M E M O

To: Icicle Work Group

From: Rachael Osborn, Center for Environmental Law & Policy[1]

Date: July 7, 2015

Re: Water conservation potential for consumptive demand reduction and supply for City of Leavenworth and Icicle-Peshastin Irrigation Districts

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This memo discusses the potential for using water conservation methods to meet City of Leavenworth and the Icicle-Peshastin Irrigation Districts' (IPID) consumptive demand in the Icicle watershed. A fundamental premise of this approach is that water users are entitled only to the amount of water they need, and must exercise reasonable efficiency in their water use. From a pragmatic standpoint, reducing demand and obtaining new supply through water conservation and efficiency measures and practices is good policy and will be more palatable to the public than projects that manipulate and increase diversions from the Enchantment Lakes region of the Alpine Lakes Wilderness.

From review of documents and field sites, it is clear that significant water savings can be obtained through tightening up water delivery and consumption infrastructure in the Leavenworth area, and through demand management efforts. Further, with respect to the City of Leavenworth, re-calculation of future demand is appropriate.

The Icicle Work Group has not conducted a detailed review of conservation potential. However, it appears feasible that water conservation and efficiency measures, combined with a transfer of water and service duties from IPID to the City of Leavenworth, could meet the consumptive use needs of both entities.[2]

Additional documents to review include:

- Aspect Consulting, "Water Conservation Plan Survey" (draft Nov. 2014)
- IWG color-coded project list for a base package, which includes "IPID and COIC Efficiencies," but contains no discussion of municipal water conservation.
- Photos of IPID canal and orchard (Att. 1)
- City of Leavenworth 2011 Water System Plan, Conservation Chapter and tables (Att. 2)
- Photos of Ski Hill residential properties served by IPID (Att. 3)

This memo discusses (1) the Aspect Survey, (2) IPID conservation potential, (3) City of Leavenworth conservation potential and (4) an IPID-Leavenworth water transfer scenario.

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[1] This memo was prepared with the assistance of Tom Fox, P.E., retired Water Resource Manager, City of Seattle, and Dan Von Seggern, CELP staff attorney.

[2] This document does not discuss conservation potential at the Leavenworth Fish Hatchery or the Cascade Orchard Irrigation Co., because conservation measures for those entities are addressed in documents prepared by NOAA for LNFH and being prepared by Washington Water Trust for COIC.

1. **Aspect Water Conservation Survey**

The Aspect Survey briefly describes the types of water conservation and efficiency projects that could be undertaken by three of the four Icicle Creek diverters: IPID, COID and the City of Leavenworth. The survey estimates conservation opportunities of 10-20 cfs for non-structural projects and another 10 cfs for piping and other structural improvements, and attaches cost figures. (Aspect Survey, pp. 1-2).

The Aspect Survey does not discuss how conservation savings might translate into agricultural reliability or meet municipal demand, nor does it quantify conservation savings for the City. The IWG's color-coded project description for "IPID and COID Efficiencies" identifies 13.5 cfs/4,000 acre-feet as having flow benefits, but does not discuss how these or other conservation projects might meet the consumptive requirements of agricultural reliability or municipal demand.

| **IPID and COIC Efficiencies** | |
|---|---|
| Update plans and implement projects. Assumes 10% annual combined non-consumptive savings | |
| FLOW | 13.5 cfs (4,000 ac-ft) to Icicle RM 0-4.5 or 5.7. *Guaranteed, Non-Consumptive* |
| TRIBAL | Flow improvement |
| HABITAT | Flow improvement |

2. **IPID conservation potential**

The Aspect Survey discusses IPID canal lining, noting that canals are lined in some areas, and not in others.[3] (Aspect Survey at p. 7). Attachment 1 provides photos, taken near Dick Rieman's property on June 18, showing the partially-lined canal and adjacent vegetation. Another photo shows vegetation growing beneath IPID orchards, which appears pretty typical throughout the valley. Opportunities exist

[3] Moving the IPID point of diversion on Icicle Creek downstream to Wenatchee would eliminate water losses in 2-3 miles of canal, and would restore streamflow in Icicle Creek up to 100 cfs (the near-terms metric target for instream flow). However, on March 10, 2015, the Icicle-Peshastin Board of Directors unilaterally removed the option of a change of point of diversion that would restore 100 cfs to Icicle Creek. The minutes from that meeting, provided by IPID Manager Tony Jantzer state:

> **Icicle Creek Working Group:** Commissioner Goehner briefed the boards on what he sees going on with the working group. The main push by the group seems to be a pump back with nothing to be done in the wilderness. Tony thinks that we should with draw the option of the Icicle pump backs. Craig moved to withdraw the option for an Icicle only pump back from the working group. Daryl seconded the motion and it passed."

to improve IPID efficiency through structural improvements and vegetation management. The Aspect Survey also identifies pump exchanges and re-regulation reservoirs for potential conservation savings.

The IWG metrics identify a need for 225 acre-feet of water for IPID for "drought reduction risk." Dan Haller, in an e-mail, explained the basis for this figure (referencing the Eight Mile Lake Restoration Report):

- Current usable storage is 1,375 ac-ft. (p. 10)
- IPID will retain 1,600 ac-ft of the restored capacity (pp. 44-45)
- The difference between those 2 numbers is 225 ac-ft, which represents the IPID portion of the agricultural metric.
- IPID releases water from all of its reservoirs to make up for water shortages in drought years, including the historic storage capacity of 8-Mile Lake.

IPID has reported at multiple IWG meetings that it does not need to restore Eight Mile Lake to obtain its water. Assuming, however, that some amount of water is necessary for "drought risk reduction," it appears feasible that such quantities can be obtained through conservation and efficiency measures.

**3. City of Leavenworth demand and conservation potential**

The City of Leavenworth's demand has not been analyzed by the IWG, and instead the unexplained 800 acre-feet settlement quantity, added to another 867 acre-feet for full build-out, has been assumed to be an accurate reflection of the City's future need. Ecology insists that the City's future demand can only be met through the Alpine Lakes water storage projects.

The Aspect Survey discusses Leavenworth conservation at pp. 11-15, and is based on information derived from the City's 2011 water system plan (WSP) and interviews with City staff. A copy of the City's conservation chapter and several tables are included with this document as Attachment 2.

