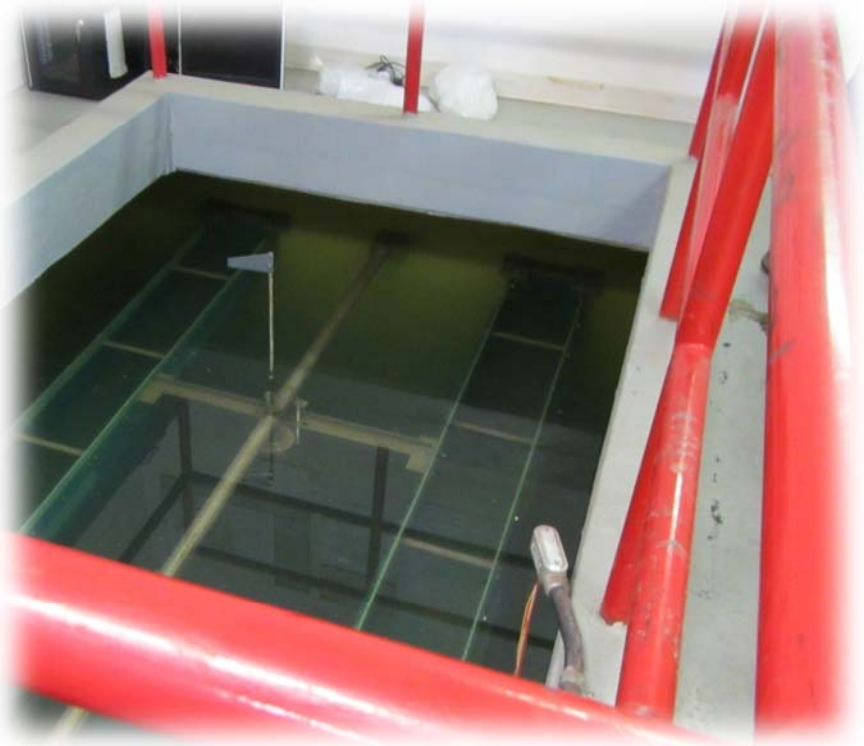
WATER RESOURCE REPORT
Town of Hayden



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Job No. 904-4.0

RESOURCE ENGINEERING INC.

RESOURCE
ENGINEERING INC.

CERTIFICATION

This report was prepared by and under the direct supervision of R. Scott Fifer, P.H. and Ashley N. Moffatt, P.E. The water rights and engineering analyses and opinions presented in this report are provided for the Town of Hayden pursuant to work agreement dated February 1, 2013.

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1.0 INTRODUCTION

In the spring of 2013, Resource Engineering, Inc. (RESORUCE) was retained by the Town of Hayden (Town) to complete an investigative study of the Town's municipal water supply system. The objective of this investigation was first to quantify the Town's existing and future water demands, then to evaluate the ability of the Town's current water supply system to adequately meet the requirements associated with those demands, and finally to identify deficiencies, if any, in either the physical supply system, the legal supply system, or a combination of the two.

RESOURCE has prepared the following Water Resource Report in culmination of the completion of this investigative study. In Section 2.0 of the report, the Town's water usage over the past decade is summarized and the baseline demand for existing conditions is quantified. This section also details the growth scenarios that RESOURCE used to forecast the Town's future population and associated water requirements. In Section 3.0 of the report, the water availability analysis that was developed in order to evaluate the Town's physical and legal water supplies is described and the results presented. Finally, Section 4.0 of the report summarizes the finding of the study and provides recommendations to help assist the Town in securing an overall long term reliable water supply system.

1.1 Scope of Work

- Locate and inventory all existing conditional and absolute water rights owned by the Town. This examination will include the Town's storage supplies, currently leased from the Upper Yampa Water Conservancy District, in Stagecoach Reservoir and Yamcolo Reservoir. A water right notebook will be prepared, containing all of the decrees, lease agreements and well permits, if applicable.

- Evaluate the volume of water physically and legally available for each water right and analyze the reliability of this supply in average and dry years.

- Analyze the existing and potential population levels that can be served from full development of the Town's water rights portfolio.

- Make recommendations regarding future water rights acquisitions to further strengthen the Town's water rights portfolio.

- Review the State's water right database to ensure that the Town's water rights are accurately entered, consistent with decrees and that the Town's diversions are accurately entered, consistent with Town records.

2.0 WATER SYSTEM DEMAND

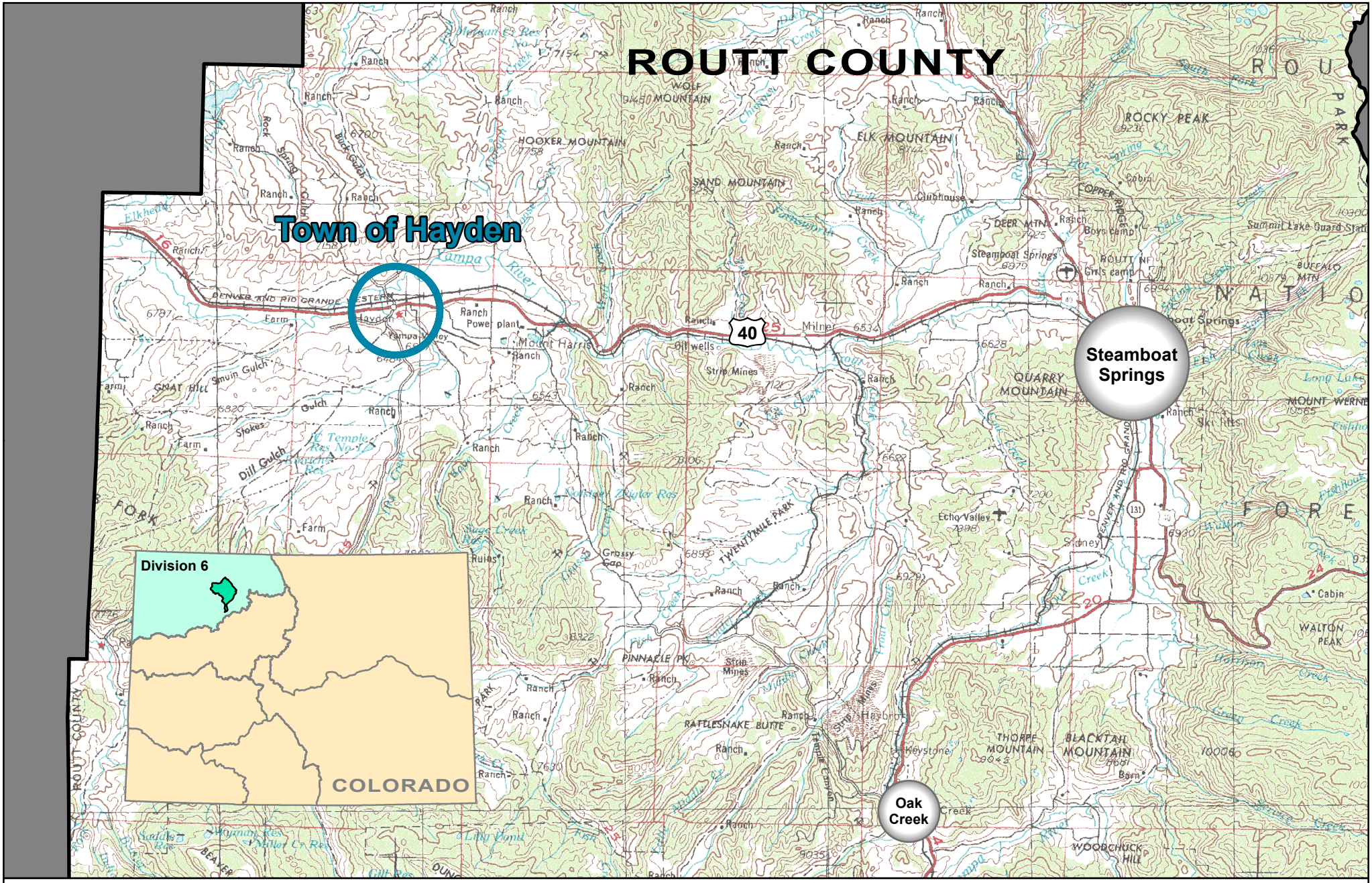
The Town of Hayden is located in western Routt County, Colorado within the Yampa River basin 25 miles west of Steamboat Springs. The Town has a current population of approximately 1,785 residents and obtains its municipal water supply from the Yampa River. The location of the Town and its general service area are shown in ***Figure 1***. The Town maintains a record of the daily production at its water treatment plant. This data provided RESOURCE an understanding of the current magnitude and timing of the water demand requirements and pattern of use within the Town's service area. These existing conditions established a baseline from which RESOURCE could project future water demand requirements by applying population growth forecasts identified for the region. The water demands quantified in this section set the basis from which the Town's physical and legal supplies are later evaluated.

2.1 Existing Water System Demand

The Town's current service area provides water to approximately 1,785 residents. In addition to supporting the domestic demand of the local population, the Town's water supply system also supports numerous municipal, commercial, and industrial demands within its service area. Specifically, the Town provides water (1) for the irrigation of pocket parks, athletic fields, and open space, (2) for a downtown service industry consisting of approximately 15-20 commercial, retail, and industrial businesses, and (3) for the Yampa Valley Airport, which is located approximately two miles east of the downtown corridor. Moreover, the Town operates a bulk water dispensing station. This station offers a year-round treated supply that has historically supported the areas industrial, residential, and agricultural users.

2.1.1 Water Production for Municipal Demand

The Town's Utility Department provided RESOURCE with daily water production records. This data represents the amount of water diverted from the Yampa River at the decreed intake structure, conveyed to the Town's water treatment plant, and delivered through the municipal supply system. RESOURCE examined the diversions records on a daily, monthly, and annual basis in order to gain an understanding of the municipal system's total annual volumetric demand and seasonal pattern of use. Furthermore, RESOUCRCE used this information to evaluate the efficiency of the physical distribution system and to establish the existing per capita water demand within the Town's service area.


ROUTT COUNTY
Town of Hayden
Steamboat Springs
Oak Creek
Division 6
COLORADO
40
Hayden
Steamboat Springs
Oak Creek
Tampa River
HOOKER MOUNTAIN
SAND MOUNTAIN
ELK MOUNTAIN
ROCKY PEAK
QUARRY MOUNTAIN
THORPE MOUNTAIN
BLACKTAIL MOUNTAIN
RATTLESNAKE BUTTE
PINNACLE PK
TWENTYMILE PARK
Mount Harris
Milner
Sidney
Echo Valley
Keystone
WALTON PEAK
WOODCHUCK HILL
DEER MTN
BUFFALO MTN
MOUNT WERNER
Summit Lake Guard Station
Boys camp
Girls camp
Ski hills
Cabin
Clubhouse
Power plant
Oil wells
Strip Mines
Grassy Gap
Ruins
Farm
Ranch
Barn
Stokes
Dill Gulch
GNAT Hill
Smuin Gulch
Rock Spring Gulch
Buck Gulch
Elkhead
Wolf Creek Res
Temple Res No 1
Yellow Water Res
Saddle Res
Wyman Res
Miller Cr Res
Lily Pond
Long Lake
Fishhook
Walton
Horsman Creek
Green Creek
Spring Creek
Fish Creek
Middle Cr
Front Creek
Temple Canyon
Dry Gulch
Elk River
Yampa River
Fish Creek
Gill Creek
Gill Res
Dunckley
Beaver
Upper Fish Creek
Upper Elk River
Upper Yampa River
Upper Middle Cr
Upper Stokes Gulch
Upper Dill Gulch
Upper Smuin Gulch
Upper Rock Spring Gulch
Upper Buck Gulch
Upper Elkhead
Upper Wolf Creek
Upper Temple Canyon
Upper Front Creek
Upper Dry Gulch
Upper Spring Creek
Upper Fish Creek
Upper Gill Creek
Upper Dunckley
Upper Beaver
Upper Green Creek
Upper Walton
Upper Horsman Creek
Upper Fishhook
Upper Long Lake
Upper Summit Lake
Upper Buffalo Mtn
Upper Deer Mtn
Upper Rocky Peak
Upper Quarry Mountain
Upper Twentymile Park
Upper Sand Mountain
Upper Hooker Mountain
Upper Wolf Mountain
Upper Elk Mountain
Upper Thorpe Mountain
Upper Blacktail Mountain
Upper Rattlesnake Butte
Upper Pinnacle Pk
Upper Mount Werner
Upper Mount Harris
Upper Milner
Upper Sidney
Upper Echo Valley
Upper Keystone
Upper Walton Peak
Upper Woodchuck Hill
Upper Steamboat Springs
Upper Oak Creek
Upper Hayden
Upper Tampa Valley
Upper Ranch
Upper Farm
Upper Barn
Upper Cabin
Upper Clubhouse
Upper Boys camp
Upper Girls camp
Upper Ski hills
Upper Strip Mines
Upper Oil wells
Upper Grassy Gap
Upper Ruins
Upper Power plant
Upper Stokes
Upper Dill Gulch
Upper GNAT Hill

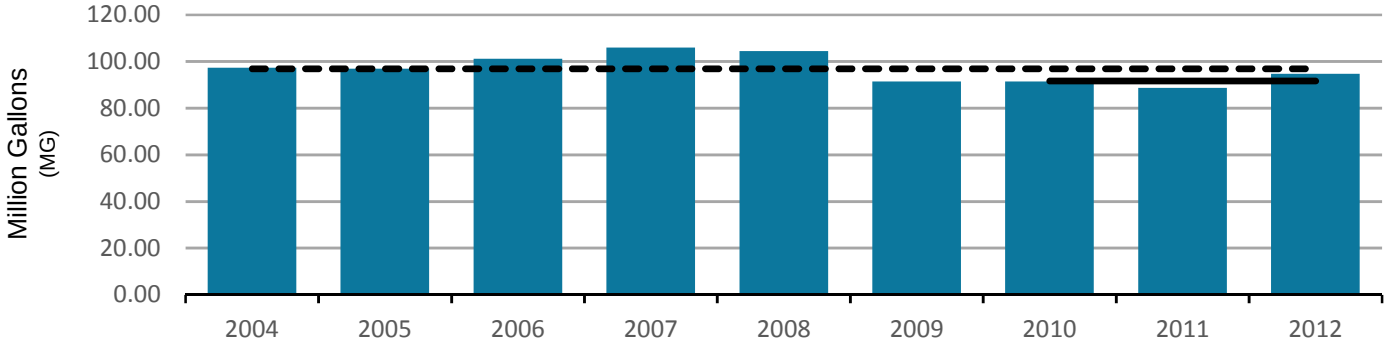
The diversion records relied on for this study cover a 9-year period from 2004-2012. On average, during this period, the Town diverted a total annual volume of approximately 96.9 million gallons (MG) or just under 300.0 acre-feet (AF). The peak water year during this period occurred in 2007, when the Town diverted an annual total of 106.0 MG (325.2 AF). This peak coincided with a surge of new construction activity that occurred within the Town's service area from 2006-2008. Over the last three years, however, the Town's annual water requirement has dropped below the 9-year average to a volume of approximately 91.6 MG (281.2 AF). This recent decline in the annual water demand can be attributed to a combination of factors. During the recent development boom, the Town constructed a pond south of the rodeo grounds that provides a raw water irrigation supply to several large public areas. The pond is unlined and receives water from the intercepted groundwater source, as well as from the Town's interest in the Walker Ditch. By changing the source and delivery of this irrigation supply the Town effectively reduced its summer demand for treated municipal water. In addition, the economic recession that followed the development boom impacted the level to which residents choose to water their lawns. This change also lowered the amount of water required over the summer season and likewise contributed to an overall reduction in the annual diverted municipal supply. A summary of the Town's monthly and annual diversions totals from 2004-2012 is presented in ***Figure 2***, and a more detailed breakdown of the Town's diversion record can be found in ***Appendix A*** attached.

In the 9-year study period from 2004-2012, the Town annually diverted over 60% of its total water demand between May and September. On average, during this 5-month period, the Town's daily diversion demand began to increase in early to mid-May from a baseline rate of 0.18 million gallons per day (MGD) to a rate of 0.26 MGD or 0.40 cubic feet per second (cfs). The daily diversion demand then continued to increase over the next two months with average rates reaching 0.42 MGD (0.65 cfs) in June and 0.51 MGD (0.79 cfs) in July. After peaking in July, the daily diversion demand then began to recede in August and continued decreasing through September until returning to baseline conditions in October. This seasonality of water use between the Town's summer and winter diversions is typical of most municipal water providers. During the winter, monthly diversion rates remains relatively constant, as the only demand on the system is for indoor water use. Then, during the summer, the monthly diversion rates increase, as there is a demand for both indoor water use and outdoor irrigation. Graphically, the "baseline," indoor demand and "bell shaped," summer irrigation demand for the Town are shown in ***Figure 3***, which summarizes the average monthly diversion rates from 2004-2012.

