EXECUTIVE SUMMARY
HIGH MEADOW RANCH
Master Plan

August, 2014

Submitted To: Wyoming Water Development Commission
6920 Yellowtail Road
Cheyenne, WY 82002

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HIGH MEADOW RANCH WATER DISTRICT

PREPARED FOR:
WYOMING WATER DEVELOPMENT COMMISSION

PREPARED BY:
WLC ENGINEERING, SURVEYING AND PLANNING

IN CONJUNCTION WITH
1. Introduction and Project Description

The High Meadow Ranch Water District (HMR) owns and operates a rural water system located approximately 6 miles southeast of the Town of Pinedale, Wyoming and approximately 1 mile north of US 191. The HMR Water District encompasses two separate water systems within the Barger Subdivision. The north portion of the water district, Blocks 1-4 Barger Subdivision (Filing 1, 2 & 4), contains 619 lots ranging in size from 0.89 Acres to 3.50 Acres. The south portion of the water district, Block 8 Barger Subdivision (3rd Filing), contains 85 lots ranging in size from 0.67 Acres to 1.31 Acres. The water district currently has a total of 204 full-time customers, 28 part-time customers and 440 vacant/non-system users.

The HMR Property Owners contacted the WWDC and applied for a Level 1 Study to be conducted on the water system. The High Meadow Ranch Water District was officially formed in 2013 and was tasked with providing and overseeing water service. In June of 2013, WLC Engineering, Surveying and Planning (WLC) was hired by the WWDC to complete this Level I study. The HMR Water District is primarily interested in upgrading problem areas of the system, connecting the north and south systems, and providing backup water supply and backup power to the system.

The primary focus of this study was to evaluate the functionality of the High Meadow Ranch Water District water system as a whole. The study then evaluated options for water system improvements, metering, interconnectivity, backup water supply, backup power source, storage, regional connection and provided recommendations and costs (capital and operating) for each option. It is the goal of this Level I Study to develop a plan that will guide the High Meadow Ranch Water District with funding and options to maintain a reliable water system into the future.

2. Water Usage

Based on conversations with the system’s operator, it was determined that the High Meadow Ranch water system operates as two separate zones. The north portion is fed by the Sauk Trail II well and the south portion of the HMR water system is fed by the Clare I well.

Monthly water usage reports were provided by the operator for the north portion of the water system. The water production reported in 2012 yielded an average daily demand of 41,853 gallons and with a population of 606 persons, the per capita average daily demand being 69 gpd/person. Table 2.1 presents the total year demands for 2008-2012. During the peak month the per capita water use was 116 gpd/person. The per capita demand is lower than many communities in Wyoming, but is reflective of the District’s restrictions on outdoor watering.
Table 2.1: North Portion Yearly Water Demand (Gallons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>10,397,400</td>
</tr>
<tr>
<td>2009</td>
<td>13,273,300</td>
</tr>
<tr>
<td>2010</td>
<td>14,292,600</td>
</tr>
<tr>
<td>2011</td>
<td>12,883,700</td>
</tr>
<tr>
<td>2012</td>
<td>15,276,200</td>
</tr>
</tbody>
</table>

A limited amount of water usage data was available on the south portion of the water system. The number of residents in Block 8 is estimated at 145 persons. If the per capita average daily demand and the peak month per capita water use were the same as Blocks 1-4 (69 gpd/person and 116 gpd/person) then during peak occupancy of Block 8, demands could approach 10,005 gpd. This demand was considered the current average daily demand for the south water system.

The “Average Daily Demand” (ADD) for the north system was then calculated by dividing the 2012 year demand by 365 days in a year, see Table 2.2. The “Average Daily Demand” (ADD) for the south system was then calculated by dividing the projected peak occupancy year demand by 365 days in a year, see Table 2.2.

