

**MUNICIPAL AND INDUSTRIAL
WATER SUPPLY AND USES
in the
WEST COLORADO RIVER BASIN**

(Data Collected for Calendar Year 1996)

Prepared by

**Utah Department of Natural Resources
Division of Water Resources**

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ACKNOWLEDGMENTS

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D. Larry Anderson, Director

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EXECUTIVE SUMMARY

This document describes the municipal and industrial (M&I) water supplies and uses for the West Colorado River Basin. Total M&I water supplies and uses for the basin are computed by tabulating the results of the four counties that comprise the basin. These counties are Carbon, Emery, Wayne, and portions of Garfield, Grand, Kane, San Juan, Sevier and Utah. County data are compiled by meeting and surveying each public community and non-community system. The results reported herein represent totals for the 1996 calendar year.

The basin's maximum annual potable water supply under present conditions for Public Community Systems is 26,945 acre-feet. Springs account for 21 percent of this total, wells 12 percent, and surface sources 67 percent. The reliable system source capacity for these systems is 13,421 acre-feet. Table I presents this data.

**TABLE 1
WEST COLORADO RIVER BASIN
Maximum Culinary Water Supplies for Public Community Systems
(Units in Acre-Feet)**

Source	Carbon County	Emery County	Garfield County	Grand County	Kane County	San Juan County	Sanpete County	Sevier County	Utah County	Wayne County	Total
Springs	1,633.0	1,360.3	1,990.6	137.0	0.0	0.0	0.0	0.0	0.0	1,157.5	6,278.4
Wells	1,612.0	0.0	1,127.0	0.0	300.0	211.0	0.0	0.0	0.0	439.0	3,689.0
Surface	10,864.0	6,114.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16,978.0
TOTALS	14,109.0	7,474.3	3,117.6	137.0	300.0	211.0	0.0	0.0	0.0	1,596.5	26,945.4
Reliable System Source Capacity	7,670.0	3,319.8	1,339.9	56.6	189.0	97.1	0.0	0.0	0.0	748.9	13,421.3

M&I water use can be divided into two categories: potable (culinary) and non-potable (secondary). Potable water is delivered by public community, public non-community, self-supplied industrial, and private domestic systems. Non-potable uses include residential and institutional secondary water usually delivered by separate irrigation companies and secondary water used by self-supplied industries. Table II presents water use data for the potable and non-potable categories delivered by public community systems. The table shows that the residential indoor

category accounts for 36 percent, residential outdoor 40 percent, commercial 7 percent, institutional 15 percent, and light industrial 2 percent of the total public community system water use (15,002 acre-feet) in the basin.

TABLE II
WEST COLORADO RIVER BASIN
Water Use for Public Community Systems
(Units in Acre-Feet)

Source	Carbon County	Emery County	Garfield County	Grand County	Kane County	San Juan County	Sanpete County	Sevier County	Utah County	Wayne County	Total
<i>Potable Uses:</i>											
Residential Indoor	3,015.6	1,946.4	129.6	10.3	6.2	39.6	0.0	0.0	0.0	260.7	5,408.4
Residential Outdoor	1,635.4	201.8	148.2	9.0	24.0	6.0	0.0	0.0	0.0	184.4	2,208.8
Commercial	478.8	182.3	49.6	23.8	151.2	18.4	0.0	0.0	0.0	110.5	1,014.6
Institutional	985.9	76.0	74.1	6.1	7.6	32.0	0.0	0.0	0.0	16.9	1,198.6
Industrial/Stockwater	162.4	61.7	2.0	0.0	0.0	1.1	0.0	0.0	0.0	132.6	359.8
TOTAL CULINARY	6,278.1	2,468.2	403.5	49.2	189.0	97.1	0.0	0.0	0.0	705.1	10,190.2
<i>Non-Potable Uses:</i>											
Residential	905.5	2,301.0	147.8	0.0	0.0	0.0	0.0	0.0	0.0	385.3	3,739.6
Commercial	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Institutional	415.0	612.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.0	1,072.8
Industrial/Stockwater	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SECONDARY	1,320.5	2,913.8	147.8	0.0	0.0	0.0	0.0	0.0	0.0	430.3	4,812.4
TOTAL WATER USE	7,598.6	5,382.0	551.3	49.2	189.0	97.1	0.0	0.0	0.0	1,135.4	15,002.6

Table III presents the total M&I water use in the West Colorado River Basin. Public community systems deliver the majority of the potable water in the basin. The table shows that the total potable M&I water use in 1996 is 14,211 acre-feet. Non-potable M&I water use for the basin is 37,012 acre-feet. Therefore, total M&I (potable and non-potable) water use in the basin is about 51,223 acre-feet.

For 1996, the population served by public community systems in the West Colorado River Basin was 36,523. Residential potable per capita water use is 186 gallons per capita per day (gpcd). Non-potable water use amounts to 91 gpcd resulting in uses of 277 gpcd for residential purposes within the public community systems of the basin. Furthermore, by adding commercial, institutional and industrial uses, public community systems use jumps to 249 gpcd for potable uses and 118 gpcd for non-potable uses for a total of 367 gpcd. Lastly, with a population of 37,200 (including the private domestic category), the total basin M&I per capita water use

including all categories and types of systems is about 1,230 gpcd. High industrial, power plant and coal mine uses account for this above average value.

TABLE III
WEST COLORADO RIVER BASIN
Total Municipal and Industrial Water Use for all Categories
(Units in Acre-Feet)

Source	Carbon County	Emery County	Garfield County	Grand County	Kane County	San Juan County	Sanpete County	Sevier County	Utah County	Wayne County	Total
<i>Potable Suppliers:</i>											
Public Community Systems	6,278.1	2,468.2	403.5	49.2	189.0	97.1	0.0	0.0	0.0	705.1	10,190.2
Public Non-Community Systems	31.3	5.9	3.4	0.0	0.0	13.8	2.1	17.1	0.4	7.0	81.0
Self-Supplied Industries	2,578.6	1,102.8	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3,684.4
Private Domestic	160.0	5.0	20.0	0.0	0.0	0.0	0.0	5.0	0.0	65.0	255.0
TOTAL CULINARY	9,048.0	3,581.9	429.9	49.2	189.0	110.9	2.1	22.1	0.4	777.1	14,210.6
<i>Non-Potable Suppliers:</i>											
Secondary Irrigation Companies	1,320.5	2,913.8	147.8	0.0	0.0	0.0	0.0	0.0	0.0	430.3	4,812.4
Non-Community Systems	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Self-Supplied Industries	2,200.0	30,000.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32,200.0
Private Domestic	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL SECONDARY	3,520.5	32,913.8	147.8	0.0	0.0	0.0	0.0	0.0	0.0	430.3	37,012.4
TOTAL WATER USE	12,568.5	36,495.7	577.7	49.2	189.0	110.9	2.1	22.1	0.4	1,207.4	51,223.0

INTRODUCTION

Authority

The Utah Division of Water Resources has overall responsibility for completing studies, investigations, and plans directed at the responsible development and utilization of the water resources of the state of Utah. The State Water Plan, prepared and distributed in early 1990, provided the foundation and overall direction to establish and implement the state policy framework of water management. As part of the state water planning process, detailed plans are prepared for each of the 11 hydrologic basins in the state. The West Colorado River Basin is one of these 11 reports. Each basin water plan will identify potential conservation and development projects and describe alternatives to satisfy the problems, needs, and demands. As part of this effort, background data reports are completed for each river basin. These include a water-related land use report and a water budget report.

Scope

The subject of this data report is a determination of present municipal and industrial (M&I) water supplies and uses within this basin. The data presented in these reports will be used in the State Water Plan for the West Colorado River Basin as well as other division reports and studies. The basin is shown in Figure 1. Information considered includes related investigations recently completed by the Division of Water Resources and the Division of Water Rights.

Data Collection

This study was begun in January 1996 by Division staff. The *1996 Municipal and Industrial Water Use Forms*, distributed by the Division of Water Rights, in cooperation with the Division of Water Resources and the Division of Drinking Water,



Figure 1. Location of the West Colorado River Basin.

were used and is the basis for the study. In all counties the data collection process is as described in the following section, *Water Supply and Use Methodology*. Water rights discussions presented herein were prepared based on conversations with Mark Page, Kerry Carpenter and Kirt Forbush, Area Engineers from the State Engineer's Office that cover the areas of the West Colorado River Basin.

General Description of the Basin

The West Colorado River Basin is comprised of approximately 15,411 square miles (9,863,040 acres) of land. The boundary starts with Soldier Summit and follows a clockwise path containing the Roan Cliffs, followed by a south-trending line toward Elk Ridge, the Clay Hills, the Straight Cliffs of the Kaiparowits Plateau, the Aquarius Plateau, the Awapa Plateau and finally the Wasatch Plateau and back up to Soldier Summit.

The basin spans all or part of 12 counties: Carbon, Duchesne, Emery, Garfield, Grand, Kane, San Juan, Sanpete, Sevier, Utah, Wasatch and Wayne. Duchesne and Wasatch contain no public water systems in the basin and therefore they are not included in this report. The Dirty Devil, Escalante, Lower Green, Lake Powell and San Rafael hydrologic study areas comprise the West Colorado River Basin.

The West Colorado River Basin contains a widely varied topography. Elevations begin at less than 4,000 feet above mean sea level at the southern tip and gradually increase throughout several valleys into the higher mountains and plateaus of the basin. Mt. Ellen, located in the Henry Mountains, stands 11,522 feet above mean sea level. Similarly, the Aquarius Plateau located about 35 miles to the west, peaks at Boulder Mountain with an elevation of 11,360 feet above mean sea level. Notable features in the basin are Capitol Reef National Park and portions of Bryce Canyon National Park, Arches National Park and Lake Powell.

The principle river system in the basin is the Colorado River and its tributaries; the Escalante, Dirty Devil, Green, Price and the San Rafael Rivers. The southern portion of the Colorado River, which lies in the basin, is now part of Lake Powell. The confluence's of the Colorado and the San Juan Rivers (in Lake Powell) and the Colorado and the Green Rivers mark the drainage divisions with this basin and the Southeast Colorado River Basin. Figure 2 shows a detailed map of the basin.

There are currently 31 public community water systems in the West Colorado River Basin. These systems serve 36,523 people (about 98 percent of the 37,200 total population within the basin). Figure 3 shows the location of these systems. The basin also claims 55 public non-community systems. These systems serve National Monuments, State Parks, campgrounds, isolated commercial establishments, and roadside rest stops and parks.