Figure 2
Town of Hayden's Total Annual Diversion Summary
2004-2012

Total Annual Diversion Volume for each Year

Average Annual Volume for the 9-Year Study Period: 96.9 million gallons (297.3 AF)
Average Annual Volume for Last 3-Years (2010-2012): 91.6 million gallons (281.2 AF)



	TOTAL ANNUAL DIVERSION SUMMARY								
Year	2004 (MG)	2005 (MG)	2006 (MG)	2007 (MG)	2008 (MG)	2009 (MG)	2010 (MG)	2011 (MG)	2012 (MG)
Jan	5.84	5.79	6.15	6.01	5.56	5.04	5.61	6.14	5.08
Feb	5.93	5.19	5.18	5.16	5.26	5.09	5.06	5.53	5.85
Mar	5.92	5.56	5.51	5.84	5.64	5.16	5.25	5.30	5.70
Apr	4.93	5.33	5.72	5.31	5.24	4.78	4.61	4.84	5.79
May	9.84	8.09	10.09	9.17	6.02	7.26	4.79	5.59	10.60
Jun	13.53	9.25	15.53	16.11	15.31	7.44	10.92	11.19	14.60
Jul	15.04	17.86	14.56	18.27	20.72	15.98	16.05	11.55	11.84
Aug	13.19	13.40	13.94	15.00	15.19	14.40	12.55	14.44	12.20
Sep	7.09	9.54	8.82	10.37	9.48	10.79	10.76	9.42	8.34
Oct	5.30	5.72	5.27	5.19	6.07	5.38	6.25	5.03	5.55
Nov	5.22	5.18	5.00	4.66	4.59	4.64	4.55	4.46	4.20
Dec	5.44	5.97	5.35	4.87	5.42	5.43	5.00	5.22	5.01
Total	**97.29**	**96.87**	**101.11**	**105.97**	**104.50**	**91.37**	**91.41**	**88.72**	**94.75**

Year	2004 (AF)	2005 (AF)	2006 (AF)	2007 (AF)	2008 (AF)	2009 (AF)	2010 (AF)	2011 (AF)	2012 (AF)
Jan	17.9	17.8	18.9	18.4	17.1	15.5	17.2	18.8	15.6
Feb	18.2	15.9	15.9	15.8	16.1	15.6	15.5	17.0	17.9
Mar	18.2	17.0	16.9	17.9	17.3	15.8	16.1	16.3	17.5
Apr	15.1	16.4	17.6	16.3	16.1	14.7	14.2	14.8	17.8
May	30.2	24.8	31.0	28.2	18.5	22.3	14.7	17.2	32.5
Jun	41.5	28.4	47.7	49.4	47.0	22.8	33.5	34.3	44.8
Jul	46.2	54.8	44.7	56.1	63.6	49.0	49.3	35.4	36.3
Aug	40.5	41.1	42.8	46.0	46.6	44.2	38.5	44.3	37.5
Sep	21.7	29.3	27.1	31.8	29.1	33.1	33.0	28.9	25.6
Oct	16.3	17.6	16.2	15.9	18.6	16.5	19.2	15.4	17.0
Nov	16.0	15.9	15.3	14.3	14.1	14.2	14.0	13.7	12.9
Dec	16.7	18.3	16.4	14.9	16.6	16.7	15.3	16.0	15.4
Total	**298.6**	**297.3**	**310.3**	**325.2**	**320.7**	**280.4**	**280.5**	**272.3**	**290.8**

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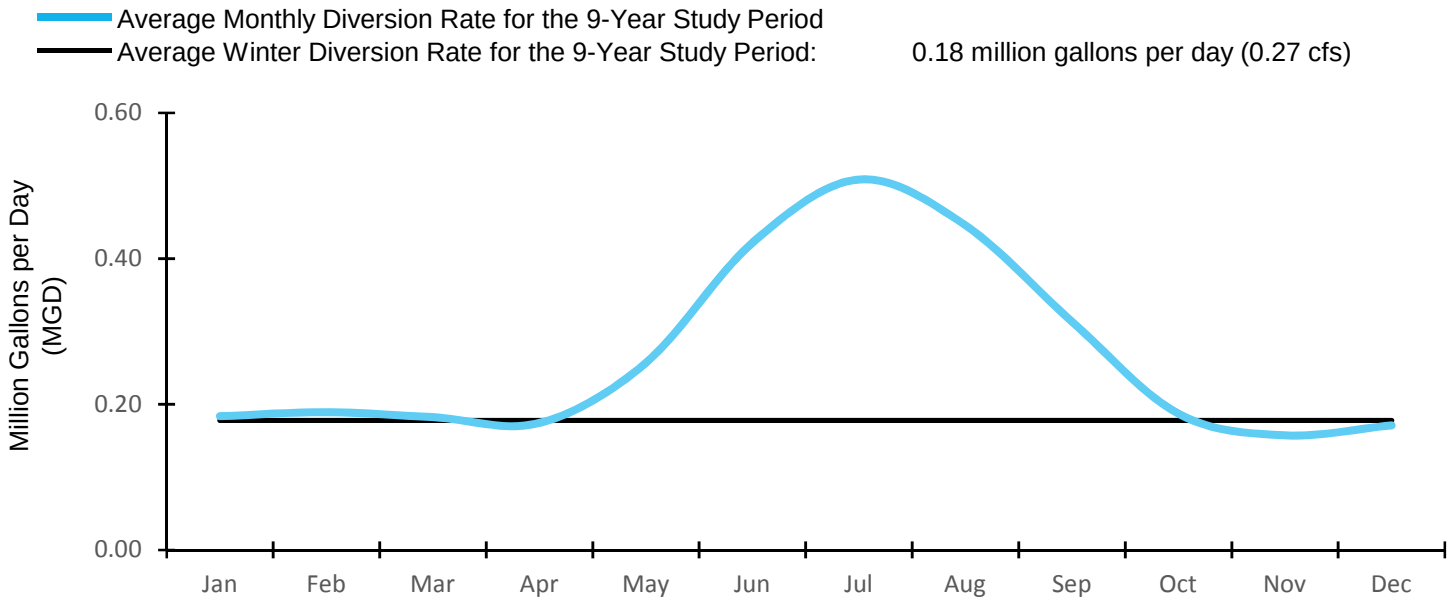
Figure 3
Town of Hayden's Average Diversion Rate Summary
2004-2012



	AVERAGE MONTHLY DIVERSION SUMMARY											
Year	Jan (MGD)	Feb (MGD)	Mar (MGD)	Apr (MGD)	May (MGD)	Jun (MGD)	Jul (MGD)	Aug (MGD)	Sep (MGD)	Oct (MGD)	Nov (MGD)	Dec (MGD)
2004	0.19	0.20	0.19	0.16	0.32	0.45	0.49	0.43	0.24	0.17	0.17	0.18
2005	0.19	0.19	0.18	0.18	0.26	0.31	0.58	0.43	0.32	0.18	0.17	0.19
2006	0.20	0.18	0.18	0.19	0.33	0.52	0.47	0.45	0.29	0.17	0.17	0.17
2007	0.19	0.18	0.19	0.18	0.30	0.54	0.59	0.48	0.35	0.17	0.16	0.16
2008	0.18	0.18	0.18	0.17	0.19	0.51	0.67	0.49	0.32	0.20	0.15	0.17
2009	0.16	0.18	0.20	0.18	0.24	0.25	0.52	0.46	0.36	0.18	0.15	0.18
2010	0.18	0.18	0.17	0.15	0.15	0.36	0.52	0.40	0.36	0.20	0.15	0.16
2011	0.20	0.20	0.17	0.16	0.18	0.37	0.37	0.47	0.31	0.23	0.15	0.17
2012	0.16	0.20	0.18	0.19	0.34	0.49	0.38	0.39	0.28	0.19	0.14	0.16
Avg	**0.18**	**0.19**	**0.18**	**0.17**	**0.26**	**0.42**	**0.51**	**0.45**	**0.31**	**0.19**	**0.16**	**0.17**

Year	Jan (cfs)	Feb (cfs)	Mar (cfs)	Apr (cfs)	May (cfs)	Jun (cfs)	Jul (cfs)	Aug (cfs)	Sep (cfs)	Oct (cfs)	Nov (cfs)	Dec (cfs)
2004	0.29	0.32	0.30	0.25	0.49	0.70	0.75	0.66	0.37	0.26	0.27	0.27
2005	0.29	0.29	0.28	0.28	0.40	0.48	0.89	0.67	0.49	0.29	0.27	0.30
2006	0.31	0.29	0.27	0.30	0.50	0.80	0.73	0.70	0.45	0.26	0.26	0.27
2007	0.30	0.29	0.29	0.27	0.46	0.83	0.91	0.75	0.53	0.26	0.24	0.24
2008	0.28	0.28	0.28	0.27	0.30	0.79	1.03	0.76	0.49	0.30	0.24	0.27
2009	0.25	0.28	0.26	0.25	0.36	0.38	0.80	0.72	0.56	0.27	0.24	0.27
2010	0.28	0.28	0.26	0.24	0.24	0.56	0.80	0.63	0.56	0.31	0.23	0.25
2011	0.31	0.31	0.26	0.25	0.28	0.58	0.58	0.72	0.49	0.25	0.23	0.26
2012	0.25	0.31	0.28	0.30	0.53	0.75	0.59	0.61	0.43	0.28	0.22	0.25
Avg	**0.28**	**0.29**	**0.28**	**0.27**	**0.40**	**0.65**	**0.79**	**0.69**	**0.48**	**0.28**	**0.24**	**0.26**

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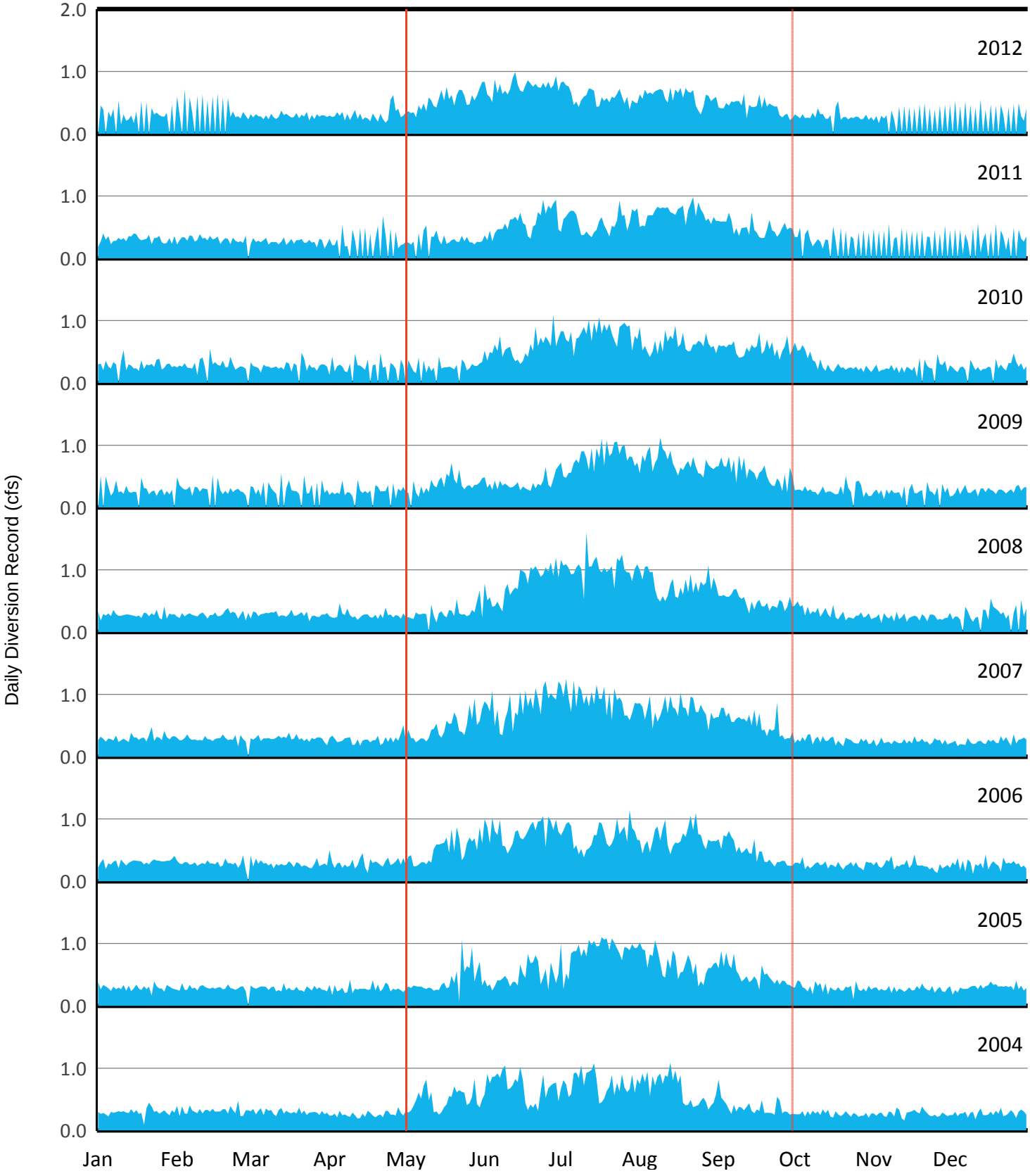
Figure 4
Daily Diversion Record at the Town of Hayden's Water Treatment Plant
2004-2012



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The seasonal water use pattern shown in ***Figure 3*** is also evident in ***Figure 4***, which displays the Town's daily diversion records over the 9-year study period. While the daily pattern shown in ***Figure 4*** demonstrates the variability of the diversion demand within each month, the overall water use pattern follows the average trend shown in ***Figure 3***. The daily variability does however, provide insight into the operation of the Town's municipal supply system. The "spiky" winter diversions that are evident in recent years, for example, are the result of operational changes at the water treatment plant. In an effort to reduce costs, the Town began operating the plant on alternating days in the winter. In this manner, the Town diverted twice as much water over the course of one day as is required to meet the single day indoor demand and then shut the plant down the next day, diverting no water. In the non-diverting days, the Town supported the municipal water requirement with its carryover storage supply. This practice of alternating diversion days in the winter started at the end of 2008 with and has continued through 2012.

The total annual municipal demand and seasonal pattern of use provide an overview of the timing and magnitude of supply that is required by the Town. The physical system, however, is tested by the diversion rate needed to meet the Town's "peak day" demand. The Town's water treatment plant is designed to treat up to 2.4 MGD; however, the current operational ability of the water treatment plant is approximately 1.8 MGD, based on information provided to RESOUCRE by Town personal. These design and operational constraints are the limiting factor in determining maximum volume of treated water that the Town's plant is capable of producing. Between 2004 and 2012, the Town diverted at an average daily rate of 0.27 MGD or 0.41 cfs. At this average rate only 11.3% to 15.0% of the capacity of the Town's current water treatment plant is being used. On a peak day, however, the Town's water demand can be several times greater than the average daily rate. RESOURCE found that on average, the Town's annual peak day demand over the 9-year study period equaled a diversion rate of 0.74 MGD or 1.15 cfs. This peak rate is 2.8 times greater than the Town's average daily diversion rate over the same period. For comparison, similar sized communities typically have a multiplier or "peaking factor" of 2.4. The fact that the Town's "peaking factor" is slightly higher than the norm is not necessarily a cause for concern or an indicator of inefficiencies within the distribution system. The difference is most likely attributed to the Town's need to flush distribution lines periodically for water quality purposes, particularly the 2 mile long pipeline that services the Yampa Valley Airport. A peak diversion demand of 0.74 MGD (1.15 cfs) is therefore a reasonable representative of the maximum capacity that is currently

required at the Town's water treatment plant. A summary of the Town's average and peak day diversions from 2004-2012 is presented in ***Figure 5***.