**(a) Demand Forecast**

WSP Figure A shows there has been no recent growth in Leavenworth water demand even with increases in service connections. (Att. 2, WSP at p.16, "Historical Source Production"). Data for 2009-2013 show that past demand does not equate to the WSP's projected 1.2% annual increase to meet water demand at ultimate buildout. (Aspect Survey, Table on p. 13). Leavenworth calculates that its future water demand will be identical to its projected household growth of 1.2% annually. (Att. 2, WSP at p. 22, Table 3-10, "Projected Water Demand"). A straight-line projection of water demand based on service connection increases is not a credible approach. The WSP does not otherwise explain or justify the 1.2% water demand growth factor.

Leavenworth's water demand forecast for ultimate buildout does not reflect the reductions that will result from building code compliance. The demand forecast at ultimate buildout assumes a 136% increase in ERUs (households) from the current ~3000 to more than 7000. (Att. 2, WSP at p.21, Table 3-9, "Pressure Zones ERU Growth Distribution"). The water demand forecast does not reflect that the growth to ultimate buildout will in fact <u>reduce</u> average household water demand. This is because new construction building codes require installation of water conserving toilets and appliances (which will likely become more water efficient in the future). Hence new construction in Leavenworth will

generally have lower water demand than current households. It is improbable that the growth in annual water demand will be a constant 1.2%.

The City should engage in analysis to more accurately estimate future demand assuming compliance with the current code requirements and a reasonable replacement rate for toilets and water appliances in existing homes and businesses (see water conservation discussion below on this point).

**(b) Metering and water system loss**

Leavenworth reports being in compliance with Washington's water metering requirements. The City also reports highly variable water loss rates: 23% water loss in 2012 but -1% in 2013 (Aspect Survey, Table, p.13). Leakage reduction is described in the Aspect Survey at p. 14 and is attributed to better accounting of water being produced and consumed. The accuracy of the change in water loss between 2012 and 2013 should be examined, along with 2014 data. It seems possible that further water savings could be obtained from leak reduction.

**(c) Water conservation generally**

The City WSP has an inconsistent approach to water conservation. On the one hand, the executive summary concludes that "at some point . . . the City will need to either acquire additional water rights or *reduce consumption through conservation*." (WSP at ES-2). On the other hand, the WSP reports that "Existing residential usage is low; it is unclear whether the City can significantly reduce consumption through conservation." (Att. 2, WSP at p. 62, Table 6-4, "Preliminary Alternatives for Addressing Ultimate Water Right Needs"). This latter statement is not correct. The City's per ERU (household) water consumption of 304 gallons per day is not "low." By way of comparison, the Puget Sound average ERU usage is about 215 gpd. Pullman's 2013 ERU usage was 271 gpd (and dropping). Experience in other cities demonstrates that average usage can be substantially reduced.[4]

Leavenworth's summer peaking factor of 2.35 over base (winter) usage is also very high, indicating potential for reducing seasonal demand through irrigation management practices (Att. 2, WSP at p.16, Table 3-2 at fn. 1, "Existing Source Production and System Demands").

Although Leavenworth has reduced overall water consumption by metering its customers (as the Municipal Water Law requires) and upgrading its infrastructure, the 2011 Water System Plan does not contain robust conservation measures. (Att. 2, WSP at pp. 91-92, "WUE Measures Evaluated and Implemented"). Some "low-hanging fruit" opportunities, discussed below, include:

(1) Adopting a conservation oriented rate structure to reduce high summer demand and monthly (rather than seasonal) billing practices
(2) Toilet retrofits and irrigation management
(3) Reclaimed water, particularly for irrigation of City properties

**i. Water rates & billing**

A properly structured water rate system is a highly effective way to manage customer demand for

[4] For example, in the 1990s, water use in Seattle dropped 12%, and per-capita use dropped 20%.Cases in Water Conservation: How Efficiency Programs Help Water Utilities Save Water and Avoid Costs. U.S. EPA, July 2002, at 40.

water. Leavenworth water customers have a high summer demand – a conservation-oriented rate structure can bring this down.

The WSP discusses water rates (Att. 2, WSP at pp. 84-87, "Water Rates"). The Aspect Survey also discusses water rates, noting that, although the City has adopted an inclining rate block structure, the City's rate structure is "fairly ineffective." (Aspect Survey, p. 14). This is because the base rate of $43/month includes a 15,000 gallon per month allotment, and higher water use is billed at minimal overage charges. In addition, although all users are metered (which is good), water use is billed only seasonally. Thus, Leavenworth water customers do not receive timely information to understand and control their consumption.

Aspect notes that a conservation oriented rate structure may encourage conservation, including:

- implementing a rate structure with a small base volume allotment
- charging high overage rates
- adding customer water use history to monthly water bills

By adopting a more effective water rate structure, Leavenworth could control future demand and the IWG metric calling for 1667 acre-feet of new water for Leavenworth could be reduced.

**ii. Toilet retrofits and irrigation management**

The City's appliance rebate program is minimal. The 2011 WSP allocates $100 per year to provide $10 rebates for 10 low flow showerheads. (Att. 2, WSP at p. 92, "Measure #5: Shower Head Rebate"). The City's total $1,000 budget allocation to water use efficiency over six years is tiny compared to its $3.4 million water department budget. (Att. 2, WSP at p.81, Table 7-2, "Capital Improvements Plan").

Non-low flow toilets are the most water consuming appliance in most households and hotels. The City should institute a rebate program to promote retrofits of existing toilets (residential and commercial) and reduce existing demand. As the WSP notes, commercial conservation potential exists where existing buildings have not been retrofitted with low use plumbing fixtures and where large base water allotments exist. Hotels constitute half of the top 20 water users in Leavenworth. (Att. 2, WSP at p.96, Table 9-2, "Inventory of Large Water Users"). A program to promote commercial toilet retrofits seems likely to yield conservation savings.

The City's seasonal water usage is high, due to summer season irrigation. The City should institute a program to promote efficient residential and commercial irrigation, including rebates for irrigation system improvements, lawn removal credits, city property irrigation management, evening only and alternate-day irrigation requirements, etc.

Adoption of these basic conservation measures could reduce Leavenworth water demand, both existing and future as set forth in the IWG metrics.

**iii. Reclaimed water potential**

The City of Leavenworth is the City's largest water customer, and consumed 7.5 million gallons of water in 2009. (Att. 2, WSP at p.96, Table 9-2, "Inventory of Large Water Users"). Reclaimed water can substitute for non-potable water uses, particularly golf course, park and ballfield irrigation. The City currently does not reclaim and reuse wastewater, but the potential exists and is being studied. See

Aspect Survey, p. 14. Reclamation and reuse of wastewater could meet existing and future demand and reduce City water needs.

### 4. Potential for IPID-City of Leavenworth Transfer

The IWG projects include 1,000 acre-feet for water banking or transfers. The Ski Hill situation represents one such opportunity.

