcel will be adequate for all of the water improvements planned for the Town.

New water distribution piping and sanitary sewers piping would need to be constructed to/from the new building, but it is likely that existing easements and right-of-ways (ROW) would be used for all piping.

One downside to this option is that the northern RO plant would still discharge to the South Platte River. The Town is currently in violation of its RO discharge permit.

e. **Land Requirements**

The land requirements for this option would be minimal, as only a new building would be needed, and it will be constructed on land that is being purchased by the Town.

f. **Potential Construction Problems**

There are minimal potential construction problems associated with this option, as there is a new building, treatment equipment, piping, valves and nitrate monitors. This option would include new treatment equipment and would require a discharge permit for the RO concentrate and backwash to be discharged to a new sanitary sewer pipe that would tie into the existing collection system. Much of the new piping, both water and sanitary sewer, would be located on Town owned land, but existing easements and rights-of-ways (ROWs) will be verified prior to construction.

The Town has limited maps and inaccurate data on the existing distribution system. During the design of this project, survey crews will locate, survey and determine the size and material of all of the water distribution piping. An accurate water distribution map, using GIS, will be prepared with sizes and locations of distribution piping, hydrants, and valves. This will be a critical component during design and for construction, as much of the planned improvements tie into and/or depend upon existing infrastructure.

g. **Sustainability Considerations**

i. **Water and Energy Efficiency**

This option would increase both water efficiency as well as energy efficiency. The water efficiency would increase, as the Town would be able to use more of the Kiowa Bijou
water, which they do not need to augment. The Town would be able to treat a portion or all of the Kiowa Bijou well water, thereby decreasing the amount of water needing to be pumped seven miles from the north wellfield.

**ii. Green Infrastructure**
Green infrastructure would be implemented into this project as much as possible and economically feasible.

**h. Cost Estimates**
The OPCC for Alternative No. 4 is $4,676,000. The full OPCC can be seen in Appendix E. The O&M costs for this alternative should not change significantly from what the Town currently experiences. The Town would operate the new RO system located in Town, and would significantly reduce the RO treatment for the South Platte wells located north of Town. The Town would optimize the treatment/blend/bypass ratio from the two water sources, and would only treat the water necessary to continue to meet the Safe Drinking Water Standards. The O&M cost estimate for a new RO system to treat the Kiowa Bijou wells is as seen in Table 10. It should be noted that $250,000 is included in the OM cost estimate for capital improvements and equipment replacement. This value will likely change year to year, as revenue allows.

### Table 10: Estimated O&M Costs for Alternative No. 4 – New Water Treatment Plant to Treat Kiowa Bijou Wells

<table>
<thead>
<tr>
<th>O&amp;M Cost Estimate</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel (i.e. Salary, Benefits, Payroll Tax, Insurance, Training)</td>
<td>$49,800</td>
</tr>
<tr>
<td>Administrative Costs (e.g. office supplies, printing, etc.)</td>
<td>$46,500</td>
</tr>
<tr>
<td>Energy Cost (Fuel and/or Electrical)</td>
<td>$71,900</td>
</tr>
<tr>
<td>Process Chemical</td>
<td>$42,500</td>
</tr>
<tr>
<td>Monitoring &amp; Testing (Contract Operator)</td>
<td>$3,300</td>
</tr>
<tr>
<td>Professional Services</td>
<td>$26,200</td>
</tr>
<tr>
<td>Maintenance (Plant)</td>
<td>$3,800</td>
</tr>
<tr>
<td>Capital Improvements/Equipment Replacement</td>
<td>$250,000</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$3,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$497,000</strong></td>
</tr>
</tbody>
</table>
**Additional Needs**

The Town of Wiggins is greatly in need of other water infrastructure, regardless of which water treatment system is the selected alternative. The following items will be addressed in the design of the water system improvements and are shown on Figure 6:

a. **Booster Pumps and Elevated Storage**

The Town currently has three booster pumps, which deliver water from the existing 500,000-gallon ground storage tank to the distribution system. The pumps were installed in the 1980s and 1990s, are beginning to exceed their useful life, and replacement parts are becoming hard to locate.

The Town currently has no elevated storage, and thus is entirely dependent on the three booster pumps for pressure and flow. When fire flows are needed, the three distribution pumps shut off and one high service pump turns on with power from a standby generator. The electrical service cannot run the high service pump and distribution pumps, and thus the distribution pumps shut off during high flow events.

