Technical Memorandum

Henrys Fork Basin Study Municipal Water Conservation Measures and New Non-potable Water Supply Options

Technical Series PN-HFS-007

Prepared by

CH2M HILL

For

Bureau of Reclamation, Idaho Water Resource Board, and Henrys Fork Watershed Council

November 2012

Contents

Section			Page
1	**Alternative Description**		**1**
2	**Key Findings**		**1**
3	**Introduction to Potential Municipal Water Conservation Measures and New Non-potable Water Supply Options**		**5**
	3.1	Water Conservation Measures	5
		3.1.1 Metering	5
		3.1.2 Public Education	5
		3.1.3 Replace Water Lines Buried Above Frost Depth	5
	3.2	New Non-potable Water Supply Options	6
		3.2.1 Reclaimed Water	6
		3.2.2 Raw Water Non-potable Systems	6
		3.2.3 Industrial Conservation Example—Breweries/Malting Plants	6
4	**Municipal Water and Wastewater Analysis**		**6**
	4.1	Water and Wastewater Data Summary	6
		4.1.1 Water Data Summary	6
		4.1.2 Wastewater Data Summary	7
	4.2	Detailed Water Demand and Usage Review by Municipality	8
		4.2.1 The City of Idaho Falls	8
		4.2.2 The City of Rexburg	9
		4.2.3 The City of Driggs	10
		4.2.4 The City of Victor	11
	4.3	Case Studies—Cities Beyond the Henrys Fork Basin that Have Implemented Conservation Measures and Developed Non-potable Supply Options	12
		4.3.1 The City of Caldwell	12
		4.3.2 The City of Meridian	12
		4.3.3 The City of Nampa	12
	4.4	Municipal Water and Wastewater Analysis Conclusions	13
5	**Implementation of Potential Municipal Water Conservation Measures and New Non-potable Water Supply Options**		**14**
	5.1	Package 1—Municipal Water Conservation Measures	14
		5.1.1 Metering	14
		5.1.2 Public Education	15
		5.1.3 Replace Water Lines Buried Above Frost Depth	15
	5.2	Package 2—New Non-potable Water Supply Options	16
		5.2.1 Reclaimed Water	16
		5.2.2 Raw Water Non-potable Systems	17
		5.2.3 Industrial Conservation Example—Breweries/Malting Plants	17
6	**Cost Estimate**		**17**
	6.1	Package 1—Municipal Water Conservation Measures	17
		6.1.1 Metering	18
		6.1.2 Public Education	18
		6.1.3 Replace Water Lines Buried Above Frost Depth	18
	6.2	Package 2—New Non-potable Water Supply Options	19
7	**Basin Water Needs**		**19**

8 Legal, Institutional, or Policy Constraints 20

9 Environmental Benefits and Impacts 20

10 Land Management, Recreation and Infrastructure Impacts and Benefits 20

11 Evaluation Criteria 21
11.1 Stakeholder Group Measurable Criteria 21
11.2 Federal Viability Tests 21

12 Key Assumptions and Limitations 21

13 Data Sources 21
13.1.1 City of Idaho Falls 22
13.1.2 City of Rexburg 22
13.1.3 City of Driggs 22
13.1.4 City of Victor 22
13.1.5 Other Sources 22

Exhibits

1. Municipal and Industrial Conservation Alternative Overview 3
2. Key Findings from the Reconnaissance Evaluation 5
3. Summary of Existing City Water Production 7
4. Summary of Existing City Wastewater Production 8
5. Idaho Falls Non-Metered Water Rates 9
6. Rexburg Non-Metered Water Rates 9
7. Driggs Non-Metered Water Rates 10
8. Victor Metered Water Rates 11
9. Summary of Potential Water Saved through Implementation of Package 1 Elements 14
10. Summary of Potential Water Saved through Implementation of Package 2 Elements 16
11. Cost Estimate for Package 1 Elements 18
12. Metering Cost Estimate 18
13. Water Line Replacement Cost Estimate 19
14. Stakeholder Group Measurable Criteria Summary 21

1 Alternative Description

This alternative is intended to assess and explore options for conserving water and developing potential new water supply sources in the municipal and industrial sectors of cities within and near the Henrys Fork Basin (the Basin). Growth in domestic, commercial, municipal, and industrial water use is currently considered to be limited by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios (high costs for additional surface water treatment or non-potable conveyance systems and inability to acquire new groundwater permits).

Current water demands in Idaho Falls, Rexburg, Driggs, and Victor (all located near or within the Basin Study area) were assessed for potential conservation measures and new non-potable water supply (see Exhibit 1). These cities, which represent a range of small to large municipalities in or near the Henrys Fork Basin, were also compared to other Idaho cities that have implemented additional water conservation measures and use non-potable water supply for outdoor water use. The case study cities that were used for comparison purposes were Meridian, Caldwell, and Nampa, Idaho.

The following conservation measures and new non-potable water supply options are outlined in this study and will be discussed further in the following sections:

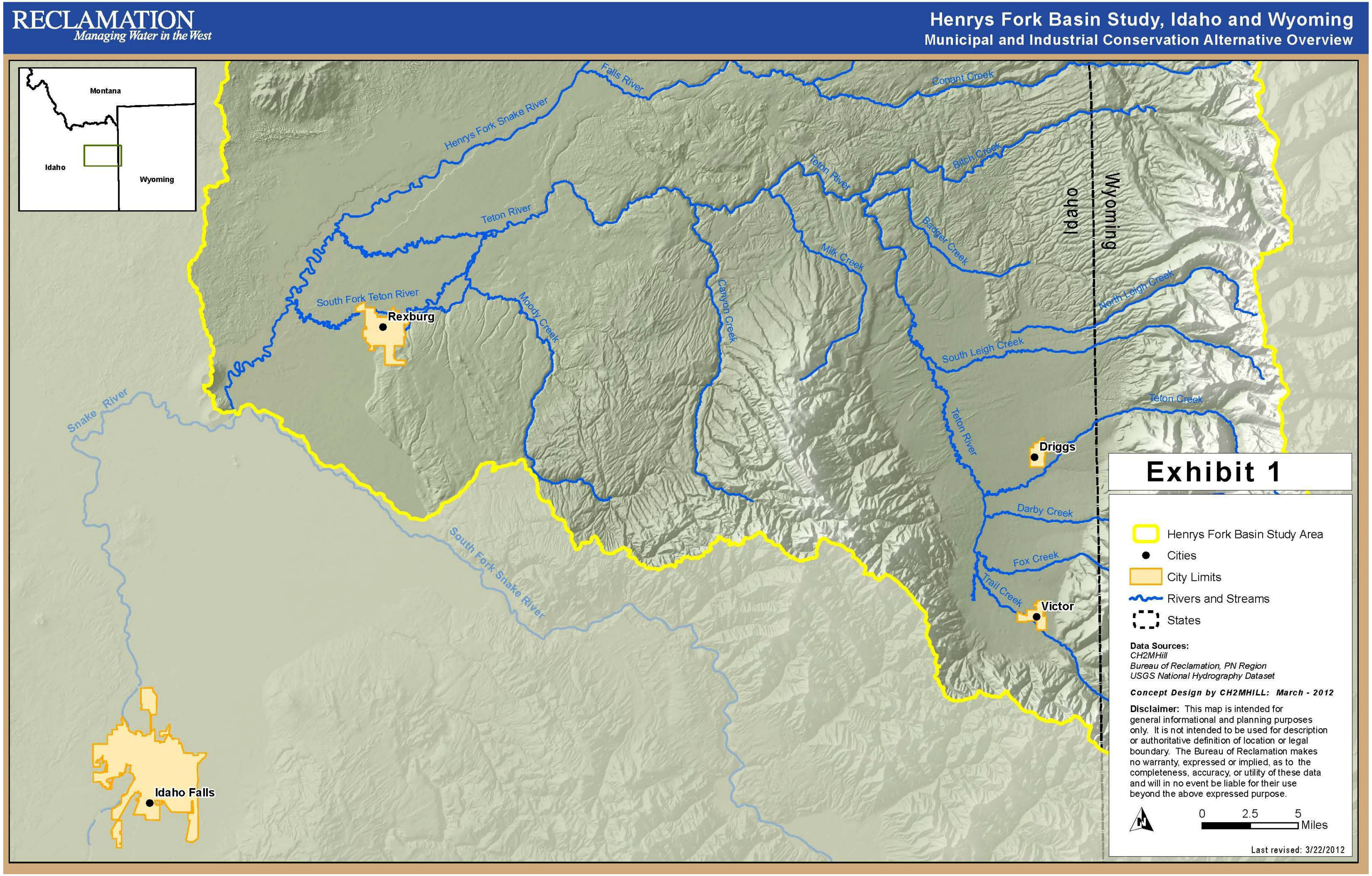
- Municipal water conservation measures
  - Metering
  - Public education
  - Replace water lines buried above frost depth
- New non-potable water supply
  - Reuse treated domestic wastewater effluent (reclaimed water)
  - Raw water non-potable systems
  - Industrial conservation