M&I water use is steadily increasing within the basin. Price and Boulder currently are experiencing the greatest growth. Tourism and Industry are driving most of this growth and this trend is likely to continue well into the next century.

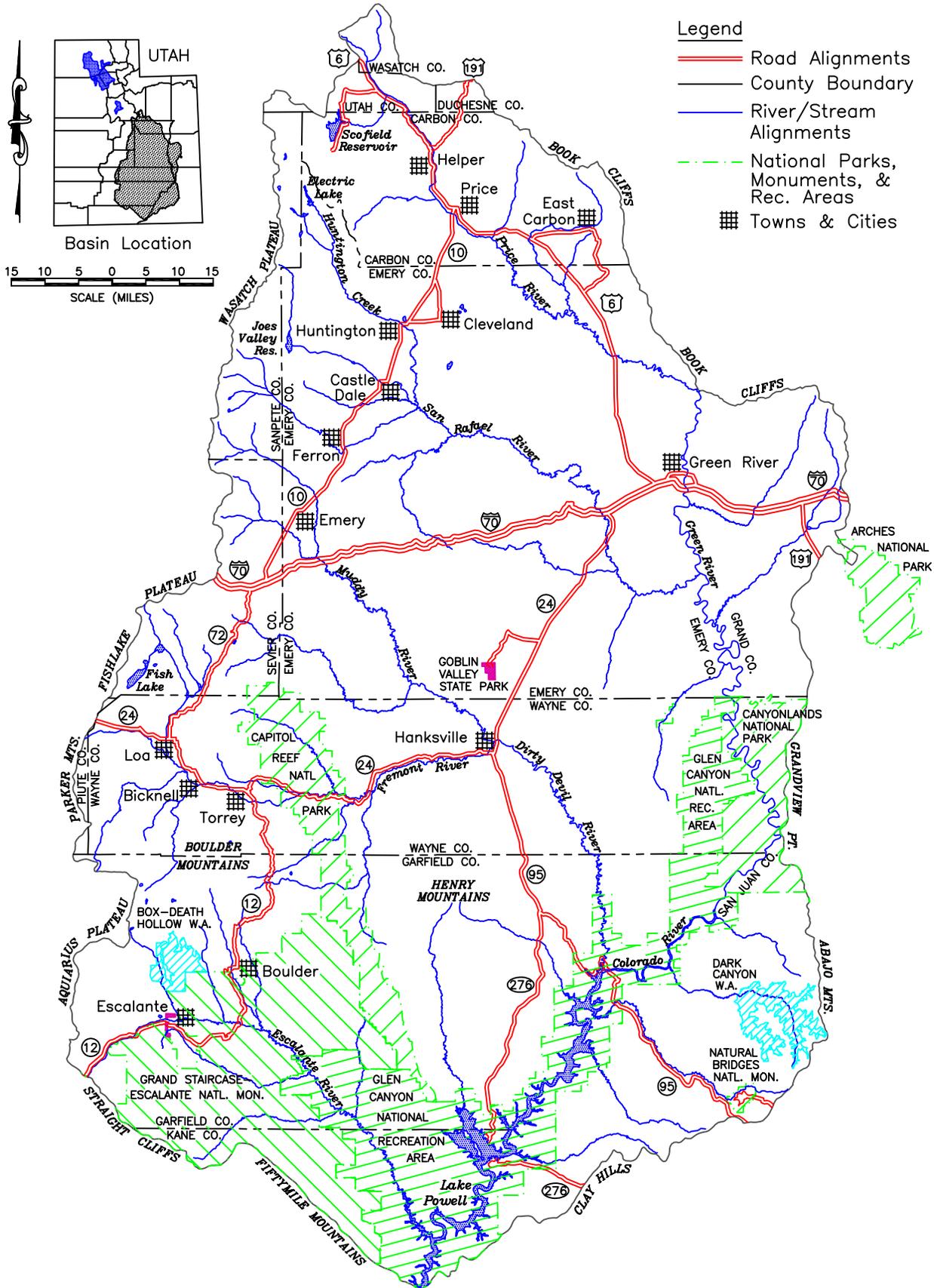


Figure 2. West Colorado River Basin Drainage Map.

- CARBON COUNTY**
1. East Carbon & Columbia Municipal Water
 2. Helper Municipal Water System
 3. Price Municipal Water System (River View)
 4. Price River Water Improvement District
 5. Carbonville Water Company
 6. E. Carbonville Water Company
 7. South Price Water Company
 8. Spring Glen Water Company
 9. Wellington Culinary Water
 10. Scofield Town
 11. Sunnyside City Water

- EMERY COUNTY**
12. Castle Valley Special Service District
 13. Green River Municipal Water
 14. North Emery Water Users
 15. Trail Canyon Residential System

- GRAND COUNTY**
16. Thompson Water Improvement District

- WAYNE COUNTY**
17. Bicknell Culinary Water System
 18. Caineville Special Service District
 19. Capitol Reef National Park
 20. Freemont Waterworks Co. Inc.
 21. Hanksville Culinary Water Works
 22. Loa Water Works Company
 23. Lyman Culinary Water System
 24. Teasdale Special Service District
 25. Torrey Culinary Water System

- GARFIELD COUNTY**
26. Boulder Farmstead Water Company
 27. Escalante Culinary Water
 28. Ticaboo Special Service Dist. #1

- KANE COUNTY**
29. National Park Service, Bullfrog Rec. Site
 30. National Park Service, Halls Crossing Marina

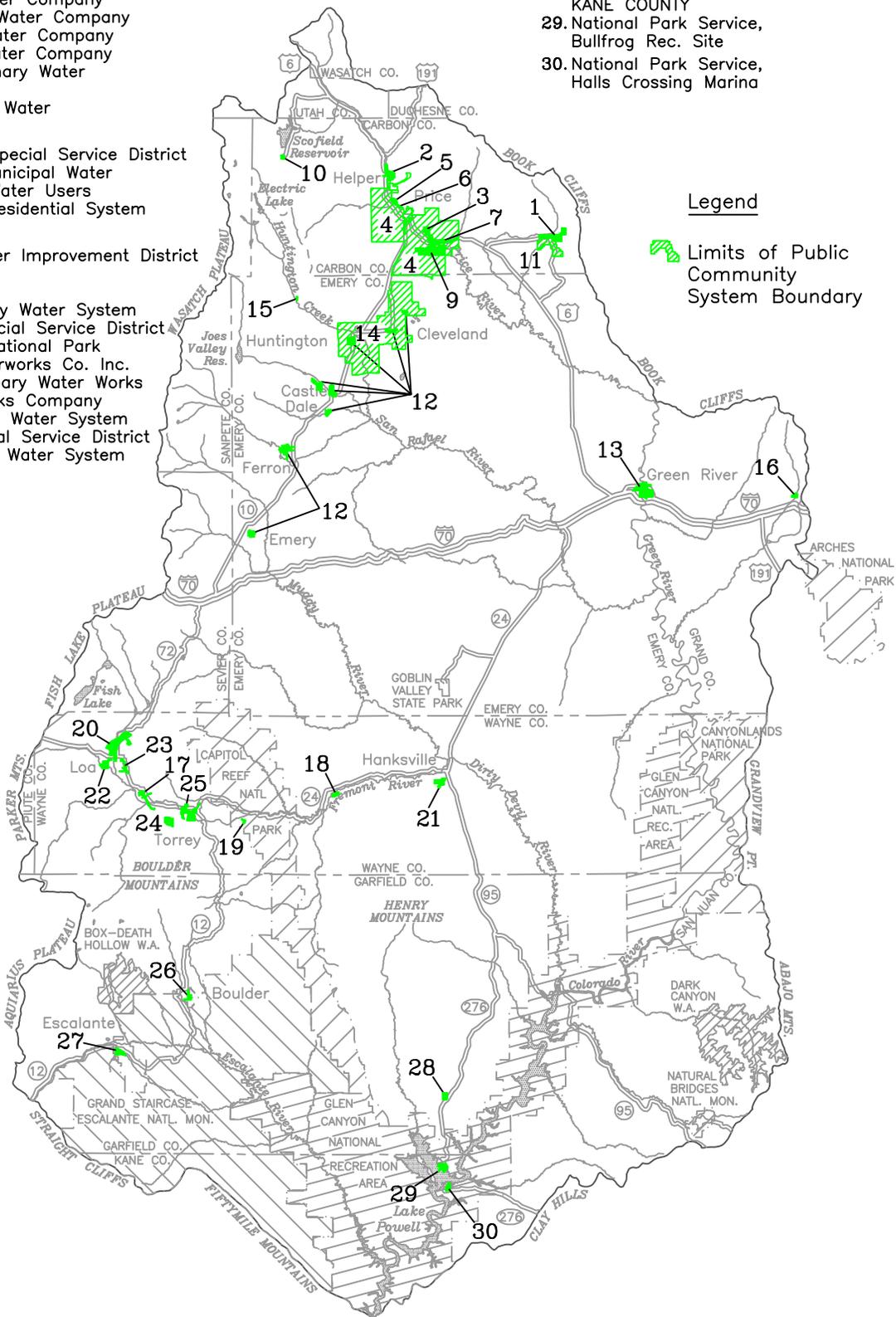


Figure 3 Public Community Systems Within the West Colorado River Basin

WATER SUPPLY AND USE METHODOLOGY

Background

Over the past 40 years the Division of Water Resources has employed various procedures to obtain needed M&I data. In recent years, these procedures have become more comprehensive. When the division began water planning in the 1960's, available data consisted mainly of supplies and uses for the entire state. At that time, agriculture uses far exceeded M&I uses in Utah. At that time M&I water use was generally calculated by using available or estimated per capita rates and multiplied by the census population data.

By the early 1980's, M&I diversions made up a larger percent of all statewide water uses and the entire water community began an increased focus on M&I water supplies and uses. The Division of Water Rights launched a program to collect yearly, statewide M&I data. The procedure involved mailing a survey designed to query each major public water supplier about their sources of water supply. In addition, the United States Geological Survey (USGS) began M&I water use studies. The division relied on both of these data sources in its planning efforts by the late 1980's.