It is recommended that the Town construct a 500,000-gallon elevated storage tank at the existing 500,000 storage tank site. A new 500,000-gallon elevated storage tank, coupled with the existing 500,000-gallon tank, will provide storage over two days demand at average daily flow for the near term projections (0 to 5 years). During high flow conditions, an elevated storage tank will provide 1,500 gpm (assuming a 12” discharge pipe), while three new 1,000 gpm booster pumps would be able to provide the remaining 2,850 gpm. This would result in the design and construction a new booster pump station with three 1,000 gpm pumps; two duty and one standby.

b. **Water Meters**

The Town of Wiggins has 346 residential customers and nine commercial/industrial customers. The Town currently has water meters, but they have reached the end of their useful life and are in need of replacement. The digital readouts from the meters need to be manually read and have provided many false readings in the past.

As part of this project, the Town plans to install new automated meters. These new devices will allow for more accurate and faster collection of water usage readings than the current manual
method and improve safety conditions for Town staff. Currently, Town staff must open every meter box to obtain a reading. Introducing automatic meter reading will allow the Town staff to collect the data using a drive-by receiver.

c. Distribution System Improvements

The Town has limited maps, inaccurate data on the existing distribution system and is in desperate need of an accurate water distribution map. On several occasions, the Town has responded to line breaks, only to discover that the valves on the maps are not correct, or the size and material of the piping is incorrect. This results in disgruntled customers, as the repairs take much longer than necessary. In addition, during an emergency, it is critical to know where valves and piping are located.

During the design of this project, survey crews will locate, survey and determine the size and material of all of the water distribution piping. An accurate water distribution map, using GIS, will be prepared with sizes and locations of distribution piping, hydrants, and valves. This will be a critical component during design and for construction, as much of the planned improvements tie into and/or depend upon existing infrastructure.

The Town also plans to loop the entire water distribution system, as there are currently many dead ends throughout the system, as well as undersized piping (2” and 4” diameter piping). Dead ends can lead to low pressure, inadequate fire flow, and stagnant water. The looped water system will reduce headloss and provide a more reliable water system for customers, should any pipes need repaired or replaced.

As seen in Figure 6, there are several portions of Town that are served by either 2” or 4” distribution piping. The Recommended Standard for Water Works (10 States Standards) states that minimum water size of water main which provides for fire protection and serving fire hydrants shall be a minimum of 6” diameter. It is recommended that all 2” and 4” diameter piping throughout Town be replaced with 8” diameter piping. In addition, new 8” diameter distribution loops will be needed to serve the park and new residential neighborhoods south of Town, as well as the industrial park east of Town. The estimated distribution piping needed to provide a looped system, replace undersized distribution piping, and provide water to the Town park, new residential neighborhoods and existing industrial buildings is approximately 20,000 lineal feet of pipe.
d. **Purchase of Additional Water**

The Town of Wiggins has the opportunity to purchase additional augmentation water at two locations. The Town plans to purchase rights which would allow it to retime its augmentation water on TH Ranch, which would increase the retiming recharge capabilities from 150 AF to 450 AF at the West Recharge/Retiming Facility. The Town also needs to purchase additional augmentation water from various sources. This additional augmentation supply will allow the Town to pump additional water from the South Platte wells as the population and water demand increase in Town. The purchase of additional augmentation water will require engineering and water rights attorneys, as the water cases typically take three years to get through the court system. The estimated costs for the legal fees and engineering for the water rights have been included in the OPCC.

In addition to additional augmentation water purchases, the Town has the opportunity to drill a third well in the South Platte Alluvial Aquifer, near the existing two South Platte wells. This would provide the Town with additional pumping capacity, as currently the two wells can only deliver approximately 500 gpm. The Town also plans to redrill two of the three Thomas wells, located in the Kiowa Bijou aquifer. The Town owns the municipal wells, but the wells will need to be redrilled and connected to the system before they can deliver water to the Town.