2 Key Findings

Implementation of municipal conservation measures and new non-potable water supply options would provide additional water for municipalities in the Basin, although these measures would not increase the total water supply in the Henrys Fork Basin or the Eastern Snake Plain Aquifer, and may actually decrease the water for downstream surface water users. Municipal water conservation measures included in Package 1 (metering, public education, and replacement of water lines currently above frost depth) would provide approximately 19,230 acre-feet (af) per year for municipalities, assuming full implementation in Driggs, Victor, Idaho Falls, and Rexburg. Further water savings (estimated to be on the order of 4,450 af per year) could be achieved through implementation of the new non-potable water supply options included in Package 2 (reclaimed water, non-potable systems, and industrial conservation) in Driggs, Victor, Idaho Falls, and Rexburg, but it is difficult to characterize the cost of implementing these measures. Since growth of these municipalities is currently considered to be limited by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios, it is assumed that existing groundwater rights would continue to be fully utilized. Consequently, although municipalities would benefit from implementation of both packages, these conservation measures and new non-potable water supply options have the potential to reduce the amount of water currently available to downstream in- and out-of-Basin users. Replacement of lines below the frost depth, while beneficial for municipalities, makes no change to the water budget as water lost from broken lines goes immediately back to the groundwater system. Other conservation measures may result in decreased groundwater pumping by municipalities, but because a large part of their pumped groundwater is discharged through treatment plants to the river, these conservation measures would result in less water being discharged to the river reducing supplies for downstream surface water users. The same issue would exist with using reclaimed water for non-potable uses. Exhibit 2 provides a tabular summary of the key findings.

This page intentionally left blank.

EXHIBIT 1
Municipal and Industrial Conservation Alternative Overview



This page intentionally left blank.

EXHIBIT 2
Key Findings from the Reconnaissance Evaluation
Municipal and Industrial Conservation Alternative

Estimated Cost per Acre-Foot*	Impact on In-Basin Water Budget*	Impact on Out-of-Basin Water Budget	Change in Connectivity of Impacted River Segment
$300 -$1,100	19,230 af to be conserved annually by the municipalities, but with likely reductions in water available to downstream users.	19,230 af potentially removed from the system and no longer available to downstream users.	Reduced groundwater pumping would have the potential to increase aquifer discharge to adjacent river reaches and improve connectivity of downstream river segments (Teton and Henrys Fork Rivers), but less water may actually be available for downstream uses if, following implementation of the measures, the cities utilize their full rights.

*Cost and water budget impact assumes implementation of Package 1 conservation measures only. Costs for Package 2 new non-potable supply options were not quantified at this stage of the study.

3 Introduction to Potential Municipal Water Conservation Measures and New Non-potable Water Supply Options

3.1 Water Conservation Measures

3.1.1 Metering

Metering provides an economic incentive for people to reduce consumption because of the corresponding impact on utility bills. Some cities in Idaho and throughout the United States have traditionally not metered their customers and charge a flat rate for water service. Charging a flat monthly fee does not encourage users to conserve water because there is no fiscal incentive to reduce water consumption. Many municipalities have meters installed on their connections, but the meters either do not work or the city has chosen not to read the meters and charge based on usage. Metering also allows cities to implement a tiered water rate structure that charges a per-gallon usage fee based upon the amount of water used by the customer. As water usage increases to successive tiers (or a larger water usage bracket), the cost per gallon also increases. A tiered water rate structure aids in water conservation because users will limit the amount of water used to stay within the lower price tier.

3.1.2 Public Education

Public education programs can be an effective means to inform water users of the importance of water conservation. Public education can be implemented through informational brochures, elementary school education programs, or by displaying water conservation information on the city’s website. This information will inform the public about the water cycle, the city’s water system, key terms, and drinking water and wastewater treatment processes. The programs focus on the importance of water conservation and ways in which they can contribute—including tips on outdoor water usage such as reducing landscape water demands by planting plants that require less water and installing water efficient fixtures such as low water toilets. Education is a powerful tool for increasing public participation in and the effectiveness of other water conservation measures.

3.1.3 Replace Water Lines Buried Above Frost Depth

On the basis of information gathered in this study, some of the cities near or within the Henrys Fork Basin currently have water distribution pipelines buried between 2 and 4 feet below grade. This depth is likely insufficient to prevent pipes from freezing and breaking during cold winter months, resulting in leakage. Replacing water lines below frost depth would result in reduced consumption and help conserve energy because less water would have to be pumped through the system to meet demands.

3.2 New Non-potable Water Supply Options

Municipalities in eastern Idaho are striving to develop sustainable water supplies to support economic growth in their communities. Because of historic depletion of the ESPA, cities are finding that it can be difficult to obtain new groundwater rights from the State of Idaho. Consequently, municipalities have acquired additional surface water rights; however, additional treatment of these surface water sources is costly and State law does not recognize aquifer storage and recovery (ASR), although a work-around exists through use of mitigation plans (see Section 8). The new non-potable water supplies described in the following text provide additional options for municipalities to support additional growth.

3.2.1 Reclaimed Water

To reduce the need for other sources of water, wastewater could be treated to Class A standards and reused as reclaimed water. Reclaimed water could be beneficially reused through land application, supply it to industrial users, or replenishing groundwater supplies through ASR (subject to legal constraints described in Section 8).

3.2.2 Raw Water Non-potable Systems

A dual-pipe system could be constructed in cities near or within the Henrys Fork Basin for irrigating open spaces, parks, or other suitable areas with raw surface water. This new non-potable water supply will decrease the amount of potable water used to satisfy outdoor demands and will help municipalities in the Basin balance their surface water and groundwater supply portfolios. Using non-potable water for irrigation also reduces the need for chemical treatment (for example, chlorine), and other costs associated with treating the water to required drinking water standards. New raw water non-potable systems would be expected to use surface water rights that are currently unused.

3.2.3 Industrial Conservation Example—Breweries/Malting Plants

Because industrial conservation measures are very industry-specific, one example industry, breweries, was examined in further detail during this study. Anheuser-Busch (A-B), a malting company located in Idaho Falls, set a goal in 2010 to reduce water use by 34 percent in their United States breweries. In addition to A-B, the Grupo Modelo malting plant in Idaho Falls could implement similar operations to reduce the amount of water used.

4 Municipal Water and Wastewater Analysis

4.1 Water and Wastewater Data Summary

The data summarized in this section represents peak and average annual flow rates based upon data provided by the municipalities and is not intended to capture seasonal fluctuations (increased water usage during the summer months).

4.1.1 Water Data Summary

The data provided by the cities of Idaho Falls, Rexburg, Driggs, and Victor were used to develop average day demands (ADD), maximum day demands (MDD), and per capita average day and maximum day demands in gallons per capita per day (gpcd). The existing water demands are summarized in Exhibit 3. Exhibit 3 also presents data for several case study cities (Nampa, Meridian, and Caldwell) that have implemented both water conservation measures and developed non-potable supply options.