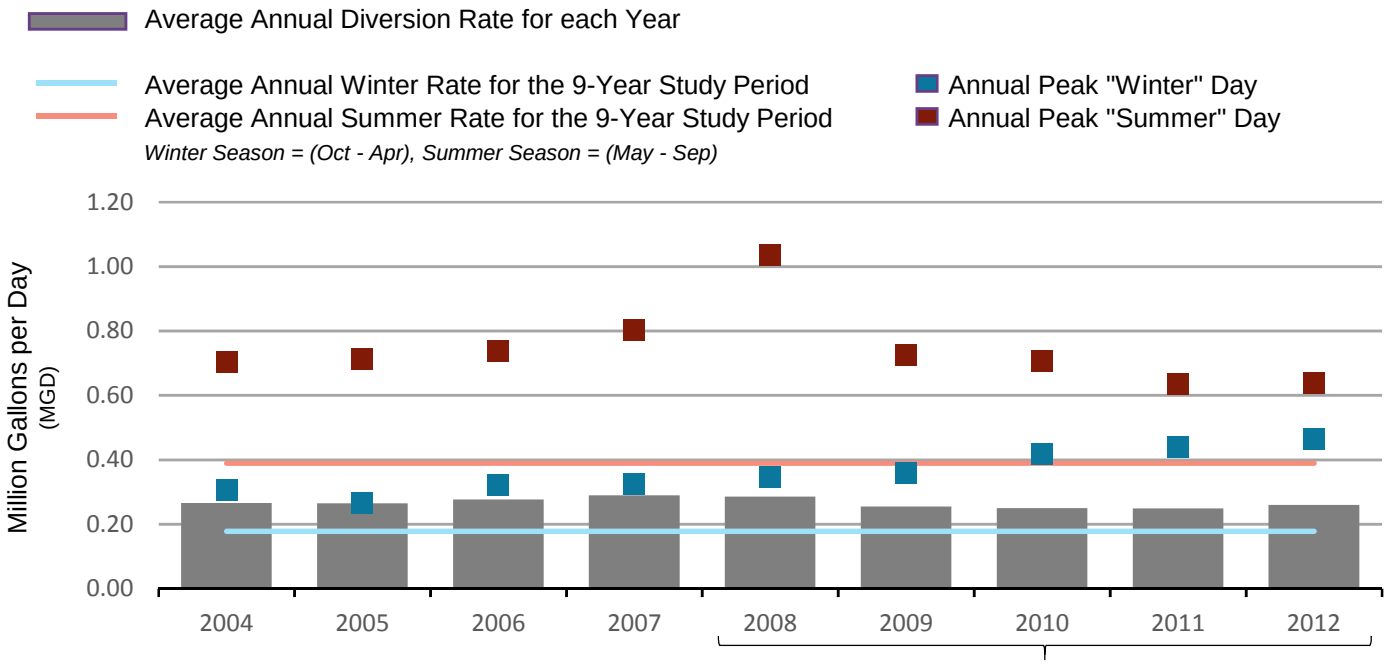
2.1.2 Water Production at the Bulk Dispensing Station

The Town has operated a bulk water sales program for approximately 15 years. Through this program, water is made available to haul to locations that are not connected to the municipal distribution system. There is currently only one dispensing station, which is located south of the downtown corridor, near the rodeo grounds. This station is directly connected to the municipal water distribution system, and as such provides customers with year-round access to a potable source of supply. The water from this system typically supports domestic and industrial needs outside of the Town's boundary, and records indicate that the annual withdrawal from the dispensing station varies between 1.4 to 4.5 MG (4.3 to 13.8 AF). At this level of use, the bulk sales program represents approximately 1.5% to 5% of the Town's total annual water demand. It is RESOURCE's understanding that as industrial demands within the region increase, the bulk sales program has the potential to gain a larger portion of overall demand. Due to the modest level of current use, however, RESOURCE did not to separate the bulk water demand from the overall municipal demand for the purpose of analyzing the Town's future water requirements. RESOURCE recommends that the Town continue to monitor the role of the bulk water program and reassess its impact on the Town's water system if the bulk water demand begins to increase.

2.1.3 Per Capita Water Production

The total water supply diverted each day by the Town and evenly distributed among the residents within its service area represents the Town's per capita water production. This calculated parameter is important as it provides a baseline from which future growth scenarios can be evaluated. In order to establish the Town's existing per capita water demand, RESOURCE analyzed the Town's diversion records in conjunction with population estimates obtained from the State Demography Office. RESOURCE specifically focused on the last three years of record: 2010 to 2012. During this period, the Town diverted at an average rate of 176,000 gallon per day (gpd) in the winter season from October through April and at a peak rate of 660,000 gpd at the height of the summer season. This supply was consequently delivered to an average estimated population of 1,785 residents.

Figure 5
Town of Hayden's Average and Peak Day Diversion Summary
2004-2012



In 2008, Town started operating WTP every other day in the Winter season. This operation increased the peak day rate.

	AVERAGE & PEAK DAY DIVERSION SUMMARY								
	Average Day			Winter **Average**			Summer **Average**		
Year	(MGD)	(cfs)		(MGD)	(cfs)		(MGD)	(cfs)	
2004	0.27	0.41		0.18	0.28		0.38	0.59	
2005	0.26	0.41		0.18	0.28		0.38	0.59	
2006	0.28	0.43		0.18	0.28		0.41	0.64	
2007	0.29	0.45		0.17	0.27		0.45	0.70	
2008	0.28	0.44		0.18	0.27		0.44	0.67	
2009	0.25	0.39		0.18	0.26		0.37	0.56	
2010	0.25	0.39		0.17	0.27		0.36	0.56	
2011	0.25	0.38		0.18	0.27		0.34	0.53	
2012	0.26	0.40		0.18	0.27		0.38	0.58	
Avg	0.27	0.41		0.18	0.27		0.39	0.60	

	Peak Day		Peaking	Winter **Peak**		Winter	Summer **Peak**		Summer
Year	(MGD)	(cfs)	Factor	(MGD)	(cfs)	Factor	(MGD)	(cfs)	Factor
2004	0.70	1.09	2.65	0.31	0.47	1.69	0.70	1.09	1.84
2005	0.71	1.10	2.69	0.27	0.41	1.46	0.71	1.10	1.88
2006	0.74	1.14	2.67	0.32	0.50	1.78	0.74	1.14	1.80
2007	0.80	1.24	2.78	0.33	0.50	1.87	0.80	1.24	1.79
2008	1.04	1.60	3.64	0.35	0.54	1.96	1.04	1.60	2.38
2009	0.73	1.12	2.85	0.36	0.56	2.05	0.73	1.12	1.98
2010	0.71	1.09	2.83	0.42	0.65	2.45	0.71	1.09	1.96
2011	0.63	0.98	2.55	0.44	0.68	2.42	0.63	0.98	1.86
2012	0.64	0.99	2.47	0.46	0.72	2.64	0.64	0.99	1.70
Avg	0.74	1.15	**2.79**	0.36	0.56	**2.04**	0.74	1.15	**1.91**

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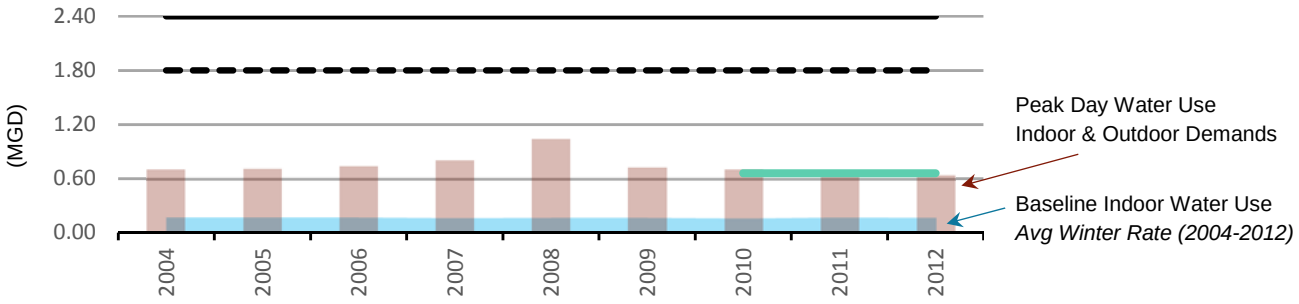
The Town's current per capita "baseline," winter demand is therefore equal to approximately 100 gallons per person per day (gpcd) or 0.15 cfs per 1,000 residents (176,000 gpd / 1,785 people). This "baseline" demand assumes only indoor water use as irrigation and other outside uses are minimal in the winter. In general, indoor water use on a national average ranges from 90 to 120 gpcd. The Town's per capita indoor water demand fits within this range, which indicates that the water supply and distribution system are in good condition with only modest system losses.

The Town's current per capita "peak day," summer demand, which includes both indoor and outdoor water use, is equal to approximately 400 gpcd or 0.60 cfs per 1,000 residents (660,000 gpd / 1,785 people). As discussed in Section 2.1.1, the "peak day" demand is the driving force in evaluating the physical limits of the Town's water supply system. A per capita "peak day" demand of 400 gpcd indicates that under current water use practices, the Town's water treatment plant needs to be able to produce 400 gallons per resident on a peak day. In order to determine the approximate population that can be sustained at this level of production, RESOURCE then compared the per capita "peak day" demand against the current operational capacity and design capacity of the Town's water treatment plant (1.8 MGD to 2.4 MDG). The comparison resulted in an approximate range of 4,500 to 6,000 residents, which is 2.5 to 3.4 times greater than the current population. The Town's existing water system, therefore, is more than adequate to support the constituents currently residing within its service area. A summary of the Town's existing per capita water production and physical system evaluation is shown in ***Figure 6***.

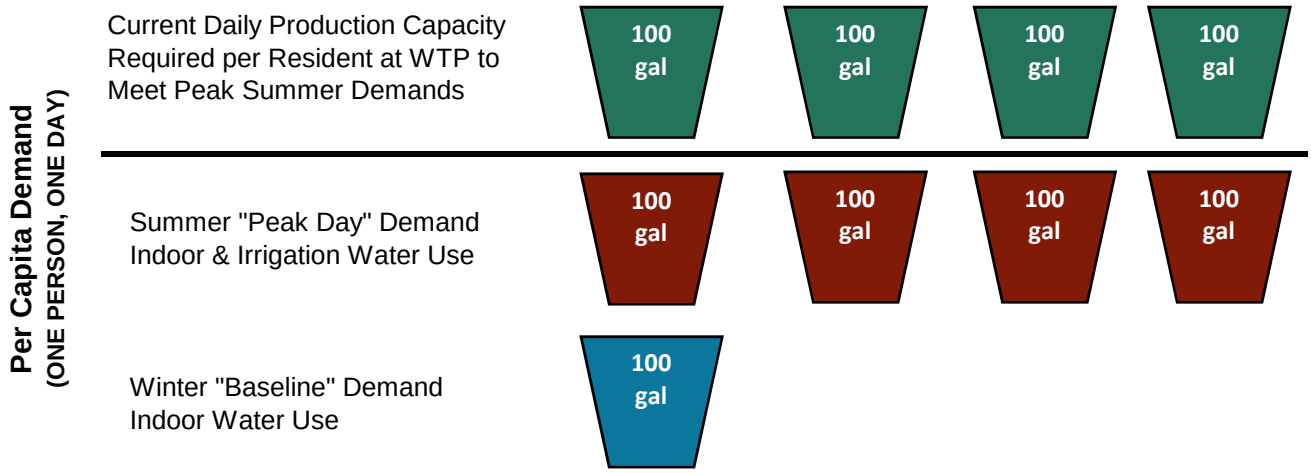
2.1.4 Consistency with State Diversion Records

One of the tasks identified for this study was to determine if the Colorado Division of Water Resources, also known as the Office of the State Engineer, was accurately documenting the Town's annual and monthly diversions. For this task, RESOURCE downloaded the annual reports and daily diversion records that were available online through the State's Colorado Decision Support System (CDSS) database. The State's records were incomplete for 2011 and 2012; therefore RESOURCE limited its review to the period 2004 through 2010. In addition, the records that RESOURCE relied upon for this study were based on the finished water production, while the records reported by the Town to the District 57 Water Commissioner were based on the raw water diversion. Consequently, the State's record should generally be slightly higher than the water treatment plant record, as the water production record represents the total diverted supply minus any backwash.

Figure 6
Town of Hayden's Current Water Treatment Plant (WTP)
Physical Water Demand & System Operations



	Town's Population (2010-2012):	1,785	residents
	Average Peak Production (2010-2012):	660,000	gallons
	Approximate Capacity Required by Current WTP per Resident per Day	400	gallons
	Current WTP Design Capacity:	2,400,000	gallons
	Current WTP Operational Capacity:	1,800,000	gallons
★	Approximate Population that Town's Current WTP could Support	6,000 4,500	residents



Year	Town of Hayden Population	PER CAPITA WATER DEMAND					
		Average Day		Winter Average		Peak Day	
		(gpcd)	(cfs/1,000)	(gpcd)	(cfs/1,000)	(gpcd)	(cfs/1,000)
2004	1,652	161	0.25	110	0.17	426	0.66
2005	1,652	160	0.25	111	0.17	431	0.67
2006	1,676	165	0.26	107	0.17	441	0.68
2007	1,687	172	0.27	104	0.16	477	0.74
2008	1,672	170	0.26	106	0.16	620	0.96
2009	1,650	154	0.23	106	0.16	440	0.68
2010	1,799	139	0.21	95	0.15	393	0.61
2011	1,777	140	0.21	102	0.15	357	0.55
2012	1,779	146	0.23	99	0.15	360	0.56
Average 2010-2012:		141	0.22	99	0.15	370	0.57

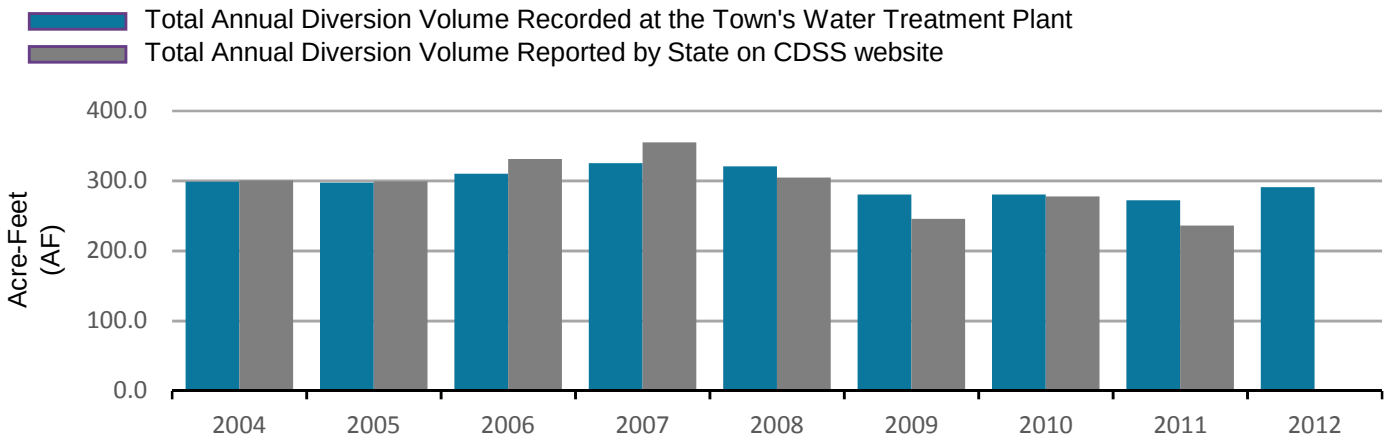
From 2004-2007, a comparative analysis revealed that the State reported annual diversion totals that were 1% to 9% greater than the production records at the Town's water treatment plant. Again, a slightly higher total should be expected, as the State's records are based on the raw water diversion. From 2008-2009, the State reported annual diversion totals that were 5% to 12.5% less than the production records from the water treatment plant. These results do not fall in line with the previously described logic; however, the State's annual report for 2008 indicates that the records were supplied infrequently and not based on daily data. Moreover, it is RESOURCE's understanding that the operation of the Town's water treatment plant changed hands in 2009, at which time several reporting inconstancies were discovered. In 2010, the annual diversion totals were within a percentage. A summary of this comparison between the Town's production records and the State's reported diversion total is shown in ***Figure 7***.

In summary, RESOURCE concludes that the State Engineer is accurately accounting for the Town's annual diversions. In order to maintain consistency between the two set of water use records, RESOURCE recommends that the Town continue to supply the State with accurate diversion totals and maintain communication with the District 57 Water Commissioner on a regular basis.

2.2 Demand Forecast

In Section 2.1, RESOURCE analyzed the Town's water demand over the past 9-years and concluded that the existing physical supply system has the capacity to support approximately 4,500 to 6,000 residents, assuming that current water use patterns are maintained. In order to determine when this future water requirement will occur, RESOUCRE reviewed various projections of growth for the region. Based on this review process, RESOUCRE was able to identify potential low, average, and high growth rates, which were subsequently applied to the Town's current population and peak day water demand. This analysis ultimately identified a range of the potential timelines for reaching 4,500-6,000 residents and the potential to reach and/or exceeded the current capacity of the Town's current water treatment plant.