The Town anticipates the need for a new wastewater treatment facility in the next two to five years and is in the process of preparing a Preliminary Engineering Report for the wastewater treatment facility. The existing wastewater treatment facility (WWTF) has exceeded its useful life. The Town plans to purchase land for a new WWTF. The site will be large enough to house a pond large enough to store several months of WWTF effluent. The intention is to store treated effluent during low demand months and sell the water during high demand periods to users along the South Platte River. The Town is also planning to pump water from the South Platte to the pond during “free river” periods and store it until the demand on the river goes up. The WWTF PER will include a discussion regarding augmentation water with regards to the wastewater treatment facility effluent, and funding requests will be included with that PER.

e. **Cost Estimates**

The OPCC for the Additional Needs is $8,230,000. The full OPCC can be seen in Appendix E. An O&M estimate was not prepared for the Additional Needs, as the O&M costs for the treatment plant alternatives contain treatment, chemicals, energy, fuel, maintenance and
administration costs for the entire water system. The Town does not keep separate records regarding treatment and distribution, and thus the O&M costs include all costs for the water system as a whole.
SECTION 5.0
SELECTION OF AN ALTERNATIVE

a. Life Cycle Cost Analysis

The Life Cycle Cost analysis for the three different alternatives, plus the Additional Needs, can be seen below in Table 11. The Life Cycle Cost Analysis has been prepared using a discount rate of 1.2% (per www.whitehouse.gov), an estimated salvage value of 25%, and a 20-year planning period. Regardless of which alternative is the recommended solution, the Additional Needs will also need to be addressed. Therefore, the Life Cycle Cost Analysis includes all three water treatment alternatives, plus the Additional Needs.

<table>
<thead>
<tr>
<th></th>
<th>Alternative No. 2</th>
<th>Alternative No. 3</th>
<th>Alternative No. 4</th>
<th>Additional Needs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blending Station</td>
<td>Relocate RO</td>
<td>New RO</td>
<td></td>
</tr>
<tr>
<td>Initial Capital</td>
<td>($2,099,000.00)</td>
<td>($3,764,000.00)</td>
<td>($4,676,000.00)</td>
<td>($8,230,000.00)</td>
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<tr>
<td>Future Salvage (25%)</td>
<td>$524,800.00</td>
<td>$941,000.00</td>
<td>$1,169,000.00</td>
<td>$2,057,500.00</td>
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<tr>
<td>PV of O&amp;M</td>
<td>($7,758,100.00)</td>
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<td>($8,790,600.00)</td>
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<td>Present Salvage Value</td>
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<td>$741,300.00</td>
<td>$920,900.00</td>
<td>$1,620,800.00</td>
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<tr>
<td>Net Present Value</td>
<td>($9,443,700.00)</td>
<td>($11,035,000.00)</td>
<td>($12,545,700.00)</td>
<td>($6,609,200.00)</td>
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</tbody>
</table>

The O&M costs for each alternative have been included in Tables 8, 9, and 10. The O&M cost estimates have been prepared for the entire water system, as the Town does not keep records regarding the fuel, energy, personnel, etc. costs for the distribution system versus the treatment system. Therefore, the O&M costs for the Additional Needs have already been included in the costs for Alternatives 2, 3, and 4, and do not appear separately in the Life Cycle Cost Analysis. The O&M costs do not differ significantly between alternatives due to the fact that the Town already has much of the equipment in operation, and the alternatives examine replacing old equipment with new, more efficient equipment, as well as relocating existing treatment equipment. Alternative No. 4 has an increased O&M cost due to the fact that a new RO system would be constructed near the Kiowa Bijou wells. However, with the addition of new RO equipment to treat the Kiowa Bijou wells, it is likely that the existing RO system would operate significantly less than it is currently, and the transmission pumps would operate less frequently.
b. **Non-Monetary Factors**

There are several non-monetary factors that need to be considered, including the following:

- The Kiowa Bijou aquifer, while thought to be declining five to ten years ago, has recently seen rising aquifer levels. The Town drilled the South Platte wells to develop water from a separate basin for their long term water supply solution. However, now, it is thought that the Kiowa Bijou wells may last another 15 to 20 years. Because the Town does not have to augment the water coming from the Kiowa Bijou wells, it benefits the Town to use and treat the water from the Kiowa Bijou wells.

- The Town only has one 10” transmission main from the South Platte wells into Town, with the disinfection system being located at the RO building. Should the transmission main be out of service due to an emergency or routine maintenance, the Town has no redundant source of water. There is currently no treatment or disinfection available for the Kiowa Bijou wells. In 2015, the 10” transmission main broke, and needed repair. The Town was able to locate and fix the break within one day, but the Town was nearly out of water by the time the transmission piping was repaired. The Town only had six feet of water remaining in their 500,000-gallon storage tank, which is as low as the water level had ever been. Should the pipe break have taken longer to repair, or was harder to locate, the Town would have been completely out of water. The Town evaluated adding a 12” parallel transmission pipeline to the existing 10” transmission pipeline. The estimated construction cost for an eight-mile parallel pipeline is nearly $4,000,000, and does not include easements, land acquisition, survey, design and engineering.