EXHIBIT 3
Summary of Existing City Water Production
Municipal and Industrial Conservation Alternative

	Cities In and Near the Henrys Fork Basin				Case Study Cities		
	City of Driggs[a]	**City of Victor[b]**	**City of Idaho Falls[c]**	**City of Rexburg[d]**	**City of Nampa[e]**	**City of Meridian[f]**	**City of Caldwell[g]**
Maximum month (million gallons)	409	31	1,717	277	348	476	266
Maximum day (mgd)	13.6	1.0	57.2	9.2	11.6	15.9	8.9
Average month (million gallons)	60	12	692	140	227	251	151
Average day (mgd)	2.0	0.4	23.1	4.7	7.6	8.4	5.0
Population[h]	2,105	1,928	56,813	25,484	81,557	75,092	46,237
Maximum month use (gpcm)	194,300	16,068	30,227	10,870	4,267	6,336	5,746
Average month use (gpcm)	28,504	6,000	12,183	5,480	2,785	3,336	3,261
Maximum day use (gpcd)	6,460	536	1,008	362	142	211	192
Average day use (gpcd)	950	200	406	183	93	111	109

[a] City of Driggs information is based upon data provided by the City of Driggs for the years 2009 through 2011.
[b] City of Victor information is based upon data provided in the City of Victor Water System Environmental Information Document prepared by Sunrise Engineering, Inc. (December 2011).
[c] City of Idaho Falls information is based upon data provided for the years 2009 through 2011.
[d] City of Rexburg data is based upon 2011 data provided by the City of Rexburg.
[e] City of Nampa information is based upon 2008 data summarized in The City of Nampa Water Master Plan, December 2010.
[f] City of Meridian information is based upon 2009 data provided by the City of Meridian.
[g] City of Caldwell information is based upon 2007 data provided in The City of Caldwell Water Master Plan, January 2009.
[h] Population data based upon 2010 U.S. Census Bureau data. The City of Driggs population includes a population of about 445 additional people outside the city limits for a total population of approximately 2,105 people.
mgd = million gallons per day
gpcm = gallons per capita per month
gpcd = gallons per capita per day

Average day uses for cities in and near the Henrys Fork Basin ranged from 183 to 950 gpcd. Rexburg was the only in-basin municipality with average day use approaching the value of 150 gpcd typically used in water supply master planning (Kawamura, 2000), and the City's 183 gpcd value may provide a reasonable target for other municipalities in the vicinity to achieve through implementation of basic conservation measures. The case study cities of Nampa, Meridian, and Caldwell are not located near the Henrys Fork Basin, but at 104 gpcd they provide an upper threshold of water savings that may be achieved if all water conservation measures and non-potable supply options (including dual pipe systems) described in Section 3 are implemented.

Although not presented in Exhibit 3, some cities within the Henrys Fork Basin have varying seasonal water usage. For example, data provided by Driggs indicated that water usage was fairly consistent throughout the year and does not drop off during the winter months; however, data provided by Idaho Falls showed that water usage was significantly higher in the summer because of increased irrigation demands.

4.1.2 Wastewater Data Summary

It is important to differentiate between indoor and outdoor water use because the conservation measures and non-potable supply options are generally more effective at reducing outdoor water consumption. Wastewater flows provide an indication of the amount of indoor water use in each municipality, but wastewater flow data may also be affected by inflow and infiltration (I&I), which is defined as surface water and groundwater flowing into the sewer through manhole rims, cracked pipes, poor joints, and manhole walls. Exhibit 4 summarizes wastewater flows for Idaho Falls, Rexburg, Driggs, and Victor.

EXHIBIT 4
Summary of Existing City Wastewater Production
Municipal and Industrial Conservation Alternative

	City of Driggs[a]	City of Victor[b]	City of Idaho Falls[c]	City of Rexburg[d]
Maximum month (mgd)	0.69	0.40	12.40	2.50
Average day (mgd)	0.35	0.20	11.02	2.27
Population[e]	2,105	1,928	77,187	25,484
Maximum day use (gpcd)	328	206	161	98
Average day use (gpcd)	166	101	143	89
Indoor water usage (%)[f]	17%	51%	35%	49%

[a] City of Driggs information is based upon projected data for 2010 wastewater flow into the Driggs Wastewater Treatment Plant less the flow from the City of Victor.
[b] City of Victor information is based upon 2006 to 2009 data tabulated in the City of Victor Interceptor Capacity Analysis and Improvement Recommendations prepared by Sunrise Engineering, Inc. The City of Victor receives irrigation water from the Trail Creek Sprinkler Irrigation Company; therefore all of the potable water produced is indoor usage.
[c] City of Idaho Falls information is based upon data provided by the City of Idaho Falls for 2003 through 2011.
[d] City of Rexburg information is based upon data provided by the City of Rexburg for 2011.
[e] Population data based upon 2010 U.S. Census Bureau data. The City of Idaho Falls WWTF treats wastewater from Ammon, Iona, Lincoln, and Ucon; therefore, the population reflects the inclusion of these communities. The City of Driggs population includes a population of about 445 additional people outside the city limits for a total population of approximately 2,105 people.
[f] Indoor water usage (%) was calculated using the average day indoor use (see Exhibit 4, Average Day Use) and dividing it by the average day use of all potable water (see Exhibit 3, Average Day Use) and multiplying that fraction by 100 to get a percentage.

According to Metcalf & Eddy (2003), the average indoor water use without water conservation practices and devices is 74 gpcd. By using the average indoor water use presented by Metcalf and Eddy and the average total potable water use used in water supply master planning of 150 gpcd (Kawamura, 2000), the average indoor water usage should be approximately 50 percent, as shown in the calculation:

$$Indoor\ Water\ Usage\ =\ \left(\frac{74\ gpcd}{150\ gpcd}\right) \times 100 = 49.3\%$$

Data from both Victor and Rexburg indicate that their water usage is in alignment with the expected indoor-to-outdoor usage ratio. Driggs and Idaho Falls have lower ratios, indicating (particularly in Driggs), that most of the water used in these communities is outdoors.

4.2 Detailed Water Demand and Usage Review by Municipality

4.2.1 The City of Idaho Falls

Idaho Falls is located on the Snake River just outside the Henrys Fork Basin, and is the largest municipality in the area with a population of just over 56,800 on the basis of the 2010 Census. The Idaho Falls water supply system has a total capacity of 88.6 mgd through operation of 19 wells that pump water from the ESPA. According to the City of Idaho Falls 2010 Comprehensive Plan, water is distributed to approximately 24,500 customers. The water users are primarily residential; however, two large malting plants operate in Idaho Falls—Anheuser-Busch (A-B) and Grupo Modelo. A-B receives a portion of its water from the City, but the majority of the water used at the malting plant is supplied from wells owned and operated by A-B. Grupo Modelo does not receive any water from the City—all water used in the malting plant is supplied from wells owned and operated by Grupo Modelo.

The City of Idaho Falls does not have water service meters for the majority of water users. Rather than charge by the amount of water consumed, each customer pays a flat monthly fee for water service, as shown in Exhibit 5. The lack of metering is reflected in the City's average day use (see Exhibit 3). On average, the City of Idaho Falls uses 406 gpcd, of which only 35 percent can be accounted for as indoor water consumption based on sewer flows (see Exhibit 4); therefore, almost two-thirds of the water produced is consumed as outdoor usage.

On the basis of historical water data, the City of Idaho Falls has elevated water use during the summer months as a result of irrigation needs. This water use trend is typical for municipalities in Idaho.

EXHIBIT 5
Idaho Falls Non-Metered Water Rates*
Municipal and Industrial Conservation Alternative

Customer Classification	Monthly Rate
Single-family dwelling	$21.00
Apartment unit (per unit)	$15.78
Office buildings, banks, bowling alleys, lodges, markets per 1,000 square feet of area	$6.29
Restaurant and fast-food establishments	$55.80
All other non-metered customers per premises or building	$21.00

*Data provided by *City of Idaho Falls Comprehensive Plan* (2010)

4.2.2 The City of Rexburg

Rexburg is located on the South Fork Teton River near the confluence with the Snake River within the Henrys Fork Basin and has a population of approximately 25,500 people on the basis of the 2010 Census. The Rexburg water system is supplied by six wells with a maximum capacity of approximately 14 mgd. According to the City of Rexburg 2020 Comprehensive Plan, water is distributed to approximately 6,500 household customers. The Rexburg community is primarily residential but Brigham Young University-Idaho (BYU-Idaho) is located in the city. BYU-Idaho is the largest private school in Idaho with approximately 15,000 students and is experiencing a growth rate of 1,000 students per year. Rexburg has large housing units under construction near BYU-Idaho to consolidate the population around the campus. These new developments will not have a lot of landscaping and, therefore, will not have a large irrigation demand. Melaleuca, Inc., a wellness supply company, is the largest industry in Rexburg; however, the water usage at Melaleuca was not available for review or considered in this study.