IPID serves properties in the Ski Hill area of Leavenworth, which is part of IPID's "Beat 5" reach. This area is converting from orchards to residential. Attachment 3 provides pictures of Ski Hill residential irrigation served by IPID. In addition to an over-abundance of green lawns and inefficient residential irrigation, run-off water collects into a ditch which spills into the Wenatchee River.

The City of Leavenworth identifies Ski Hill as an area where it expects to see 75% of its future residential growth and water demand (presumably outside of the IPID service area). (Att. 2, WSP at p. 21, Table 3-9, "Pressure Zones ERU Growth Distribution). The City has recently rehabilitated its storage tank near the upper end of the Ski Hill neighborhood, in part to accommodate future growth in that area.

Ski Hill is an area where a transfer of water rights and service duties from IPID to the City of Leavenworth would make sense. This transfer could eliminate some or all of IPID's Beat 5 diversion quantities from Icicle Creek and instead, the City would pump groundwater and pressurize water deliveries. The City could put existing IPID customers on a water conservation oriented rate system to reduce consumption, facilitate buy-out of in-city agricultural properties, and use the water savings to serve a portion of its future demand.

This transfer would also have the effect of reducing IPID diversions from Icicle Creek, improving instream flows.

### 5. CONCLUSION

The Icicle Work Group has not seriously considered the potential for water conservation and efficiency measures to meet and reduce agricultural and municipal demand. It is apparent that much more can be done by the City of Leavenworth and the Icicle-Peshastin Irrigation Districts to conserve water.

It is reasonable for the Work Group to (1) evaluate whether conservation could reduce demand, (2) propose conservation as a source of supply for consumptive demand, (3) study conservation options in detail, and (4) implement conservation as an alternative to water projects in the Enchantment Lakes region.

Attachments:

Att. 1: Photos, Icicle-Peshastin Irrigation Districts canal and orchard

Att. 2: Excerpts, City of Leavenworth Water System Plan

Att. 3: Photos, Ski Hill residential properties served by IPID

**Attachment 1**
**Icicle-Peshastin Irrigation District Photos (6-18-15)**

IPID Ditch – partial lining

IPID Ditch vegetation at Dempsey Hill bridge

IPID Ditch vegetation – Dempsey Hill Rd.

IPID Orchard vegetation


City of Leavenworth

# WATER SYSTEM PLAN

JULY 2011 - *FINAL*

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
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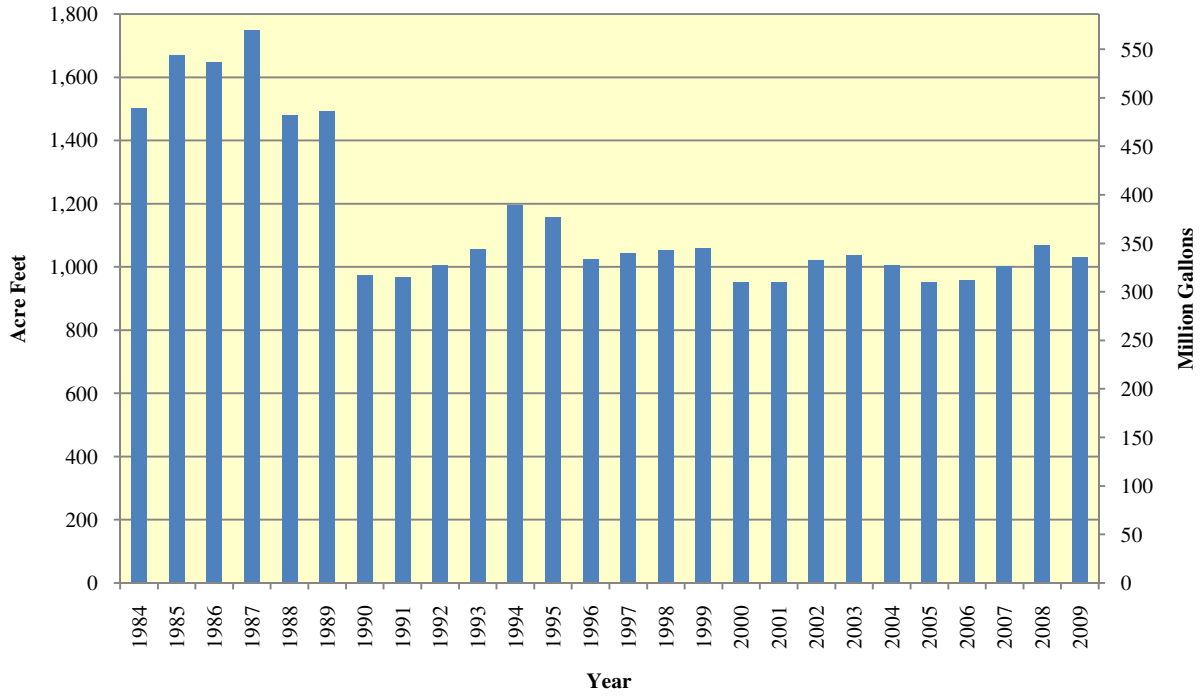
Figure A Historical Source Production




## 3.1.4 Current Source Production and System Demands

The Table following shows system production and demand for the past three years.

Table 3-2 Existing Source Production and System Demands

| Description | Units | 2007 | 2008 | 2009 | Average |
|---|---|---|---|---|---|
| Annual | MG | 324 | 342 | 331 | 332 |
| | ac-ft | 994 | 1,050 | 1,016 | 1,020 |
| ADD | gpd | 887,671 | 936,986 | 906,849 | 910,502 |
| | gpm | 616 | 651 | 630 | 632 |
| MDD (1) | gpd | 1,956,000 | 2,140,000 | 2,330,000 | 2,142,000 |
| | gpm | 1,358 | 1,486 | 1,618 | 1,488 |
| PHD (2) | gpm | 2,294 | 2,508 | 2,729 | 2,510 |

(1) *Based on actual MDD recorded by system Operator. The City's average ADD:MDD peaking factor for 2007-2009 is approximately 2.35.*

(2) *PHD values calculated using Equation 5-1 from DOH 2009 Water System Design Manual (N = 2,981 ERUs). The system Operator reports that City PHD varies between 2,000-2,300 gpm; the Operator bases his estimate of PHD on reservoir levels, well pump operation, and water treatment plant operation.*