- In 2007, the Town spent a significant amount of money on the existing RO equipment. The RO equipment has worked well, but the entire water system can be greatly improved by moving the RO WTP to Town. Moving the equipment would allow for the treatment of all Town wells and not just the South Platte Wells, thereby increasing much needed redundancy and flexibility. Operations and energy costs would also be decreased should the treatment system be moved into Town.

- The Town was proactive in their approach to secure two water sources, with the addition of the South Platte wells, and could develop a redundant, long term and reliable water system by moving the treatment equipment into Town.

- It recently came to the attention of the Town that the RO WTP was not meeting its discharge permit due to the results of the Whole Effluent Toxicity (WET) tests. The Town reported chronic WET test failures of Ceriodaphia dubia under CDPs Permit No. CO0048853. By relocating the RO treatment equipment into Town, the Town would be
able to work with the CDPHE to directly discharge RO reject and backwash water to the existing sanitary sewer collection system.
SECTION 6.0
PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

a. Preliminary Project Design

The recommended alternative for the Town of Wiggins is Alternative 3 – Relocate Existing Reverse Osmosis System. This alternative would provide the Town with a long term, reliable water solution. The design of the system would ensure the following:

- Ability to treat various water sources through the water treatment plant
- Disinfect in a location that treats all water sources
- Maximize the water from the Kiowa Bijou wells, thereby minimizing augmentation requirements and costs
- Maximize the bypass and blend ratios through use of the online nitrate analyzers
- Increase energy efficiency by minimizing the amount of South Platte well water treated and pumped into Town
- Provide redundancy to the water system, as currently there is only one pipeline from the South Platte wells into town
- Provide redundancy to the disinfection system, as currently the disinfection system in located at the RO building and can only disinfect the South Platte wells. Should the pipeline to Town be out of service, the Town has no means to disinfect water from the Kiowa Bijou wells.

The proposed project would include the following:

- New ~3,500 square foot building located on Town property. Building will be designed to include a knock out wall so that the building size can easily be increased in the future if additional RO skids are needed.
- Relocate existing RO equipment (two 225 gpm skids) and CIP equipment to new building
- Relocate the existing macrolyte filters to treat bypass water from the Kiowa Bijou wells
- Purchase and install one additional 225 gpm RO skid
- Potentially purchase and install three 10-foot diameter pressure filters with a PLC capable of running the entire treatment system
- Relocate existing disinfection system to new building
- Install modulating valve network to optimize and monitor the blending of water from both well fields
- Extend 10” diameter transmission pipeline to connect the South Platte wells to the new water treatment plant
- Extend 8” diameter raw water pipeline to connect Kiowa Bijou wells to new water treatment plant.
- Construct 8” diameter sanitary sewer from new WTP to existing collection system.

In addition to moving the existing RO equipment to ensure treatment of two water sources, the Additional Needs of the Town include the following:

- Extend distribution piping south and east through Town
- Replace 2” and 4” undersized distribution piping throughout Town with 8” piping
- Construct 500,000-gallon elevated storage tank
- Install three new 1,000 gpm booster pumps with VFDs and emergency generator at new WTP
- Purchase six acres of land in Town, on which new WTP and elevated storage tank will be housed
- Purchase additional augmentation water from TH Ranch
- Purchase additional augmentation water from Fort Morgan Canal
- Redrill two Thomas wells and connect to water system
- Drill and construct new South Platte well and connect to water system

b. Project Schedule

- Submit PER April 5, 2016
- Submit funding application for SRF and USDA for loans and grants May 15, 2016
- Design of proposed WTP and water distribution system April 1 – Nov. 30, 2016
- Secure project funding December 31, 2016
- Advertise for bids publication March 1, 2017
- Construction contract award April 15, 2017
- Construction start June 1, 2017
- Construction completion September 1, 2018
c. **Permit Requirements**

Permits that may be required include the following:

- Construction Stormwater Permit (Colorado Department of Public Health and Environment [CDPHE])
- Wastewater Treatment Facility Discharge Permit (CDPHE)
- Dewatering Permit (CDPHE)
- Grading Permit (Morgan County)
- Railroad Crossing Permit (Burlington Northern RR)


d. **Sustainability Considerations**

i. **Water and Energy Efficiency**

This option would increase both water efficiency as well as energy efficiency. The water efficiency would increase, as the Town would be able to use more of the Kiowa Bijou water, which they do not have to augment. The online nitrate monitors would allow the Town to increase the amount of water supplied by the Kiowa Bijou wells, and blend that with water from the South Platte Alluvial wells, while ensuring that the ratio was kept within the Safe Drinking Water Standards. By increasing the amount of water supplied by the Kiowa Bijou wells, the Town would increase their energy efficiency, as the transmission pumps would run less to deliver water to Town from the South Platte wells.

ii. **Green Infrastructure**

Green infrastructure would be implemented into this project as much as possible and economically feasible. Green infrastructure includes the reuse and relocating the existing RO and Macrolyte treatment equipment.

e. **Cost Estimate (Engineer’s Opinion of Probable Cost)**

The OPCC for Alternative No. 3 is $3,764,000, while the OPCC for the Additional Needs is $8,230,000. The full OPCCs can be seen in Appendix E.
f. Annual Operating Budget

I. Income

The Town’s annual income consists primarily of water sales and tap fees. The Town’s 2016 budget is included in Appendix F. According to a 2013 Water Rate Study, the Town has 364 residential customers and nine commercial taps. The Town currently has a base fee of $69.50 per month and $3.20 per thousand gallons for a usage fee. The average monthly water bill for residential users is approximately $105 per month. The Town is optimistic that they will receive grants to help pay for the various projects so that they do not need to increase the base fee or usage fees for existing or future customers. The fees are already considered to be high amongst neighboring Towns and municipalities. For example, Morgan County Quality Water District has a base fee of $23.50 per month per tap equivalent, and a tiered cost for water ranging from $1.54 per 1,000 gallons to $11.76 per 1,000 gallons. The Town’s water tap fee is currently $11,000.00.

For the purposes of estimating the water income for the foreseeable future, the Town is taking a conservative approach. While the Town expects the 520 new homes to be sold and occupied in the next five years, for budget purposes, it has been assumed that the 520 new homes are built over ten years. The following assumptions have been made for projecting income from water sales and tap fees:

- Taps Fees ($11,000 each)
  - Year 1 (2016): 23 new units
  - Year 2 (2017): 27 new units
  - Year 3 (2018): 58 new units
  - Year 4 (2019): 58 new units
  - Year 5 – Year 10 (2020 - 2025): 59 new units per year

- Currently, the average residential water bill is $105. While it is not anticipated that the Town will need to increase water rates, the average residential bill is assumed to be $125, as projections need to be calculated based on loans, not grants. If no grants are obtained, it is likely that the Town will need to increase usage rates.

- All new water customers are assumed to have water bills of $125 each. The 346 existing taps are assumed to have a $20 increase to their existing water bill.
II. **Annual O&M Costs**

The annual O&M costs are presented in the 2016 budget. They include breakdowns for maintenance, contract operator, utilities, treatment/operations, supplies, office supplies, equipment and other miscellaneous expenses. The O&M costs also include approximately $250,000 for the construction of new distribution piping and equipment.

Typically, the actual operations costs for the Town range from $100,000 to $150,000 per year. For the purposes of this PER, it has been assumed that the O&M costs only increase slightly (10% annually) until the year 2020, at which time the third RO skid would likely need to operate daily to keep up with water demand, and a fourth (backup) RO skid would need to be purchased. In year 2020, there is a large increase in O&M costs to include these additional purchases, and a 10% increase in O&M costs after that.

The following assumptions have been made for the various professional, administrative and operations costs:

- Professional Services – 5% annual increase
- Water Administration – 5% annual increase
- Public Works Administration – 5% annual increase. New full-time water employee necessary in year 2020 to assist with new water treatment plant and facilities.
- Supplies – 5% annual increase

III. **Debt Repayments**

According to the 2016 Budget, the Town had an annual debt service amount of nearly $190,000, with $147,07200 due to USDA for the loan payment for the existing RO system. Approximately $42,000 is paid annually for lease/purchase payments of existing water supplies.