Table 2.2: System Average Day Demand

<table>
<thead>
<tr>
<th>Area</th>
<th>GPD</th>
<th>GPM</th>
<th>GPD/PERSON</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Meadow Ranch North</td>
<td>41,853</td>
<td>29.06</td>
<td>69</td>
</tr>
<tr>
<td>High Meadow Ranch South</td>
<td>10,005</td>
<td>6.95</td>
<td>69</td>
</tr>
</tbody>
</table>

The Peak Daily Demand (PDD) for the north water system was also determined from the master meter data by taking the peak demand month which was recorded in July 2012 when a total of 2,181,400 gallons were pumped by Sauk Trail II, see Table 2.3. The peak daily demand for Blocks 1-4 is 70,368 gallons (49 gallons per minute (gpm)). The peak daily demand for the south system cannot be determined from the current data set. The peak daily demand in the north system is 1.68 times the average daily demand. Using the same ratio, of 1.68 for the south system, yields an estimated peak daily demand of 16,808 gallons (11.7 gpm), see Table 2.3.

Table 2.3: Peak Month Demand (Gallons)

<table>
<thead>
<tr>
<th>System</th>
<th>Year</th>
<th>Month</th>
<th>Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>2012</td>
<td>July</td>
<td>2,181,400</td>
</tr>
<tr>
<td>South</td>
<td>-</td>
<td>-</td>
<td>521,048</td>
</tr>
</tbody>
</table>

The current Peak Hour Demand (PHD) was determined from the model using diurnal demand patterns and running an extended period simulation (EPS). From the model, the current PHD for the north system is 103,680 gpd (72 gpm) and for the south system it is 18,720 gpd (13 gpm).
3. Hydraulic Analysis

The layout for the current water system was determined using a combination of existing plans, collected field survey data, and information from the system operator. This information was compiled and a layout was developed using Bentley WaterCAD V8i modeling software.

The analysis of the High Meadow Ranch water distribution system shows that the system is adequately sized to provide necessary flows and pressures for the current demands required. However, there is a significant potential for growth within the systems which could add enough additional demand to cause shortages of supply. Following the future growth projections, the water system will have some difficulty at a 20 year build out and would be unable to accommodate the demand of a complete build out scenario.

4. Geographic Information System (GIS) Development

The Geographic Information System (GIS) database for the High Meadow Ranch Level I Study includes all of the water features that were able to be surveyed with specific information regarding each feature. The following components are included in the GIS database to provide the HMR Water District with a solid base of geospatial data for their water system and to provide a platform to further develop the GIS database in other areas of critical infrastructure management. The components included in the GIS database include:

1. Geodatabase – A geodatabase is a database specifically designed to support the collection, maintenance, analysis and visualization of spatial data. The geodatabase developed for this project was designed to store water system features and to support the implementation of recommended water system improvements identified in this Level II Study document.

2. Aerial Photography – high spatial and temporal accuracy aerial imagery provides a consistent backdrop for the production of mapping products as well as serving as a valuable resource for further spatial data development. Aerial imagery was obtained from the Sublette County Aerial Database for the study area.

5. Water System Operations

The High Meadow Ranch Water District currently gets its raw water from three groundwater supply wells including Sauk Trail II, HM #5 and the Clare well. Sauk Trail II is located in Lot 49, Blocks 1-4 (north system) at the intersection of Sauk Trail and Sauk Path and approximately 1,200 feet southwest of HM #5. Sauk Trail II was drilled and constructed in 2007 to a depth of 840’ with the pump set at 811’. This well provides all of the raw water for the north water system. HM #5 is located in Lot 16 on the northern boundary of Blocks 1-4 (North system) and approximately 1,200
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feet northeast of the Sauk Trail II well. HM #5 was drilled and constructed in 1975 to a depth of 730’ with the pump set at 623’. The well is not currently used on a regular basis because the well produces sand when pumped and because of difficulties with adjusting the pressure settings of the VFDs at HM #5. There is also no telemetry in the water system to automatically alternate the well operation between HM #5 and Sauk Trail II. The Clare well is located in Lot 43, Block 8 (south system) along Meadow Lark Lane. The Clare well was drilled and constructed in 2007 to a depth of 460’ with the pump set at 305’. The Clare well is the only water supply for the south water system in the HMR Water District.