The City of Rexburg has water service meters installed to meter all of their customers' water usage, but charges their water customers a monthly minimum flat fee on the basis of the size of connection (see Exhibit 6). Their flat fee includes a usage allowance of 1,667 gpd, and if users exceed the allowance, they will be charged an additional fee per 1,000 gallons used (see Exhibit 6). Rexburg has replaced all of their water meters for residential and commercial users within the last six years. Areas such as city parks and city owned landscaping is now metered so Rexburg can accurately access their water consumption. Also within the last 5 years, Rexburg has taken an initiative to irrigate larger green spaces such as parks and new schools with non-potable surface water.

EXHIBIT 6
Rexburg Non-Metered Water Rates[a]
Municipal and Industrial Conservation Alternative

Connection Size	Monthly Minimums—In City[b]	Monthly Minimums —Out of City[c]
0.75-inch	$15.62	$20.31
1.0-inch	$39.05	$50.77
1.25-inch	$54.67	$71.07
1.5-inch	$70.29	$91.38
2.0-inch	$101.53	$131.99
3.0-inch	$148.39	$192.91
4.0 inch	$187.44	$243.67
6.0-inch	$374.88	$487.34
8.0-inch	$562.32	$731.02

[a] Data provided by the City of Rexburg (2011).
[b] The in city fee for usage in excess of allowance: $0.99 per 1,000 gallons above 1,667 gpd.
[c] The out of city fee for usage in excess of allowance: $1.49 per 1,000 gallons above 1,667 gpd.

Rexburg has a relatively low average per capita usage when compared to other cities in the Henrys Fork Basin. However, the data provided by the City only included 2011 water and wastewater data, and historical trends may show an increase in the per capita usage. On the basis of 2011 data, the City of Rexburg uses water in a relatively efficient manner. The City, on average, uses 183 gpcd (see Exhibit 3), which may be a reasonable target for other municipalities in the vicinity to achieve through implementation of basic conservation measures. Of the water produced, about 50 percent can be accounted for as indoor water consumption (Exhibit 4); therefore, approximately 50 percent of the average per capita usage is consumed as outdoor usage.

Based upon historical water data, the City of Rexburg has elevated water use during the summer months as a result of irrigation needs. This water use trend is typical for municipalities in the state of Idaho.

4.2.3 The City of Driggs

Driggs is located on the upper Teton River in the Henrys Fork Basin. Driggs has a population of approximately 1,700 people based on the 2010 Census and with 445 additional customers outside the city limits the water service population is approximately 2,105 people. Driggs is mainly residential with a mix of primary and secondary residences. Because Driggs is located near the Teton Mountains, Grand Targhee Ski Resort, and Jackson, Wyoming, many of the residences are second homes that are only occupied during the winter and summer. Driggs supplies customers with potable water from six wells and a local spring, with a total capacity of 4,875 gpm. According to discussion notes from the City of Driggs Water System City Council meeting on May 10, 2010, the City of Driggs has just over 1,200 Equivalent Residential Connections (ERCs).

Driggs has water service meters installed to meter a majority of customer water usage, but charges users a flat fee on the basis of the size of connection (see Exhibit 7). Their flat fee includes a usage allowance in gallons and if the users exceed the allowance, they will be charged an additional $1.00 per 1,000 gallons used.

EXHIBIT 7
Driggs Non-Metered Water Rates
Municipal and Industrial Conservation Alternative

Connection Size	Base Rate[a]	Water Allowance[b]
0.75- or 1.0-inch	$27.00	Includes 10,000 gallons
1.5-inch	$67.50	Includes 25,000 gallons
2.0-inch	$121.50	Includes 45,000 gallons
3.0-inch	$175.50	Includes 65,000 gallons
4.0-inch	$215.99	Includes 80,000 gallons
6.0-inch	$323.99	Includes 120,000 gallons

[a] The fee for usage in excess of allowance: $1.00 per 1,000 gallons.
[b] Data provided by the City of Driggs (2010).

Many of the City’s potable water pipes are currently buried at shallow depths between 2 and 4 feet below grade, which is not below the frost depth and poses potential freezing issues. According to the City of Driggs Public Works Director, many of their users (at least half of their customers) are required to continuously run their faucets with a stream of water during winter to prevent pipes in the distribution system from freezing. As a result of the depth of bury, many of the potable water pipes in the City of Driggs are cracked and leak. According to the Director, the soils in the area are predominantly alluvial deposits that drain well; therefore, the water that is leaking through the pipes does not come to the surface to provide an indication of where the leakage may be located.

The potential of water leaking from broken pipes is reflected in the City’s average day use (see Exhibit 3). The City of Driggs, on average, uses 950 gpcd. Of the water produced, only 17 percent can be accounted for as indoor water consumption (see Exhibit 4). Therefore over 83 percent of the average per capita usage is likely water leaking from broken pipes, with a fraction of that water being consumed as outdoor usage.

On the basis of historical water data, the City of Driggs has elevated water use during the summer months as a result of irrigation needs and also has elevated water use during the winter months. The City of Driggs has elevated water use during the winter months because of the practice of continuously running faucets to prevent pipes in the distribution system from freezing. This water use trend is not typical for municipalities in the state of Idaho.

4.2.4 The City of Victor

Victor is located on the upper Teton River in the Henrys Fork Basin about 8 miles south of Driggs and includes a population of just over 1,900 people according to the 2010 Census. Victor's service area is mainly primary and secondary residences. As is the case with Driggs, Victor is located near the Teton Mountains, Grand Targhee Ski Resort, and Jackson, Wyoming. Many of the residences are second homes that are only occupied during the winter and summer. Victor has two water sources—the Game Creek Springs and the Willow Creek Well, with production capacities of 350 and 800 gpm respectively. According to the Victor Water System Facilities Planning Study, the city has 971 ERCs.

The City has water service meters installed to meter the majority of customer water usage and has a tiered water rate structure. Victor charges their users a flat fee in addition to a usage fee based upon the amount of water used (see Exhibit 8). If the user exceeds 12,000 gallons in one billing cycle the user will be charged the first tier overage rate, and if the user exceeds 20,000 gallons in one billing cycle the user will be charged the second tier overage rate. A tiered water rate structure is effective in encouraging users to conserve water because there is a fiscal incentive to reduce the amount of water used.

EXHIBIT 8
Victor Metered Water Rates*
Municipal and Industrial Conservation Alternative

Customer Classification	Monthly Rate
Base rate	$24.00 per Equivalent Residential Connection (ERC)
Usage fee	$1.75 per 1,000 gallons of usage up to 12,000 gallons in one Billing Cycle (approximately one month)
First tier overage fee	$2.00 per 1,000 gallons of usage between 13,000 gallons to 20,000 gallons in one Billing Cycle
Second tier overage fee	$3.00 per 1,000 gallons of usage above 20,000 gallons in one Billing Cycle

*Data provided by Victor Water System Environmental Information Document (2011).

As is the case with Driggs, many of Victor's potable water pipes are currently buried at shallow depths between 2 and 4 feet below grade, which is not below the frost depth and poses potential freezing issues. According to the *Victor Water System Environmental Information Document* (2011), "to prevent freezing, the City has its residents continuously run a stream of water in the winter time." Victor has not historically collected water service meter data in the winter time to allow users to run their faucets continually to prevent pipes from freezing; therefore, the customers are charged a flat fee during the winter months rather than a usage fee.