Table 3-9 Pressure Zones ERU Growth Distribution

| Pressure Zone | Current ERUs (1) | Present to 6-year | | 6-year to 20-year | | Ultimate ERUs (2) |
|---|---|---|---|---|---|---|
| | | Percent of Growth | ERUs (1) | Percent of Growth | ERUs (1) | |
| Zone 1 (Main Zone) | 2,911 | 55% | 3,032 | 25% | 3,178 | 6,232 |
| Zone 2 (existing Ski Hill) | 70 | 45% | 170 | 40% | 403 | 923 |
| Zone 3 (future upper Ski Hill) | - | 0% | - | 25% | 145 | 545 |
| Zone 4 (future top Ski Hill) | - | 0% | - | 10% | 58 | 152 |
| Total System | 2,981 | 100% | 3,202 | 100% | 3,784 | 7,852 |

(1) *Current, 6-yr, and 20-yr ERU distribution estimated based on land availability, zoning, and the professional judgments of the City's staff and Engineering Consultant. All ERUs listed include unaccounted/non-revenue/leakage ERUs.*

(2) *Refer to discussion in **Section 3.2.2**; ERU figures developed based on land capacity analysis in the City's Water Distribution System and Wastewater Collection System Master Plan.*

Growth projected in Zone 1 will manifest itself as infill inside City Limits and, to a limited extent, infill along East Leavenworth Rd and Icicle Rd; refer to **Section 2.6** for details pertaining to City policies for additional connections outside of the UGA and RSA but inside of the water service area.

### *3.2.4 Projected Water Demand*

The following Table contains projected water demand for the established planning horizons based on the growth projections developed in preceding Sections.

Table 3-10 Projected Water Demand

| Zone | Attribute | Existing [1] | 6-year [2] | 20-year [2] | Ultimate [3] |
|---|---|---|---|---|---|
| Zone 1 (main zone) | ERUs | 2,911 | 3,032 | 3,178 | 6,232 |
| | Annual (MG) | 323 | 336 | 353 | 751 |
| | ADD (gpm) | 615 | 640 | 671 | 1,428 |
| | MDD (gpm) [4] | 1,444 | 1,504 | 1,577 | 3,071 |
| | PHD (gpm) [5] | 2,440 | 2,536 | 2,652 | 5,042 |
| Zone 2 (existing Ski Hill) | ERUs | 70 | 170 | 403 | 923 |
| | Annual (MG) | 8 | 19 | 45 | 111 |
| | ADD (gpm) | 15 | 36 | 85 | 212 |
| | MDD (gpm) [4] | 35 | 84 | 200 | 455 |
| | PHD (gpm) [5] | 117 | 224 | 440 | 856 |
| Zone 3 (future upper Ski Hill) | ERUs | - | - | 145 | 545 |
| | Annual (MG) | - | - | 16 | 66 |
| | ADD (gpm) | - | - | 31 | 125 |
| | MDD (gpm) [4] | - | - | 72 | 269 |
| | PHD (gpm) [5] | - | - | 199 | 559 |
| Zone 4 (future top Ski Hill) | ERUs | - | - | 58 | 152 |
| | Annual (MG) | - | - | 6 | 18 |
| | ADD (gpm) | - | - | 12 | 35 |
| | MDD (gpm) [4] | - | - | 29 | 75 |
| | PHD (gpm) [5] | - | - | 102 | 205 |
| Total System | ERUs | 2,981 | 3,202 | 3,784 | 7,852 |
| | Annual (MG) | 332 | 355 | 420 | 946 |
| | ADD (gpm) | 632 | 676 | 799 | 1,799 |
| | MDD (gpm) [4] | 1,488 | 1,589 | 1,877 | 3,868 |
| | PHD (gpm) [5] | 2,510 | 2,671 | 3,133 | 6,661 |

(1) *Refer to **Section 3.1.4** for source of existing demand figures.*
(2) *Refer to **Section 3.2.2** for 6-year and 20-year growth percentages.*
(3) *Refer to discussion in **Section 3.2.2** on ultimate demands; also refer to the City's Water Distribution System and Sewer Collection System Master Plan for calculation of UGA and UGA expansion area demands.*
(4) *Existing, 6-year, and 20-year reflect an ADD:MDD peaking factor of 2.35; also see note 3.*
(5) *Existing, 6-year and 20-year PHD calculated using Equation 5-1 from the 2009 DOH WSDM; also see note 3.*

## 3.3 Topography

The City's water system currently consists of two pressure zones. The UGA encompasses a large portion of the Ski Hill area to the north of downtown. The Ski Hill area spans approximately 200 vertical feet. The planning data in preceding Sections includes two additional pressure zones which will provide service to the area of land not serviceable by the City's existing pressure zones. Please refer to **Figure 2** for system topography and approximate pressure zone boundary contours.

projected ultimate system demands. The following Table contains possible solutions to the City's eventual water rights shortfall. The Table ranks the alternatives in order of probable feasibility taking into account the current regulatory environment. The City may need to implement more than one alternative to meet ultimate water rights needs.

Table 6-4 Preliminary Alternatives for Addressing Ultimate Water Rights Needs

| Rank of Feasibility | Description | Comments/Key Issues |
|---|---|---|
| 1 | Buy existing water rights | • Feasibility dependent on a willing seller and ability to transfer rights<br>• Could be expensive |
| 2 | Increase conservation | • Existing residential usage is low; it is unclear whether the City can significantly reduce consumption through conservation.<br>• Commercial conservation potential exists where existing buildings have not been retrofitted with low use plumbing fixtures and where large base water allotments exist.<br>• A conservation oriented rate structure may encourage conservation; this would involve implementing a rate structure with a small base volume allotment, high overage rates, and adding customer water use history to monthly water bills. |
| 3 | Restrict future growth (moratorium on new connections) | • Significant political and economic issues accompany this approach. |
| 4 | Reuse wastewater | • Very high initial and on-going costs |
| 5 | Obtain additional water rights from the State | • Highly unlikely in the current regulatory environment<br>• The City's pending litigation against Ecology prevents considered analysis of this option at this time. The City expects to refine the description of alternatives in future plans. |

The City will reassess the adequacy of water rights every six years in conjunction with updating its WSP. The City will implement one or a combination of the alternatives from the preceding Table when system growth makes it necessary.

## 6.4 Booster Zones

The analysis of the existing Ski Hill booster zone (Zone 2) indicates the zone will not require improvements within the 20-year planning horizon. However, the City will need additional booster zones to serve the Ski Hill area above elevation 1,300. The following Sections outline the City's plan for additional booster zones.