With the preparation of the State Water Plan Basin reports, the division saw the need to check and improve the quality and quantity of the available data through two methods. The first was to join with the Division of Water Rights to improve their M&I data collection program. Secondly, the division began exploring the accuracy of the data through yearly field surveys described in the following four sections.

Present Methodology for Community Water Systems

Each year, division staff targets a particular hydrologic basin or study area for M&I water supply and use analysis. The division of Water Rights' most recent water

use form is the primary tool for these analyses. As an example, the following three pages exhibit the 1996 water use form submitted by Helper Municipal Water System.

Division staff contact the manager or operator of each community water system (as defined by the Division of Drinking Water) to schedule a data analysis meeting. Many times operators inadvertently omit necessary information on their yearly form. During such meetings, division staff attempts to retrieve missing data and estimate unavailable data. Additionally, staff attempts to educate the operator or manager to correctly complete the water use data form. Division staff supply a new form to those systems that either didn't receive one or didn't return one. This methodology has been used since 1994, and all of the community water systems for the various basins studied have provided the necessary M&I water supply and use data.

During the analysis, division staff determines the system's water supply and use. Two factors define water supply: 1) maximum water supply available under present conditions and 2) reliable system source capacity. The maximum water supply available under present conditions is defined as the water resource which is presently developed. The resource is limited by either a mechanical constraint (such as pump capacity or pipe size), a hydrologic constraint (such as reliable streamflow or groundwater safe yield) or a legal constraint (such as a water right or contract). The lesser amount of these three constraints is considered in this study as the maximum water supply available under present conditions. Determination of well pump capacities, spring flow estimates, treatment plant capacities, and water right information aid in the calculation of this value. It should be noted here that due to the complexity of water rights, contracts, exchanges, etc., a detailed search of water right limitations associated with each entity is not in the scope of this study.

The reliable system source capacity is defined as the capacity to meet peak day demands, expressed as an annual volume. The maximum water supply available under present conditions (defined earlier) deals with an average annual volume. Many water supply components in M&I systems (treatment plants, storage facilities,

4 Source Name: Price River W.I.D. Type: Location:
 Method of Measurement: Master Meter, () Individual Meters, () Estimate, () Other
 Units of Measurement: gallons WR Number: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
0	0	0	0	0	0	0	0	0	0	0	0	0

** If you are using other sources which are not shown above, please enter the appropriate data in the space provided below. **

5 Source Name: _____ Type: Location:
 Method of Measurement: () Master Meter, () Individual Meters, () Estimate, () Other
 Units of Measurement: _____ WR Number: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

6 Source Name: _____ Type: Location:
 Method of Measurement: () Master Meter, () Individual Meters, () Estimate, () Other
 Units of Measurement: _____ WR Number: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

7 Source Name: _____ Type: Location:
 Method of Measurement: () Master Meter, () Individual Meters, () Estimate, () Other
 Units of Measurement: _____ WR Number: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

8 Source Name: _____ Type: Location:
 Method of Measurement: () Master Meter, () Individual Meters, () Estimate, () Other
 Units of Measurement: _____ WR Number: _____

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL

SOURCE COMMENTS: Water supply conditions were: Above normal, () Normal, () Below normal

III. WATER USE BREAKDOWN: (If quantities are not known, please estimate percentages. See instructions for definition of uses shown in bold.)
 Units of Measurement: gallons

Source of data: () Meter readings at the source; [] Meter readings at individual connections; or () Estimated

Residential: Annual quantity of water delivered for residential purposes -	<u>246,800,000</u>	Total number of residential connections	<u>957</u>
Commercial: Annual quantity of water delivered for commercial purposes -	<u>17,935,000</u>	Total number of commercial connections	<u>80</u>
Industrial: Annual quantity of water delivered for industrial purposes -	<u>16,629,000</u>	Total number of industrial connections	<u>5</u>
Institutional: Annual quantity of water delivered for institutional purposes -	<u>21,227,000</u>	Total number of institutional connections	<u>17</u>
Stockwatering: Annual quantity of water delivered for stockwatering purposes -	<u>26,000</u>	Total number of stockwatering connections	<u>2</u>
Wholesale: Annual quantity of water delivered to other systems -	<u>0</u>	Please attach a listing of those supplied.	<u>0</u>
Other Uses: Annual quantity of water delivered for other purposes -	<u>1,309,000</u>	Total number of other connections	<u>8</u>

Describe other uses OUT OF CITY LIMITS--COMMERCIAL

IV. IRRIGATION SYSTEM (Separate lawn and garden irrigation system, whether controlled by the drinking water supplier or not)
 Is your area served by a separate irrigation water system? Yes, () No If yes, please provide the following information:
 What percent of your customers are served by a separate irrigation system? 50 % The water is delivered 100 % by ditch & 0 % by pressurized system
 If system is operated by another entity, please give name of company, contact person & phone number: SPRING GLEN CANNAL COMPANY

Number of stock holders: _____ Total shares of stock: _____ Total acres irrigated: _____
 Please enter quantity of water delivered by the irrigation system: _____ Institutional acreage _____
 Method of Measurement: () Master Meter, () Individual Meters, () Estimate, () Other _____ Quantity of water _____

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEARLY TOTAL
Do these quantities reflect water delivered to the municipal service area only? () Yes, () No If no, percent delivered to municipal service area? _____													

V. ADDITIONAL INFORMATION:

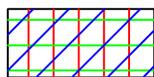
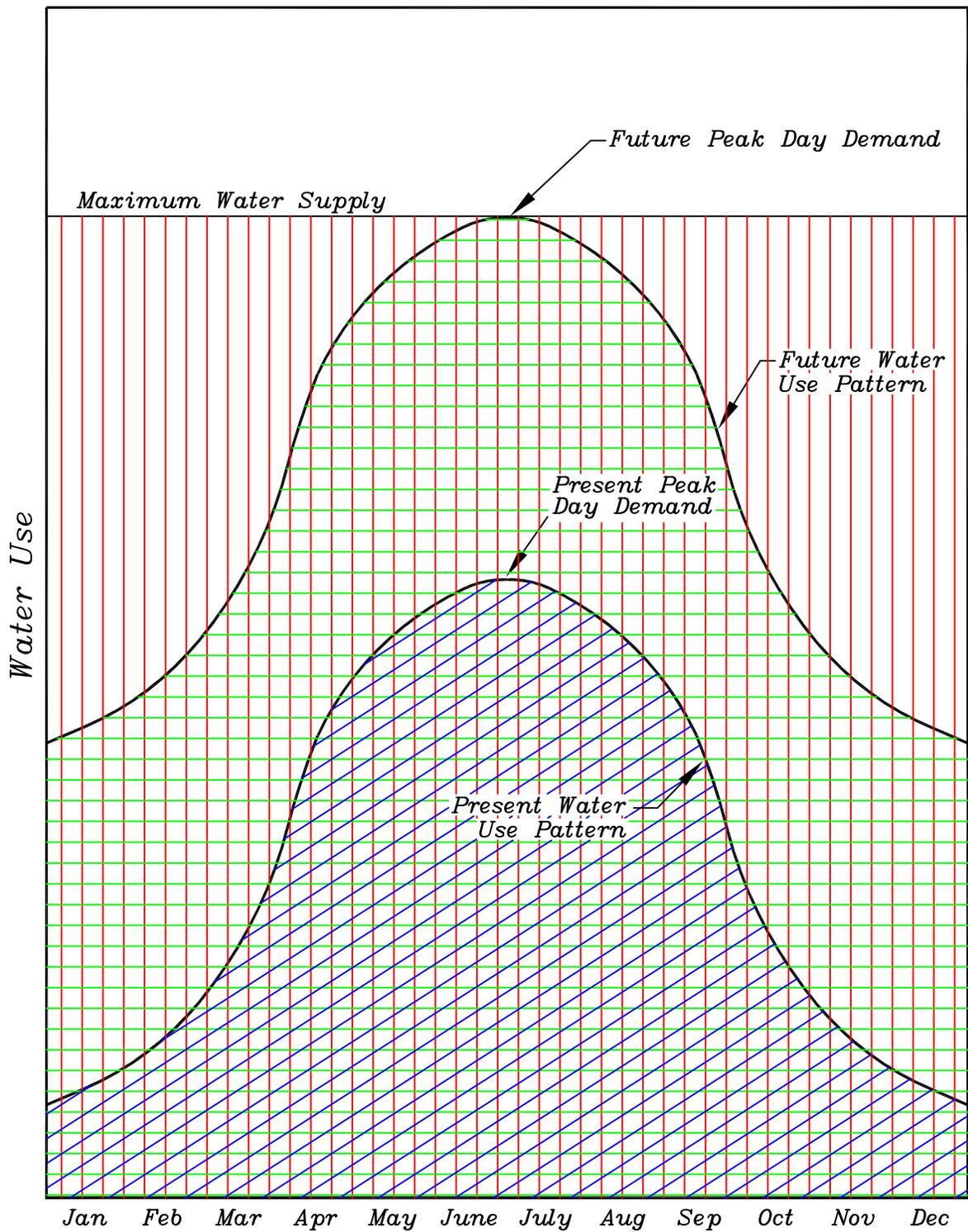
Which of the following maps are available? Service area, Zoning, Distribution systems (pipes and ditches)
 Can a listing of businesses served by the water system be provided? Yes, () No

pump motors, etc.) are sized using demand during a peak 24-hour period. The relationship between average day and peak day demand is important. It is for this reason that a more reliable system source capacity is determined to accurately reflect future M&I water conditions for each system. The relationship that is used is as follows:

$$P_D = - 49.4 + 2.5 A_D$$

where P_D is peak day demand and A_D is average daily demand. For each public community system, the average per capita use (described later) is used in the relationship above to determine a peak factor, and the maximum water supply available under present conditions is used to determine a peak day supply. These two values are then used in calculating the reliable system source capacity which represents the systems' annual maximum water supply's ability to meet peak day demand conditions. It also represents the volume of water which, when divided by the average annual per capita water use, gives the population that can be reliably served by the present system sources.

Figure 4 graphically presents the relationship between maximum water supply and reliable system source capacity. Current water use is shown in the figure as the volume under the lower curve. The future water use is shown as the volume under the upper curve. The maximum water supply under present conditions is shown by the volume under the upper line. Because this amount is associated with a maximum daily flow rate (limited by the water right or system capacity), the line in the figure must pass through the peak day demand point on the future water use curve. It is for this reason (and the fact that most culinary water system storage tanks are designed to store only about one days' worth of water demand) that not all of the maximum water supply is available to meet future water needs. Therefore, the reliable system source capacity, which is equal to the volume under the future water use curve, is a better indication for meeting future water needs. For most systems this value is about one half of the maximum water supply.