The City of Victor estimates that average per capita usage is 200 gpcd, as shown in Exhibit 3. This usage may be realistic for the City; however, the City of Victor has issues with broken and leaking water pipes as does Driggs. Because actual water usage data were not provided, actual water production data may show a larger average per capita usage because much of the water is likely leaking from the pipes into the ground. On the basis of the assumed average per capita usage, just over 50 percent can be accounted for as indoor water consumption (see Exhibit 4); therefore half of the water produced can be accounted for as outdoor usage.

Victor receives the bulk of their irrigation water from Trail Creek Sprinkler Irrigation Company. The City of Victor has a dual-pipe system. One set of pipelines is owned and operated by the City and supplies potable water throughout Victor. This system is also known as culinary water system. The second set of pipelines is owned and operated by the Trail Creek Sprinkler Irrigation Company and supplies pressurized irrigation water throughout Victor.

As is the case with Driggs, Victor has elevated potable water use during the winter because many users are required to continuously run their faucets with a stream of to prevent pipes in the distribution system from freezing. This water use trend is not typical for municipalities in Idaho.

4.3 Case Studies—Cities Beyond the Henrys Fork Basin that Have Implemented Conservation Measures and Developed Non-potable Supply Options

Several case study cities outside the Henrys Fork Basin, specifically the Cities of Nampa, Meridian, and Caldwell, all located in western Idaho's Treasure Valley, are reviewed here because they have taken steps to conserve water or use other non-potable water sources to meet outdoor demands. These case studies provide an important point of reference to estimate an upper threshold of water savings that may be achieved if all water conservation measures and non-potable supply options (including dual pipe systems) described in Section 3 were implemented.

4.3.1 The City of Caldwell

According to Exhibit 3, Caldwell uses 109 gpcd. Caldwell has meters installed on the majority of their users and charges on the basis of the amount of water used. The City also owns and operates an irrigation district called the Caldwell Municipal Irrigation District. The irrigation district operates and maintains all city pressurized irrigation systems and provides non-potable water for outdoor usage.

4.3.2 The City of Meridian

Meridian has taken great measures to conserve water, as shown in the City's per capita average daily usage of 111 gpcd (see Exhibit 3). The City of Meridian has meters installed on the majority of their users and charges them on the basis of the amount of water used ($1.86 per 1,000 gallons used). Meridian currently has approximately 26,000 water service connections. Non-potable water supply options implemented by the City are described in the following text.

According to the City of Meridian Water Conservation Plan, Meridian has been producing Class A reclaimed water since 2009, and beneficially reuses a portion of the reclaimed water for irrigation at a local park. In fact, one of the City of Meridian's goals is to reclaim and reuse 80 percent of their wastewater by 2030 to decrease water consumption within the municipality (City of Meridian, 2011).

The City currently has a flow-based National Pollutant Discharge Elimination System (NPDES) permit limit which was the initial driver for the reclaimed water program. Meridian has had substantial growth and the City worried that they would meet or exceed the flow limit within a few years. Reusing a portion of their wastewater effluent as reclaimed water decreases the amount of flow being discharged from their wastewater treatment plant, and, therefore, the maximum flow in their NPDES permit would not be exceeded.

Although growth in the City has slowed over the past couple of years, a pending NPDES permit is anticipated and has become the new driver for the program. The permit will have more stringent effluent nutrient limitations resulting from the Snake River-Hells Canyon Total Maximum Daily Load (TMDL) and Boise River phosphorus load allocations. By implementing the reclaimed water program the City's wastewater treatment plant already treats the wastewater to Class A standards; therefore, the program will help the City achieve the anticipated low phosphorus levels. Also, the substantial growth that the City has seen over the past decade has caused concerns about whether potable water production will be limited because of water rights constraints. Implementation of the reclaimed water program will alleviate irrigation and non-potable water demands throughout the City, thereby reducing the demands on the potable water supply.

Meridian plans to reduce the need for other sources of water through the use of reclaimed water in irrigation, dust suppression, toilet flushing, lined surface water features, sanitary sewer flushing, and fire suppression throughout the City. In the future, the City also plans to replenish groundwater supplies through ASR with reclaimed water.

In addition to the City's reclaimed water goals, non-potable irrigation water is supplied to a portion of the users within Meridian. The City of Meridian does not own or operate the pressurized irrigation system. The City of Meridian also has information on their website to educate users on ways they can conserve water.

4.3.3 The City of Nampa

As shown in Exhibit 3, the City of Nampa uses 93 gpcd and currently has approximately 28,000 water service connections. Nampa has meters installed on majority of their users and charges based upon water consumption. Non-potable water supply options implemented by the City are described in the following text.

The City of Nampa has non-potable irrigation water available to residents for outdoor usage. The City of Nampa does not own or operate the pressurized irrigation system. According the Nampa Waterworks website, users can receive violations for overwatering, the City of Nampa Codes Section 8-1-23 Waste of Irrigation Water states, "It is unlawful for any person to allow or permit the waste of irrigation water by allowing said water to flow on or upon any street, alley or other public right-of-way in the City, or by allowing said water to flow on or upon adjacent or adjoining property so as to cause the unnecessary inconvenience or expense to the owner of such adjacent or adjoining property or by using more of said water than good husbandry requires for the maintenance and cultivation of the premises being irrigated. Waste of said water can result in a citation if situation has not been corrected." The City of Nampa has a link on their website to report overwater and will have a technician dispatched to verify overwatering. The City of Nampa also has links on the website that educate users on ways in which they can conserve water.

4.4 Municipal Water and Wastewater Analysis Conclusions

It is evident from the analysis performed for this study that municipalities within or near the Henrys Fork Basin could take additional measures to conserve water. The average day per capita water use in three out of the four municipalities studied was much higher than the value of 150 gpcd typically used in water supply master planning (Kawamura, 2000). All four municipalities have a much higher average day per capita usage than municipalities that are aggressively implementing conservation measures or using non-potable water supplies for outdoor use (for example, Meridian, Nampa, and Caldwell). On the basis of the information collected from the municipalities within or near the Henrys Fork Basin, CH2M HILL concludes the following:

- Water supply to municipal and industrial users in the Henrys Fork Basin is almost exclusively from groundwater sources. Wells are constructed in shallow, often alluvial, aquifers. A portion of the water used in the Henrys Fork Basin includes spring water.
- A low percentage of the water used in these municipalities is indoor usage, which suggests that a majority of the water used is for outdoor purposes such as irrigation.
- A low percentage of the water used in these municipalities is accounted for as industrial use. Idaho Falls has two large industrial water users, the Anheuser-Busch malting plant and Grupo Modelo malting plant; however, these breweries have private wells that they own and operate.
- The municipalities either do not have meters installed on every connection or the municipalities have meters but are not collecting water data and do not charge customers on the basis of the amount of water used. Both practices give little incentive for users to conserve water.
- The smaller municipalities have aging and poorly constructed water distribution systems that do not have proper bury below frost depth, which has led to pipes that have excessive leakage. It is recommended that the smaller municipalities with pipe freezing problems replace distribution systems with pipes at proper depth of bury to reduce leakage and pumping requirements from groundwater supplies.
- Because of the potential freezing issues, many of the water users in small municipalities are advised to continually run faucets to prevent the water lines from freezing during the winter. In addition to the increased pumping requirements, running water through a faucet throughout the winter leads to higher than necessary loading rates at the wastewater treatment plants, which could require larger wastewater facilities than necessary.
- The City of Rexburg makes efficient use of water, averaging 183 gpcd. This value may provide a reasonable target for other municipalities in the vicinity to achieve through implementation of basic conservation measures like metering, education, and replacement of pipes currently buried above frost depth.
- The case study cities, which have an average use of 104 gpcd, provide an upper threshold of water savings that may be achieved if all water conservation measures and non-potable supply options (including dual pipe systems) described in Section 3 are implemented.

On the basis of the conclusions drawn from information provided by the municipalities, the following sections outline measures that can be implemented to conserve water.