### *6.4.1 Existing and Future Pressure Zones*

The City intends Zone 1 to serve connections up to elevation 1,200. In most cases service from Zone 1 to connections at or below elevation 1,200 results in static pressures of at least 50 psi and pressures during PHD of at least 40 psi. At present, Zone 1 serves the Mountain View Dr area which has connections as high as elevation 1,230. Eventually the City will connect the Mountain View Dr area to Zone 2.

The City plans for existing Zone 2 to serve connections up to elevation 1,300. The City may eventually wish to provide service to the highest portion of the UGA in the northwest corner above elevation 1,300 and possibly as high as 1,440; this will require two additional booster zones. The table following contains the details of the City's pressure zone plans.

## Table 7-2 City of Leavenworth Capital Improvements Plan

| Category | Component | Project | 2011-2016 | 2017-2031 |
|---|---|---|---|---|
| Supply | WTP | Onsite water storage and pump system for maintenance | 45,000 | |
| | | Expand lab/office | 60,000 | |
| | | Fence Perimeter of WTP | 20,000 | |
| | | Renovate, replace, or abandon WTP | | |
| | Wells | Expand pumping capacity of well field | 300,000 | |
| Booster Zones | Zone 2 | Upgrade booster pump capacity in Zone 2 booster station | | 20,000 |
| | Zone 3 | New booster station, reservoir, and transmission main to serve Zone 3 | | 1,100,000 |
| | Zone 4 | New closed system booster station to serve Zone 4 | | 400,000 |
| Distribution System | Supply Transmission | 3,400 LF of 18" main on Icicle Rd from wells t-main to Icicle Reservoir | 600,000 | |
| | | 2,000 LF of 20" main from Icicle Reservoir to Commercial St & Mill St | 460,000 | |
| | Downtown Transmission | 1,400 LF of 18" main on Commercial St from Mill St to 3rd St | 290,000 | |
| | | 1,600 LF of 18" main on Commercial St from 3rd St to 8th St (1) | 330,000 | |
| | | 2,350 LF of 12" main on Commercial St from 8th St to 14th St | 350,000 | |
| | | 2,350 LF of 12" main on Front St from 8th St to 14th St | 350,000 | |
| | Deteriorating Mains | 1,400 LF of 16" main on East Leavenworth Rd (problem area) (2) | 620,000 | |
| | | 15,000 LF of 16" main on East Leavenworth Rd (2) | | 2,000,000 |
| | | 12,400 LF of 18" main from WTP to East Leavenworth Rd | | 2,200,000 |
| | PRV | PRV between Zone 2 (Titus Rd) and Zone 1 (Chumstick Hwy) | 40,000 | |
| Non-Capital Items | Water Rates | Water Rates Study | | 15,000 |
| | WUE | Budget for Water Use Efficiency measures | 1,000 | 1,000 |
| | | Total | 3,466,000 | 5,736,000 |

(1) *The City's Master Plan indicates that either 16" or 18" main will meet the City's criteria; the CIP assumes the City installs 18" main.*

(2) *The City's Master Plan calls for 12" or 16" main depending on location of future storage; this CIP assumes the City will install the 16" main*

The City also maintains a Water and Sewer Bond Reserve Fund for the purpose of covering debt payments if/when the water and sewer fund cannot make a debt payment; this fund contains an additional $264,048.

## 8.2 Water Rates

The following Sections summarize the City's water rates. The rates shown went into effect in December 2009.

### *8.2.1 Residential*

Residential services are charged according to the following schedule. Residential meters are read monthly April through October in approximately the 3rd week of the month.

Inside City Limits

| | |
|---|---|
| Base charge per month (includes base volume of 15,000 gallons) | $43.00 |

Outside City Limits

| | |
|---|---|
| Base charge per month (includes base volume of 15,000 gallons) | $54.00 |

Overage Rates – All Residential Customers

| | |
|---|---|
| 15,001 - 50,000 | $1.25 per 1,000 gallons |
| 50,001 – 100,000 | $1.50 per 1,000 gallons |
| 100,001-150,000 | $2.00 per 1,000 gallons |
| Above 150,001 | $2.75 per 1,000 gallons |

### *8.2.2 Commercial*

Commercial rates are charged according to the following schedule. As with residential customers, the base charge per month includes the base volume of 15,000 gallons. Commercial meters are read monthly year round in approximately the 3rd week of the month.

Inside City Limits

| | |
|---|---|
| ¾" meter | $43.00 |
| 1" meter | $45.00 |
| 1½" meter | $55.00 |
| 2" meter | $57.00 |
| 3" meter | $177.00 |
| 2" x 6" fire service | $290.00 |

# 9.3 Water Supply Characteristics

## *9.3.1 Surface Water Supply – Icicle Creek*

The City's water treatment plant (WTP) withdraws water from Icicle Creek. The WTP is located on Icicle Creek approximately three miles south of town. During peak demand in summer irrigation season, the WTP treats approximately 2.0 MGD. Icicle Creek experiences heavy sediment loading during spring snow melt and runoff; the City typically shuts down the WTP during the peak sediment loads. The City's water rights constrain the instantaneous and annual quantities of water available for withdrawal (refer to water rights analysis in preceding Sections). The City foresees no significant changes it its planned use of this resource that would adversely impact the quantity and quality of water in Icicle Creek.

## *9.3.2 Ground Water Supply – Well Field*

The City's well field withdraws water from a sand and gravel aquifer. Icicle Creek and the Wenatchee River recharge the aquifer. The wells are located adjacent to the City golf course south of town. The two wells have a combined capacity of 2,050 gpm. The City uses the wells year round to augment supply provided by the Icicle Creek surface water supply. The City's water rights constrain the instantaneous and annual quantities of water available for withdrawal (refer to water rights analysis in preceding Sections). The City foresees no significant changes in its planned use of this resource that would adversely impact the quantity and quality of water in the aquifer.

# 9.4 Current WUE Program

The City's existing WUE program seeks to gradually and permanently reduce average per-capita demand. Short-term voluntary or mandatory reductions in water use to overcome temporary water shortages associated with drought, transmission line failures, or emergency conditions are not considered elements of a WUE program. Rather, WUE program elements constitute a long-term voluntary reduction in customer demand through education, improved technology, and water rate structure.

As a part of the existing WUE program the City trains employees to perform water use efficiency oriented public outreach in the normal course of their duties.

## *9.4.1 Estimated Conservation Savings to Date*

The City's 2002 WSP calculated the City's ERU usage at 389 gpd. As shown in **Section 3.1.6** the City has reduced ERU usage to 304 gpd. The City has saved approximately 85 gpd/ERU.

# 9.5 Goal Setting and the Public Forum

One of the most important steps in achieving efficient water use is setting goals that can be measured. The Water Use Efficiency Rule requires systems to set goals through a public process.