Present Yearly Water Use (Volume under curve)



Present Reliable System Source Capacity/Future Water Use (Volume under curve)
When this volume is divided by annual per capita water use, this yields the population that can be reliably served.



Maximum Source Capacity Available Under Present Conditions (Volume under line)

Figure 4. Water Supply and Use Hydrograph.

The reliable system source capacity is valuable in determining future water capacities of the particular community water system sources (wells, springs, etc.). Although future water projections are not addressed in this study, the data provided here are used in the state water plans which the division is formulating for each major hydrologic basin in the state. These basin plans deal with considerable detail about future water demands and supplies.

The last part of the data collection process is to determine the present water use for each community water system. Present water use, as defined herein, includes the developed water which is actually diverted into the distribution system from surface or subsurface sources. The data collected represents the latest available complete calendar year from when the study is started. Water use is divided into four categories: residential, commercial, institutional and industrial. For comparative purposes the division chose these categories to correlate with the United States Geological Survey's (USGS) categories of domestic, commercial, industrial, and mining. The division's residential category is equivalent to the USGS domestic category and includes water used in residential homes for inside and outside uses. The USGS commercial category is equivalent to the division's combined commercial and institutional categories. The commercial category includes water use for retail establishments and businesses. The institutional category includes water use for government facilities, military facilities, schools, hospitals, churches, parks, cemeteries, golf courses, etc. The division's industrial category is equivalent to the combined USGS categories of industrial and mining which includes a wide variety of water uses associated with businesses that produce a specific product.

Residential Use

From the system operator, the staff collects data about the number of residential connections and the amount of water used by those connections. Water use in this category is divided into three subcategories: culinary-outside, culinary-

inside, and secondary-outside use. The first step in calculating the amount of water used in each of these subcategories is determining the amount of outside irrigation. Because very few entities meter outside water use, division staff attempts to determine the acreage that is actually irrigated by homeowners. Average lot size, percent irrigated, percent of residences that are supplied by separate secondary (pressurized and ditch) irrigation systems, water right-duty rates in the area, and other related information are used to estimate outside water use for each entity. Occasionally, delineation between lawns or gardens and farm fields becomes difficult. In these cases, the division's land use mapping program is utilized to take out the areas of the community that have been included as irrigated farmland.

Once residential outside water use is determined, it is subtracted from the given total residential water use. This amount is assumed to be the residential inside water use. When available, indoor water use can be estimated by looking at several residences' winter water bills and meter readings. When either of these methods yield an unreasonable value, then the staff uses a general range of between 75 and 120 gallons per capita per day (gpcd) for inside use and back-calculates outside water use from the total water use given.

Commercial Use

For most systems, the system operator can separate metered commercial water use data from the total water use. In cases where this data is not available or is extremely difficult to obtain, the division staff attempts to estimate commercial water use by inventorying commercial businesses in the area and using published commercial water use estimates. These publications come from the Division of Drinking Water and from reports published by the Utah State Water Lab. In some rural communities where there is a relatively small number of commercial connections, the businesses are visited by division staff and asked about their water use.

Institutional Use

Institutional water use is water used for city, county, state and federal government facilities, parks, golf courses, schools, hospitals, churches, military facilities, fire hydrant testing and other municipal losses in the water system. Because this water use is rarely metered, the process to acquire this data is a difficult one. Again, the system operator is asked to provide information about city facilities such as number and size of parks, schools, churches, and golf courses. Water right-duty rates for the area are used to calculate the amount of water these areas use. Also, estimates are made of leakage and testing of water system facilities and included in this category.

Industrial Use

Industrial use within community water systems is acquired with the same process used to obtain commercial water use data discussed earlier. Industrial water use is defined as water used in the production of a product. Therefore, such commercial establishments as dairies and mink farms are included in this category, provided a community system serves them.

Present Methodology for Non-Community Water Systems

Division staff attempts to contact each non-community system and make a personal visit. These systems rarely meter their water use, so estimates are made by division staff as to their actual annual water use. Questions are asked to determine type of facility, population served, water source information, irrigation of outside areas, etc. This data, along with other water -related publications, are used to determine water use. The maximum water supply for these systems is often not available and is not in the scope of this study.

Present Methodology for Self-Supplied Industrial Water Systems

For self-supplied industries, water use is acquired by using data given on the Division of Water Rights Industrial Water Use Form. The Division of Water Rights collects annual water use data from most of the major self-supplied industrial water users in the state. This data is confidential. Therefore, the data presented in this M&I study is only given as county totals. Again, the maximum water supply is often not available and is not in the scope of this study.

Present Methodology for Private Domestic Water Systems

Private domestic systems are residences that are not connected to any public community or non-community water system. They are usually supplied by individual wells. The water use data for this category is acquired by taking the State Office of Budget county population data and subtracting the population served by community water systems. The remainder is the population that is served by private domestic systems. A reasonable per capita rate (usually determined from the residential per capita rates from nearby community systems) is applied to this population to determine the total water use by private domestic systems. Since the maximum water supply for private wells is really an analysis of the total groundwater reservoir/recharge area, it is not in the scope of this study.

DEFINITIONS OF WATER TERMS

Some water terms peculiar to the water industry are briefly defined in order to better understand the information presented.

Water Supply Terms

Water is supplied by a variety of systems for many users. The general term supply is defined as the amount of water available. Most water supply systems are owned by a municipality, but in some cases the owner/operator is a private company or a state or federal agency. Thus, a "public" water supply may be either publicly or privately owned. Also, systems may supply treated or untreated water.

Maximum Water Supply Available Under Present Conditions - The annual volume of water which is the lesser of the hydrologic capacity of the water source, the physical capacity of the water system, or the use allowed by the water right. See Figure 4.

Reliable System Source Capacity - The actual annual quantity of the maximum water supply that is available to meet peak demands. When this number is divided by the average per capita usage, the resulting number represents the maximum population that the water source can serve. See Figure 4.

Municipal Water Supply - A supply that provides potable (culinary) water for residential, commercial, and institutional uses. The terms municipal, community and city are often used interchangeably.

Municipal and Industrial Water Supply - Includes all water (potable and non-potable) supplied for residential, commercial, institutional, light industry, and large self-supplied industries. This supply is available for public community systems, public

non-community (transient and non-transient) system, self-supplied industrial systems, unregulated Indian systems and private wells.

Potable Water Supply - Water meeting all applicable safe drinking water requirements for residential, commercial, institutional and industrial uses. Sometimes referred to as culinary water supply.

Non -Potable Water Supply - Water not meeting safe drinking water requirements. Secondary irrigation companies and self-supplied industries supply this water. Sometimes referred to as non-culinary water supply, but usually referred to as secondary water.

Public Community Water Supply - Includes potable water supplied by either privately or publicly owned community systems which serve at least 15 service connections or 25 individuals occupied year round. Water from public community supplies may be used for residential, commercial, institutional, and industrial purposes. This can include both indoor and outdoor uses.

Public Non-Community Water Supply - Includes potable water supplied by either privately or publicly owned systems of two types; transient and non-transient. Transient systems are systems that do not serve 25 of the same non-resident persons per day for more than six months per year. Examples include campgrounds, RV parks, restaurants, convenience stores, etc. Non-transient systems are systems that regularly serve 25 of the same non-resident persons per day for more than six months per year. Examples include churches, schools and industries. This report combines transient and non-transient systems together and calls them all public non-community systems. Industries are reported under self-supplied industries.

Secondary Water Supply - Pressurized or open ditch water supply systems that supply untreated water for irrigation of privately and publicly owned lawns, gardens, parks, cemeteries, golf courses and other open areas. These systems, sometimes called "dual" water systems, are installed to provide an alternative to irrigating with culinary water for these outdoor areas. This supply is often provided by irrigation companies. Self-supplied industries can also use secondary water for industrial processes.

Self-supplied Industrial Supply - Includes potable or non-potable water supplied by individual privately owned industries usually from their own wells or springs.

Water Use Terms

Water is used in a variety of ways and for many purposes. Water is often said to be "used" when it is diverted, demanded, withdrawn, depleted or consumed. But it is also "used" in place for such things as fish and wildlife habitat, recreation and hydropower production. The word *use* can be inserted where the word *supply* is written in most of the previous water supply terms to define the current demand associated with those definitions. Some additional water use terms are as follows:

Commercial Use - Uses normally associated with small business operations which may include drinking water, food preparation, personal sanitation, facility cleaning and maintenance and irrigation of facility landscapes. Retail businesses, restaurants and hotels are some examples.

Industrial Use - Uses associated with the manufacturing or production of products. The volume of water used by industrial businesses can be considerably greater than water used by commercial businesses. Manufacturing plants, oil and gas producers, mining companies, mink farms and dairies are some examples.

Institutional Use - Uses normally associated with general operation of various public agencies and institutions including drinking water, personal sanitation, facility cleaning and maintenance and irrigation of parks, cemeteries, playgrounds, recreational areas, golf courses, and other facilities. Many times the amount used by cities for outside irrigation of public areas is not metered.

Municipal and Industrial (M&I) Use - Term includes all residential, commercial, institutional, and industrial uses. It includes total uses (potable and non-potable) supplied by public water systems (community and non-community), self-supplied industries, private domestic systems, and secondary irrigation companies.

Private-Domestic Use - Includes water from private wells or springs for use in individual homes, usually in rural areas not accessible to public water supply systems.

Residential Use - Water use associated with residential cooking; drinking water; washing clothes; miscellaneous cleaning; personal grooming and sanitation; irrigation of lawns, gardens and landscapes, and washing automobiles, driveways and other outside facilities. Single family homes, apartments, duplexes and condominiums are some examples.

Other Water Terms

Consumption - Water evaporated, transpired or irreversibly bound in either a physical, chemical or biological process.

Consumptive Use - Losses of water brought about by human endeavors when used for residential, commercial, institutional, industrial, agricultural, power generation, and recreation. Naturally occurring vegetation and fish and wildlife also consumptively use water.

