# Final Report

*Executive Summary*

## *City of Rawlins Operations Level I Study*

A Wyoming Water Development Commission Project
Consultant Contract for Services 05SC0294568

June 2013


PMPC

*Saratoga, Wyoming*

*In association with:*

Hinckley Consulting

*Laramie, Wyoming*

*and*

TST Inc. of Denver

*Denver, Colorado*

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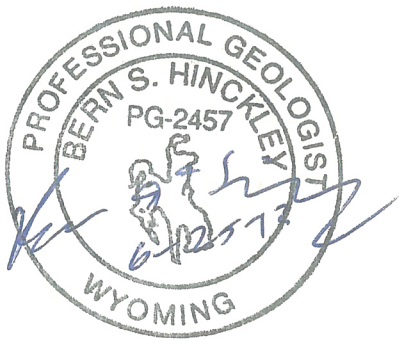

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# INTRODUCTION

Located in south-central Wyoming, Rawlins is the largest city in Carbon County and the thirteenth largest city in Wyoming. With more than 9,000 residents and a strong economy supported by energy and extraction industries the city is planning for growth in the foreseeable future.

Operation of the City of Rawlins water system requires balancing the three water supply sources, three reservoirs, numerous pump stations, storage tanks, miles of distribution and transmission lines, not to mention treatment and pretreatment plants, see Figure A1-1.

Rawlins water sources are the Sage Creek Basin Springs, Nugget Wellfield and the North Platte River and each have unique quality, quantity and operational constraints associated with their use. The reservoirs' water quality fluctuates with the supply source and the pretreatment plant has a production limit half that of the primary treatment plant. City water use is also limited by Wyoming water law and interstate agreements such as the Platte River Recovery Implementation Program (PRRIP).

This study is anticipated to be used as a tool by the City of Rawlins to maximize the supply, storage, treatment and distribution of their municipal water, and to complement previous master plans and storage and supply studies. This report has identified improvements and changes to the Rawlins system that will help manage and improve supply and treatment of the municipal water supplies. Operational scenarios include:

- Managing the Atlantic Rim and Peaking Reservoir levels
- Alternative irrigation water sources
- Blending the three water sources for optimal quality and economical operation
- Accounting for and addressing annual depletions
- Watershed study of Sage Creek Basin
- Snow fence in Sage Creek Basin
- Booster pumps in the Nugget Wellfield vault

Operational scenarios are fixed views of a dynamic system which are largely influenced by source water quality, demand, climate, the Platte River Basin endangered species issues and mandates of the SDWA. The operational scenarios were developed from various components of this study and are based on two simple premises: 1. the system will be most stressed by reductions in supply due to climatic conditions, and 2. an increasing population will drive up the demand for water.