Figure 7
Town of Hayden's Water Treatment Plant Records Compared to State Database
2004-2012



	WATER TREATMENT PLANT RECORD								
Year	2004 (AF)	2005 (AF)	2006 (AF)	2007 (AF)	2008 (AF)	2009 (AF)	2010 (AF)	2011 (AF)	2012 (AF)
Jan	17.9	17.8	18.9	18.4	17.1	15.5	17.2	18.8	15.6
Feb	18.2	15.9	15.9	15.8	16.1	15.6	15.5	17.0	17.9
Mar	18.2	17.0	16.9	17.9	17.3	15.8	16.1	16.3	17.5
Apr	15.1	16.4	17.6	16.3	16.1	14.7	14.2	14.8	17.8
May	30.2	24.8	31.0	28.2	18.5	22.3	14.7	17.2	32.5
Jun	41.5	28.4	47.7	49.4	47.0	22.8	33.5	34.3	44.8
Jul	46.2	54.8	44.7	56.1	63.6	49.0	49.3	35.4	36.3
Aug	40.5	41.1	42.8	46.0	46.6	44.2	38.5	44.3	37.5
Sep	21.7	29.3	27.1	31.8	29.1	33.1	33.0	28.9	25.6
Oct	16.3	17.6	16.2	15.9	18.6	16.5	19.2	15.4	17.0
Nov	16.0	15.9	15.3	14.3	14.1	14.2	14.0	13.7	12.9
Dec	16.7	18.3	16.4	14.9	16.6	16.7	15.3	16.0	15.4
Total	**298.6**	**297.3**	**310.3**	**325.2**	**320.7**	**280.4**	**280.5**	**272.3**	**290.8**

	STATE CDSS RECORD								
Year	2004 (AF)	2005 (AF)	2006 (AF)	2007 (AF)	2008 (AF)	2009 (AF)	2010 (AF)	2011 (AF)	2012 (AF)
Jan	18.0	17.8	20.0	21.2	18.0	15.6	17.2	18.0	
Feb	18.2	15.9	17.2	18.8	17.0	15.8	15.6	16.0	
Mar	18.2	17.0	17.6	20.4	17.0	15.2	14.9	16.0	
Apr	15.1	16.4	18.4	18.6	17.0	14.6	14.2	15.0	
May	30.2	24.8	31.2	29.1	18.0	21.3	14.1	17.0	
Jun	41.5	28.4	50.7	53.2	43.0	22.2	33.5	33.0	
Jul	46.2	54.8	47.5	58.8	57.0	44.3	49.3	35.0	
Aug	40.5	41.1	44.5	48.1	41.0	38.4	41.8	42.0	
Sep	21.7	29.3	29.6	35.5	27.0	10.8	33.0	28.0	
Oct	18.4	17.6	16.4	19.2	19.0	16.7	16.1	16.0	
Nov	16.0	16.7	18.7	16.0	14.8	14.2	13.0		
Dec	16.7	19.1	19.3	16.0	16.0	16.7	15.0		
Total	**300.7**	**299.0**	**331.1**	**354.8**	**304.8**	**245.6**	**277.7**	**236.0**	**0.0**

Black: Monthly Total Based on Daily Record available on State's CDSS website.

Red: Monthly Total Reported on Annual Summary available on State's CDSS website.

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For this study, RESOURCE reviewed and evaluated population forecasts prepared by the State Demography Office, the Statewide Water Supply Initiative, and the BBC Research & Consulting Firm. The State Demography Office is the primary state agency for population and demographic information. The website affiliated with this agency provides annual population forecasts for each county through 2040. Based on this information, RESOURCE determined that the growth rate for Routt County is projected to vary from 1.8% to 2.7% over the next 28-years. The Statewide Water Supply Initiative (SWSI) was implement in 2003 by the Colorado Water Conservation Board (CWCB) for the purpose of identifying current and future water needs within Colorado. In 2004, SWSI published a study that projected growth rates within the major river basins. This report was subsequently updated in 2010, and projected growth rates through 2050 in the Yampa-White basin to vary from 1.8% to 3.0%. Finally, the BBC Research & Consulting Firm (BBC) was retained by the Upper Yampa Conservancy District (UYWCD) in 2008 and again in 2009 to provide growth projections and water demand forecasts for the Yampa Valley. In its most recent projection, the BBC estimates that Routt County will grow at a rate between 2.0% and 2.5% over the long term, with 50% of the growth occurring within Steamboat Springs, 10% of the growth occurring within the towns of Hayden, Oak Creek, and Yampa, and 40% of the growth occurring in unincorporated areas.

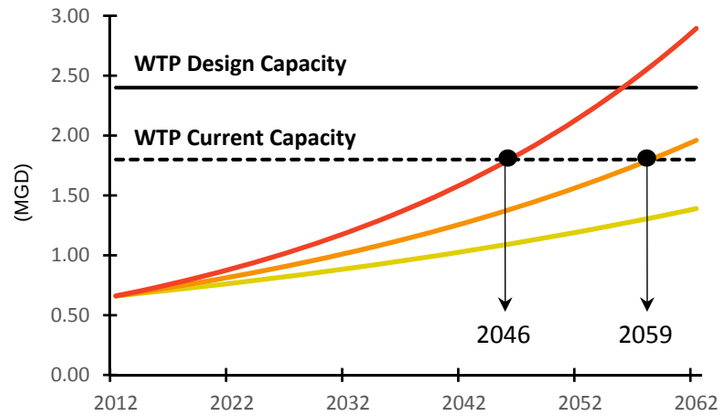
Based on these projected future growth rates and a review of the Town's historical population trends, RESOUCE assumed a low growth rate of 1.5% per year, an average growth rate of 2.2% per year, and high growth rate of 3.0% per year. These rates were then applied over a 50-year planning horizon to the Town's current population of 1,785 people and "peak day" water use of 0.66 MG or 1.02 cfs. Under the low growth scenario of 1.5%, the Town would reach a population of approximately 3,750 people at the end of the 50-year planning horizon, with an associated maximum water requirement equal to 1.39 MGD (2.15 cfs) on a "peak day." As shown in ***Figure 8***, this demand is within the design capacity and current operational capacity (2.4 MGD & 1.8 MGD) of the Town's water treatment plant.

Under the average growth scenario of 2.2%, the Town would reach a population of approximately 5,300 people at the end of the 50-year planning horizon, with an associated maximum water requirement equal to 1.96 MGD (3.03 cfs) on a "peak day." As shown in ***Figure 8***, this demand is within the design capacity of the Town's water treatment plant, however, it exceeds the current operational capacity. The average growth scenario, therefore, identifies a timeline of 45-years until the Town reaches its current operational limit.

Figure 8
Town of Hayden's Projected Growth and Peak Water Demand
50-Year Study Period (2012-2062)

Potential Annual Growth Rates	
Low Rate of Growth:	1.5%
Average Rate of Growth:	2.2%
High Rate of Growth:	3.0%

Current Water Demand (2010-2012)		
Town's Population	1,785	people
Peak Day Water Use:	1.02	cfs
Peak Day Water Use:	0.66	MGD
WTP Capacity:	2.40	MGD
Operational Limit:	1.80	MGD



	Low Growth Projections			**Average** Growth Projections			**High** Growth Projections		
		Water Demand			Water Demand			Water Demand	
Year	Population	(cfs)	(MGD)	Population	(cfs)	(MGD)	Population	(cfs)	(MGD)
2012	**1,785**	**1.02**	**0.66**	**1,785**	**1.02**	**0.66**	**1,785**	**1.02**	**0.66**
2013	1,812	1.04	0.67	1,824	1.04	0.67	1,839	1.05	0.68
2014	1,839	1.05	0.68	1,864	1.07	0.69	1,894	1.08	0.70
2015	1,867	1.07	0.69	1,905	1.09	0.70	1,951	1.12	0.72
2016	1,895	1.08	0.70	1,947	1.11	0.72	2,009	1.15	0.74
2017	1,923	1.10	0.71	1,990	1.14	0.74	2,069	1.18	0.77
2018	1,952	1.12	0.72	2,034	1.16	0.75	2,131	1.22	0.79
2019	1,981	1.13	0.73	2,079	1.19	0.77	2,195	1.26	0.81
2020	2,011	1.15	0.74	2,124	1.22	0.79	2,261	1.29	0.84
2021	2,041	1.17	0.75	2,171	1.24	0.80	2,329	1.33	0.86
2022	2,072	1.19	0.77	2,219	1.27	0.82	2,399	1.37	0.89
2023	2,103	1.20	0.78	2,268	1.30	0.84	2,471	1.41	0.91
2024	2,134	1.22	0.79	2,318	1.33	0.86	2,545	1.46	0.94
2025	2,166	1.24	0.80	2,369	1.36	0.88	2,621	1.50	0.97
2026	2,199	1.26	0.81	2,421	1.39	0.90	2,700	1.55	1.00
2027	2,232	1.28	0.83	2,474	1.42	0.92	2,781	1.59	1.03
2028	2,265	1.30	0.84	2,528	1.45	0.94	2,864	1.64	1.06
2029	2,299	1.32	0.85	2,584	1.48	0.96	2,950	1.69	1.09
2030	2,334	1.34	0.86	2,641	1.51	0.98	3,039	1.74	1.12
2031	2,369	1.36	0.88	2,699	1.54	1.00	3,130	1.79	1.16
2032	2,404	1.38	0.89	2,758	1.58	1.02	3,224	1.85	1.19
2033	2,440	1.40	0.90	2,819	1.61	1.04	3,321	1.90	1.23
2034	2,477	1.42	0.92	2,881	1.65	1.07	3,420	1.96	1.27
2035	2,514	1.44	0.93	2,944	1.69	1.09	3,523	2.02	1.30
2036	2,552	1.46	0.94	3,009	1.72	1.11	3,629	2.08	1.34
2037	2,590	1.48	0.96	3,075	1.76	1.14	3,737	2.14	1.38
2038	2,629	1.50	0.97	3,143	1.80	1.16	3,850	2.20	1.42
2039	2,668	1.53	0.99	3,212	1.84	1.19	3,965	2.27	1.47
2040	2,708	1.55	1.00	3,283	1.88	1.21	4,084	2.34	1.51
2041	2,749	1.57	1.02	3,355	1.92	1.24	4,206	2.41	1.56
2042	2,790	1.60	1.03	3,429	1.96	1.27	4,333	2.48	1.60
2043	2,832	1.62	1.05	3,504	2.01	1.30	4,463	2.55	1.65
2044	2,874	1.65	1.06	3,582	2.05	1.32	4,597	2.63	1.70
2045	2,918	1.67	1.08	3,660	2.09	1.35	4,734	2.71	1.75
2046	2,961	1.69	1.10	3,741	2.14	1.38	4,876	2.79	1.80
2047	3,006	1.72	1.11	3,823	2.19	1.41	5,023	2.87	1.86
2048	3,051	1.75	1.13	3,907	2.24	1.45	5,173	2.96	1.91
2049	3,097	1.77	1.15	3,993	2.29	1.48	5,329	3.05	1.97
2050	3,143	1.80	1.16	4,081	2.34	1.51	5,488	3.14	2.03
2051	3,190	1.83	1.18	4,171	2.39	1.54	5,653	3.24	2.09
2052	3,238	1.85	1.20	4,263	2.44	1.58	5,823	3.33	2.15
2053	3,287	1.88	1.22	4,356	2.49	1.61	5,997	3.43	2.22
2054	3,336	1.91	1.23	4,452	2.55	1.65	6,177	3.54	2.28
2055	3,386	1.94	1.25	4,550	2.60	1.68	6,363	3.64	2.35
2056	3,437	1.97	1.27	4,650	2.66	1.72	6,554	3.75	**2.42**
2057	3,488	2.00	1.29	4,753	2.72	1.76	6,750	3.86	**2.50**
2058	3,541	2.03	1.31	4,857	2.78	1.80	6,953	3.98	**2.57**
2059	3,594	2.06	1.33	4,964	2.84	1.84	7,161	4.10	**2.65**
2060	3,648	2.09	1.35	5,073	2.90	1.88	7,376	4.22	**2.73**
2061	3,702	2.12	1.37	5,185	2.97	1.92	7,597	4.35	**2.81**
2062	3,758	2.15	1.39	5,299	3.03	1.96	7,825	4.48	**2.89**

Under the high growth scenario of 3.0%, the Town would reach a population of approximately 7,825 people at the end of the 50-year planning horizon, with an associated maximum water requirement associated equal to 2.89 MGD (4.48 cfs) on a "peak day." As shown in ***Figure 8***, this demand exceeds both the design capacity and the current operational capacity of the Town's water treatment plant. The high growth scenario, therefore, identifies a timeline of 33-years until the Town reaches its operational limit and 43-years until the Town reaches it design limit.

3.0 WATER AVAILABILITY

In the previous section, RESOURCE calculated the Town's existing per capita demand and from that basis, projected a range of future water requirements over a 50-year planning horizon based on several identified growth scenarios. These potential demands requirements were then evaluated against the Town existing water treatment plant's capacity, in order to determine a timeline for when the production system will reach and/or exceed its physical limits. While this analysis set forth the Town's future water needs and provided insight in regards to the operation of the water treatment plant, it did not examine the ability of the Town to actually divert the required annual and "peak day" water supply. The reliability of this supply component necessitates that it be both physically and legally available at the Town's diversion intake. Each of these aspects is equally important. An abundant water source is unreliable if the diverting structure is out-of-priority, because its water right is junior to the administrative call. Likewise, a senior water right is unreliable if the diversion source is of insufficient quantity. The adequacy of the Town's municipal water system, therefore, depends on the available physical and legal water supply, both of which were analyzed by RESOURCE in the following section.

3.1 Physical Water Supply

The Town diverts its municipal water supply from a headgate structure on the Yampa River referred to as the Town of Hayden Intake Pipeline (Intake Pipeline). This diversion structure is located on a river bend approximately a half mile north of the downtown corridor, as shown in ***Figure 9***. From this location, the diverted supply is gravity fed through a 12 inch pipeline into two wet wells. Each of these wet well is equipped with two pumps that convey the raw water supply approximately 100 feet to the water treatment plant. Water demands from Town residents, the Yampa Valley Airport, and the bulk water dispensing station are then delivered

a produced water supply via a distribution system that includes a one million gallon storage tank located on top of hospital hill.

The Yampa River is the Town's sole source of supply for both raw water irrigation and potable consumption. As such, the physical availability of this supply, especially at the Intake Pipeline, is critically important. Of the major rivers within the State, the Yampa River has historically produced an annual streamflow volume second only to the Colorado River, and at its location approximately 80 miles downstream from the headwater region, the Yampa River near the Town of Hayden has historically reflected this robust nature. In order to quantify this observation, RESOURCE analyzed the daily streamflow record collected by the USGS at its Yampa River gauge above Elkhead Creek (No. 09244490). This monitoring site is the closest in proximity to the Town. The gauge is located approximately 10 miles downstream of the Intake Pipeline and has a streamflow record that covers the study period from 2004 through 2012. While this site does not include the critically dry year of 2002, it does include the 2012 water year, which was the second driest year in the last 30 years. As such, RESOUCE determined that this site would provide an accurate evaluation of the available physical supply.

Based on the daily record from 2004 to 2012, the mainstem of the Yampa River flows at an average monthly rate between 100.0 cfs and 10,000 cfs, as shown in ***Figure 10***. This range would indicate that on an average monthly basis the physical supply just downstream of the Intake Pipeline is 20 times greater than the Town's high growth, 50-year "peak day" diversion requirement of 4.48 cfs (2.89 MGD) and therefore sufficient to meet both the current and future water supply needs. This conclusion, however, is based on data collected at a site that is not fully representative of the streamflow conditions at the Town's point of diversion on the Yampa River. Specifically, there are two large agricultural diversions that deplete the water supply directly above the Town's Intake Pipeline. This depletive volume is not available to divert by the Town, however, the non-consumptive portion of this volume does accrue back to the stream system as irrigation return flow and is account for by the downstream USGS gauge.

In order to better approximate the Town's reliable physical supply, RESOURCE made two adjustments to the daily streamflow record collected at the Yampa River above Elkhead Creek gauge. The first adjustment was to reduce the streamflow record by the diversion record of the Walker Ditch and the Shelton Ditch. This reduction simulated the depletive effect that these irrigation systems have above the Town's Intake Pipeline.