Involving the public allows water users to understand the characteristics and future needs of the City's system and to set a reasonable, attainable goal.

### 9.5.1 WUE Goals

The City has set the following WUE goals:

> Supply Side Goal: strive to continue water production within 3% of 342 MG/year, even with projected growth. Continue to address and minimize system's water loss. Update 20 year old metering system citywide, starting with replacing largest meters and largest water user's per meter size. Ongoing public education programs for increased awareness.
>
> Demand Side Goal: continue to keep water billed VS water produced difference equal to or less than 3%. Review current base rate of 15,000 gallons per customer and review annually the water rate structure. Support public education programs concerning WUE.

### 9.5.2 Public Forum for Establishing WUE Goal

The Water Use Efficiency Rule requires that systems allow customers and interested members of the public to participate in the goal setting process through a public forum. This allows the public an opportunity to provide input on the decisions and it helps customers to understand the need to use water more efficiently and how they can help achieve the WUE goal.

The City conducts public forums when establishing or revising the WUE goals in accordance with the requirements of WAC 246-290-830(4).

## 9.6 Evaluation of WUE Measures

### 9.6.1 Required Number of WUE Measures

The City serves approximately 1,363 connections. The Table following contains the number of measures systems of must either implement or evaluate for cost effectiveness based on the number of connections served. The City must either implement or evaluate for cost effectiveness at least five measures.

Table 9-1 Required Number of WUE Measures

| Number of Connections | Less than 500 | 500 – 999 | 1,000 – 2,499 | 2,500 – 9,999 | 10,000 – 49,999 | 50,000 or more |
|---|---|---|---|---|---|---|
| Number of WUE Measures Required | 1 | 4 | 5 | 6 | 9 | 12 |

### 9.6.2 WUE Measures Evaluated and Implemented

The following Sections list the five WUE measures evaluated by the City. Each section contains a description of the measure, whether or not the City chose to implement the measure, and an analysis of the measure's cost efficacy (if not implemented).

#### 9.6.2.1 Measure #1: Customer Education

WAC 246-290-810(4)(f) requires systems to educate customers annually on water use efficiency; the City accomplishes this through placing educational material once per year in their quarterly news letter (The Leavenworth Courier). In addition to the customer education requirements of WAC 246-290-810(4)(f) the City will host a booth at a City Festival to further educate customers on merits of using water more efficiently. The City chooses to implement customer education to help achieve the WUE goal.

#### 9.6.2.2 Measure #2: Customer Leaks

The City will attempt to use customer monthly meter reading data to identify water use patterns that suggest a customer leak may exist. The City will inform customers when their water use pattern suggests a leak may exist. The City chooses to implement customer leak information to help achieve the WUE goal.

#### 9.6.2.3 Measure #3: Workshop for Landscape Professionals

The City will host (possibly in cooperation with neighboring water systems) a workshop for landscape professionals to promote water use efficient landscaping such as xeriscaping, drip irrigation, soil moisture sensors, rain sensors, etc. The City chooses to implement a workshop for landscape professionals to help achieve the WUE goal.

#### 9.6.2.4 Measure #4: Xeriscape Promotion to Customers

The City will send out information to customers about local resale outlets for xeriscape products and local outdoor exhibits of xeriscaping. The City chooses to implement xeriscape promotion to customers to help achieve the WUE goal.

#### 9.6.2.5 Measure #5: Shower Head Rebate

The City considered offering a fixed annual number of rebates to customers that purchase low flow shower heads. The following calculations estimate the amount of water saved by each shower head replaced:

Estimated average shower head flow rate: 4.0 gpm
Low flow shower head flow rate: 2.5 gpm
Estimated water savings per head replaced: 1.5 gpm
Estimated average length of shower: 8 mins
Estimated number of showers per shower head per day: 2
Estimated daily water savings: 24 gal
Estimated annual water savings: 8,760 gal

The City chooses to offer 10 rebates annually for $10 if customers purchase a low flow shower head and provides a sales receipt as proof of purchase. The City will award the rebates on a first come first served basis. This measure will cost $100 annually and will save approximately 87,600 gallons annually.

#### 9.6.2.6 Budget for WUE Measures

The city estimates the selected WUE measures will cost approximately $1,000 annually.

#### 9.6.2.7 Estimating Water Savings from WUE Measures

WUE measures #1, #2, #3, and #4 have difficult to quantify water savings potentials. Educating customers, helping them find leaks, encouraging WUE irrigation, and promoting xeriscaping will all likely have a positive effect in reducing customers' water use. However, due to the uncertainty associated with estimating the water savings potential of WUE measures #1-#4 the City chooses not to rely on the water savings reaped from these WUE measures when forecasting system demand. Water savings due to WUE measure #5 can be quantified using established values for common plumbing fixtures (see preceding section for calcs).

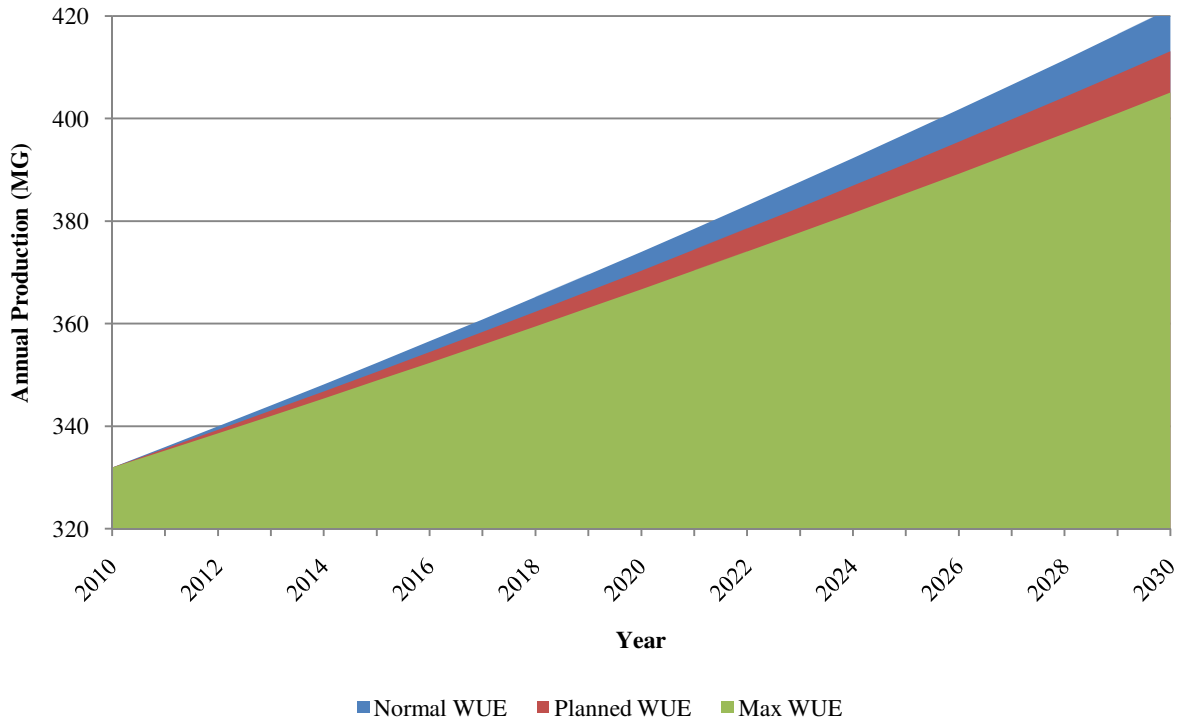
## 9.7 Evaluating Efficacy of WUE Measures