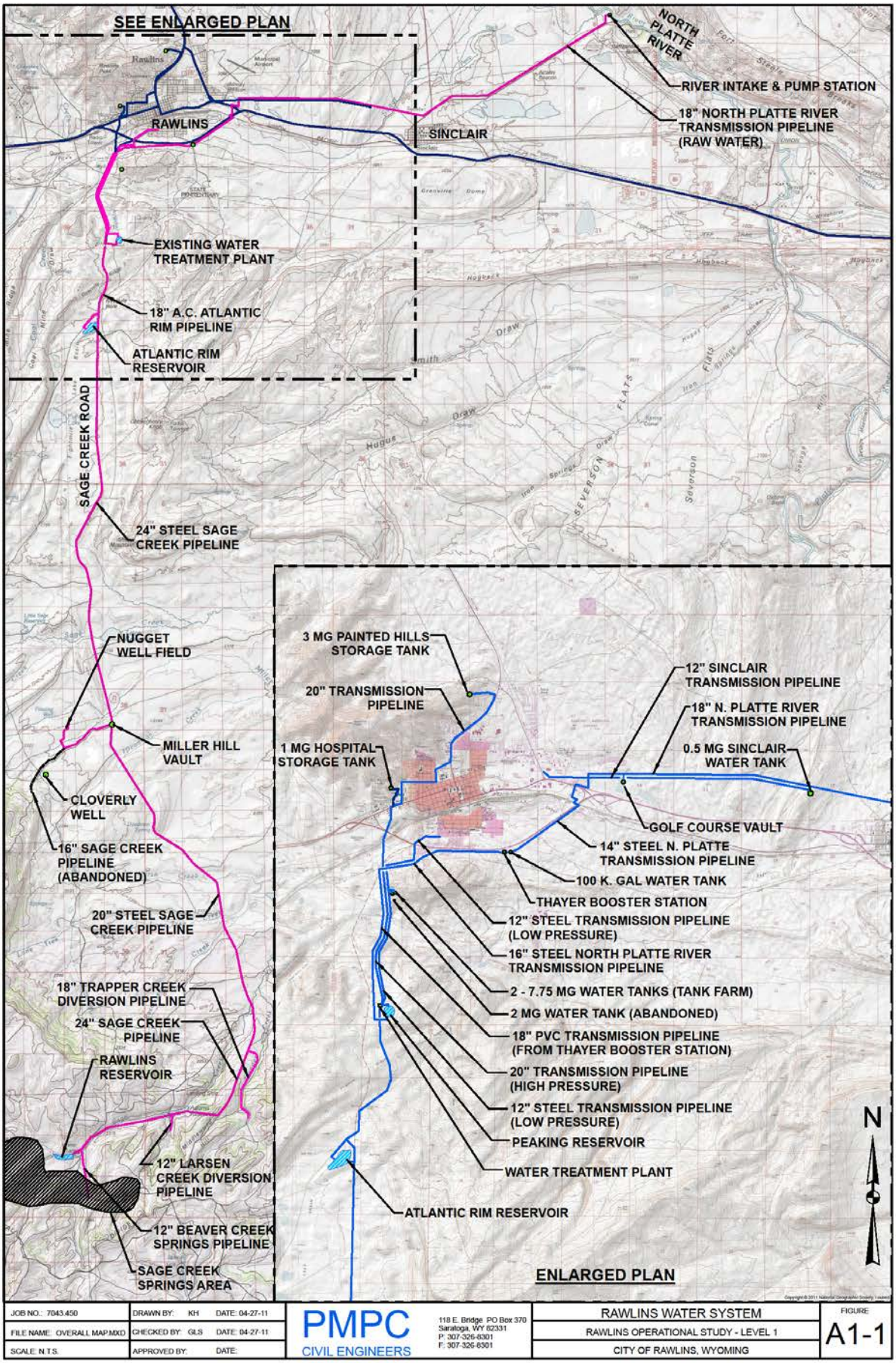


**Figure A1 -1. Rawlins Water System**

# RESERVOIR LEVEL AND WATER SOURCE MANAGEMENT

Managing the Atlantic Rim and Peaking reservoir levels is an important operational component of managing the City's water supply. The Springs produce their greatest volume of water over a three-month period in the spring and effectively using this resource requires storing excess production for later use. Storing this excess is accomplished in the Atlantic Rim and Peaking reservoirs and maintaining adequate reservoir levels is crucial to maintaining water supply and quality while controlling cost.

The current policy of filling the Atlantic Rim and Peaking reservoirs to 100% of capacity by April 1st does not allow for any storage of the peak runoff flows in the Sage Creek Basin pipeline. In the past, peak flows have been diverted to the Platte River. While there is some assurance in keeping the reservoirs full (from an ability to meet demand perspective), using the Nugget Wells and River sources to fill them is costly and not recommended.

Storage should be maintained at a level to accommodate excess Springs flows during the peak flow months of May, June and early July to effectively utilize all of the high quality Springs' water. Pretreatment of the lower quality river water adds an additional $417 in costs per million gallons of treated water. If this excess water were bypassed (not stored), the value lost could be calculated based upon the cost of pumping and pretreating 100 million gallons of North Platte River water. The cost to pump and pretreat 100 million gallons of North Platte River Water equates to a total cost (or value) of $103,400.

# IN-TOWN WELL USE FOR IRRIGATION DEMAND

Future growth in Rawlins will likely require the development of additional domestic water supplies. Alternative irrigation water sources would free up treated water for residential consumption and reduce water system costs. Three in-town wells have the potential to contribute a significant volume of raw water for landscape irrigation: the South Penitentiary well (60 gpm potential), the Wyoming Penitentiary Well No. 2 (250 gpm potential; new well) and the Cemetery Well No. 1 (250 gpm potential).

Treated water cost is $1.58 per thousand gallons delivered. At this rate, the gross savings in treatment costs by switching the cemetery to raw-water irrigation during the summer months would be approximately $9,400 per month, or $10,400 per month when the cemetery reaches full expansion. Further savings could be realized if nearby parks (e.g., old penitentiary, old Outlaw Bowl, etc.) are also converted to raw water from the Penitentiary wells. A portion of the treatment cost-savings would be offset by the development and operations costs of a raw water system.