In the north system, water from the Sauk Trail II pump is distributed to the system by a 3” HDPE line from the well which connects to a 4” PVC main line via reducer connecting to the rest of the north system at Sauk Trail. The north system back up well, HM #5, is distributed to the north system by a 1 ¼” HDPE line from the well which connects to a 4” PVC main line via reducer which is them encased in a 6” PVC line. This 4” PVC main line then connects into the north end of the system at Sauk Trail for distribution. The distribution piping for the entire north system consists of approximately 52,750 lineal feet of 4” PVC Pipe, 1,560 lineal feet of 2” HDPE and 270 lineal feet of 1” HDPE to distribute water throughout the system. The 4” PVC mains in the north system were installed in large part in the mid 1970’s. The north system is capable of delivering the required demands to the water district at pressures ranging from 50 to 134 psi.

In the south system, water from the Clare well pump is distributed to the system by a 2” HDPE line from the well which connects to a 4” main line via reducer connecting to the rest of the system at Meadow Lark Lane. The south system consists of approximately 8,159 lineal feet of 4” PVC Pipe, and 790 lineal feet of 1” HDPE pipe installed in large part in the 1970’s. The south system contains one isolation valve. The south system is capable of delivering the required demands to the water district ranging from 50 to 74 psi.

The 4” PVC Pipe comprising the majority of the distribution lines throughout both systems is constructed with glued PVC joints. These lines have yielded frequent breaks in certain areas that exceed 100 psi or are in poor condition. There are no pressure reducing valves (PRVs) within the current system. Throughout the subsequent years since these lines were installed, several leak repairs have been completed often with mechanical joints. The water services coming off on the main lines are largely 1” Poly Pipe in both systems. None of the individual services are metered. Some of the service lines are lacking curb stops. The north system contains approximately 24 isolation valves within the system. No back-up power supply or storage is in place for the north or south systems. In the event of power loss all users will experience water outage within a short time frame as the water is drained from the pipes. There is no current storage so the entire water system will remain without water until power is restored. Both distribution systems are lacking main line
valves that would allow better isolation of sections during repairs. Many legs of both systems are without isolation valves.

6. Water Supply Analysis

The HMR Water District is comprised of two separate water systems that supply the two separate HMR Subdivision areas, Blocks 1-4 and Block 8, respectively. The following is a summary of the well analysis.

The Sauk Trail II well (Sauk Trail II) has been the primary water supply well for Blocks 1-4 of the HMR water system since 2007. The well has been able to meet the demands of the system without supplemental water from HM #5. The pumping capacity is slightly greater than the adjudicated pumping rate. The analysis of the well reveals that the well can yield 100 gpm for extended periods of time. The water levels measured since the well was put into production have not dropped below 378 feet and suggest that the well is capable of sustaining continued production at the current demand into the foreseeable future. Comparison of pump testing results does not suggest that the biological growth has had any negative effects on well production.

The HM #5 well (North Portion) is permitted and equipped to pump 50 gpm but the well has a history of producing large quantities of sand when pumped. Pump testing reveals that the aquifer transmissivity is very low. It is very likely that the sandstones yielding water to the well have a significant silt or clay content that reduces permeability and results in low long-term pumping rates. The water level has declined in the nearly 40 years since the well was drilled, but without additional water level data the trend in the decline cannot be determined. Recent efforts to rehabilitate the well have had the apparent effect of reducing the amount of sand produced from the well. However, the yield of the well is inadequate to meet the average daily demand of the water system if Sauk Trail II is inoperable. The age of the well, coupled with the torch slot construction with no filter pack, makes further rehabilitation of the well unlikely to succeed in achieving a higher yield.