Depletion - Water lost or made unavailable for return to a given designated area, river system or basin. It is intended to represent the net loss to a system. The terms consumption and depletion are often used interchangeably but are not the same. For example, water exported from a basin is depletion to the basin system but is not consumed in the basin. The exported water is available for use in another system. Water diverted to irrigated crops in a given system, but not returned for later use, is depletion. Precipitation that falls on irrigated crops is not considered a part of the supply like surface water and groundwater diversions. For this reason, precipitation falling on and consumed by irrigated crops is not considered as being a depletion to the system.

Diversion - Water diverted from supply sources such as streams, lakes, reservoirs or groundwater for a variety of uses including cropland irrigation, residential, commercial, institutional and industrial. The terms diversion and withdrawal are often used interchangeably.

Withdrawal - Water withdrawn from supply sources such as lakes, streams, reservoirs or groundwater. This term is normally used in association with groundwater withdrawal.

WATER RIGHTS IN THE WEST COLORADO RIVER BASIN

Although a detailed analysis of water rights is not part of this report, a water supply and use study would not be complete without a discussion on the current water right regulations in the area. The following discussion was obtained from the Division of Water Rights, Price, Cedar and Richfield area offices. It explains the current general water right regulations in the West Colorado River Basin counties with regards to M&I uses.

Carbon, Emery, Garfield, Grand, Kane, San Juan, Sanpete, Sevier and Utah Counties

Surface water is fully appropriated. In areas outside of public system boundaries groundwater applications are limited to inside uses for one family with one acre of irrigation and 10 head of stock.

Wayne County

Surface water is fully appropriated. In areas outside of public system boundaries groundwater applications are limited to inside uses for one family with .25 acre of irrigation and 10 head of stock.

CARBON COUNTY M&I WATER SUPPLIES AND USES

Carbon County includes the incorporated communities of East Carbon, Helper, Price, Wellington, Scofield and Sunnyside. Within this area are 12 public community systems, 6 public non-community systems and 7 self-supplied industries. Price River Water Improvement District delivers water to retail customers and wholesales to Carbonville, East Carbonville, South Price, Spring Glen and Wellington water companies along with 10 other unregulated systems. Price city also wholesales water to River View Water Company while delivering to retail customers. Supply for both entities comes mostly from treated Price River water. Figure 3 locates the public community systems.

Table 1 shows that the maximum annual water supply for public community systems in this portion of Carbon County is 14,109 acre-feet; 1,633 acre-feet from springs, 1,612 acre-feet from wells and 10,864 acre-feet from the two Price River treatment plants. Reliable system source capacity is about 7,670 acre-feet.

**TABLE 1
CARBON COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
CARBON COUNTY				
East Carbon & Columbia Municipal Water	0.0	0.0	672.0	672.0
Helper Municipal Water System	850.0	1,612.0	0.0	2,462.0
Price Municipal Water System	748.0	0.0	2,800.0	3,548.0
River View	NA	NA	NA	NA
Price River Water Improvement District	0.0	0.0	6,720.0	6,720.0
Non Public Water Companies	NA	NA	NA	NA
Carbonville Water Company	NA	NA	NA	NA
E. Carbonville Water Company	NA	NA	NA	NA
South Price Water Company	NA	NA	NA	NA
Spring Glen Water Company	NA	NA	NA	NA
Wellington Culinary Water	NA	NA	NA	NA
Scofield Town	35.0	0.0	0.0	35.0
Sunnyside City Water	0.0	0.0	672.0	672.0
CARBON COUNTY TOTALS	1,633.0	1,612.0	10,864.0	14,109.0

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 2 shows reliable system source capacity along with a breakdown of potable water use for each public community system. This table shows that for this portion of Carbon County the current annual potable use of 6,278 acre-feet is about 82 percent the reliable supply of 7,670 acre-feet.

Secondary water is another important aspect of total M&I use. Table 3 gives the amount of secondary water used for various categories within the boundaries of the public community systems. In this portion of Carbon County various irrigation companies deliver secondary water to customers. Total secondary use is 1321 acre-feet.

Table 4 gives water use for public non-community system, self-supplied industries and private domestic systems. Scofield State Park is among the 6 listed non-community systems. Canyon Fuel Co., Cyprus Western Coal (Plateau and Willow Creek Mines), ECDC Environmental, L.C., Sunnyside Cogeneration Associates, Utah Power and Light and White Oak Mining and Construction Co. are the listed self-supplied industries in the basin. There are a small number of private domestic wells. All of these uses amount to 2,770 acre-feet of potable and 2,200 acre-feet of non-potable water.

Total potable M&I water use in the county is 9,048 acre-feet, while secondary water use is 3,521 acre-feet; giving a total M&I water use of 12,569 acre-feet. Since the current population of Carbon County is about 21,400 the total M&I per capita use is 524 gpcd. Table 5 gives various per capita rates for public community systems. Coal mining and hydropower production are the reasons for this high value. Appendix A shows the data for each public community system that is presented in the tables.

**TABLE 2
CARBON COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE					POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)		Average Per Capita Water Use (GPCPD)	Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)		Peak Day Supply Over Demand (MGD)
CARBON COUNTY															
East Carbon & Columbia Municipal Water	113.5	180.0	1.0	48.1	41.4	384.0	1,270	0.302	269.9	672	2,3170	0.7942	0.7942 *	0.0000	384
Helper Municipal Water System	506.2	251.2	59.1	65.1	51.1	932.7	2,350	0.397	354.3	2,462	2,3606	2.1978	1.9654	0.2324	1,043
Price Municipal Water System	1,428.7	819.2	299.7	415.4	34.2	2,997.2	8,712	0.344	307.1	3,548	2,3391	6.2585	6.2585 *	0.0000	2,997
River View	30.7	0.0	0.0	0.0	0.0	30.7	250	0.123	109.6	NA	NA	NA	NA	NA	NA
Price River Water Improvement District	374.4	163.5	9.9	384.8	18.4	951.0	3,800	0.250	223.4	6,720	2,2789	5.9988	1.9346	4.0642	2,949
Non Public Water Companies**	60.5	12.8	0.0	0.0	7.3	80.6	450	0.179	159.9	NA	NA	NA	NA	NA	NA
Carbonville Water Company	41.5	16.7	0.6	0.3	0.0	59.1	300	0.197	175.9	NA	NA	NA	NA	NA	NA
E. Carbonville Water Company	22.1	0.0	0.0	0.0	0.0	22.1	175	0.126	112.7	NA	NA	NA	NA	NA	NA
South Price Water Company	57.3	0.0	6.4	0.0	0.0	63.7	553	0.115	102.8	NA	NA	NA	NA	NA	NA
Spring Glen Water Company	78.8	51.8	1.8	0.0	0.0	132.4	800	0.166	147.7	NA	NA	NA	NA	NA	NA
Wellington Culinary Water	164.3	81.3	77.1	57.7	0.0	380.4	1,632	0.233	208.1	NA	NA	NA	NA	NA	NA
Scofield Town	9.2	0.0	0.6	0.0	0.0	9.8	92	0.107	95.1	35	1,9805	0.0312	0.0173	0.0139	18
Sunnyside City Water	128.4	58.9	22.6	14.5	10.0	234.4	400	0.586	523.1	672	2,4056	0.5999	0.5034	0.0965	279
										see note					
CARBON COUNTY TOTALS	3,015.6	1,635.4	478.8	985.9	162.4	6,278.1	20,784	0.302	269.6	14,109	2,3168	15,8805	11,4735	4,4070	7670
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand. Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

**P.R.W.I.D. wholesales water to Brotherson Water Co., Carbon County Ind. Park, Central Trailer Park, Lessar Water Co., Marchello Water Co., Pillings Trailer Park, Pinnacle Peak Water Co., North Blue Cut Water Co., South Hwy. Water Co., and Thomas Trailer Park.

TABLE 3
CARBON COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
CARBON COUNTY					
East Carbon & Columbia Municipal Water	0.0	0.0	0.0	0.0	0.0
Helper Municipal Water System	179.4	0.0	0.0	0.0	179.4
Price Municipal Water System	179.8	0.0	0.0	0.0	179.8
River View	30.8	0.0	0.0	0.0	30.8
Price River Water Improvement District	245.3	0.0	400.0	0.0	645.3
Non Public Water Companies	38.5	0.0	0.0	0.0	38.5
Carbonville Water Company	21.8	0.0	0.0	0.0	21.8
E. Carbonville Water Company	18.8	0.0	0.0	0.0	18.8
South Price Water Company	56.6	0.0	0.0	0.0	56.6
Spring Glen Water Company	103.5	0.0	0.0	0.0	103.5
Wellington Culinary Water	31.0	0.0	15.0	0.0	46.0
Scofield Town	0.0	0.0	0.0	0.0	0.0
Sunnyside City Water	0.0	0.0	0.0	0.0	0.0
CARBON COUNTY TOTALS	905.5	0.0	415.0	0.0	1320.5

Note: Separate irrigation companies provide secondary water to the water supplier unless indicated by an **.

TABLE 4
CARBON COUNTY
**Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
CARBON COUNTY						
State Park Systems						
Scofield State Park-Mountain View	0.0	0.0	1.2	0.0	1.2	0.0
Scofield State Park-Madsen Bay	0.0	0.0	1.2	0.0	1.2	0.0
Aspen View-Scofield Mountain Homes	2.7	0.0	0.0	0.0	2.7	0.0
Bacon Rine Ridge Water Company	8.6	0.0	0.0	0.0	8.6	0.0
Clear Creek Utilities, Inc.	17.4	0.0	0.0	0.0	17.4	0.0
Scofield Camp Site	0.0	0.0	0.2	0.0	0.2	0.0
SELF SUPPLIED INDUSTRIES*	0.0	0.0	0.0	2,578.6	2,578.6	2,200.0
PRIVATE DOMESTIC SYSTEMS	160.0	0.0	0.0	0.0	160.0	0.0
CARBON COUNTY TOTALS	188.7	0.0	2.6	2,578.6	2,769.9	2,200.0

*SELF SUPPLIED INDUSTRIES:
Canyon Fuel Company-Skyline Mine
Cyprus Western Coal Company-Plateau Mine
Cyprus Plateau Mining-Willow Creek Mine
ECDC Environmental, L.C.
Sunnyside Cogeneration Associates
Utah Power and Light
White Oak Mining and Construction Co.