For the purposes of this PER, debt repayments have been estimated for three scenarios; $12 million loan, $9 million loan (assuming $3 million grant) and $6 million loan (assuming $6 million loan). The Town will need to secure a $12 million construction loan, and pay the interest for three years, until the full loans from funding sources are in place and payments are due in approximately three years. It is assumed that not all of the construction will be completed in one year, and thus the construction loan has been
spread out over three years. The following assumptions have been made in regards to debt repayments:

- **Construction Loan Payment (3.5% interest)**
  - Year 1 (2016): $140,000 payment on $4 million loan
  - Year 2 (2017): $280,000 payment on $8 million loan
  - Year 3 (2018): $420,000 payment on $12 million loan

- **USDA/SRF Loan Payment (3.0% interest)**
  - $516,000 annual payment on $12 million loan
  - $387,000 annual payment on $9 million loan (assume $3 million grant)
  - $264,000 annual payment $6 million loan (assume $6 million grant)

The proposed debt repayments would be in conjunction with the existing debt payments of approximately $190,000 per year. As seen in the following tables, Tables 12 through 14, it is imperative that the Town receive grant money to pay for the much needed improvements.

### Table 12: Preliminary Operating Budget

**Assume: $12 Million Loan - $0 Grant**

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**Notes:**
1. Professional Services increases 5% per year.
2. Water Administration increases 5% per year.
3. Public Works Administration increases 5% per year, and hires one full time employee in 2020.
4. Supplies increase 5% per year.
5. Operations increase 10% per year until 2020. At that time, new RO skids are purchased and in operation. Operations increase 10% per year after 2020.
6. Debt Service includes existing debt service in 2016, construction loan interest on $4 million in 2017 ($140,000), construction loan interest on $8 million in 2018 ($280,000), and construction loan interest on $12 million in 2019 ($420,000). In 2020, full debt service ($516,000) for USDA/SRF loans are included.
### Table 13: Preliminary Operating Budget
Assume: $9 Million Loan - $3 Million Grant

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Notes:
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### Table 14: Preliminary Operating Budget
Assume: $6 Million Loan - $6 Million Grant

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### IV. Reserves
Various funding agencies require different reserves, and that will be considered as funding (both grants and loans) are secured. As seen in Tables 12 through 14, the Town will not be able to maintain healthy reserves should the entire project be funded using loans. The Town needs to obtain a significant amount of grant money in order for the water enterprise to be able to transfer money to reserve accounts.
SECTION 7.0
CONCLUSIONS AND RECOMMENDATIONS

The Town currently has multiple deficiencies, many of which lead to unreliable water supply. Specifically, the Town depends on water from the South Platte wells, where the disinfection system is located, and it not able to utilize the Kiowa Bijou wells as efficiently as possible. The Town has one 10” diameter transmission main that delivers water from the South Platte wells into Town. Should the 10” transmission main from the South Platte wells to the Town break or need repair, the Town does not have the means to treat or disinfect water from the Kiowa Bijou wells. In addition, the Town has to augment the water from the South Platte wells, which is an expense that could be minimized if able to treat water from the Kiowa Bijou wells.

Other water deficiencies that exist in Town is aging and undersized distribution piping. The Town has several 2” and 4” water mains which are undersized and in need of replacement. The Town booster pumps have reached their useful life, and are also in need of replacement. New 8” water distribution piping will be provided for areas south and east of Town, to ensure new and existing residential neighborhoods, parks and industrial parks have adequate sized and looped distribution networks.

The Town does not have any elevated storage. Because of this, the Town relies completely on its booster pump station to supply residents with water. If the station goes down for any reason, residents go without water. Elevated storage would allow for water during emergencies and periods of high demand.

It is recommended that the Town relocate the existing RO equipment from the north to a location in Town, where it could be used to treat both water sources. The blend and bypass ratios from the two water sources could be optimized by means of online nitrate analyzers, thereby decreasing treatment, pumping and augmentation costs. In addition, it is recommended that the Town construct a new booster pump station, complete with three 1,000 gpm centrifugal pumps equipped with variable frequency drives (VFDs). The new pumps would be used to pump water to a new 500,000-gallon storage tank, which would provide the Town with much needed flexibility and reliability during high flow conditions. The Town will also map the entire water system, including locations of valves, hydrants and piping. The Town will make improvements
to the water distribution piping by providing looped distribution throughout Town and replacing distribution piping that is undersized and/or aging.

It is imperative that the Town of Wiggins proceed forward with water system improvements. The Town is not only able to serve existing customers, but will be unable to provide future services to new residences, commercial developments and industries. The Town will continue to secure loan and grant monies to assist with paying for much needed improvements.