The City will monitor total system annual water use and average customer water use to determine whether WUE measures reduce actual water use. The number of rebates issued for low flow shower heads will also provide the City with insight into the amount of water the WUE program saves; each rebate issued theoretically carries with it a guaranteed savings (see preceding calculations).

## 9.8 Demand Forecasting – Projected Conservation

The Demand projections developed in **Section 3** do not take into account WUE efforts that might reduce future demand. The City projects total water use to increase 1.2% annually without WUE. With planned WUE measures the City believes it possible to reduce annual water use growth to 1.1%. If the City implemented all available WUE measures annual growth could conceivably reduce to 1.0%. The figure following illustrates potential water savings due to more efficient use of water.

Figure C Projected Water Use with WUE




The City plans to review water consumption annually to determine success of WUE efforts. The City also plans to review its WUE program annually to evaluate future water saving targets, and assess program benefits versus costs.

## 9.9 Distribution System Leakage Standard

The Water Use Efficiency Rule divides system water use into two categories: authorized consumption and distribution system leakage (DSL). DOH defines authorized consumption as the volume of water authorized for use by the water system. In addition to normal water sales metering records, systems can track and estimate other types of authorized water uses such as:

- Maintenance flushing of the water system
- Fire fighting and hydrant testing
- Cleaning of water tanks or reservoirs
- Street cleaning

DOH considers DSL all water use not authorized by a water system; this includes both apparent losses and real losses such as:

- Leakage
- Theft
- Meter inaccuracies
- Meter reading errors

- Data collection errors
- Calculation errors
- Water main breaks

The City calculates DSL by comparing source production meters with water sales from customer meters. **Table 3-4** contains the City's current calculated DSL; **Table 3-3** contains the City's historical DSL from the 2002 WSP. The City's DSL meets the standard of less than 10%.

## 9.10 Evaluation of Conservation Oriented Rate Structure

An inclining block type rate structure encourages conservation by directly linking a customer's increased consumption to higher water bills. Implementing an inclining block rate structure is relatively simple and inexpensive (to the water system) to implement. The City utilizes an inclining block rate structure for most of its customers (refer to **Section 8**); this encourages conservation. However, customers enjoy a large base allotment (15,000 gal) and rate blocks spaced at large intervals. Furthermore, the inclining block overage rates do not apply to commercial customers inside City Limits; these users pay a fixed overage rate. The following changes to the City's water rates structure would further orient the City's water rates towards conserving water:

- Reduce base volume allotment
- Reduce volume between rate blocks
- Apply inclining block overage rates to commercial customers inside City Limits.

Price elasticity of water demand describes the sensitivity of customer water use to changes in the price of water; it measures the responsiveness of water use to price change (e.g. for a system with a price elasticity of -0.3, a 10% increase in price will result in a 3% reduction in demand). In order to estimate the volume of water conserved by a rate increase a system must estimate the elasticity of water demand. The AWWA estimates that typical price elasticity values for systems consisting primarily of residential customers range from -0.1 to -0.3. At present, the City estimates demand elasticity to be approximately -0.1 (relatively inelastic). As such, the City would likely need to increase rates substantially (30-40%) to noticeably affect system demand. At present, the City feels that raising water rates 30-40% as a means to achieve WUE would place undue financial hardship on its customers.

## 9.11 Evaluation of Reclaimed Water Opportunities

Utilizing treated wastewater to satisfy non-potable water demands, such as irrigation of parks or golf courses, can reduce demand on a system's potable water supply. The Municipal Water Law requires systems with over 1,000 connections to evaluate opportunities for reclaimed water use when completing a Water System Plan.

#### 9.11.1.1 Inventory of Large Water Users as Potential Reclaimed Water Users

The table following contains a list of the City's 20 largest water users:

Table 9-2 Inventory of Large Water Users

| Rank | Customer Name | Potential Reclaimed Water User? (1) | Customer Address | 2009 Water Use (gal) |
|---|---|---|---|---|
| 1 | City Of Leavenworth | Yes | 1402 Commercial St | 7,480,800 |
| 2 | Enzian Inn | Yes | 590 Hwy 2 | 5,195,500 |
| 3 | Enzian Falls | Yes | 311 Hwy 2 Irr | 3,456,500 |
| 4 | Icicle Junction | Yes | 565 W Hwy 2 Irr | 3,153,000 |
| 5 | Cascade Medical Center | No | 817 Commercial St | 3,123,000 |
| 6 | Sleeping Lady Retreat | No | 7375 Icicle Rd | 2,921,500 |
| 7 | Cascade School District | No | 10190 Chumstick Hwy | 2,876,000 |
| 8 | Cascade School District | Yes | 225 Central Ave Irr | 2,859,500 |
| 9 | U.S. Fish Hatchery | No | 12790 Fish Hatchery Rd | 2,288,000 |
| 10 | Boyd Management LLC | No | 810 Hwy 2 | 2,271,500 |
| 11 | Worldmark The Club | Yes | 100 Enchantment Park Wy Irr | 2,229,500 |
| 12 | Der Ritterhof Motor Inn | No | 190 W Hwy 2 | 2,147,500 |
| 13 | LDS Church | Yes | 10170 Titus Rd | 2,134,000 |
| 14 | Icicle Inn Best Western | No | 505 W Hwy 2 | 2,105,000 |
| 15 | Icicle Junction | No | 565 W Hwy 2 | 1,615,500 |
| 16 | Cascade School District | No | 10195 Titus Rd | 1,581,000 |
| 17 | Bavarian Village Apts | No | 330 Prospect St | 1,557,000 |
| 18 | Alpine Village Condos | No | 525 Alpine Pl | 1,545,000 |
| 19 | Mountain Meadows | No | 320 Park Ave | 1,543,000 |
| 20 | Village At Leavenworth | Yes | 200 Joseph St Irr | 1,446,000 |

(1) *Potential reclaimed water users in this table were not consulted on their desire to use reclaimed water. This list is purely for a rough estimate of irrigated area visible from an aerial photograph.*

As shown in the preceding table, several of the large water users in the City have the potential to use reclaimed water if it becomes available. Customers with large irrigated areas could potentially use reclaimed water.