TABLE 5
CARBON COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.224	200
Residential Potable Plus Secondary Use	0.267	239
Total Potable Use	0.302	270
Total Potable Plus Secondary Use	0.366	326

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

EMERY COUNTY M&I WATER SUPPLIES AND USES

Emery County includes the incorporated communities of Castledale, Cleveland, Elmo, Emery, Ferron, Huntington, Orangeville. Within this area are 4 public community systems, 8 public non-community systems, and 4 self-supplied industries. Location of the public community systems are shown back in figure 3. Castle Valley Special Service District receives water from the Emery County Water Conservancy District and the wholesales it to the towns of Clawson, Cleveland, Elmo, Emery, Ferron, Huntington and Orangeville.

Table 6 shows that the maximum annual water supply for public community systems in Emery County is 7,474 acre-feet; 1,360 acre-feet from springs and 6,114 acre-feet from three treatment plants on Ferron Creek, Huntington Creek and the Green River. Reliable system source capacity is less than half that amount at 3,320 acre-feet.

**TABLE 6
EMERY COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
EMERY COUNTY				
Castle Valley Special Service District	766.0	0.0	4,434.0	5,200.0
Green River Municipal Water	0.0	0.0	1,680.0	1,680.0
North Emery Water Users	575.0	0.0	0.0	575.0
Trail Canyon Residential System	19.3	0.0	0.0	19.3
EMERY COUNTY TOTALS	1,360.3	0.0	6,114.0	7,474.3

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 7 shows the reliable system source capacity along with a breakdown of the potable water use for each public community system. This table shows that for Emery County the current annual potable water use of 2,468 acre-feet is about 74 percent of the reliable system source capacity of 3,320 acre-feet of water.

**TABLE 7
EMERY COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)		
EMERY COUNTY																
Castle Valley Special Service District **	1,543.6	105.0	25.5	22.7	29.5	1,726.3	8,055	0.214	191.3	5,200	2,2418	4,6419	3,4547	1,1873	2,320	
Green River Municipal Water	223.3	72.0	149.4	51.3	6.4	502.4	1,500	0.335	299.0	1,680	2,3348	1,4997	1,0471	0,4526	720	
North Emery Water Users	168.0	24.8	7.4	2.0	25.8	228.0	1,500	0.152	135.7	575	2,1359	0,5133	0,4347	0,0786	269	
Trail Canyon Residential System	11.5	0.0	0.0	0.0	0.0	11.5	112	0.103	91.7	19	1,9610	0,0201	0,0201 *	0,0000	12	
										see note						
EMERY COUNTY TOTALS	1,946.4	201.8	182.3	76.0	61.7	2,468.2	11,167	0.221	197.3	7,474	2,2496	6,6751	4,9566	1,7184	3320	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.

Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

** Castle Valley Special Service District includes the systems of Clawson, Cleveland, Elmo, Emery, Ferron, Huntington and Orangeville.

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
EMERY COUNTY						
Forest Service Systems						
Forks of Huntington Campground	0.0	0.0	0.1	0.0	0.1	0.0
Indian Creek Campground	0.0	0.0	0.2	0.0	0.2	0.0
Joes Valley Campground	0.0	0.0	1.2	0.0	1.2	0.0
Old Folks Flat Campground	0.0	0.0	0.3	0.0	0.3	0.0
BLM Systems						
Cleveland Lloyd Dinosaur Quarry	0.0	0.0	0.3	0.0	0.3	0.0
State Park Systems						
Goblin Valley State Park	0.0	0.0	1.5	0.0	1.5	0.0
Filmore(Joes Valley) Subdivision	1.8	0.0	0.0	0.0	1.8	0.0
Sportsmans Lodge	0.0	0.5	0.0	0.0	0.5	0.0
SELF SUPPLIED INDUSTRIES*	0.0	0.0	0.0	1,102.8	1,102.8	30,000.0
PRIVATE DOMESTIC USE	5.0	0.0	0.0	0.0	5.0	0.0
EMERY COUNTY TOTALS	6.8	0.5	3.6	1,102.8	1,113.7	30,000.0

*SELF SUPPLIED INDUSTRIES:
Co-Op Mining Co.
Genwal Resources, INC.
Energy West
Utah Power and Light

Table 8 gives the annual amount of secondary water used for various categories within the boundaries of the public community systems. In Emery County, the Castle Valley Special Service District and some irrigation companies deliver secondary water to customers. Total secondary water use is 2,914 acre-feet.

**TABLE 8
EMERY COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems**

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
EMERY COUNTY					
Castle Valley Special Service District*	1,953.0	0.0	462.8	0.0	2,415.8
Green River Municipal Water	168.0	0.0	150.0	0.0	318.0
North Emery Water Users	180.0	0.0	0.0	0.0	180.0
Trail Canyon Residential System	0.0	0.0	0.0	0.0	0.0
EMERY COUNTY TOTALS	2,301.0	0.0	612.8	0.0	2,913.8

Note: Separate irrigation companies provide secondary water to the water supplier unless indicated by an **.

Table 9 gives annual water use for public non-community systems, self-supplied industries, and private domestic systems. Goblin Valley State Park is among the 8

**TABLE 9
EMERY COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
EMERY COUNTY						
Forest Service Systems						
Forks of Huntington Campground	0.0	0.0	0.1	0.0	0.1	0.0
Indian Creek Campground	0.0	0.0	0.2	0.0	0.2	0.0
Joes Valley Campground	0.0	0.0	1.2	0.0	1.2	0.0
Old Folks Flat Campground	0.0	0.0	0.3	0.0	0.3	0.0
BLM Systems						
Cleveland Lloyd Dinosaur Quarry	0.0	0.0	0.3	0.0	0.3	0.0
State Park Systems						
Goblin Valley State Park	0.0	0.0	1.5	0.0	1.5	0.0
Filmore(Joes Valley) Subdivision	1.8	0.0	0.0	0.0	1.8	0.0
Sportsmans Lodge	0.0	0.5	0.0	0.0	0.5	0.0
SELF SUPPLIED INDUSTRIES*	0.0	0.0	0.0	1,102.8	1,102.8	30,000.0
PRIVATE DOMESTIC USE	5.0	0.0	0.0	0.0	5.0	0.0
EMERY COUNTY TOTALS	6.8	0.5	3.6	1,102.8	1,113.7	30,000.0

*SELF SUPPLIED INDUSTRIES:
Co-Op Mining Co.
Genwal Resources, INC.
Energy West
Utah Power and Light

listed non-community systems. Co-op Mining Co., Energy West, Genwal Resources, Inc. and Utah Power and light are the listed self-supplied industries. There are a few residences that use their own wells. All of these uses amount to 1,114 acre-feet potable water and 30,000 acre-feet non-potable water.

Total potable M&I water use in the county is 3,582 acre-feet, while secondary use is 32,914 acre-feet; giving a total M&I water use of 36,496 acre-feet. Since the current population of Emery County is about 10,850 the total M&I per capita use is 3,002 gpcd. Mining and power production are the reasons for this high value. Table 10 gives various per capita rates for public community systems. Appendix B shows the data for each public community system that is presented in the tables.

**TABLE 10
EMERY COUNTY
Average Per Capita M&I Water Use for all Public Community Systems**

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.192	172
Residential Potable Plus Secondary Use	0.398	356
Total Potable Use	0.221	197
Total Potable Plus Secondary Use	0.482	430

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

GARFIELD COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Garfield County includes the incorporated communities of Boulder, Escalante and Ticaboo. Within this area are 3 public community systems, 4 public non-community systems and one self-supplied industry. Location of the public community systems are shown back in figure 3.

Table 11 shows that the maximum annual water supply for public community systems in this portion of Garfield County is 3,118 acre-feet; 1,991 acre-feet from springs and 1,127 acre-feet from wells. Reliable system source capacity is less than half that amount at 1,340 acre-feet.

**TABLE 11
GARFIELD COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
GARFIELD COUNTY				
Boulder Farmstead Water Company	180.6	0.0	0.0	180.6
Escalante Culinary Water	1,810.0	724.0	0.0	2,534.0
Ticaboo Special Service District #1	0.0	403.0	0.0	403.0
GARFIELD COUNTY TOTALS	1,990.6	1,127.0	0.0	3,117.6

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 12 shows the reliable system source capacity along with a breakdown of the potable water use for each public community system. This table shows that for this portion of Garfield County the current annual potable water use of 404 acre-feet is a little more than one quarter the reliable supply of 1,340 acre-feet of water.

**TABLE 12
GARFIELD COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
GARFIELD COUNTY															
Boulder Farmstead Water Company	12.7	31.9	9.2	9.2	2.0	65.0	150	0.433	386.8	181	2.3723	0.1612	0.1377	0.0236	76
Escalante Culinary Water	111.5	115.5	32.4	64.9	0.0	324.3	1,050	0.309	275.7	2,534	2.3208	2.2621	0.6719	1.5902	1,092
Ticaboo Special Service District #1	5.4	0.8	8.0	0.0	0.0	14.2	40	0.355	316.9	403	2.3441	0.3598	0.0297	0.3300	172
GARFIELD COUNTY TOTALS	129.6	148.2	49.6	74.1	2.0	403.5	1,240	0.325	290.5	see note	2.3299	2.7830	0.8392	1.9438	1340
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.

Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor.

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

Secondary water is another important aspect of total M&I use. Table 13 gives the annual amount of secondary water used for various categories within the boundaries of the public community systems. Various irrigation companies deliver secondary water to customers. Total secondary water use is 148 acre-feet.

**TABLE 13
GARFIELD COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems**

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
GARFIELD COUNTY					
Boulder Farmstead Water Company	13.0	0.0	0.0	0.0	13.0
Escalante Culinary Water	134.8	0.0	0.0	0.0	134.8
Ticaboo Special Service District #1	0.0	0.0	0.0	0.0	0.0
GARFIELD COUNTY TOTALS	147.8	0.0	0.0	0.0	147.8

Note: Separate irrigation companies provide secondary water to the water supplier unless indicated by an '*1'.

Table 14 gives water use for public non-community systems, the one self-supplied industry and private domestic systems. The Grand Staircase-Escalante National Monument is among the 4 listed non-community systems. Plateau Resources, Inc. is the one listed self-supplied industry. There are only a few private domestic wells. All of these uses amount to 26 acre-feet.