5 Implementation of Potential Municipal Water Conservation Measures and New Non-potable Water Supply Options

As stated previously, growth in domestic, commercial, municipal, and industrial water use is currently considered to be limited in the Henrys Fork Basin by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios. The municipal water conservation measures and new non-potable water supply options discussed in this section may allow for additional growth. Prediction of the specific water usage impact of individual conservation measures and supply options was beyond the scope of this analysis. However, the conservation measures and supply options were evaluated for feasibility of implementation, and two packages were established that would reduce water consumption to two different levels. Package 1 consists of several individual measures that could be taken to help the cities of Driggs, Victor, Idaho Falls, and Rexburg achieve an average per capita water use similar to that typically used in water supply master planning (150 gpcd; Kawamura, 2000). Package 2 consists of new non-potable water supply options that may further reduce water use of municipalities in and near the Basin to similar levels achieved in the case study cities (104 gpcd).

5.1 Package 1—Municipal Water Conservation Measures

Package 1 consists of several water conservation measures, including metering, education, and replacement of pipes currently buried above frost depth. The average day per capita water use in three out of the four municipalities studied was much higher than the value of 150 gpcd typically used in water supply master planning (Kawamura, 2000). This value represents a reasonable target for municipalities in the vicinity (Driggs, Victor, Rexburg, and Idaho Falls) to achieve through implementation of the measures discussed below. Exhibit 9 presents an estimate of the amount of water that could be conserved through implementation of Package 1 conservation measures. Replacement of lines below the frost depth, while beneficial for municipalities, makes no change to the water budget as water lost from broken lines goes immediately back to the groundwater system. Other conservation measures may result in decreased groundwater pumping by municipalities, but because a large part of their pumped groundwater is discharged through treatment plants to the river, these conservation measures would result in less water being discharged to the river reducing supplies for downstream surface water users.

EXHIBIT 9
Summary of Potential Water Saved through Implementation of Package 1 Elements
Municipal and Industrial Conservation Alternative

	Driggs	Victor	Idaho Falls	Rexburg
Population[a]	2,105	1,928	56,813	25,484
Current average day water use (gpcd)	950	200	406	183
Projected future average day water use (gpcd)	150	150	150	150
Projected water savings (gpcd)	800	50	256	33
Projected water savings[b] (af/year)	1,890	110	16,290	940

[a] Population data based upon 2010 U.S. Census Bureau data.
[b] Projected water savings were rounded to the nearest 10 af.

5.1.1 Metering

The concept of metering was introduced in Section 3.1.1. As discussed in Section 4.2, the Cities of Rexburg, Driggs, Victor, and Idaho Falls currently have the following metering and rate structure programs in place:

- Idaho Falls: Does not meter all of their customers because there are not meters installed on majority of their customers. Because there are not meters installed, Idaho Falls charges their customers a flat fee.
- Rexburg: Currently meters all of their customers. Rexburg charges water customers a monthly minimum flat fee based of the size of connection. The flat fee includes a usage allowance in gallons and if the users exceed the allowance, they are charged an additional fee per 1,000 gallons used.

- Driggs: Currently meters the majority of their customers. Driggs charges their water customers a monthly minimum flat fee based of the size of connection. The flat fee includes a usage allowance in gallons and if the users exceed the allowance, they will be charged an additional fee per 1,000 gallons used.
- Victor: Currently meters the majority of their customers. Victor is the only city in the Basin that has implemented a tiered rate structure.

5.1.2 Public Education

The concept of public education is introduced in Section 3.1.2, and additional details are provided in the remainder of this section. Public education programs can be an effective means to inform water users of the importance of water conservation. To inform the public about water conservation many different programs can be developed and implemented. These programs can be as easy as sending informative brochures in utility bills about water conservation or as extensive as implementing outreach programs in elementary schools.

School Outreach

Many cities have been leading highly successful education programs for elementary students, typically Grades 4, 5, or 6, informing elementary students about their local watershed, water treatment, and wastewater treatment programs. These programs educate students through in-class lessons, videos, and field trips that encourage students to learn about the water cycle, their city's water system, key terms, and the processes that go into treating both drinking water and wastewater. Cities within the Henrys Fork Basin can implement similar programs to educate students about the importance of water conservation.

Water Conservation Marketing

The cities within the Henrys Fork Basin can distribute promotional handouts in utility bills or in public locations. Public works employees could give presentations at association meetings (for example, Rotary Club meetings), or at group functions to promote water conservation. Cities can also provide extensive information on water conservation for their customers on the city's website.

Technical Study

The cities within the Henrys Fork Basin can commission a water conservation survey to assess residents' views on water conservation. The purpose of the survey would be to assist the cities in developing water conservation goals for the coming years. The survey findings could be used to develop social marketing strategies for conservation programs to raise awareness and change water use patterns. The City of Victor commissioned a water conservation survey in December 2011 to assess the residents' views on water conservation, and other cities in the Henrys Fork Basin could use the City of Victor's survey as a baseline for their surveys. On the basis of the results of Victor's water conservation survey, majority of the Victor residents believe that it is very important to conserve water. Victor residents believe that the most appropriate water conservation measure to introduce in their community is implementation of a tiered water structure, which charges lower rates for lower water use. On the other hand, they believe the least appropriate conservation measure would be the introduction of mandatory water restrictions during the summer, such as only allowing outside watering on certain days/times. Currently, majority of the residents of Victor water their yard for about hour, every day in the summer.

Provide Information to Reduce Landscaping Water Demands

Cities can inform customers about the types of plants that do not require a lot of water consumption to reduce the amount of water consumed as outdoor use. In addition to education about low water consumption plants, cities can implement land use regulations within city code to encourage landscaping that requires lower water usage for new developments.

5.1.3 Replace Water Lines Buried Above Frost Depth

The concept of water line replacement is introduced in Section 3.1.3, and additional details are provided in the remainder of this section. On the basis of the information gathered in this study, the smaller municipalities in the Henrys Fork Basin (Driggs and Victor) currently have water distribution pipelines buried between 2 and 4 feet below grade. The depth of bury poses potential freezing issues in the winter because the water pipes are not buried below frost depth, which is typically 6 feet below grade. In cities where this is an issue, water users are encouraged to continually run water to prevent the pipes from freezing. By replacing the water lines buried above frost depth, the amount of water used will decrease throughout the year, especially during the winter. Replacing water lines would also decrease the amount of energy that a municipality will need to use to provide water to customers because the wells would not need to pump as much water out of the aquifer to maintain pressure in the system to serve users.

Driggs has already replaced portions of their potable water pipes and buried the new pipes below frost depth at 6 feet below grade. The City of Driggs' Public Works Director stated that after the water lines were replaced and buried below frost depth, the users connected to the new water line did not need to run water continuously in the winter months to prevent the pipes in the distribution system from freezing.

If the pipelines are replaced, municipalities will no longer need to pump as much water through their systems to maintain pressure. Once the pipelines are replaced and buried below frost depth, the municipalities will also no longer need to advise users to continually run faucets during winter months to prevent the potable water pipelines from freezing.

5.2 Package 2—New Non-potable Water Supply Options

Growth in domestic, commercial, municipal, and industrial water use in the Henrys Fork Basin is currently considered to be limited by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios. Should future economic conditions warrant growth, municipalities in and near the Basin may need to consider in investing in costly additional surface water treatment or non-potable conveyance systems since new groundwater permits have been difficult to acquire.

Package 2 consists of new non-potable water supply options that build on Package 1 presented in the previous section. Assuming the conservation measures from Package 1 have already been implemented and reduced average water use for municipalities in and near the Basin to 150 gpcd (see Exhibit 9), the supply options associated with Package 2 (reclaimed water, raw water non-potable systems, and industrial conservation) may be able to further reduce water consumption. For the sake of this analysis, it was assumed that implementation of the Package 2 elements discussed below would reduce water consumption in municipalities in and near the Basin to 104 gpcd (average water use for the case study cities). Exhibit 10 presents an estimate of the amount of water that could be conserved through implementation of Package 2 elements.

EXHIBIT 10
Summary of Potential Water Saved through Implementation of Package 2 Elements
Municipal and Industrial Conservation Alternative

	Driggs	Victor	Idaho Falls	Rexburg
Population[a]	2,105	1,928	56,813	25,484
Average day water use following Package 1 Implementation (gpcd)	150	150	150	150
Projected future average day water use following Package 2 Implementation (gpcd)	104	104	104	104
Projected water savings (gpcd)	46	46	46	46
Projected water savings[b] (af/year)	110	100	2,930	1,310

[a] Population data based upon 2010 U.S. Census Bureau data.
[b] Projected water savings were rounded to the nearest 10 af.