# SOURCE WATER BLENDING AND PRETREATMENT

The City's raw water supply consists of three source waters: Sage Creek Basin Springs, North Platte River and Nugget Wells; and three reservoirs: Peaking, Rawlins and Atlantic Rim. A water quality sampling program was conducted on the City's water supply sources to measure specific water quality parameters. The program consisted of sampling each source bi-monthly during the time of year when water quality has been known to drastically change. These water quality results were used to determine an optimal source water blend for each of the following blending scenarios: (1) springs and river; (2) springs and wells; (3) river and wells and (4) all three.

A summary of the optimal blends for the blending scenarios are presented below.

**Table 1. Summary of Optimal Blend**

| **Blending Scenario** | **Optimal Blend** |
|---|---|
| Springs and North Platte | 80% SC/20% NP |
| Springs and Nugget Wells | 80% SC/20% NW |
| North Platte and Nugget Wells | 60% NP/40% NW |
| North Platte, Springs and Nugget Wells | 10% NP/72% SC and 18% NW |

Blending of the three water sources has numerous implications for the operation of the water system and the cost of treated water. Water treatment and pretreatment operations are both affected by source water quality. Water from the North Platte River must be pumped and pretreated, both of which are not required when demand can be met solely by Springs production.

Pretreatment is costly, in a pilot study conducted during the summer of 2012 the cost of pretreatment was estimated to be $475.60 per million gallons. This estimate is based on monthly operation cost assuming 4 million gallons per day is run through the pretreatment plant. The ability to use surface water is also dependent upon the limitation imposed by the PRRIP and annual depletion accounting procedures. Sound operational blending decisions will assure sustainable water quantity and quality at an efficient price.

## Operational Water Supply Growth Limits

The growth limit is a theoretical limit on population that can be served by the current water supply sources. A conservative limit would be the lowest available supply, less City use, divided by the average per capita use. The low limit of what the City supply can comfortably produce is 5.06 million gallon per day. This represents maximum treatment plant production and is the sum of Platte River water, reservoir water, spring water and Nugget wells water at their minimum operational limits. The average per capita consumption ranges from 100 GPCD, for in-house use, to 225 GPCD including outdoor use. From the 5.06 million gallons per day, 20% is the expected loss and 0.2 million gallons is the expected City demand, which leaves 4.15 million gallons for City residents. Based on an adjusted per capita consumption of 225 GPCD the system can potentially serve 16,600 full time residents at these minimum operational limits.

Population is supposed to peak with the planned projects at 14,266 persons in 2014. This is an increase of 4,932 persons in two years. Of the 4,932 people, 90% could be temporary residents and 10% full time. At 100 GPCD for the temporary and 225 GPCD for the permanent, the total increased demand would peak at an additional 0.5 million gallons a day. This temporary population peak is estimated to last 4 years through the construction of the projects.

# DEPLETIONS, ACCRETIONS AND WATER ACCOUNTING

Under the Platte River Recovery Implementation Plan (PRRIP), allowable annual depletions thresholds/benchmarks for the City of Rawlins were established at 1,341 acre-feet in the irrigation season, from May 1 through September 31, and 462 acre-feet during the non-irrigation season, October 1 through April 31. Annual depletions in excess of the City's benchmark values are not necessarily out of compliance if sufficient underruns are available to offset the City's overruns during either the irrigation or non-irrigation season. However, the City should have plans in place to assist the state with mitigation/depletion replacement efforts in the event that sufficient underruns are not available to mitigate depletions in excess of the benchmark values.

The City currently reserves 700 acre-feet of water from the Wyoming Account of the Pathfinder Modification Project. The reserved water can be used to offset depletions, if the State Engineer were to put the City on notice. The water has been reserved at a cost of $5.00 per acre foot. In the event of a depletion over-run and request for offset plans from the State engineer, the water can be purchase for an additional $25.00 an acre-foot. The Pathfinder Modification water must be reserved by February 15th of each year.

A potential reduction in surface water use would be to account for the return flow attributable to waste water discharge from the City's sewage treatment works to Sugar Creek. In the 2012 water year, approximately 150.2 million gallons of water was returned to the river system during the irrigation season. If this water were credited during the non-irrigation season it would cover the depletion overruns. With these accretions the City could reduce dependence on purchasing Pathfinder Modification water and overall water system costs.