**TABLE 14
GARFIELD COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
GARFIELD COUNTY						
B.L.M. Systems						
Grand Staircase-Escalante N.M.-Calf Creek Campground	0.0	0.0	2.8	0.0	2.8	0.0
Forest Service Systems						
Blue Spruce Campground	0.0	0.0	0.1	0.0	0.1	0.0
Pleasant Creek Campground	0.0	0.0	0.2	0.0	0.2	0.0
Posey Lake Campground	0.0	0.0	0.3	0.0	0.3	0.0
SELF SUPPLIED INDUSTRIES*	0.0	0.0	0.0	3.0	3.0	0.0
PRIVATE DOMESTIC SYSTEMS	20.0	0.0	0.0	0.0	20.0	0.0
GARFIELD COUNTY TOTALS	20.0	0.0	3.4	3.0	26.4	0.0

SELF SUPPLIED INDUSTRIES:
Plateau Resources LTD.

Total potable M&I water use in the county is 430 acre-feet, while secondary water use is 148 acre-feet; giving a total M&I water use of 578 acre-feet. Since the current population of this portion of Garfield County is 1,300 the total M&I per capita use is 397 gpcd. Table 15 gives various per capita rates for public community systems. Appendix C shows the data for each public community system that is presented in the tables.

**TABLE 15
GARFIELD COUNTY
Average Per Capita M&I Water Use for all Public Community Systems**

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.224	200
Residential Potable Plus Secondary Use	0.343	306
Total Potable Use	0.325	291
Total Potable Plus Secondary Use	0.445	397

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

GRAND COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Grand County includes the incorporated community of Thompson. Within this area is one public community system. Location of this system is shown back in figure 3.

Table 16 shows that the maximum annual water supply for the public community system in this portion of Grand County is 137 acre-feet; all from springs. Reliable system source capacity is less than half that amount at 57 acre-feet.

**TABLE 16
GRAND COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
GRAND COUNTY				
Thompson Water Improvement District	137.0	0.0	0.0	137.0
GRAND COUNTY TOTALS	137.0	0.0	0.0	137.0

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 17 shows the reliable system source capacity along with a breakdown of the potable water use by this system. This table shows that for this portion of Grand County the current annual potable water use of 49 acre-feet is about 86 percent of the reliable supply of 57 acre-feet of water.

There is no secondary use, self-supplied industrial use or private domestic use in this small portion of Grand County.

**TABLE 17
GRAND COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
GRAND COUNTY															
Thompson Water Improvement District	10.3	9.0	23.8	6.1	0.0	49.2	70	0.703	627.4	137	2.4213	0.1223	0.1063	0.0160	57
GRAND COUNTY TOTALS	10.3	9.0	23.8	6.1	0.0	49.2	70	0.703	627.4	137	2.4213	0.1223	0.1063	0.0160	57
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.

Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

Total M&I water use in the county is 49 acre-feet. Since the current population of Thompson is about 70 the total M&I per capita use is 627 gpcd. Table 18 gives various per capita rates for this system. Appendix D shows the data for the public community system that is presented in the tables.

TABLE 18
GRAND COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.276	246
Residential Potable Plus Secondary Use	0.276	246
Total Potable Use	0.703	627
Total Potable Plus Secondary Use	0.703	627

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

KANE COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Kane County includes no incorporated communities. Bullfrog Marina on Lake Powell is the only community system. Within this area is one public community system and 2 public non-community systems. The community system is run by the National Park Service. Location of the public community system is shown back in figure 3.

Table 19 shows that the maximum annual water supply for the public community system in this portion of Kane County is 300 acre-feet; all from wells. Reliable system source capacity is a little more than half that amount at 189 acre-feet.

TABLE 19
KANE COUNTY
Potable Water Supplies for Public Community Systems

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
KANE COUNTY				
National Park Service, Bullfrog Rec. Site	0.0	300.0	0.0	300.0
KANE COUNTY TOTALS	0.0	300.0	0.0	300.0

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 20 shows the reliable system source capacity along with a breakdown of the potable water use for this public community system. This table shows that for this portion of Kane County the current annual potable use is the same as the reliable supply at 189 acre-feet. This system is currently at full capacity. There is no secondary water use at Bullfrog.

Total M&I water use in the county is 189 acre-feet. Since the current population of this portion of Kane County is 800 the total M&I per capita use is 211 gpcd. Table 21 gives various per capita rates for the public community system. Appendix E shows the data for Kane county's one public community system.

**TABLE 20
KANE COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
KANE COUNTY															
National Park Service, Bullfrog Rec. Site	6.2	24.0	151.2	7.6	0.0	189.0	800	0.236	210.9	300.0	2.2658	0.3823	0.3823 *	0.0000	189
KANE COUNTY TOTALS	6.2	24.0	151.2	7.6	0.0	189.0	800	0.236	210.9	300	2.2658	0.2678	0.3823	(0.1145)	189
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand.

Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

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TABLE 21
KANE COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.038	34
Residential Potable Plus Secondary Use	0.038	34
Total Potable Use	0.236	211
Total Potable Plus Secondary Use	0.236	211

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

SAN JUAN COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of San Juan County includes no incorporated communities. Halls Crossing Marina on Lake Powell is the only community system. Within this area is one public community system and 2 public non-community systems. The community system is run by the National Park Service. Location of the public community system is shown back in figure 3.

Table 22 shows that the maximum annual water supply for the public community system in this portion of San Juan County is 211 acre-feet; all from wells. Reliable system source capacity is a little less than half that amount at 97 acre-feet.

**TABLE 22
SAN JUAN COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
SAN JUAN COUNTY				
National Park Service, Halls Crossing Marina	0.0	211.0	0.0	211.0
SAN JUAN COUNTY TOTALS	0.0	211.0	0.0	211.0

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 23 shows the reliable system source capacity along with a breakdown of the potable water use for this public community system. This table shows that for this portion of San Juan County the current annual potable use is the same as the reliable supply of 97 acre-feet. This system is currently at full capacity. There is no secondary water use at Halls Crossing.

Table 24 gives water use for public non-community systems. Hite Marina in the Glen Canyon National Recreation Area and Natural Bridges National Monument are the 2 listed non-community systems. There are no self-supplied industries or

**TABLE 23
SAN JUAN COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)	
SAN JUAN COUNTY															
National Park Service, Halls Crossing Marina	39.6	6.0	18.4	32.0	1.1	97.1	330	0.294	262.7	211	2.3119	0.2004	0.2004 *	0.0000	97
SAN JUAN COUNTY TOTALS	39.6	6.0	18.4	32.0	1.1	97.1	330	0.294	262.7	211	2.3119	0.1884	0.2004	(0.0120)	97
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand. Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*L/1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

private domestic wells in this portion of San Juan County. The non-community water use is 14 acre-feet.

**TABLE 24
SAN JUAN COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
SAN JUAN COUNTY						
Glen Canyon N.R.A. - Hite Marina	3.9	1.8	5.8	0.0	11.5	0.0
Natural Bridges National Monument	0.4	1.9	0.0	0.0	2.3	0.0
SELF-SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC	0.0	0.0	0.0	0.0	0.0	0.0
SAN JUAN COUNTY TOTALS	4.3	3.7	5.8	0.0	13.8	0.0

Total M&I water use in the county is 111 acre-feet. Since the current population of this portion of San Juan County is 330 the total M&I per capita use is 300 gpcd. Table 25 gives various per capita rates for the public community system.. Appendix F shows the data for the public community system presented in the tables.

**TABLE 25
SAN JUAN COUNTY
Average Per Capita M&I Water Use for all Public Community Systems**

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.138	123
Residential Potable Plus Secondary Use	0.138	123
Total Potable Use	0.294	263
Total Potable Plus Secondary Use	0.294	263

Note: Total Potable categories include residential, commercial, institutional and industrial uses.

SANPETE COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Sanpete County includes no incorporated communities. Within this portion of the county are 5 public non-community systems. Table 26 gives water use for public non-community systems. There are no self-supplied industries and no private domestic wells. All of these uses amount to 2 acre-feet.

**TABLE 26
SANPETE COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
SANPETE COUNTY						
Forest Service Systems						
Ferron Reservoir Campground	0.0	0.0	0.1	0.0	0.1	0.0
Flat Canyon Campground	0.0	0.0	0.1	0.0	0.1	0.0
Mamouth Guard Station	0.0	0.0	0.1	0.0	0.1	0.0
Twelve Mile Flat Campground	0.0	0.0	0.1	0.0	0.1	0.0
Fairview Lakes Development	1.7	0.0	0.0	0.0	1.7	0.0
SELF SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC SYSTEMS	0.0	0.0	0.0	0.0	0.0	0.0
SANPETE COUNTY TOTALS	1.7	0.0	0.4	0.0	2.1	0.0

SEVIER COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Sevier County which basically covers the Fish Lake area includes no incorporated communities. Within this portion of the county are 8 public non-community systems. Table 27 gives water use for public non-community systems. There are also a small number of private domestic wells. All of these uses amount to 22 acre-feet.

**TABLE 27
SEVIER COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
SEVIER COUNTY						
<i>Forest Service Systems</i>						
Bowery Spring Campground	0.0	0.0	2.8	0.0	2.8	0.0
Doctor Creek Campground	0.4	0.0	1.2	0.0	1.6	0.0
Frying Pan Campground	0.0	0.0	0.3	0.0	0.3	0.0
Twin Creeks Picnic Area	1.7	0.0	0.3	0.0	2.0	0.0
Bowery Haven Resort	0.0	4.9	0.0	0.0	4.9	0.0
Fish Lake Lodge	0.0	3.0	0.0	0.0	3.0	0.0
Lakeview Subdivision	1.0	0.0	0.0	0.0	1.0	0.0
Lakeside Resort	0.0	1.5	0.0	0.0	1.5	0.0
SELF SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC SYSTEMS	5.0	0.0	0.0	0.0	5.0	0.0
SEVIER COUNTY TOTALS	8.1	9.4	4.6	0.0	22.1	0.0

UTAH COUNTY M&I WATER SUPPLIES AND USES

The West Colorado River Basin portion of Utah County which basically covers the Soldier Summit area includes no incorporated communities. There is however, one public non-community system. The Soldier Summit system is run by Utah County. Table 28 gives water use for this public non-community system. There are no self-supplied industries or private domestic wells. This one system uses less than one acre-foot of water.