The Clare I well (south portion) is the only water supply well for Block 8 of the Barger Subdivision. The permitted maximum pumping rate for the Clare I well is 20 gpm. The initial water level when the well was drilled was 88 feet. Water levels when the well was not actively pumping ranged from 130.95 feet to 145.27 feet. The variability in measurements is the result of Clare I being pumped to meet the needs of the residents of Block 8. Clare I is permitted and equipped to pump 20 gpm but analysis of pumping water levels during recent testing suggests that the long term capacity of the well is less than 18 gpm. There is currently insufficient data to predict water level trends in the well.

Recent water quality sampling demonstrate that the water meets all EPA standards for the
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The overall quality of the water from all three wells is very good with the total dissolved solids (TDS) being less than 500 mg/l. The water meets all EPA primary and secondary standards for a public water supply source, with the exception of the pH. The pH of the water from the wells ranges from 9.33 to 9.7 and the un-enforced EPA secondary standard for pH is 6.5 to 8.5. The major dissolved constituents in the water include sodium, sulfate, bicarbonate, and carbonate. The water produced by the wells is very soft.

The wells appear to be in good physical condition with limited mineral and biological deposits on the casing. The current pumping equipment is also in good working order and is expected to last for some time to come.

7. Proposed System Improvements and Recommendations

Based on evaluation, the High Meadow Ranch water distribution system is in fair to poor condition. The supply wells Sauk Trail II and Clare I provide a consistent quantity of water. In the north system, when the Sauk Trail II well goes down for an extended period of time it is unlikely that HM #5 can provide the necessary amount of water to meet supply demands. The north system lacks a redundant supply. Since the south system is completely reliant on the Clare I well as the sole water supply, it also lacks a redundant supply.

In order to address the previously stated deficiencies within the High Meadow Ranch Water District systems, the following Alternatives have been outlined. Although not all alternatives may be cost effective or necessary at this time, they were analyzed to guide decision making.

- Alternative 1 – Replace all Piping in Blocks 1-4 (North System) to meet WDEQ Requirements
- Alternative 2 – Replace all Piping in Block 8 (South System) to meet WDEQ Requirements
- Alternative 3 – Connect the North and South Water Systems (Blocks 1-4 to Block 8)
- Alternative 4 – Install a Tank for Blocks 1-4 (North System)
- Alternative 5 – Install a Tank for Block 8 (South System)
- Alternative 6 – Install a backup well for Blocks 1-4 (North System)
- Alternative 7 – Install a backup well for Block 8 (South System)
- Alternative 8 – Install water meters and curb stops for all system users
- Alternative 9 – Install a backup generator for Block 1-4
- Alternative 10 – Install a backup generator for Block 8
- Alternative 11 – Install three phase power to well house Block 8
- Alternative 12 – Connect HMR to the Town of Pinedale System
- Alternative 13 – Replace known problem lines with new PVC piping
- Alternative 14 – Install curb stops to all remaining existing users
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With the 14 improvement alternatives established, the team formulated four preferred scenarios considering constructive feedback from the HMR Water District and the WWDC. The options were evaluated based on the benefit that each provides to the district along with overall cost to the customers. The following scenarios are further described in the following paragraphs.

**Scenario A** is comprised of the alternative that is a necessary step in order to qualify for outside funding and is essential for operations improvement. The first component of Scenario A is to meter all system users (Alternative 8). Included with meters is the addition of curb stops on all user services. This scenario would be the first step toward further improvements in the water district and provide an equitable means of charging water customers based on usage.

**Scenario B** is formulated in order to address the HMR Water District’s most immediate needs including storage, interconnectivity, and replacing problem areas. Firstly, a storage tank would be implemented at the Sauk Trail II well (or HM #5 well) sized to accommodate twice the maximum daily demand of the systems for a 20 year projected build out (Alternative 4). This would fulfill the WYDEQ requirement for storage. Then a connection from the north system to the south system would be established (Alternative 3) creating a single unified system. Lastly, the identified problem areas throughout the system would be replaced with reliable materials, along with strategic water line looping and isolation valving (Alternative 13). If this scenario were to be initiated it would allow the water district to address most of its inadequacies and operate proficiently into the future.