Figure 9
Town of Hayden's Water Rights and Water Features

Miles
0 0.25 0.5 1

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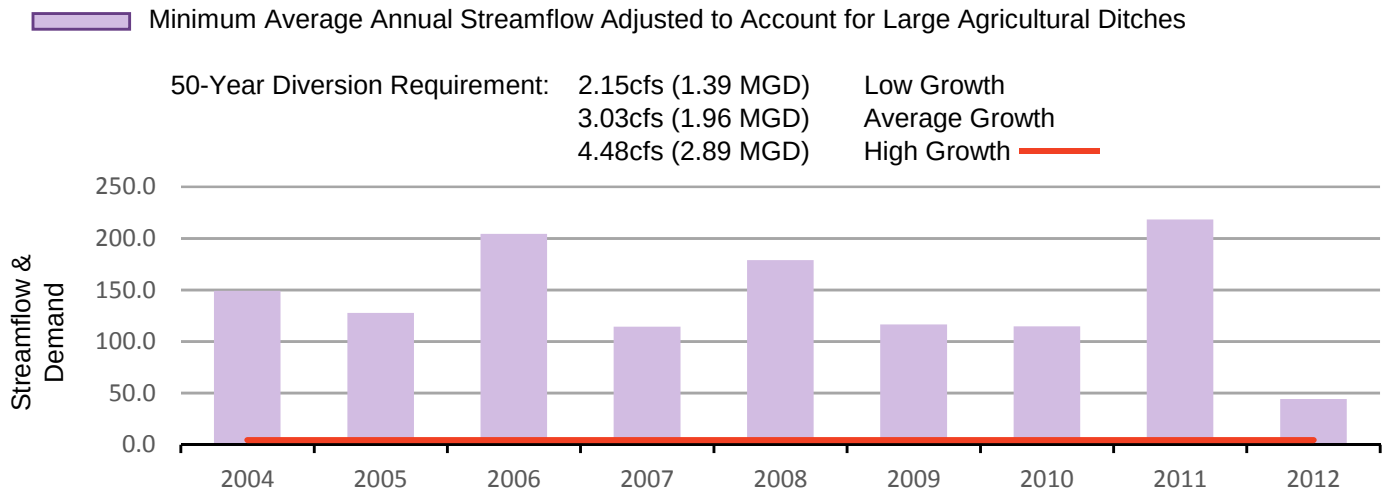
Date: 09-27-2013
File: 904-4.0
Drawn: ANM

Figure 10
Summary of the Streamflow of the Yampa River above Elkhead Creek
2004-2012



	AVERAGE STREAMFLOW SUMMARY								
Year	2004 (cfs)	2005 (cfs)	2006 (cfs)	2007 (cfs)	2008 (cfs)	2009 (cfs)	2010 (cfs)	2011 (cfs)	2012 (cfs)
Jan		279.7	230.6	276.4	181.0	238.7	122.2	222.5	245.6
Feb		268.4	203.8	224.6	214.9	281.8	119.6	220.4	235.6
Mar	1,111.3	438.8	354.1	974.5	275.5	564.9	220.7	498.4	798.1
Apr	1,552.1	1,929.2	3,116.1	1,776.3	1,921.7	2,313.5	1,446.6	2,876.3	1,904.0
May	2,873.2	4,585.2	5,325.5	3,689.0	5,381.6	5,519.0	3,577.4	5,797.1	2,385.5
Jun	2,011.2	4,916.3	3,530.6	1,875.6	6,505.0	4,532.3	5,614.7	10,029.7	685.3
Jul	552.8	1,203.2	582.2	283.8	1,448.3	1,106.4	841.5	5,717.1	192.6
Aug	158.7	257.9	229.0	131.6	343.5	247.0	340.6	724.8	108.9
Sep	272.2	146.7	277.5	207.5	213.5	150.1	152.3	372.7	82.6
Oct	481.8	303.8	555.5	424.4	232.8	284.9	268.3	397.3	142.1
Nov	429.2	302.1	403.2	307.9	258.0	285.3	342.4	325.6	160.6
Dec	273.6	257.7	305.2	190.9	200.3	160.3	250.4	270.7	120.7
Min	**158.7**	**146.7**	**203.8**	**131.6**	**181.0**	**150.1**	**119.6**	**220.4**	**82.6**

	AVERAGE ADJUSTED STREAMFLOW SUMMARY								
Year	2004 (cfs)	2005 (cfs)	2006 (cfs)	2007 (cfs)	2008 (cfs)	2009 (cfs)	2010 (cfs)	2011 (cfs)	2012 (cfs)
Jan		278.2	231.1	271.4	179.0	232.7	117.2	220.5	245.6
Feb		266.9	204.3	219.6	212.9	275.8	114.6	218.4	235.6
Mar	1,107.3	437.3	354.6	969.5	273.5	558.9	215.7	496.4	797.9
Apr	1,548.1	1,927.7	3,114.0	1,773.6	1,919.8	2,307.7	1,441.6	2,873.3	1,896.7
May	2,861.1	4,584.6	5,314.8	3,662.8	5,373.8	5,496.3	3,590.7	5,794.1	2,373.7
Jun	1,981.1	4,898.7	3,484.7	1,852.4	6,466.8	4,497.6	5,552.3	10,026.7	661.0
Jul	533.0	1,194.5	575.7	267.1	1,436.8	1,101.7	807.9	5,669.1	149.5
Aug	149.1	251.0	215.3	114.2	347.9	213.8	337.2	708.5	65.6
Sep	247.0	127.6	264.9	185.6	210.7	116.5	119.3	364.0	44.1
Oct	466.7	298.6	550.8	416.6	231.4	273.6	250.8	395.3	131.9
Nov	427.7	302.6	398.2	305.9	255.0	280.3	339.4	325.6	160.6
Dec	272.1	258.2	300.2	188.9	194.3	155.3	248.4	270.7	120.7
Min	**149.1**	**127.6**	**204.3**	**114.2**	**179.0**	**116.5**	**114.6**	**218.4**	**44.1**

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RESOURCE choose to subtract the entire diversion amount for each ditch and not to try to factor in the return flow portion that accrues back to the stream system above the gauge site. Likewise, RESOURCE did not factor out the Town's ownership in either of the ditches. This approach provided a conservatively lower flow rate for evaluation. The second adjustment increased the streamflow record by the diversion record of the Brock Ditch, an irrigation diverter located a short distance upstream of the USGS gauge site. The agricultural diversions from this ditch system are fully depletive above the monitoring site, and therefore reflect a water supply that would be available at the Town's Intake Pipeline, but was not accounted for at the gauge.

In total, these adjustments reduced the average annual streamflow in the driest month of the 9-year record (September 2012) from 82.6 cfs to 44.1 cfs, as shown in ***Figure 10***. At this adjusted rate, the available physical supply of the Yampa River near the Town's Intake Pipeline is more than adequate to meet the Town's high growth, 50-year "peak day" diversion demand of 4.48 cfs (2.89 MGD). If growth and water use practice within the Town's service area follow this projected trend, the available physical supply should not be a limiting factor over the next 50-years. This analysis, however, does not account for the impact that future growth outside of the Town's service area will have on the Yampa River system or the affect, if any, that climate change will have on the regions temperature and snowpack conditions. RESOURCE recommends that the Town continue to monitor the nearby streamflow, and reevaluate this physical availability analysis if annual trend progressively begin to decrease.

3.2 Legal Water Supply

The Town owns a portfolio of water rights to supply various uses throughout its service area, and as its sole municipal diversion source, the Intake Pipeline is at the center of this portfolio. The intake structure itself has an original and enlargement water right totaling 4.00 cfs. In addition, the Town has changed its ownership in the Shelton Ditch and Walker Ditch to be available for diversion at the Intake Pipeline for domestic, municipal, and other uses. With the addition of these historical irrigation rights, the Town has the legal ability to divert up to 8.87 cfs at the Intake pipeline, which exceeded the projected high growth, 50-year "peak day" water requirement of 4.48 cfs (2.89 MGD). Moreover, the administrative priorities associated with the historical irrigation rights provide the Intake Pipeline with a more secure legal supply.

Within the State of Colorado, water rights are operated based on the doctrine of prior appropriation – often referred to as "first in time, first in right." Under this system, the State

Engineer assigns an administrative priority to each water right. This assigned number is unique and is based on an analysis related to the date that the water right was appropriated (intent to divert and use water) and the date that the water rights was adjudicated (confirmed by the Water Court). The priority hierarchy is largely important in water short scenarios, wherein a downstream, senior water right can place an administrative call that requires all upstream, junior water rights to curtail and/or cease diverting. The more senior priorities assigned to the Town's historical irrigation rights, therefore, strengthen the legal ability of the Intake Pipeline to divert when a downstream administrative call is placed.

In addition to its owned water rights, the Town also leases water from the Upper Yampa Water Conservancy District (UYWCD) in both Yamcolo Reservoir and Stagecoach Reservoir. These leased supplies allow the Town to divert water when it would otherwise be out-of-priority. In these circumstances, the Town would request that the UYCWD release a portion of its leased supply to the Yampa River. That supply would then travel downstream, as an addition to the natural streamflow. The Town would then divert the requested amount minus any assessed transit loss at the Intake Pipeline, without causing injury to the senior, downstream calling water right.

The water rights included in the Town's portfolio are described in more detail in the following sub-sections, as is an analysis of the portfolio's ability to legal supply the Town's future water requirements.

3.2.1 Town of Hayden Intake Pipeline

The Town of Hayden Intake Pipeline is comprised of two absolute water rights capable of diverting up to 4.00 cfs, as shown in ***Table 1***. The original water right was appropriated on September 1, 1913 for general municipal purposes at an absolute diversion rate of 1.125 cfs and a conditional rate of 0.875 cfs. The right was subsequently adjudicated in Routt County as part of Civil Action Case No. 3155 on April 24, 1959. The conditional portion of the diversion rate was later made absolute in Case W-0084. The first enlargement water right was appropriated on February 16, 1972 for municipal purposes at an absolute rate of 2.00 cfs. This enlargement water right was subsequently adjudicated in Routt County as part of Case W-0103 on December 31, 1972.

Table 1
Town of Hayden's Water Rights Portfolio

Structure Name	Source	Administration Number	Adjudication Date			Appropriation Date			Decreed Rate	Case Number	Notes	Decreed Use
			Y	M	D	Y	M	D				
DIRECT FLOW / PIPELINE												
Intake Pipeline *Original Right* *Enlargement Right*	Yampa River	35987.23253	1959	Apr	24	1913	Sep	1	2.00 cfs	CA3155	Remaining 7/8 cfs Made Absolute in Case W-84	Municipal
		44606.00000	1972	Dec	31	1972	Feb	16	2.00 cfs	W-0130	Original Case for Full Absolute Amount	
								Total	**4.00 cfs**			
CONSUMPTIVE USE DIVERSIONS / CREDITS												
Shelton Ditch Portion of Right Owned by Town *57.38 AF/yr APOD at Intake*	Yampa River	12158.00000	1892	Sep	22	1883	Apr	15	0.26 cfs	81CW339	Changed the Type of Use (additional to irrigation) and Point of Diversion as an Alternate (APOD) to Town's Intake & Williams Pump	Irrigation Mun, Dom Com, Ind Rec, Fire
		14183.00000	1892	Sep	22	1888	Oct	30	0.79 cfs			
		34139.14183	1948	Jul	12	1888	Oct	30	1.05 cfs			
Walker Ditch Portion of Right Owned by Town 45.23 AF/yr APOD at Intake Case No. 03CW0017 *68.34 AF/yr Transferred to Intake* *Case No. 05CW0005*	Yampa River	11809.00000	1892	Sep	22	1882	May	1	0.36 cfs	05CW0005	Both Cases Changed the Type of Use (additional to irrigation). Case No. 03CW0017 Changed the Point of Diversion as an Alternate (APOD) to Town's Intake. Case No. 05CW0005 Changed the Point of Diversion as a Transfer (no longer taken at original point) to the Town's Intake.	Irrigation Municipal Domestic Commercial Industrial Recreational Fire
		14154.00000	1892	Sep	22	1888	Oct	1	0.50 cfs 0.36 cfs	03CW0017 05CW0005		
		23541.19144	1914	Jun	18	1902	Jun	1	0.08 cfs	05CW0005		
		23549.18809	1914	Oct	6	1901	Jul	1	0.08 cfs	05CW0005		
		34139.14154	1948	Jul	12	1888	Oct	1	0.50 cfs 0.89 cfs	03CW0017 05CW0005		
								Total	**4.87 cfs**			
LEASED STORAGE												
Stagecoach Reservoir	Original Lease Agreement Signed on November 20, 1986 for 30 Years. Releases are delivered down the Yampa River to the Town's Intake (~55 miles).								200.0 AF	172.5 AF	Available Supply with a Transit Loss Factor of 0.50 cfs per Mile *(UYWCD / Tri-State)* .	
Yamcolo Reservoir	Original Lease Agreement Extended on July, 15 2011 for another 30 Years. Releases are delivered down the Yampa River to the Town's Intake (~80 miles).								300.0 AF	260.0 AF	Available Supply with a Transit Loss Factor of 0.50 cfs per Mile *(UYWCD / Tri-State)* .	
								Total	**500.0 AF**			

** Need to Correct State Database to Reflect that Irrigation is a Use under Case No. 05CW0005*

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Table 2
Town of Hayden's Water Right Constraints

Structure Name	Administration Number	Available Diversion Amount (cfs)												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Intake Pipeline	35987.23253	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	***Sr. to Maybell Canal Jr. Right***
	44606.00000	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	***Junior to Maybell Canal***
	Total	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	
Shelton Ditch 81CW339	12158.00000				0.26	0.26	0.26	0.26	0.26	0.26				**Senior to Maybell Canal**
	14183.00000				0.09	0.19	0.58	0.29	0.19	0.09				
	34139.14183													
	Total				**0.35**	**0.45**	**0.84**	**0.55**	**0.45**	**0.35**				
Walker Ditch 03CW0017	14154.00000				0.15	0.43	0.50	0.50	0.38	0.27	0.11			**Senior to Maybell Canal**
	34139.14154				0.00	0.00	0.25	0.09	0.00	0.00	0.00			***Sr. to Maybell Canal Jr. Right***
	TOTAL				**0.15**	**0.43**	**0.75**	**0.59**	**0.38**	**0.27**	**0.11**			
Walker Ditch 05CW0005	11809.00000				0.10	0.36	0.36	0.36	0.36	0.36	0.16			**Senior to Maybell Canal**
	14154.00000				0.00	0.23	0.36	0.36	0.17	0.03	0.00			
	23541.19144				0.00	0.00	0.08	0.08	0.00	0.00	0.00			
	23549.18809				0.00	0.00	0.08	0.04	0.00	0.00	0.00			
	34139.14154				0.00	0.00	0.21	0.00	0.00	0.00	0.00			***Sr. to Maybell Canal Jr. Right***
	Total				**0.10**	**0.59**	**1.09**	**0.84**	**0.53**	**0.39**	**0.16**			

Diversion Totals (cfs)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No Call / FREE RIVER	4.00	4.00	4.00	4.60	5.47	6.68	5.98	5.36	5.01	4.27	4.00	4.00
Senior to Maybell Canal Rights	**0.00**	**0.00**	**0.00**	**0.60**	**1.47**	**2.22**	**1.89**	**1.36**	**1.01**	**0.27**	**0.00**	**0.00**
Senior to Maybell Canal Jr. Right	2.00	2.00	2.00	2.00	2.00	2.46	2.09	2.00	2.00	2.00	2.00	2.00
Junior to Maybell Canal Rights	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00

Legal Supply Summary at Town's Intake

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3.2.2 Shelton Ditch

The Shelton Ditch is comprised of three absolute water rights capable of diverting up to 53.52 cfs from the Yampa River. The Town owns a share is each of the three water rights for a total of 2.10 cfs, as shown in ***Table 1***. In Case No. 81CW0339, the Town successfully changed the type of use and point of diversion related to its portion of the Shelton Ditch water rights. The associated decree allowed the Town to divert water under the Shelton Ditch for municipal, domestic, commercial, industrial, recreational, and fire protection uses in addition to irrigation. The decree also granted the Town an ability to divert up to 57.38 AF per year at the Town's Intake Pipeline or at the Williams Pump. When operating the water rights under these changed conditions, the Town is required to (1) inform the Division Engineer, (2) forgo irrigating the land that was historically supported by the Town's rights, as shown in ***Figure 9***, and (3) comply with decreed volumetric and rate limits, as shown in ***Table 2***. A more detailed breakdown of these three water rights follows.

The original Shelton Ditch water right was appropriated on April 15, 1883 for irrigation use at a diversion rate of 7.50 cfs. This right was subsequently adjudicated in Routt County on September 22, 1892 and assigned an administrative number of 12158.00000. Of this original water right, only 6.69 cfs is still available to divert at the Shelton Ditch headgate as 0.45 cfs and 0.36 cfs were transferred to other structures in Civil Action No. 3025 and Civil Action No. 3315 respectively. The Town owns 0.26 cfs of the remaining original Shelton Ditch water right.