TABLE 28
UTAH COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
UTAH COUNTY						
Soldier Summit Special Service District	0.1	0.3	0.0	0.0	0.4	0.0
SELF SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC SYSTEMS	0.0	0.0	0.0	0.0	0.0	0.0
UTAH COUNTY TOTALS	0.1	0.3	0.0	0.0	0.4	0.0

WAYNE COUNTY M&I WATER SUPPLIES AND USES

Wayne County includes the incorporated communities of Bicknell, Fremont, Hanksville, Loa, Lyman, Teasdale and Torrey. Within this area are 9 public community systems and 7 public non-community systems. One system, Capitol Reef National Park, is administered by the National Park Service. Location of the public community systems are shown back in figure 3.

Table 29 shows that the maximum annual water supply for public community systems in Wayne County is 1,597 acre-feet; 1,158 acre-feet from springs and 439 acre-feet from wells. Reliable system source capacity is a little more than half that amount at 843 acre-feet.

**TABLE 29
WAYNE COUNTY
Potable Water Supplies for Public Community Systems**

WATER SUPPLIER	Springs (Ac-Ft/Yr)	Wells (Ac-Ft/Yr)	Surface (Ac-Ft/Yr)	Total (Ac-Ft/Yr)
WAYNE COUNTY				
Bicknell Culinary Water System	141.4	0.0	0.0	141.4
Caineville Special Service District	0.0	44.0	0.0	44.0
Capitol Reef National Park	0.0	40.3	0.0	40.3
Fremont Waterworks Company, Inc.	209.6	0.0	0.0	209.6
Hanksville Culinary Water Works	0.0	129.0	0.0	129.0
Loa Water Works Company	129.0	225.7	0.0	354.7
Lyman Culinary Water System	97.0	0.0	0.0	97.0
Teasdale Special Service District	129.0	0.0	0.0	129.0
Torrey Culinary Water System	451.5	0.0	0.0	451.5
WAYNE COUNTY TOTALS	1,157.5	439.0	0.0	1,596.5

Note: All values represent maximum system source capacities limited by water rights, hydrologic constraints, and/or system constraints.

Table 30 shows the reliable system source capacity along with a breakdown of potable water use for each public community system. This table shows that for Wayne County the current annual potable water use of 705 acre-feet is about 95 percent the reliable supply of 749 acre-feet of water.

**TABLE 30
WAYNE COUNTY
WATER USE AND SUPPLY FOR PUBLIC COMMUNITY SYSTEMS**

WATER SUPPLIER	POTABLE USAGE						POTABLE PER CAPITA USAGE			MAXIMUM WATER SUPPLY AVAILABLE UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	POTABLE ESTIMATED PEAK DAY VALUES				RELIABLE SYSTEM SOURCE CAPACITY UNDER PRESENT CONDITIONS (Ac-Ft/Yr)	
	Residential Indoor Use (Ac-Ft/Yr)	Residential Outdoor Use (Ac-Ft/Yr)	Commercial Indoor and Outdoor Use (Ac-Ft/Yr)	Institutional Indoor and Outdoor Use (Ac-Ft/Yr)	Industrial/ Stockwater Indoor and Outdoor Use (Ac-Ft/Yr)	Total Potable M & I Use (Ac-Ft/Yr)	Population	Average Per Capita Water Use (Ac-Ft/Yr)	Average Per Capita Water Use (GPCPD)		Assumed Peaking Factor (PD/AD)	Peak Day Supply (MGD)	Peak Day Demand (MGD)	Peak Day Supply Over Demand (MGD)		
WAYNE COUNTY																
Bicknell Culinary Water System	36.0	0.0	13.9	3.1	8.4	61.4	390	0.157	140.5	141	2.1485	0.1262	0.1178	0.0085	66	
Caineville Special Service District	4.5	12.0	0.0	0.0	0.0	16.5	40	0.413	368.2	44	2.3658	0.0393	0.0348	0.0044	19	
Capitol Reef National Park	4.8	0.6	0.0	4.8	0.1	10.3	57	0.181	161.3	40	2.1938	0.0360	0.0202	0.0158	18	
Freemont Waterworks Company, Inc.	32.2	18.0	1.2	2.4	51.0	104.8	250	0.419	374.2	210	2.3680	0.2215	0.2215 *	0.0000	105	
Hanksville Culinary Water Works	17.5	1.8	15.5	3.9	0.0	38.7	170	0.228	203.2	129	2.2569	0.1152	0.0780	0.0372	57	
Loa Water Works Company	63.9	16.5	18.2	1.9	65.1	165.6	500	0.331	295.7	355	2.3329	0.3449	0.3449 *	0.0000	166	
Lyman Culinary Water System	25.8	0.0	0.0	0.1	8.0	33.9	200	0.170	151.3	97	2.1735	0.0866	0.0658	0.0208	45	
Teasdale Special Service District	18.3	60.0	0.0	0.0	0.0	78.3	175	0.447	399.4	129	2.3763	0.1661	0.1661 *	0.0000	78	
Torrey Culinary Water System	57.7	75.5	61.7	0.7	0.0	195.6	350	0.559	498.9	452	2.4010	0.4192	0.4192 *	0.0000	196	
										see note						
WAYNE COUNTY TOTALS	260.7	184.4	110.5	16.9	132.6	705.1	2,132	0.331	295.2	1,597	2.3327	1.5550	1.4683	0.0867	749	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

* Note: Peak Day Demand exceeds the calculated Peak Day Supply. An assumption was made that in these cases the Peak Day Supply has been exactly met and should be set equal to the Peak Day Demand. Although some systems may withdraw the maximum water supply available under present conditions, the hydrologic conditions will probably limit all systems collectively from withdrawing this quantity, as presented.

A, B, C, D, E, F, H, and K

G=B+C+D+E+F

I=G/H

J=I*892.682

L=(2.5*J-49.4)/J

M=K*892.682/1000000; (except as provided in the note above)

N=H*J*1000000

O=M-N

P=(M/(L*J))*J*1120.22

These values are all input data.

This value represents only Potable M&I Water Use.

Average per capita potable water use.

Converts from Ac-Ft/Yr to GPD

The factor which when multiplied to the average per capita water use represents water use during peak demands.

Peak Day Supply of potable water based on maximum reliable source capacity converted to MGD). Where the calculated Peak Day Supply of potable water is less than the Peak Day Demand of Potable Water, this value was set equal to the Peak Day Demand of potable water.

Peak Day Demand on potable water based on the total potable M&I water use multiplied by the peaking factor

The amount of Peak Day Supply of potable water above the amount of the Peak Day Demand of potable water.

Reliable system source capacity represents that volume of water, which when divided by the average annual water per capita use, gives that population that can be reliably served by the system sources under peak day demand conditions.

Secondary water is another important aspect of total M&I use. Table 31 gives the amount of secondary water used for various categories within the boundaries of the public community systems. In Wayne County various irrigation companies deliver secondary water to customers. Total secondary water use is 430 acre-feet.

**TABLE 31
WAYNE COUNTY
Secondary (Non-Potable) Water Use Within Public Community Systems**

WATER SUPPLIER	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Secondary Use (Ac-Ft/Yr)
WAYNE COUNTY					
Bicknell Culinary Water System	77.0	0.0	0.0	0.0	77.0
Caineville Special Service District	0.0	0.0	0.0	0.0	0.0
Capitol Reef National Park	0.0	0.0	26.0	0.0	26.0
Freemont Waterworks Company, Inc.	67.5	0.0	0.0	0.0	67.5
Hanksville Culinary Water Works	37.8	0.0	6.0	0.0	43.8
Loa Water Works Company	102.5	0.0	8.0	0.0	110.5
Lyman Culinary Water System	42.5	0.0	0.0	0.0	42.5
Teasdale Special Service District	27.0	0.0	0.0	0.0	27.0
Torrey Culinary Water System	31.0	0.0	5.0	0.0	36.0
WAYNE COUNTY TOTALS	385.3	0.0	45.0	0.0	430.3

Note: Separate irrigation companies provide secondary water to the water supplier unless indicated by an **.

Table 32 gives water use for public non-community system and private domestic systems. There are no self-supplied industries and a small number of private domestic wells. All of these uses amount to 72 acre-feet.

**TABLE 32
WAYNE COUNTY
Water Use for Public Non-Community Systems,
Self-Supplied Industries and Private Domestic Systems**

Non-Community System	POTABLE USAGE					SECONDARY USE (Ac-Ft/Yr)
	Residential Use (Ac-Ft/Yr)	Commercial Use (Ac-Ft/Yr)	Institutional Use (Ac-Ft/Yr)	Industrial/ Stockwater Use (Ac-Ft/Yr)	Total Potable Use (Ac-Ft/Yr)	
WAYNE COUNTY						
Forest Service Systems	0.0	0.0	0.0	0.0	0.0	0.0
Elkhorn Campground & Guard Station	0.0	0.0	0.1	0.0	0.1	0.0
Single Tree Campground	0.0	0.0	0.3	0.0	0.3	0.0
Boulder Mountain Homestead RV Park	0.0	0.7	0.0	0.0	0.7	0.0
Hollow Mountain	0.0	1.0	0.0	0.0	1.0	0.0
Redrock Cafe	0.0	0.5	0.0	0.0	0.5	0.0
Sleepy Hollow Campground	0.0	1.9	0.0	0.0	1.9	0.0
Thousand Lakes RV Park	0.0	2.5	0.0	0.0	2.5	0.0
SELF SUPPLIED INDUSTRIES	0.0	0.0	0.0	0.0	0.0	0.0
PRIVATE DOMESTIC SYTEMS	65.0	0.0	0.0	0.0	65.0	0.0
WAYNE COUNTY TOTALS	65.0	6.6	0.4	0.0	72.0	0.0

Total potable M&I water use in the county is 777 acre-feet, while secondary use is 430 acre-feet; giving a total M&I water use of 1,207 acre-feet. Since the current population of Wayne County is about 2,400 the total M&I per capita use is 449 gpcd. Table 33 gives various per capita rates for public community systems. Appendix G shows the data for each public community system that is presented in the tables.

TABLE 33
WAYNE COUNTY
Average Per Capita M&I Water Use for all Public Community Systems

CATEGORY	Average Per Capita Use (Ac-Ft/Yr)	Average Per Capita Use (GPCD)
Residential Potable Use	0.209	186
Residential Potable Plus Secondary Use	0.389	348
Total Potable Use	0.331	295
Total Potable Plus Secondary Use	0.533	475

Note: Total Potable categories include residential, commercial, institutional and industrial uses.