**Scenario C** is formulated as a secondary alternative to Scenario B to address the HMR Water District’s most immediate needs including a redundant water source, interconnectivity, and replacing problem areas. Firstly, a backup well would be drilled and installed on the same lot as the HM #5 well capable of meeting the peak hour demand of the systems for a 20 year projected build out (Alternative 6). This would fulfill the WYDEQ requirement for a minimum of 2 wells or storage. Then a connection from the north system to the south system would be established (Alternative 3) creating a single unified system. Lastly, the identified problem areas throughout the system would be replaced with reliable materials, along with strategic water line looping and isolation valving (Alternative 13). If this scenario were to be initiated it would allow the water district to address most of its inadequacies and operate proficiently into the future.

**Scenario D** would include adding additional redundancy. It is recommended that backup power generator(s) should be installed for the wells in the north system that would feed both systems (Alternative 9) in order to ensure continued operation of the system during an outage. If this scenario were to be completed it would have built in redundancies in power supply.

Completing a combination of these scenarios will allow the HMR Water District to have a reliable system that will provide water for many years to come. The recommended scenarios will also
allow the district more flexibility of services in the future. It is anticipated that minor repairs will continue to be required to the system due to the age and methods of original installation for many of the components.

8. Financial Evaluation and Funding Recommendations

The HMR Water District provided a copy of their annual budget which includes sufficient information to determine the approximate costs directly related to operations of the water system. Income is generated from assessments and a County mil levy. Because the HMR Water District is in an infancy stage (recently formed) no significant reserves exist at this time. Properly billing for water usage and rate adjustment will ensure the assessment income is at or exceeds projected levels. A current budget and plan will be needed to pursue WWDC and other funding sources. The following scenarios appear to be the most cost beneficial at the time this report was completed. These scenarios would also allow the HMRWD to have one cohesive system that will be easier to maintain in future years and be expanded as growth occurs. The budgets and funding scenarios presented below are based on average current non-metered water usages.

Scenario A is the installation of additional curb stops and metering all system users. Included in this scenario is curb stop installation for those services not having one currently. As mentioned, these improvements will need to be made to be eligible for additional funding sources. The total project cost for Scenario A is $786,204 (2016 dollars). Total annual operating expenses and debt service are shown to increase by approximately $12,813 from 2014. The increase in yearly operating budget would be approximately 19%, which could be offset by the increased customer fees. Possible funding sources would include the State Revolving Fund (SRF), State Loan and Investment Board (SLIB). A recommended break down of these costs would be comprised of 50% ($393,102) SLIB Grant, 25% ($196,551) SRF Principle Forgiveness and 25% ($196,551) SRF Loan at 2.5% interest 20 year term.

Scenario B, the second scenario, is a combination of connecting the two water systems in the district (Alternate 1), replacing lines in the known problem areas (Alternate 13) and installation of a storage tank (Alternate 4). These improvements will allow the district to provide adequate and reliable service to all the services in the district. The total project cost for Scenario B is $2,047,225 (2016 dollars). The total annual operating expenses and debt service are shown to increase by approximately $36,652 over the current 2014 budget. The increase in yearly operating budget would be approximately 56%, which could be offset by the increased customer fees. Some Alternates associated with this system upgrade costs would be eligible for WWDC funding. The District would be responsible for a third of the costs associated with the system upgrade. Alternates not eligible for WWDC funding are eligible for other funding sources including the State Revolving Fund (SRF) and State Loan and Investment Board (SLIB). A recommended break down
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of Alternate 3 costs would be comprised of 67% ($465,929) WWDC Grant and 33% ($229,487) WWDC Loan at 4.0% interest 30 year term. A recommended break down of Alternate 4 costs would be comprised of 67% ($329,268) WWDC Grant and 33% ($162,177) WWDC Loan at 4.0% interest 30 year term. A recommended break down of Alternate 13 costs would be comprised of 50% ($430,182) SLIB Grant, 25% ($215,091) SRF Principle Forgiveness and 25% ($215,091) SRF Loan at 2.5% interest 20 year term.