# WATER SYSTEM OPERATION UNDER PRIORITY REGULATION

In February of 2013 intensifying drought has prompted the first wintertime call for administration of water rights on the North Platte River drainage in Wyoming since 2005. Specifically, the call applies to rights upstream of Pathfinder Reservoir with priorities junior to Dec. 6, 1904. The City's water rights on Sage Creek and the North Platte River are affected by this call. The call remains in effect until May 1 unless there is a dramatic increase in precipitation.

During water rights administration the City can continue to utilize its surface rights that are senior to Pathfinder. The City has senior rights for 3.01 cubic feet per second (CFS), of North Platte water that includes a portion of the Town of Sinclair's senior water right (1.00 CFS). 2.00 CFS of the senior rights were obtained from the Union Pacific railroad (Permit No. 2860, 1900 Priority, Fort Steele Pipeline). In addition, the City can utilize water from the Nugget Wells, as production from these wells does not impact flows in the North Platte River. River water use over the 3.01 CFS, not including well water, must come from the reserved Pathfinder Modification water.

The City needs to make a couple of updates to their 2.00 CFS Union Pacific water rights from the North Platte. The point of diversion for this right needs to be moved to the recently constructed North Platte Pipeline. There also needs to be an enlargement of the pipeline supply to include filling Peaking and Atlantic Rim Reservoirs.

The City has the ability to pump river water at 4.00 million gallons per day, approximately 6.19 CFS. If the City were to pump at this rate it would be exceeding its water right by 3.18 CFS or .84 acre feet per day and may have to purchase Pathfinder water as described above.

The City's spring rights are also subject to calls for regulation by downstream seniors on Sage Creek. During the non-irrigation season there is little conflict with irrigators on Sage Creek, however, during the irrigation season senior rights may be impacted by the City's diversions.

# WATERSHED STUDY AND PROTECTION AREA

Ninety percent (90%) of City's water usage is supplied by the Sage Creek Basin Springs (Springs). During normal hydrologic cycles the Springs provide an adequate amount of good quality water. A hydrologic analysis, performed by HNTB in 1977, determined the potential annual yield from the Springs flow to be 2.02 billion gallons. However, due to storage limitations and competing senior water rights within the basin, the entire production is not available to the City. The City currently diverts 1.00 billion gallons of high quality water a year for their municipal supply.

Watersheds can be threatened by activities such as private development, road building, stock grazing and energy extraction. It is recommended that the City initiate a watershed study to identify present and future risks to the Sage Creek Basin. The 24 springs could be monitored on an individual basis to identify any changes in production and to recommend appropriate methodologies that may improve production. Identifying the current condition and possible improvements to the collection system should also be part of an ongoing maintenance program.

The Springs are a million-dollar per-year asset based on retail value of the water delivered to the City's customers. The cost to replace the Springs water from the North Platte River, which includes cost for pumping and for pretreatment, is more than $600,000 per year. North Platte River water would cost $1.29 more per thousand gallons than spring water; which would increase overall water system cost to $2.87 per thousand gallons The initial cost for undertaking the watershed study and for subsequently implementing protection and Sage Creek Basin Springs improvement projects is estimated at $261,360.

# INSTALLATION OF SNOW FENCE

The City of Rawlins Springs in the Sage Creek Basin are dependent on seasonal precipitation for water production. The snowpack accumulating in the mezzo topography of the basin is subject to seasonal variations of wind and snowfall. In an open basin such as Sage Creek snow fence installation would alter the mezzo topography of the basin and relocate snow pack to more directly benefit the Springs water collection.

This additional water would be particularly important during the low precipitation seasons when the Springs produce approximately 50.0 million gallons less than average years. Typically the shortfall is supplemented with Nugget wells or river water. Both the wells and river have additional costs over the Springs supply. Reliably improving the Springs supply will yield sustainable benefits.

The cost to acquire this additional Springs water is the construction and maintenance of 2,652 lineal feet of 12-foot high Wyoming Wood Snow Fence. The estimated construction cost of 2,652 feet of fence is approximately $80,000.00. Regular maintenance would add up to an additional $69,000 over the thirty-year life of the fence.

With the initial investment and regular maintenance, the City could realize 10.8 million gallons (33 acre-feet) of additional water each year the fence is operational. The additional water would require an initial investment of $6.48 per thousand gallons and yearly maintenance costs of $0.22 per thousand gallons. When the initial investment is amortized over the 30-year service life of the snow fence, the total cost of the additional water is approximately $0.45 per thousand gallons.