5.2.1 Reclaimed Water

The concept of reclaimed water is introduced in Section 3.2.1 and additional details are provided in the remainder of this section. Implementing a reclaimed water system requires an advanced wastewater treatment process to produce highly treated wastewater. Reclaimed water can be beneficially reused through land application, supply to industrial users, and replenishing groundwater supplies through ASR (subject to legal constraints described in

Section 8). To reduce the need for other sources of water, wastewater can be treated to Class A standards and reused. The Idaho Department of Environmental Quality has established standards for the reuse of reclaimed water and these standards must be met before a municipality can use reclaimed water. Creating reclaimed water that meets Class A standards would require significant and costly improvements to existing wastewater treatment processes. In addition to increased wastewater treatment, a dual pipe system and a series of pump stations will need to be constructed to convey the reclaimed water to open spaces, parks, other suitable areas for irrigation, or to industrial users for use as non-potable water. Because a large part of the groundwater pumped by the Cities is currently discharged through treatment plants to the river, becoming part of the surface water supply for downstream users, this option would increase supplies for Municipalities at the expense of downstream surface water users.

5.2.2 Raw Water Non-potable Systems

The concept of raw water non-potable systems is introduced in Section 3.2.2, and additional details are provided in the remainder of this section. A dual-pipe system for raw surface water could be constructed in cities near or within the Henrys Fork Basin for irrigating open spaces, parks, or other suitable areas. This new, non-potable water supply would decrease the amount of potable water consumed as outdoor usage. Installing a dual pipe system and a series of pump stations to convey the raw water to open spaces, parks, other suitable areas for irrigation, or to industrial users for use as non-potable water would require costly system improvements. To utilize this new non-potable water supply the municipality would need to more fully utilize existing surface water rights or obtain additional surface water rights to convey water for irrigation purposes. It is unlikely that new surface water rights for irrigation-season uses could be issued without new surface water storage being constructed.

5.2.3 Industrial Conservation Example—Breweries/Malting Plants

The concept of industrial conservation is introduced in Section 3.1.4, and additional details are provided in the remainder of this section. According to A-B's website, A-B has "steadily reduced its global water usage rate over the past year by employing a mix of engineering improvements, operational innovations, and strong awareness and behavior-driven actions to optimize efficiency in every plant."

Many of the A-B breweries in China have been recycling the effluent from the brewery to public housing nearby, similar to reclaimed water. The recycled brewery effluent is used for washrooms, landscaping, and firefighting. According to A-B, they are considering expanding the project to 32 other factories in China. To recycle effluent from breweries in the U.S., the brewery would be required to treat the effluent to Class A standards and acquire a permit to recycle the treated water.

6 Cost Estimate

6.1 Package 1—Municipal Water Conservation Measures

A summary of the total implementation cost and cost per acre-foot of water conserved following implementation of all Package 1 measures is presented in Exhibit 11, and a more detailed breakdown of the cost for each measure is provided in the following sections.

EXHIBIT 11
Cost Estimate for Package 1 Elements
Municipal and Industrial Conservation Alternative

Conservation Measure[b]	Total Implementation Cost[a]				Total
	Driggs	Victor	Idaho Falls	Rexburg	
Metering	\$80,000 - \$450,000	\$70,000 - \$410,000	\$2,130,000 - \$12,070,000	\$960,000 - \$5,420,000	\$3,240,000 - \$18,350,000
Education	Minimal	Minimal	Minimal	N/A	Minimal
Replace water lines buried above frost depth	\$1,000,000	\$1,000,000	N/A	N/A	\$2,000,000
				Combined Total Implementation Cost	\$5,240,000 - \$20,350,000
				Combined Anticipated Water Savings (af/yr)	19,230
				Cost Per Unit Yield[c] (\$/af)	300 – 1,100

[a] Total estimated construction costs were rounded to the nearest \$10,000.
[b] For detailed cost estimates and source of cost data see Exhibits 12 and 13.
[c] Cost per unit yield was rounded to the nearest \$100/af.

6.1.1 Metering

To estimate the cost of meter installation, it was assumed that \$750 per connection would cover the cost of the meter, an isolation valve, and the associated installation costs. Exhibit 12 below presents the estimated cost of meter installation for municipalities in and near the Basin. A range of costs was estimated to reflect uncertainty regarding the number of meters currently installed in Idaho Falls and the number of operational meters in Driggs, Victor, and Rexburg.

EXHIBIT 12
Metering Cost Estimate
Municipal and Industrial Conservation Alternative

	Driggs	Victor	Idaho Falls	Rexburg
Population[a]	2,150	1,928	56,813	25,484
Assumed number of connections[b]	702	643	18,938	8,495
Assumed Percentage of Meters to Replace[c]	15% - 85%	15% - 85%	15% - 85%	15% - 85%
Estimated cost per connection[d]	\$750	\$750	\$750	\$750
Estimated total cost[e]	\$80,000 - \$450,000	\$70,000 - \$410,000	\$2,130,000 - \$12,070,000	\$960,000 - \$5,420,000

[a] Population data based upon 2010 U.S. Census Bureau data. The City of Driggs population includes a population of about 445 additional people outside the city limits for a total population of approximately 2,105 people.
[b] Number of connections assumes that an average of three people reside in each household or dwelling.
[c] Rexburg, Driggs, and Victor already have meters in place. However, some meters may need to be replaced because they are not operational.
[d] Cost per connection is based upon data summarized in the City of Victor Water System Facilities Planning Study, April 2011.
[e] Estimated total costs were rounded to the nearest \$10,000.

6.1.2 Public Education

The cost of public education is minimal compared to the other conservation alternatives evaluated. The cities near or within the Henrys Fork Basin could implement water conservation education programs for minimal cost.

6.1.3 Replace Water Lines Buried Above Frost Depth

Data reviewed in Section 4.2 indicated that small municipalities in the Basin (Driggs and Victor) have water lines currently buried above frost depth, which leads to freezing, breaking, and leakage. However, this issue does not appear to be prevalent in the larger cities of Rexburg and Idaho Falls. Therefore, cost estimates for pipe replacement were developed for the smaller municipalities only. As stated previously, the City of Driggs replaced portions of their water mains in 2011. Using cost information provided by the City of Driggs, it is estimated that it would cost approximately $100 per linear foot to replace water mains with new 8-inch ductile iron pipelines. This cost includes installation of the water main, engineering, and administrative costs. Exhibit 13 below summarizes the estimated cost of water main replacement for a small municipality (assumed applicable to both Driggs and Victor).

EXHIBIT 13
Water Line Replacement Cost Estimate
Municipal and Industrial Conservation Alternative

	Small Municipality (Driggs[a] or Victor)
Assumed total length of pipe[b] (linear feet)	10,000
Estimated cost per linear foot[c]	$100
Estimated total cost	$1,000,000

[a] Although Driggs replaced a portion of shallow pipes in 2011, this estimate assumes full system pipe replacement.
[b] Total pipe length for Driggs and Victor was not provided, so this value was assumed as being representative of a small municipality.
[c] The cost per linear foot was estimated based upon data provided by the City of Driggs from the 2011 water replacement project. The unit price includes engineering (20%) and administrative costs (5%).

It is estimated that it would cost a small municipality approximately $1 million to replace water lines throughout the city. The cost per acre foot of water saved per year is approximately $700 for a small municipality.

6.2 Package 2—New Non-potable Water Supply Options

As indicated in Section 5.2, growth in domestic, commercial, municipal, and industrial water use in the Henrys Fork Basin is currently considered to be limited by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios. Should future economic conditions support growth, municipalities in and near the Basin may need to consider in investing in costly additional surface water treatment or non-potable conveyance systems since new groundwater permits have been difficult to acquire.

It is beyond the scope of the current study to acquire all the detailed information necessary to quantify implementation costs for the Package 2 supply options (reclaimed water, raw water non-potable systems, and industrial conservation). However, those costs, which may include wastewater treatment plant upgrades to produce Class A water, construction of additional pump stations, and construction of miles of transmission and distribution pipes to convey the treated wastewater or raw water to the points of application, could be further investigated in a future phase of the study.