Scenario C, the third scenario, is a combination of connecting the two water systems in the district (Alternate 1), replacing lines in the known problem areas (Alternate 13) and installation of an additional well (Alternate 6). These improvements will allow the district to provide adequate and reliable service to all the services in the district. The total project cost for Scenario C is $1,974,293 (2016 dollars). The total annual operating expenses and debt service are shown to increase by approximately $35,260 over the current 2014 budget. The increase in yearly operating budget would be approximately 54%, which could be offset by the increased customer fees. Some Alternates associated with this system upgrade costs would be eligible for WWDC funding. The District would be responsible for a third of the costs associated with the system upgrade. Alternates not eligible for WWDC funding are eligible for other funding sources including the State Revolving Fund (SRF) and State Loan and Investment Board (SLIB). A recommended break down of Alternate 3 costs would be comprised of 67% ($465,929) WWDC Grant and 33% ($229,487) WWDC Loan at 4.0% interest 30 year term. A recommended break down of Alternate 6 costs would be comprised of 67% ($280,404) WWDC Grant and 33% ($138,109) WWDC Loan at 4.0% interest 30 year term. A recommended break down of Alternate 13 costs would be comprised of 50% ($430,182) SLIB Grant, 25% ($215,091) SRF Principle Forgiveness and 25% ($215,091) SRF Loan at 2.5% interest 20 year term.

Scenario D, the fourth scenario, consists of backup power generation. These improvements would benefit each of the above scenarios. The total project cost for Scenario D is $71,520 (2016 dollars). The total annual operating expenses and debt service are shown to increase by approximately $3,115 over the current 2014 budget. The increase in yearly operating budget would be approximately 5%, which could be offset by the increased customer fees. Alternative 9 would be eligible for WWDC funding. The District would be responsible for a third of the costs associated with the system upgrade. A recommended break down of Alternate 9 costs would be comprised of 67% ($47,919) WWDC Grant and 33% ($23,602) WWDC Loan at 4.0% interest 10 year term.

Rates increases were assumed to be the only method for the district to repay or service any debt, at this time. The following Table 8.1 is a summary of the effect each scenario has on the water rates for the district in terms of monthly effect to the customer. These rates and increases are based on the existing percentage of full-time users, part-time users and vacant lot owners.
These rates are based on the flat rate systems, which could change after Scenario A is completed. Projected monthly rates for full time customers are anticipated to be within $24 - $30 per month based on the funding scenarios presented.

9. Conclusions and Recommendations

The HMR Water District system is in need of repair and additional improvements to provide reliable water now and in the future. Although the water quality is good, the infrastructure throughout the system(s) is in need of improvements. HMR does not have water storage or another means of backup supply. Power deficiencies and outages limit or shut down the system causing problems for the residents in the HMR area. Old and incorrectly installed water lines have also caused numerous leaks in the system making it difficult to maintain. Lack of valving also makes it difficult to maintain and/or isolate portions of the system. Pressure variances in the system also create difficult demands on the system operations. Overall, many problems in the water system exist and a multitude of improvement options were explored.

Solutions were identified for each deficiency found during the evaluation of the system. Alternates for each potential solution were defined and discussed with the HMR Water District board and operators. Cost estimates were assembled for each alternate solution presented. The alternates were then evaluated based on benefit versus cost to the district. Also taken into consideration were the long term maintenance requirements for each solution. Due to several alternates being important to the district, the preferred alternates were assembled in to scenarios. Combining the potential projects into one may possibly result in a lower overall cost to the HMR Water District.

Improvements to the High Meadow Ranch Water District are necessary, as seen in this report. Providing reliable and quality water for over 200 customers in and near the HMR subdivision will require dedicated operators, board members and detailed budgeting. Funding opportunities for system improvements will also be critical as financial needs will require significant funding for a young water district.