# NUGGET WELLFIELD BOOSTER PUMPS

The Nugget Wells are artesian or flowing wells that flow into the Sage Creek Basin pipeline at the Miller Hill Vault. These ground water resources could provide an important supplement to the City supply in the event of a Sage Creek Basin Springs failure in production.

The Nugget Wells have the potential to produce 1,000 gpm. Although the current layout/configuration of the wellfield is capable of producing up to 700 gpm to the City, the head pressure at the vault connection prevents the Nugget wells from realizing their maximum production potential. Installing booster pumps would increase the production of the Miller Hill wellfield.

Installation of electric booster pumps in the wellfield vault could be easily accomplished, but power must first be brought to the site. Powering the booster pumps with a portable diesel generator may be a viable option when compared to the cost of electric transmission facilities. Based on current cost of generator rental and fuel, to pump water from the Nugget Wells would be approximately $0.73 per 1000 gallons with the pumps running 24 hours a day at 1,000 gpm.

# IMPLEMENTATION

The operational recommendations from this report should be implemented in phases. Following are the recommended implementation priorities.

1. Reservoir Level Management
2. Tiered Water Rates
3. Cemetery and Prison Well Development
4. ClearLogx Pretreatment
5. Nugget Well Booster Pumps
6. Watershed Study/Springs Collection Upgrade
7. Snow Fence Installation

From the available data, Rawlins has adequate water supply, treatment and storage for the anticipated growth. Population growth in the City is not limited, at this time, by available water sources. There are measures the City can take to insure this supply even further. Snow fence could make more than 10.8 million gallons of additional water and development of in-town wells could free up as much as 100 million gallons of treated water during the irrigation season.

# WATER RATES AND TIERED PRICING

Currently, Rawlins water availability fee of $14 is among the lowest in the state. With usage fees, water rates approach average levels. There is a single rate for all in-town metered customer use: $2.00 per thousand gallons. The City's water fund is self-supporting at the current levels of debt, operational cost and rate structure.

From June of 2010 through July of 2011 the Water Treatment Plant produced 721.952 million gallons of water for an average return of $1.92 for each 1,000 gallons at a cost of $1.58 per thousand.

If the City were to move forward with the recommendations outlined in this report without funding assistance, sinking funds would have to be built up with increased user fees or with additional loans provided by private sector funding institutions. Table 2 shows recommended projects and an estimation of the impact to user fees if the improvements were made with loans amortized over thirty years at 4% interest. The estimate is based on 3,500 users and a current user availability fee of $14.00 per month.

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**Table 2. Impact to User Availability Fees with no Outside Funding**

| Recommendations | Cost | Year | Annual Payment | Change in Base Rate |
|---|---|---|---|---|
| Reservoir Level Management | $0.00 | 2013 | $0.00 | $0.00 |
| Cemetery Well Development | $84,312.00 | 2013 | $4,824.00 | $0.11 |
| Prison Well Development | $171,072.00 | 2013 | $9,792.00 | $0.23 |
| ClearLogx Pretreatment | $231,340.00 | 2013 | $13,248.00 | $0.32 |
| Watershed Study/Springs Collection Upgrades | $261,360.00 | 2013 | $14,976.00 | $0.36 |
| Snow Fence Installation | $79,639.56 | 2013 | $4,560.00 | $0.11 |
| Total | $827,723.56 | | $47,400.00 | $1.13 |

As demonstrated in the table, the recommended improvements total $827,723. With no outside funding, user availability fees would increase $1.13 to $15.13.

The planned improvements were reviewed for impacts to water rates assuming WWDC funding is provided. WWDC project funding typically includes a 67% grant and a 33% loan, with interest at 4%. The loan portion of the project could be sourced through the Wyoming State Revolving Fund at 2.5% interest and ½% origination fee. If the recommended improvements were completed with outside funding assistance, there would be $86,248 in additional debt and user availability fees would increase to $14.41.

Re-drilling of the Prison Well No. 2 may qualify for specific funding through the WWDC. The WWDC has funds set aside for the drilling of wells only. These funds would cover 75% of the $30,000 direct drilling cost for the well with a 25% City match. While the well drilling is a small portion of the total well development cost, the grant share reduces the City's portion to $7,500.

City policy could be used as a tool to maximize the return on delivered water and promote water conservation as well. Tiered pricing would effectively price water to communicate its true value and the cost of wasting it. Pricing is one of the most powerful tools water managers have to ensure a long term supply. Effective pricing rewards conservation, discourages gross wasteful use and, when correctly implemented, results in affordable water for the majority of consumers over the long run.