A first, enlargement water right was appropriated on October 30, 1888 for irrigation use at a diversion rate of 22.50 cfs. This right was also adjudicated in Routt County on September 22, 1892 and assigned an administrative number of 14183.00000. Of this first enlargement water right, only 20.07 cfs is still available to divert at the Shelton Ditch headgate as 1.35 cfs and 1.08 cfs were transferred to other structures in Civil Action No. 3025 and Civil Action No. 3315 respectively. The Town owns 0.79 cfs of the remaining first enlargement water right.

A second, enlargement water right was appropriated on October 30, 1888 for irrigation use at a diversion rate of 30.00 cfs. This right was subsequently adjudicated in Routt County on July 12, 1948 and assigned an administrative number of 34139.14183. Of this second enlargement water right, only 26.76 cfs is still available to divert at the Shelton Ditch headgate as 1.80 cfs and 1.44 cfs were transferred to other structures in Civil Action No. 3025 and Civil

Action No. 3315 respectively. The Town owns 1.05 cfs of the remaining second enlargement water right.

3.2.3 Walker Ditch

The Walker Ditch is comprised of seven absolute water rights capable of diverting up to 42.73 cfs from the Yampa River. The Town owns and/or has transferred portions of five of the seven water rights for a total of 2.77 cfs, as shown in ***Table 1***. In Case No. 03CW0017, the Town successfully changed the type of use and point of diversion related to its portion of two of the Walker Ditch water rights (Administration Nos. 14154.00000 and 34139.14154). Then in Case No. 05CW0005, the Town successfully changed the type of use and point of diversion related to its portion of five of the Walker Ditch water rights: additional portions of two of the water rights that had previously been changed and portions of three of the other water rights (Administration Nos. 11809.00000, 23541.19144, and 23549.18809). In both cases, the decrees allowed the Town to divert water under the Walker Ditch for municipal, domestic, commercial, industrial, recreational, and fire protection uses in addition to irrigation. The decrees also granted the Town an ability to divert its Walker Ditch supply at the Town of Hayden Intake Pipeline. This change in point of diversion, however, differs slightly between the two cases. In Case No. 03CW0017, the water rights were changed as alternative points of diversion. This distinction allows the Town to either divert at the Walker Ditch headgate for the continued irrigation of the acreage historically supported by the Town's rights or to forgo that irrigation and divert an alternative supply of up to 45.23 AF per year at the Intake Pipeline. Operating under this decree, requires that the Town (1) inform the Division Engineer where it will take its diversion supply, (2) forgo irrigating historical acreage, as shown in ***Figure 9***, when diversions are not taken through the Walker Ditch headgate, and (3) comply with decree volumetric and rate limits, as shown in ***Table 2***. In Case No. 05CW0005, the water rights were transferred to the Town of Hayden Intake Pipeline and the historically irrigated acreage was subsequently dried up. Operating under this decree, the Town can divert up to 68.34 AF per year at the Intake Pipeline, so long as the volumetric and rate limits are not exceeded, as shown in ***Table 2***. A more detailed breakdown of the five water rights owned by the Town in the Walker Ditch follows. As a side note, the structure summary for the Walker Ditch that is available on the State's CDSS online database does not show irrigation as an allowable use under Case No. 05CW0005. This description is incorrect and should be addressed with the Division Engineer.

The original Walker Ditch water right was appropriated on May 1, 1882 for irrigation use at a diversion rate of 8.75 cfs. This right was subsequently adjudicated in Routt County on September 22, 1892 and assigned an administrative number of 11809.00000. Of this original water right, the Town transferred 0.36 cfs to the Town of Hayden Intake Pipeline.

A first, enlargement water right was appropriated on October 1, 1888 for irrigation use at a diversion rate of 8.75 cfs. This right was also adjudicated in Routt County on September 22, 1892 and assigned an administrative number of 14154.00000. Of this first enlargement water right, the Town owns 0.50 cfs and has transferred 0.36 cfs to the Town of Hayden Intake Pipeline.

A second, enlargement water right was appropriated on June 1, 1902 for irrigation use at a diversion rate of 2.00 cfs. This right was subsequently adjudicated in Routt County on June 18, 1914 and assigned an administrative number of 23541.19144. Of this second enlargement water right, the Town has transferred 0.08 cfs to the Town of Hayden Intake Pipeline.

A third, enlargement water right was appropriated on July 1, 1901 for irrigation use at a diversion rate of 2.00 cfs. This right was subsequently adjudicated in Routt County on October 6, 1914 and assigned an administrative number of 23549.18809. Of this third enlargement water right, the Town has transferred 0.08 cfs to the Town of Hayden Intake Pipeline.

A forth, enlargement water right was appropriated on October 1, 1888 for irrigation use at a diversion rate of 21.50 cfs. This right was subsequently adjudicated in Routt County on July 12, 1948 and assigned an administrative number of 34139.14154. Of this forth enlargement water right, the Town owns 0.50 cfs and has transferred 0.89 cfs to the Town of Hayden Intake Pipeline.

The Walker Ditch has two additional water rights totaling 1.50 cfs. These water rights are the ditches most junior in priority with adjudication dates of December 31, 1975 and December 31, 1995. The Town does not currently own any portion of either of these water rights.

3.2.4 UYWCD Contract Water (Stagecoach & Yamcolo Reservoirs)

The Upper Yampa Water Conservancy District (UYWCD) was formed in 1966 with an intent to conserve, develop, and stabilize water supplies for domestic, irrigation, manufacturing and

other beneficial uses. As part of this mission, the UYWCD initiated a water supply plan designed to provide dependable physical and legal water supplies to residents within its service area. The UYWCD's service area extends from the headwaters of the Yampa River downstream to an area near Craig, Colorado – covering nearly all of Routt County and a portion of Moffat County. In order to meet the water demands within this expansive boundary, the UYWCD then acquired a portfolio of direct flow and storage water rights and constructed two major reservoirs: Yamcolo Reservoir and Stagecoach Reservoir.

In 1981, the Town entered into a 30-year agreement with the UYWCD for 300.0 AF of storage in Yamcolo Reservoir. This contract expired in 2011, at which time the Town extended the agreement for the storage of 300.0 AF another 30-years. In addition to the Yamcolo storage lease, the Town also entered into a 30-year agreement with the UYWCD in 1986. This second agreement was for the storage of 200.0 AF in Stagecoach Reservoir. Combined the Town currently leases 500.0 AF of storage supply from the UYWCD, 300.0 AF of which is secure through the year 2041 and 200.0 AF of which is secure through the year 2019.

3.2.5 Reliability of Town's Water Rights Portfolio

In order to determine the Town's reliable legal supply, RESOURCE first investigated the potential administration of the Yampa River under dry-year conditions. Based on the call chronology available on the State's CDSS database, the mainstem of the Yampa River has never been placed under administration. As such, a historical call regime is not available for analysis. Instead, RESOURCE relied on several studies of the Yampa basin that identify the downstream Maybell Canal as the most likely water right to place an administrative call on the river system. The Maybell Canal is a large agricultural diverter capable of calling for 129.00 cfs from the Yampa River between two water rights. The most senior water right for 42.20 cfs has an administration number of 26810.18172 and a priority date of October 2, 1899, while the more junior water right for 86.80 cfs has an administration number of 40421.35168 and a priority date of April 15, 1946. The Maybell Canal is located downstream of the Town's Intake Pipeline and therefore has the potential to impact the Town's legal ability to divert in dry years.

In response to this potential impact, RESOURCE developed a spreadsheet model that evaluated the Town's available legal supply from the Yampa River under two call scenarios: (1) an administrative call placed by the senior Maybell Canal water right and (2) an administrative call placed by the junior Maybell Canal water right. RESOURCE assumed that each of these call scenarios would be in effect from the beginning of July through the end of

October. While it is unlikely that the Maybell Canal would actually place a call for the duration of this four month period, it provided RESOURCE with a conservative length of administration to compare the Town's water rights portfolio against. The currently water demands over this four monthly period was then calculated based on an average of daily data recorded at the Town's water treatment plant from 2010 through 2012. These monthly values were subsequently projected, over a 50-year planning horizon, based on the future growth rates identified in Section 2.2. In total, RESOURCE modeled the available legal supply through a combination of six scenarios:

1. Demand at ***Low*** Growth Rate vs. Administration under Senior Maybell Call
2. Demand at ***Average*** Growth Rate vs. Administration under Senior Maybell Call
3. Demand at ***High*** Growth Rate vs. Administration under Senior Maybell Call
4. Demand at ***Low*** Growth Rate vs. Administration under Junior Maybell Call
5. Demand at ***Average*** Growth Rate vs. Administration under Junior Maybell Call
6. Demand at ***High*** Growth Rate vs. Administration under Junior Maybell Call

In each month of each scenario, the model tried to first satisfy the diversion requirement using the water rights originally decreed to the Town's Intake Pipeline. Of these two water rights, the more junior right was never in-priority as it is administratively junior to both of the Maybell Canal water rights (44606.00000 vs. 26810.18172 / 40421.35168). The more senior Intake Pipeline water right, however, was in-priority for three of the six scenarios as its administrative priority is junior to the senior Maybell Canal water right (35987.23253 vs. 26810.18172), but senior to the junior Maybell Canal water right (35987.23253 vs. 40421.35168). If the diversion requirement was not satisfied completely in this first step, the model then tried to use the water rights from the Shelton Ditch and Walker Ditch that can be alternately diverted at the Intake Pipeline or that have been permanently transferred to the Intake Pipeline. The decrees that granted this changed point of diversion also constrained the available diversion rate of each water to its historical monthly consumptive use, as shown in ***Table 2***. Any remaining diversion requirement after this step was considered to be a shortage at the Intake Pipeline. This shortage was then assumed to be supplemented with water released from the Town's leased storage supplies.

The amount of supplemental storage that the Town needs was further refined by RESOURCE into two categories: the storage requirement without a plan for augmentation and the storage requirement with a plan for augmentation. Without a plan for augmentation, the Town must release the entire diversion demand from storage in order to divert a like amount at the Intake Pipeline. With a plan for augmentation, however, this one-for-one storage requirement would be reduced to an amount equal to the consumptive portion of the diversion demand. The

balance, or non-consumptive portion of the diversion demand, would then be accounted for as it accrued back to the stream system as irrigation return flow and wastewater effluent. Moreover, this non-consumptive portion can be significant as 90% to 95% of indoor use is typically returned through wastewater effluent and 20% of lawn irrigation is retuned through the alluvium. Each of these options supplements a water right shortage at the Town's Intake Pipeline. RESOURCE choose to analyze both options in order to provide the Town with a potential range of maximum and alternative storage requirements.

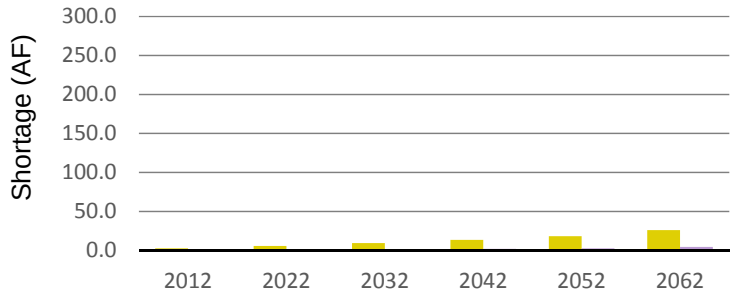
At the end of the 50-year planning horizon, with the Yampa River under administration from a call placed by the senior Maybell Canal water right, the Town's Intake Pipeline had a legal supply shortage of 25.9 AF (low growth) to 288.2 AF (high growth). Without a plan for augmentation, this shortage would require a supplemental supply of up to 288.2 AF. It should be noted that this required volume does not account for transit loss between the reservoir and the desired point of diversion. Conservatively assuming a rate of 0.10% per mile and an average distance of 65 miles, the Town's would need to release an additional 27.5 AF for a totaled storage requirement of just over 300.0 AF. This required volume is within the Town current leased supply of 500.0 AF. If the Town were to pursue a plan for augmentation, the legal supply shortage at the Town's Intake Pipeline would drop to 4.3 AF (low growth) and 110.2 AF (high growth). Again, using the transit loss assumption from above, an additional 7.2 AF of storage would be needed for a total requirement just over 115.0 AF. This required volume is well within the Town's current leased supply of 500.0 AF and is less than the required volume without the development of an augmentation plan. This difference presents the Town with an alternative volume to evaluate long term storage supply costs against. A summary of the legal supply analysis is shown in ***Figure 11*** and a more detailed breakdown of the model results is attached in ***Appendix B***.

With the Yampa River under administration from a call placed by the junior Maybell Canal water right, the Town's Intake Pipeline had a legal supply shortage of 0.0 AF at the end of the 50-year planning horizon for all three growth scenarios. The Town is therefore capable of providing a legal water supply that is sufficient to meet its 50-year, high growth demand without reliance on upstream storage, when the call is associated with the Maybell Canal's junior water right. This result reflects the ability of the Town to divert 2.00 cfs under the Intake Pipeline's original 1913 water right, which unlike the first administrative scenario is in-priority against the junior Maybell Canal water right.

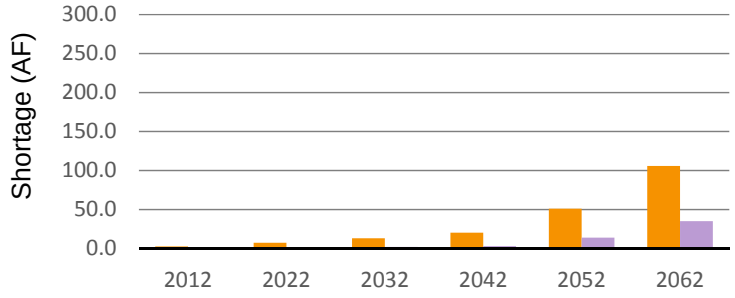
Figure 11
Summary of the Town's Legal Water Shortage and Supplement Storage Supply
50-Year Study Period (2012-2062)

Administrative Call by Maybell Canal Sr. Water Right

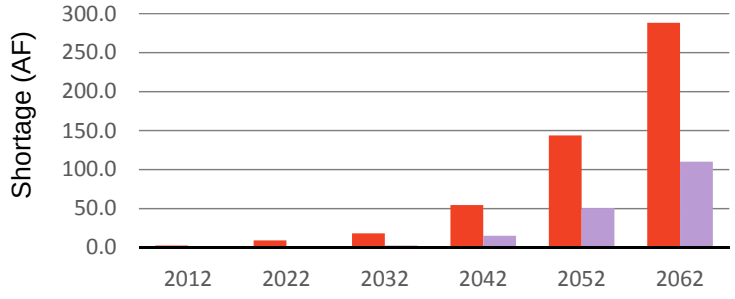
Year	Low Growth Scenario		
	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	2.6	2.6	0.4
2022	5.7	5.7	0.8
2032	9.2	9.2	1.3
2042	13.4	13.4	1.9
2052	18.2	18.2	2.6
2062	25.9	25.9	4.3



Year	Average Growth Scenario		
	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	2.6	2.6	0.4
2022	7.2	7.2	1.0
2032	13.0	13.0	1.9
2042	20.3	20.3	2.9
2052	50.9	50.9	13.8
2062	105.8	105.8	34.9



Year	High Growth Scenario		
	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	2.6	2.6	0.4
2022	9.2	9.2	1.3
2032	18.0	18.0	2.6
2042	54.4	54.4	15.1
2052	143.6	143.6	50.5
2062	288.2	288.2	110.2



Administrative Call by Maybell Canal Jr. Water Right

Year	Low Growth Scenario			Average Growth Scenario			High Growth Scenario		
	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2022	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2032	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2042	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2052	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2062	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

RESOURCE's analysis of the Town's current water rights portfolio demonstrates that under an administrative call placed by the Maybell Canal from July through October, the Town's available legal supply is more than adequate to support its future diversion requirements. At the high growth, 50-year demand of 4.48 cfs (2.89 MGD) the Town could need up to 300.0 AF of storage. This volume has the potential to be reduced by 185.0 AF to an approximate storage supply of 115.0 AF, if the Town obtains a plan for augmentation. Both of these required storage volumes, however, are well within the Town's current supply of 500.0 AF leased from the UYWCD. RESOURCE recommends that the Town examine the cost between obtaining an augmentation plan and the long term storage.