### *9.11.2 Availability of Reclaimed Water*

At present, the City does not have access to reclaimed water nor regulations requiring the use of reclaimed water. In the future the City would be willing to consider upgrading its waste water treatment plant to produce reclaimed water if the upgrades made financial sense. At present, the modest income available from selling reclaimed water does not justify the high cost of modifying the WWTP.

### *9.11.3 Financial and Operational Feasibility of Using Reclaimed Water*

Providing reclaimed water for non-potable uses costs a lot of money. A partial list of the associated costs includes:

- Additional treatment facilities for the wastewater (as compared to what is otherwise required per the City's existing NPDES permit)
- Storage facilities for the reclaimed water
- Pumping facilities
- Transmission and distribution mains from the treatment, storage, and pumping site to the sites which would utilize the reclaimed water.

- Additional operational expenditures related to operating the expanded wastewater treatment facility and the reclaimed water storage, pumping, and transmission facilities.

Until a source of reclaimed water becomes available to the City it is difficult to quantify the capital cost to supply reclaimed water. In general, use of reclaimed water requires installation of distribution facilities from the source of reclaimed water to the point of use. Depending on the distance between the source of reclaimed water and point of use, costs will vary significantly and affect financial and operational feasibility.

## 9.12 Water Shortage Response Plan

The City utilizes two relatively secure sources of water supply (surface water and ground water). The City's WTP provides consistent, high quality water for approximately 11 months out of the year; the City takes the WTP offline during spring snow melt and runoff. City wells withdraw water from high quality aquifer that has consistently produced water without problems for decades. Therefore, in both the short term (e.g. power interruptions, redundancy, spills) and long term (e.g. aquifer capacity, redundancy), water shortages do not present a major concern to the City. Nevertheless, a catastrophic failure of one or more of the City's sources of the supply could require the City to respond to short or long term water shortages. The following paragraphs and Table lay out the City's plan for dealing with water shortages.

The likely duration of the water shortage, which sources are affected and the time of year the shortage occurs largely determine which response steps are required.

- Supply interruptions affecting only the wells or the WTP during non-summer months are not likely to have a severe effect since demand is significantly reduced. With the WTP offline the remaining sources can supply at least twice average day demand.
- Power outages no longer threaten the City's ability to supply water due to the backup power generators at the well field. In addition the City has storage that would allow the system to operate for short periods of time in the event of supply interruption.
- In the event that the existing sources' capacity was reduced due to dramatically reduced aquifer or Icicle Creek levels or for some other reason, a use reduction plan for customers is needed and is laid out in the following table.

## Table 9-3 Water Shortage Response Plan

| Stage 1<br>Minor Shortage<br>Voluntary Measures<br>5% – 10% reduction goal | Stage 2<br>Moderate Shortage<br>Mandatory Program<br>10% – 20% reduction goal | Stage 3<br>Severe Shortage<br>Rationing Program<br>20% – 30% reduction goal |
|---|---|---|
| A. PUBLIC INFORMATION ACTIONS | | |
| – Prepare & distribute water conservation materials (bill insert, etc.)<br>– Prepare & disseminate technical conservation information to specific customer types<br>– Coordinate media outreach program<br>– Issue news releases to the media | – Continue public information program | – Continue public information program |
| B. GOVERNMENT ACTIONS | | |
| – Increase enforcement of hydrant opening<br>– Increase meter reading frequency & meter maintenance<br>– Promote intensive leak detection & repair program<br>– Draft & adopt ordinances banning water waste. A typical ordinance could require:<br>▪ No unfixed leaks;<br>▪ No hosing of paved surfaces;<br>▪ No fountains except those using re-circulated water;<br>▪ No water running onto streets;<br>▪ No watering during the middle of the day; and<br>▪ No irrigation runoff<br>▪ Draft & adopt ordinances allowing City to declare a water emergency and require fixed consumption allotments or % cutbacks (rationing) | – Reduce water usage for main flushing, street cleaning, public fountains, & park irrigation<br>– Watering of parks, cemeteries, etc., restricted to nights or designated irrigation days | – All public water uses not required for health or safety prohibited unless using tank truck water supplies or reclaimed wastewater<br>– Irrigation of public parks, cemeteries, etc., severely restricted<br>– Pool covers required for all municipal pools<br>– Main flushing allowed only for emergency purposes |
| C. USER RESTRICTIONS | | |
| – Implement voluntary water use reductions (see A. Stage 1) | – Implement ordinance banning water waste (See B. Stage 1 above)<br>– Adopt landscape irrigation restrictions incorporating one or more of the following:<br>▪ Time of day (e.g., 7 pm to 7 am)<br>▪ Weekly frequency (e.g., odd/even, time per week)<br>▪ Sprinkler bans (e.g., hand)<br>– Commercial car washes should intensify voluntary use reductions<br>– Golf course irrigation times and weekly watering limits reduced | – Implement ordinance allowing utilities to declare a water emergency & to require rationing (see B. Stage 1)<br>– Car washing permitted only during specified watering hours of designated irrigation days<br>– Times of day restrictions applied to commercial car washes<br>– Golf course watering times & weekly watering limits reduced<br>– Permissible watering hours & weekly frequency for landscaping irrigation further reduced |
| D. PENALTIES | | |
| – None | – Warning<br>– House call<br>– Shut off and reconnection fee | – Fines |
| E. PRICING | | |
| – None | – Impose surcharges | – Impose surcharges |

The City Council has the necessary authority to implement the above measures at such time as they are required.

**Attachment 3**
**Residential Irrigation, Ski Hill Neighborhood, Leavenworth**

Irrigation run-off ditch, Ski Hill, Leavenworth

Lawn irrigation, Ski Hill

Ski Hill lawn

**Attachment 3**
**Residential Irrigation, Ski Hill Neighborhood, Leavenworth**

Ski Hill lawn

Lawn irrigation, Ski Hill