7 Basin Water Needs

Municipal water conservation measures associated with Package 1 (metering, public education, and replacement of water lines currently above frost depth) would conserve approximately 19,230 af per year for the municipalities, assuming full implementation in Driggs, Victor, Idaho Falls, and Rexburg. Further municipal savings on the order of 4,450 af per year could be achieved through implementation of the new non-potable water supply options included in Package 2 (reclaimed water, non-potable systems, and industrial conservation) in Driggs, Victor, Idaho Falls, and Rexburg.

Since growth of these municipalities is currently considered to be limited by inadequate water supply or an inability to balance use of surface water and groundwater supply portfolios (high costs for additional surface water treatment or non-potable conveyance systems and inability to acquire new groundwater permits), it is assumed that existing groundwater rights would continue to be fully utilized. Consequently, although municipalities would benefit from implementation of both packages, these conservation measures and new non-potable water supply options have the potential to reduce the amount of water currently available to downstream in- and out-of-basin users. In short, while these measures may provide additional supplies for municipalities, it may come at the expense of other water users in the basin.

Basin water needs are discussed in further detail in the *Draft Henrys Fork Watershed Basin Study Water Needs Assessment* (Bureau of Reclamation, 2012).

8 Legal, Institutional, or Policy Constraints

- **Water Rights.** Although not considered at this level of study, water rights would need to be accounted for prior to utilization of any new surface water source (e.g., raw water non-potable systems).
- **Reclaimed Water.** Appropriate permits would have to be acquired to implement water reuse systems.
- **Aquifer Storage and Recovery.** Although the State of Idaho does not recognize conventional ASR, cities in the Basin could (and in some cases have previously done so) acquire existing surface water shares in a canal system through annexation. An application for a new water right permit could then be accompanied by a mitigation plan through which their surface water shares could be recharged into the groundwater in an amount equal to the City's pumping under their new permit. This scenario was successfully implemented by Micron in the Boise area many years ago.

9 Environmental Benefits and Impacts

Alternatives in this study were evaluated for benefits and impacts related to the following:

- Impacted river segments
- Change in connectivity
- State Aquatic Species of Special Concern (Yellowstone Cutthroat Trout and Rainbow Trout)
- Natural environment (including wildlife habitat impacts, federally listed species, wetlands, State species of concern, and special river designations)

Municipalities in the Basin currently provide customers with water pumped from wells rather than water diverted from surface sources, so implementation of municipal and industrial conservation measures would not be likely to directly impact any river segments. Indirectly, decreased groundwater pumping has the potential to result in increased aquifer discharge to local river segments, effectively enhancing downstream connectivity, but such changes may not be observed if the cities utilize their full rights following implementation of the measures (less water may actually be available for downstream uses). If raw water non-potable systems were implemented, additional water surface water may be withdrawn from local river reaches. Yellowstone cutthroat trout and other natural environment factors listed above are likely to be relatively unaffected by implementation of municipal and industrial conservation measures and new non-potable water supply options.

10 Land Management, Recreation and Infrastructure Impacts and Benefits

Municipal and industrial conservation measures and new non-potable water supply options are unlikely to have substantial benefits or impacts related to land management, recreation, and infrastructure. However, there may be temporary construction impacts to roads during installation of new pipe systems, and

11 Evaluation Criteria

11.1 Stakeholder Group Measurable Criteria

There are four Stakeholder Group Measurable Criteria, with results summarized in Exhibit 14:

- **Water Supply.** The net change for in basin and out of basin water budgets in acre-feet is described in Section 7 and summarized in Section 2.
- **Water Rights.** Water rights were not specifically addressed during this level of study, but known legal, institutional, and policy constraints are summarized in Section 8.
- **Environmental Considerations.** Environmental benefits and impacts are summarized above in Section 9.
- **Economics.** The estimated reconnaissance-level field cost to construct the project is summarized in Section 6.

EXHIBIT 14
Stakeholder Group Measurable Criteria Summary
Municipal and Industrial Conservation Alternative

Stakeholder Group Measurable Criteria	Criteria Characterization
Water supply (in-basin water transfer)	19,230 af/yr
Water supply (out-of-basin water transfer)	Minimal
Legal, institutional, or policy constraints (yes, no)	Yes
Environmental considerations (net positive, negative or neutral)	Neutral
Economics (reconnaissance-level field costs for implementation)	$5,240,000 - $20,350,000

11.2 Federal Viability Tests

The four federal viability tests used to evaluate potential projects are listed below:

- **Acceptability**
- **Effectiveness** (extent to which basin needs are met)
- **Completeness** (extent to which all needs are met)
- **Efficiency** (relative construction/implementation cost per af)

For alternatives that are carried forward to future phases of the Basin Study, the information needed to evaluate each of the criteria listed above will be further developed and refined.

12 Key Assumptions and Limitations

Cost estimates are comparative and preliminary. Future concept refinements could potentially change the ranking of alternatives by cost. Costs are relative and are not intended for budgeting.

13 Data Sources

Water usage and sanitary sewer flow data was collected from the following municipalities in or near the Henrys Fork Basin:

- City of Idaho Falls
- City of Rexburg
- City of Driggs
- City of Victor

13.1.1 City of Idaho Falls

The City of Idaho Falls provided water and wastewater data from the City's supervisory control and data acquisition system and flow meters throughout Idaho Falls. Water production data was provided for 2009 through 2011, and wastewater data was provided for 2003 through 2011. The data provided were helpful to understand the City of Idaho Falls indoor and outdoor water consumption history.

- City of Idaho Falls. 2010. City of Idaho Falls Comprehensive Plan Background Studies.
- Anheuser-Busch Water Conservation. http://www.anheuser-busch.com/s/index.php/our-responsibility/environment-our-earth-our-natural-resources/water/. 23 February 2012.

13.1.2 City of Rexburg

The City of Rexburg provided water and wastewater flow data for 2011. The data provided were helpful to understand the trend of indoor and outdoor water consumption for 2011; however, long term trends could not be developed. For the purposes of this study, the data provided was sufficient to understand the City of Rexburg indoor and outdoor water consumption.

13.1.3 City of Driggs

The City of Driggs provided water production data for 2009 through 2011 and metered data for 2003 through 2009. The City of Driggs also provided the *Driggs Wastewater Treatment Facilities Plan* (2006) as a resource for the City's wastewater data as well as 2011 wastewater flow data. The data and reports provided enough information to understand the City of Driggs water consumption history.

- Nelson Engineering. 2006. *Driggs Wastewater Treatment Facilities Plan*.
- Sunrise Engineering, Inc. 2010. City of Driggs Water System Discussion Notes for Information Presented at the City of Driggs Council Meeting.

13.1.4 City of Victor

The City of Victor water and wastewater data was provided by Sunrise Engineering in Afton, Wyoming. Sunrise Engineering provided the *City of Victor Water System Environmental Information Document* (2011), the *Water System Facilities Planning Study* (2011), and a technical memorandum, *Victor/Driggs Interceptor Capacity Analysis and Improvement Recommendation* (2010). These reports and the technical memorandum provided enough data and information to understand the City of Victor indoor and outdoor water consumption history.

- Sunrise Engineering, Inc. 2010. *City of Victor and City of Driggs Interceptor Capacity Analysis and Improvement Recommendations Technical Memorandum*.
- Sunrise Engineering, Inc. 2011. *City of Victor Water System Environmental Information Document*.
- Sunrise Engineering, Inc. 2011. *City of Victor Water System Facilities Planning Study*.

13.1.5 Other Sources

- Bureau of Reclamation. 2012. *Draft Henrys Fork Watershed Basin Study Water Needs Assessment*. March.
- City of Meridian. 2011. *City of Meridian, Idaho, 2011 Water Conservation Plan*.
- Kawamura, Susumu. 2000. *Integrated Design and Operation of Water Treatment Facilities*. 2nd Edition.
- Metcalf & Eddy. 2003. *Wastewater Engineering Treatment and Reuse*. 4th Edition.