4.0 SUMMARY OF FINDINGS & RECOMMENDATIONS

Overall, the Town's municipal water system is well situated to provide a future population of 4,500 to 6,000 residents with a physical and legal potable supply. In Section 2.2, RESOURCE projected the Town's future water requirements based on several identified growth rates over a 50-year planning horizon. Under the high growth scenario of 3.0% per year, the Town would reach a population of approximately 7,825 people in year 2062 and require 4.48 cfs (2.89 MGD) of water on a "peak day." Based on this demand requirement, RESOURCE evaluated the ability of the Town's water treatment plant to produce the needed supply and found that the current operational capacity would be exceeded in 33 years and found that the design capacity would be exceeded in 43 years. In Section 3.1, RESOURCE evaluated the reliability of the physical stream system to support the 50-year, high growth water requirement and found that in the driest month of the study period the average streamflow at the Town's Intake Pipeline equaled 44.1 cfs, which is more than adequate to meet a diversion demand of 4.48 cfs (2.89 MGD). In Section 3.2, RESOURCE evaluated the reliability of the Town's water rights portfolio to divert the 50-year, high growth demand requirement and found that a four month administrative call placed by the senior Maybell Canal water right would necessitated a supplemental storage supply of approximately 300.0 AF. This volume of storage is within the Town's current leased supply of 500.0 AF and therefore adequate to meet the diversion demand of 4.48 cfs (2.89 MGD). Specific findings and recommendation are highlighted below.

4.1 Water System Demand

1. The Town currently produces 91.6 MG or approximately 280.0 AF for 1,785 residents at its municipal treatment plant each year, with a “peak day,” summer demand equal to 0.66 MGD or approximately 1.00 cfs.

2. The Town’s “baseline,” winter water demand equals approximately 100 gpcd. This per capita indoor water use is within the national average, which suggests that the Town’s distribution system is in good shape.

3. The Town’s “peak day,” summer water demand equals approximately 400 gpcd. At this rate, the Town’s water treatment plant could support a population of 4,500 residents at its current operational capacity and 6,000 residents at its design capacity.

4. Assuming a 50-year planning horizon and a sustained growth rate of between 1.5% and 3.0%, the Town’s “peak day” demand will increase from 0.66 MGD to between 1.39 MGD (2.15 cfs) and 2.89 MGD (4.48 cfs). Under the high growth rate scenario, the Town’s water treatment plant will exceed its current operational capacity in 33 years and its design capacity in 43 years.

5. RECOMMENDATION: In addition the diversion records maintained at the water treatment plant, the Town should account for the monthly use associated with the Town’s bulk water program. If this diversion demand begins to increase and account for a great percentage of the total water demand, the Town should reassess the growth analysis.

6. RECOMMENDATION: The Town should continue to supply the Division of Water Resources for the State of Colorado with accurate diversion totals and maintain communication with the District 57 Water Commissioner on a regular basis.

4.2 Physical & Legal Water Supply

1. The physical water supply available at the Town's Intake Pipeline will be sufficient to meet future "peak day" demands even under the high growth scenario. This statement is generally true under average, dry, and drought year conditions.

2. RECOMMENDATION: The physical supply analysis did not consider impacts to the Yampa River related to future growth outside of the Town's service area or climate change. These parameters could reduce the available supply at the Town's Intake Pipeline. The Town should periodically monitor the nearby streamflow gauge, and reevaluate this physical availability analysis if the annual trend progressively begin to decrease.

3. The Town's legal water supplies available at the Intake Pipeline are adequate to meet "peak day" demands under either the low or high growth scenarios. Water right calls originating downstream of the Intake Pipeline on Yampa River have the potential to curtail the Town's diversions during the late summer and early fall of dry years. The potential shortage vary based on the seniority of the calling water right from 0.0 AF to 300.0 AF. The Town's leased storage supplies with the UYWCD total 500.0 AF and therefore are sufficient to supplement this shortage.
4. RECOMMENDATION: The Town should evaluate the cost benefit of obtaining a plan for augmentation, which would reduce the amount of supplemental storage that is required and consequently reduce the amount of storage leased.

5. RECOMMENDATION: The pond described in Section 2.1.1 is undecreed groundwater well. In order to maintain this pond, the Town will need to apply for a well permit and either install a low level outlet or obtain a plan for augmentation.

APPENDIX A
ANNUAL DIVERSION SUMMARY

Appendix A

Monthly Summary		2004 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day	2005 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day
Jan		17.9	0.29	0.44	21-Jan	17.8	0.29	0.39	23-Jan
Feb		18.2	0.32	0.47	25-Feb	15.9	0.29	0.36	3-Feb
Mar		18.2	0.30	0.36	20-Mar	17.0	0.28	0.36	14-Mar
Apr		15.1	0.25	0.37	28-Apr	16.4	0.28	0.41	9-Apr
May		30.2	0.49	0.83	28-May	24.8	0.40	1.06	23-May
Jun		41.5	0.70	1.04	9-Jun	28.4	0.48	0.83	18-Jun
Jul		46.2	0.75	1.08	14-Jul	54.8	0.89	1.10	17-Jul
Aug		40.5	0.66	1.09	13-Aug	41.1	0.67	1.05	7-Aug
Sep		21.7	0.37	0.82	1-Sep	29.3	0.49	0.88	2-Sep
Oct		16.3	0.26	0.34	12-Oct	17.6	0.29	0.41	2-Oct
Nov		16.0	0.27	0.38	20-Nov	15.9	0.27	0.36	20-Nov
Dec		16.7	0.27	0.36	21-Dec	18.3	0.30	0.40	27-Dec
Avg / Max		298.6	**0.41**	1.09		297.3	**0.41**	1.10	
Max Peak	**Summer**		**0.75**	**1.09**	13-Aug		**0.89**	**1.10**	17-Jul
Max Peak	**Winter**		**0.32**	**0.47**	25-Feb		**0.30**	**0.41**	9-Apr

Monthly Summary		2004 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day	2005 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day
Jan		5,844,426	188,530	287,370	21-Jan	5,788,863	186,738	254,421	23-Jan
Feb		5,933,836	204,615	306,642	25-Feb	5,189,805	185,350	233,775	3-Feb
Mar		5,920,610	190,987	235,144	20-Mar	5,555,682	179,216	232,650	14-Mar
Apr		4,932,626	164,421	241,857	28-Apr	5,332,254	177,742	267,546	9-Apr
May		9,844,243	317,556	535,392	28-May	8,086,824	260,865	682,776	23-May
Jun		13,530,510	451,017	674,100	9-Jun	9,246,708	308,224	537,672	18-Jun
Jul		15,038,818	485,123	696,984	14-Jul	17,857,476	576,048	711,711	17-Jul
Aug		13,188,735	425,443	704,025	13-Aug	13,401,990	432,322	680,736	7-Aug
Sep		7,086,858	236,229	528,870	1-Sep	9,541,245	318,042	569,718	2-Sep
Oct		5,299,731	170,959	218,610	12-Oct	5,721,684	184,570	263,418	2-Oct
Nov		5,221,656	174,055	246,717	20-Nov	5,180,472	172,682	230,175	20-Nov
Dec		5,444,460	175,628	234,675	21-Dec	5,969,787	192,574	260,355	27-Dec
Avg / Max		97,286,509	**265,380**	704,025		96,872,790	**264,531**	711,711	
Max Peak	**Summer**		**485,123**	**704,025**	13-Aug		**576,048**	**711,711**	17-Jul
Max Peak	**Winter**		**204,615**	**306,642**	25-Feb		**192,574**	**267,546**	9-Apr

Minimum Daily Diversion (gal)	*58,710*	*19-Jan*	*Minimum Daily Diversion (gal)*	*43,848*	*22-May*
Number of Day Plant Turned Off	*0*		*Number of Day Plant Turned Off*	*0*	

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Monthly Summary		2006 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day	2007 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day
Jan		18.9	0.31	0.41	31-Jan	18.4	0.30	0.47	22-Jan
Feb		15.9	0.29	0.42	27-Feb	15.8	0.29	0.36	19-Feb
Mar		16.9	0.27	0.41	1-Mar	17.9	0.29	0.38	16-Mar
Apr		17.6	0.30	0.50	1-Apr	16.3	0.27	0.50	30-Apr
May		31.0	0.50	0.87	21-May	28.2	0.46	0.93	28-May
Jun		47.7	0.80	1.04	24-Jun	49.4	0.83	1.21	25-Jun
Jul		44.7	0.73	1.14	28-Jul	56.1	0.91	1.24	3-Jul
Aug		42.8	0.70	1.10	23-Aug	46.0	0.75	1.02	17-Aug
Sep		27.1	0.45	0.81	5-Sep	31.8	0.53	0.87	24-Sep
Oct		16.2	0.26	0.39	4-Oct	15.9	0.26	0.36	7-Oct
Nov		15.3	0.26	0.43	17-Nov	14.3	0.24	0.33	17-Nov
Dec		16.4	0.27	0.43	15-Dec	14.9	0.24	0.36	26-Dec
Avg / Max		310.3	**0.43**	1.14		325.2	**0.45**	1.24	
Max Peak	**Summer**		**0.80**	**1.14**	28-Jul		**0.91**	**1.24**	3-Jul
Max Peak	**Winter**		**0.31**	**0.50**	1-Apr		**0.30**	**0.50**	30-Apr

Monthly Summary		2006 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day	2007 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day
Jan		6,153,462	198,499	263,676	31-Jan	6,008,720	193,830	306,334	22-Jan
Feb		5,175,501	184,839	269,016	27-Feb	5,159,042	184,252	230,007	19-Feb
Mar		5,507,040	177,646	265,965	1-Mar	5,839,106	188,358	247,899	16-Mar
Apr		5,724,057	190,802	320,862	1-Apr	5,312,621	177,087	326,359	30-Apr
May		10,094,940	325,643	559,980	21-May	9,174,802	295,961	603,550	28-May
Jun		15,527,426	517,581	673,931	24-Jun	16,111,127	537,038	781,041	25-Jun
Jul		14,556,709	469,571	738,314	28-Jul	18,272,793	589,445	804,448	3-Jul
Aug		13,939,739	449,669	710,560	23-Aug	14,997,299	483,784	662,063	17-Aug
Sep		8,815,545	293,852	520,962	5-Sep	10,369,732	345,658	559,983	24-Sep
Oct		5,270,485	170,016	250,870	4-Oct	5,192,377	167,496	232,202	7-Oct
Nov		5,000,744	166,691	276,583	17-Nov	4,664,280	155,476	210,418	17-Nov
Dec		5,346,685	172,474	277,390	15-Dec	4,870,340	157,108	232,810	26-Dec
Avg / Max		101,112,332	**276,440**	738,314		105,972,238	**289,624**	804,448	
Max Peak	**Summer**		**517,581**	**738,314**	28-Jul		**589,445**	**804,448**	3-Jul
Max Peak	**Winter**		**198,499**	**320,862**	1-Apr		**193,830**	**326,359**	30-Apr

Minimum Daily Diversion (gal)	*75,996*	*10-Dec*	*Minimum Daily Diversion (gal)*	*105,360*	*25-Feb*
Number of Day Plant Turned Off	*0*		*Number of Day Plant Turned Off*	*0*	

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Monthly Summary		2008 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day	2009 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day
Jan		17.1	0.28	0.41	27-Jan	15.5	0.25	0.51	2-Jan
Feb		16.1	0.28	0.39	21-Feb	15.6	0.28	0.52	15-Feb
Mar		17.3	0.28	0.36	17-Mar	15.8	0.26	0.56	13-Mar
Apr		16.1	0.27	0.46	5-Apr	14.7	0.25	0.45	12-Apr
May		18.5	0.30	0.67	30-May	22.3	0.36	0.71	19-May
Jun		47.0	0.79	1.19	29-Jun	22.8	0.38	0.66	30-Jun
Jul		63.6	1.03	1.60	11-Jul	49.0	0.80	1.10	17-Jul
Aug		46.6	0.76	1.07	28-Aug	44.2	0.72	1.12	9-Aug
Sep		29.1	0.49	0.69	8-Sep	33.1	0.56	0.84	9-Sep
Oct		18.6	0.30	0.49	2-Oct	16.5	0.27	0.50	21-Oct
Nov		14.1	0.24	0.32	10-Nov	14.2	0.24	0.41	22-Nov
Dec		16.6	0.27	0.54	17-Dec	16.7	0.27	0.36	7-Dec
Avg / Max		320.7	**0.44**	1.60		280.4	**0.39**	1.12	
Max Peak	**Summer**		**1.03**	**1.60**	11-Jul		**0.80**	**1.12**	9-Aug
Max Peak	**Winter**		**0.30**	**0.54**	17-Dec		**0.27**	**0.56**	13-Mar

Monthly Summary		2008 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day	2009 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day
Jan		5,560,218	179,362	265,173	27-Jan	5,036,932	162,482	327,012	2-Jan
Feb		5,260,347	181,391	248,921	21-Feb	5,087,299	181,689	334,185	15-Feb
Mar		5,635,454	181,789	232,517	17-Mar	5,156,878	198,341	359,910	13-Mar
Apr		5,235,027	174,501	298,041	5-Apr	4,776,970	176,925	288,794	12-Apr
May		6,019,000	194,161	431,628	30-May	7,262,818	242,094	460,162	19-May
Jun		15,312,787	510,426	768,471	29-Jun	7,437,364	247,912	429,694	30-Jun
Jul		20,724,747	668,540	1,036,829	11-Jul	15,981,923	515,546	713,356	17-Jul
Aug		15,187,873	489,931	690,932	28-Aug	14,396,508	464,403	725,600	9-Aug
Sep		9,480,185	316,006	443,623	8-Sep	10,787,260	359,575	542,371	9-Sep
Oct		6,069,963	195,805	318,310	2-Oct	5,376,612	179,220	324,330	21-Oct
Nov		4,587,348	152,912	209,154	10-Nov	4,642,554	154,752	265,634	22-Nov
Dec		5,422,924	174,933	347,255	17-Dec	5,427,120	175,068	235,026	7-Dec
Avg / Max		104,495,872	**284,980**	1,036,829		91,370,235	**254,834**	725,600	
Max Peak	**Summer**		**668,540**	**1,036,829**	11-Jul		**515,546**	**725,600**	9-Aug
Max Peak	**Winter**		**195,805**	**347,255**	17-Dec		**175,068**	**359,910**	13-Mar

Minimum Daily Diversion (gal)	*91,299*	*4-Nov*	*Minimum Daily Diversion (gal)*	*84,847*	*5-Nov*
Number of Day Plant Turned Off	*5*		*Number of Day Plant Turned Off*	*10*	

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Monthly Summary		2010 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day	2011 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day
Jan		17.2	0.28	0.53	11-Jan	18.8	0.31	0.40	3-Jan
Feb		15.5	0.28	0.55	14-Feb	17.0	0.31	0.39	10-Feb
Mar		16.1	0.26	0.48	21-Mar	16.3	0.26	0.34	14-Mar
Apr		14.2	0.24	0.48	21-Apr	14.8	0.25	0.68	22-Apr
May		14.7	0.24	0.42	14-May	17.2	0.28	0.53	9-May
Jun		33.5	0.56	1.09	28-Jun	34.3	0.58	0.94	24-Jun
Jul		49.3	0.80	1.05	16-Jul	35.4	0.58	0.93	24-Jul
Aug		38.5	0.63	0.92	15-Aug	44.3	0.72	0.98	22-Aug
Sep		33.0	0.56	0.81	17-Sep	28.9	0.49	0.74	14-Sep
Oct		19.2	0.31	0.65	1-Oct	15.4	0.25	0.51	16-Oct
Nov		14.0	0.23	0.46	26-Nov	13.7	0.23	0.55	7-Nov
Dec		15.3	0.25	0.47	26-Dec	16.0	0.26	0.56	12-Dec
Avg / Max		280.5	**0.39**	1.09		272.3	**0.38**	0.98	
Max Peak	**Summer**		**0.80**	**1.09**	28-Jun		**0.72**	**0.98**	22-Aug
Max Peak	**Winter**		**0.31**	**0.65**	1-Oct		**0.31**	**0.68**	22-Apr

Monthly Summary		2010 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day	2011 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day
Jan		5,607,283	180,880	342,180	11-Jan	6,142,202	198,136	259,981	3-Jan
Feb		5,058,636	180,666	353,531	14-Feb	5,526,187	197,364	252,514	10-Feb
Mar		5,254,709	169,507	312,999	21-Mar	5,304,697	171,119	216,562	14-Mar
Apr		4,611,659	153,722	309,245	21-Apr	4,837,615	161,254	440,193	22-Apr
May		4,794,837	154,672	273,893	14-May	5,594,319	180,462	341,219	9-May
Jun		10,918,584	363,953	706,476	28-Jun	11,187,273	372,909	607,618	24-Jun
Jul		16,051,800	517,800	679,466	16-Jul	11,548,282	372,525	599,401	24-Jul
Aug		12,549,545	404,824	594,412	15-Aug	14,439,700	465,797	634,284	22-Aug
Sep		10,764,271	358,809	520,811	17-Sep	9,423,795	314,127	477,900	14-Sep
Oct		6,248,207	201,555	419,329	1-Oct	5,029,659	228,621	330,939	16-Oct
Nov		4,549,030	151,634	299,713	26-Nov	4,463,140	148,771	356,906	7-Nov
Dec		4,998,718	161,249	305,696	26-Dec	5,224,810	168,542	363,028	12-Dec
Avg / Max		91,407,278	**249,939**	706,476		88,721,678	**248,302**	634,284	
Max Peak	**Summer**		**517,800**	**706,476**	28-Jun		**465,797**	**634,284**	22-Aug
Max Peak	**Winter**		**201,555**	**419,329**	1-Oct		**198,136**	**440,193**	22-Apr

Minimum Daily Diversion (gal)	*59,868*	*18-Nov*	*Minimum Daily Diversion (gal)*	*42,399*	*6-Dec*
Number of Day Plant Turned Off	*16*		*Number of Day Plant Turned Off*	*34*	

RESOURCE ENGINEERING, INC.
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Appendix A

Monthly Summary		2012 Diversion Summary Total (AF)	Avg (cfs)	Peak (cfs)	Peak Day
Jan		15.6	0.25	0.53	9-Jan
Feb		17.9	0.31	0.72	4-Feb
Mar		17.5	0.28	0.37	13-Mar
Apr		17.8	0.30	0.62	26-Apr
May		32.5	0.53	0.83	31-May
Jun		44.8	0.75	0.99	13-Jun
Jul		36.3	0.59	0.84	2-Jul
Aug		37.5	0.61	0.74	13-Aug
Sep		25.6	0.43	0.64	11-Sep
Oct		17.0	0.28	0.52	18-Oct
Nov		12.9	0.22	0.49	21-Nov
Dec		15.4	0.25	0.55	13-Dec
Avg / Max		290.8	**0.40**	0.99	
Max Peak	**Summer**		**0.75**	**0.99**	13-Jun
Max Peak	**Winter**		**0.31**	**0.72**	4-Feb

Monthly Summary		2012 Diversion Summary Total (gal)	Avg (gpd)	Peak (gal)	Peak Day
Jan		5,081,037	163,904	343,846	9-Jan
Feb		5,845,682	201,575	464,151	4-Feb
Mar		5,696,878	183,770	240,196	13-Mar
Apr		5,789,335	192,978	401,827	26-Apr
May		10,602,966	342,031	536,579	31-May
Jun		14,596,833	486,561	639,972	13-Jun
Jul		11,843,739	382,056	540,811	2-Jul
Aug		12,203,401	393,658	480,423	13-Aug
Sep		8,339,019	277,967	413,328	11-Sep
Oct		5,550,168	185,006	338,888	18-Oct
Nov		4,200,136	140,005	317,392	21-Nov
Dec		5,005,808	161,478	356,335	13-Dec
Avg / Max		94,754,999	**259,249**	639,972	
Max Peak	**Summer**		**486,561**	**639,972**	13-Jun
Max Peak	**Winter**		**201,575**	**464,151**	4-Feb

Minimum Daily Diversion (gal)	*95,863*	*10-Jan*
Number of Day Plant Turned Off	*42*	

RESOURCE ENGINEERING, INC.
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APPENDIX B
LEGAL WATER SUPPLY ANALYSIS

Appendix B

LOW GROWTH RATE SCENARIO / MAYBELL CANAL SR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	0.0	40.3	0.0	0.0	40.1	0.0	40.1	0.0	0.0	29.2	0.0	29.2	0.0	0.0	19.2	0.0	16.6	2.6	0.4	2.6	2.6	0.4
2013	41.0	0.0	41.0	0.0	0.0	40.7	0.0	40.7	0.0	0.0	29.6	0.0	29.6	0.0	0.0	19.5	0.0	16.6	2.9	0.4	2.9	2.9	0.4
2014	41.6	0.0	41.6	0.0	0.0	41.3	0.0	41.3	0.0	0.0	30.1	0.0	30.1	0.0	0.0	19.8	0.0	16.6	3.2	0.5	3.2	3.2	0.5
2015	42.2	0.0	42.2	0.0	0.0	41.9	0.0	41.9	0.0	0.0	30.5	0.0	30.5	0.0	0.0	20.1	0.0	16.6	3.5	0.5	3.5	3.5	0.5
2016	42.8	0.0	42.8	0.0	0.0	42.6	0.0	42.6	0.0	0.0	31.0	0.0	31.0	0.0	0.0	20.4	0.0	16.6	3.8	0.5	3.8	3.8	0.5
2017	43.5	0.0	43.5	0.0	0.0	43.2	0.0	43.2	0.0	0.0	31.4	0.0	31.4	0.0	0.0	20.7	0.0	16.6	4.1	0.6	4.1	4.1	0.6
2018	44.1	0.0	44.1	0.0	0.0	43.8	0.0	43.8	0.0	0.0	31.9	0.0	31.9	0.0	0.0	21.0	0.0	16.6	4.4	0.6	4.4	4.4	0.6
2019	44.8	0.0	44.8	0.0	0.0	44.5	0.0	44.5	0.0	0.0	32.4	0.0	32.4	0.0	0.0	21.3	0.0	16.6	4.7	0.7	4.7	4.7	0.7
2020	45.5	0.0	45.5	0.0	0.0	45.2	0.0	45.2	0.0	0.0	32.9	0.0	32.9	0.0	0.0	21.6	0.0	16.6	5.0	0.7	5.0	5.0	0.7
2021	46.1	0.0	46.1	0.0	0.0	45.8	0.0	45.8	0.0	0.0	33.4	0.0	33.4	0.0	0.0	21.9	0.0	16.6	5.3	0.8	5.3	5.3	0.8
2022	46.8	0.0	46.8	0.0	0.0	46.5	0.0	46.5	0.0	0.0	33.9	0.0	33.9	0.0	0.0	22.3	0.0	16.6	5.7	0.8	5.7	5.7	0.8
2032	54.3	0.0	54.3	0.0	0.0	54.0	0.0	54.0	0.0	0.0	39.3	0.0	39.3	0.0	0.0	25.8	0.0	16.6	9.2	1.3	9.2	9.2	1.3
2042	63.1	0.0	63.1	0.0	0.0	62.7	0.0	62.7	0.0	0.0	45.6	0.0	45.6	0.0	0.0	30.0	0.0	16.6	13.4	1.9	13.4	13.4	1.9
2052	73.2	0.0	73.2	0.0	0.0	72.7	0.0	72.7	0.0	0.0	52.9	0.0	52.9	0.0	0.0	34.8	0.0	16.6	18.2	2.6	18.2	18.2	2.6
2062	84.9	0.0	84.9	0.0	0.0	84.4	0.0	83.6	0.8	0.4	61.4	0.0	60.1	1.3	0.5	40.4	0.0	16.6	23.8	3.4	25.9	25.9	4.3

AVERAGE GROWTH RATE SCENARIO / MAYBELL CANAL SR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	0.0	40.3	0.0	0.0	40.1	0.0	40.1	0.0	0.0	29.2	0.0	29.2	0.0	0.0	19.2	0.0	16.6	2.6	0.4	2.6	2.6	0.4
2013	41.2	0.0	41.2	0.0	0.0	41.0	0.0	41.0	0.0	0.0	29.8	0.0	29.8	0.0	0.0	19.6	0.0	16.6	3.0	0.4	3.0	3.0	0.4
2014	42.1	0.0	42.1	0.0	0.0	41.9	0.0	41.9	0.0	0.0	30.5	0.0	30.5	0.0	0.0	20.0	0.0	16.6	3.4	0.5	3.4	3.4	0.5
2015	43.1	0.0	43.1	0.0	0.0	42.8	0.0	42.8	0.0	0.0	31.2	0.0	31.2	0.0	0.0	20.5	0.0	16.6	3.9	0.6	3.9	3.9	0.6
2016	44.0	0.0	44.0	0.0	0.0	43.7	0.0	43.7	0.0	0.0	31.8	0.0	31.8	0.0	0.0	20.9	0.0	16.6	4.3	0.6	4.3	4.3	0.6
2017	45.0	0.0	45.0	0.0	0.0	44.7	0.0	44.7	0.0	0.0	32.5	0.0	32.5	0.0	0.0	21.4	0.0	16.6	4.8	0.7	4.8	4.8	0.7
2018	46.0	0.0	46.0	0.0	0.0	45.7	0.0	45.7	0.0	0.0	33.3	0.0	33.3	0.0	0.0	21.9	0.0	16.6	5.3	0.8	5.3	5.3	0.8
2019	47.0	0.0	47.0	0.0	0.0	46.7	0.0	46.7	0.0	0.0	34.0	0.0	34.0	0.0	0.0	22.3	0.0	16.6	5.7	0.8	5.7	5.7	0.8
2020	48.0	0.0	48.0	0.0	0.0	47.7	0.0	47.7	0.0	0.0	34.7	0.0	34.7	0.0	0.0	22.8	0.0	16.6	6.2	0.9	6.2	6.2	0.9
2021	49.1	0.0	49.1	0.0	0.0	48.8	0.0	48.8	0.0	0.0	35.5	0.0	35.5	0.0	0.0	23.3	0.0	16.6	6.7	1.0	6.7	6.7	1.0
2022	50.2	0.0	50.2	0.0	0.0	49.8	0.0	49.8	0.0	0.0	36.3	0.0	36.3	0.0	0.0	23.8	0.0	16.6	7.2	1.0	7.2	7.2	1.0
2032	62.4	0.0	62.4	0.0	0.0	62.0	0.0	62.0	0.0	0.0	45.1	0.0	45.1	0.0	0.0	29.6	0.0	16.6	13.0	1.9	13.0	13.0	1.9
2042	77.5	0.0	77.5	0.0	0.0	77.0	0.0	77.0	0.0	0.0	56.1	0.0	56.1	0.0	0.0	36.9	0.0	16.6	20.3	2.9	20.3	20.3	2.9
2052	96.4	0.0	96.4	0.0	0.0	95.7	0.0	83.6	12.1	5.9	69.7	0.0	60.1	9.6	3.7	45.8	0.0	16.6	29.2	4.2	50.9	50.9	13.8
2062	119.8	0.0	116.2	3.6	1.7	119.0	0.0	83.6	35.4	17.2	86.6	0.0	60.1	26.5	10.2	57.0	0.0	16.6	40.3	5.8	105.8	105.8	34.9

HIGH GROWTH RATE SCENARIO / MAYBELL CANAL SR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	0.0	40.3	0.0	0.0	40.1	0.0	40.1	0.0	0.0	29.2	0.0	29.2	0.0	0.0	19.2	0.0	16.6	2.6	0.4	2.6	2.6	0.4
2013	41.6	0.0	41.6	0.0	0.0	41.3	0.0	41.3	0.0	0.0	30.1	0.0	30.1	0.0	0.0	19.8	0.0	16.6	3.2	0.5	3.2	3.2	0.5
2014	42.8	0.0	42.8	0.0	0.0	42.5	0.0	42.5	0.0	0.0	31.0	0.0	31.0	0.0	0.0	20.4	0.0	16.6	3.8	0.5	3.8	3.8	0.5
2015	44.1	0.0	44.1	0.0	0.0	43.8	0.0	43.8	0.0	0.0	31.9	0.0	31.9	0.0	0.0	21.0	0.0	16.6	4.4	0.6	4.4	4.4	0.6
2016	45.4	0.0	45.4	0.0	0.0	45.1	0.0	45.1	0.0	0.0	32.8	0.0	32.8	0.0	0.0	21.6	0.0	16.6	5.0	0.7	5.0	5.0	0.7
2017	46.8	0.0	46.8	0.0	0.0	46.5	0.0	46.5	0.0	0.0	33.8	0.0	33.8	0.0	0.0	22.2	0.0	16.6	5.6	0.8	5.6	5.6	0.8
2018	48.2	0.0	48.2	0.0	0.0	47.9	0.0	47.9	0.0	0.0	34.8	0.0	34.8	0.0	0.0	22.9	0.0	16.6	6.3	0.9	6.3	6.3	0.9
2019	49.6	0.0	49.6	0.0	0.0	49.3	0.0	49.3	0.0	0.0	35.9	0.0	35.9	0.0	0.0	23.6	0.0	16.6	7.0	1.0	7.0	7.0	1.0
2020	51.1	0.0	51.1	0.0	0.0	50.8	0.0	50.8	0.0	0.0	37.0	0.0	37.0	0.0	0.0	24.3	0.0	16.6	7.7	1.1	7.7	7.7	1.1
2021	52.6	0.0	52.6	0.0	0.0	52.3	0.0	52.3	0.0	0.0	38.1	0.0	38.1	0.0	0.0	25.0	0.0	16.6	8.4	1.2	8.4	8.4	1.2
2022	54.2	0.0	54.2	0.0	0.0	53.9	0.0	53.9	0.0	0.0	39.2	0.0	39.2	0.0	0.0	25.8	0.0	16.6	9.2	1.3	9.2	9.2	1.3
2032	72.9	0.0	72.9	0.0	0.0	72.4	0.0	72.4	0.0	0.0	52.7	0.0	52.7	0.0	0.0	34.7	0.0	16.6	18.0	2.6	18.0	18.0	2.6
2042	97.9	0.0	97.9	0.0	0.0	97.3	0.0	83.6	13.7	6.7	70.8	0.0	60.1	10.7	4.1	46.6	0.0	16.6	30.0	4.3	54.4	54.4	15.1
2052	131.6	0.0	116.2	15.4	7.5	130.8	0.0	83.6	47.2	22.9	95.2	0.0	60.1	35.1	13.4	62.6	0.0	16.6	46.0	6.6	143.6	143.6	50.5
2062	176.9	0.0	116.2	60.7	29.6	175.8	0.0	83.6	92.1	44.8	127.9	0.0	60.1	67.8	26.0	84.1	0.0	16.6	67.5	9.7	288.2	288.2	110.2

Appendix B

LOW GROWTH RATE SCENARIO / MAYBELL CANAL JR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	40.3	0.0	0.0	0.0	40.1	40.1	0.0	0.0	0.0	29.2	29.2	0.0	0.0	0.0	19.2	19.2	0.0	0.0	0.0	0.0	0.0	0.0
2013	41.0	41.0	0.0	0.0	0.0	40.7	40.7	0.0	0.0	0.0	29.6	29.6	0.0	0.0	0.0	19.5	19.5	0.0	0.0	0.0	0.0	0.0	0.0
2014	41.6	41.6	0.0	0.0	0.0	41.3	41.3	0.0	0.0	0.0	30.1	30.1	0.0	0.0	0.0	19.8	19.8	0.0	0.0	0.0	0.0	0.0	0.0
2015	42.2	42.2	0.0	0.0	0.0	41.9	41.9	0.0	0.0	0.0	30.5	30.5	0.0	0.0	0.0	20.1	20.1	0.0	0.0	0.0	0.0	0.0	0.0
2016	42.8	42.8	0.0	0.0	0.0	42.6	42.6	0.0	0.0	0.0	31.0	31.0	0.0	0.0	0.0	20.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0
2017	43.5	43.5	0.0	0.0	0.0	43.2	43.2	0.0	0.0	0.0	31.4	31.4	0.0	0.0	0.0	20.7	20.7	0.0	0.0	0.0	0.0	0.0	0.0
2018	44.1	44.1	0.0	0.0	0.0	43.8	43.8	0.0	0.0	0.0	31.9	31.9	0.0	0.0	0.0	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0
2019	44.8	44.8	0.0	0.0	0.0	44.5	44.5	0.0	0.0	0.0	32.4	32.4	0.0	0.0	0.0	21.3	21.3	0.0	0.0	0.0	0.0	0.0	0.0
2020	45.5	45.5	0.0	0.0	0.0	45.2	45.2	0.0	0.0	0.0	32.9	32.9	0.0	0.0	0.0	21.6	21.6	0.0	0.0	0.0	0.0	0.0	0.0
2021	46.1	46.1	0.0	0.0	0.0	45.8	45.8	0.0	0.0	0.0	33.4	33.4	0.0	0.0	0.0	21.9	21.9	0.0	0.0	0.0	0.0	0.0	0.0
2022	46.8	46.8	0.0	0.0	0.0	46.5	46.5	0.0	0.0	0.0	33.9	33.9	0.0	0.0	0.0	22.3	22.3	0.0	0.0	0.0	0.0	0.0	0.0
2032	54.3	54.3	0.0	0.0	0.0	54.0	54.0	0.0	0.0	0.0	39.3	39.3	0.0	0.0	0.0	25.8	25.8	0.0	0.0	0.0	0.0	0.0	0.0
2042	63.1	63.1	0.0	0.0	0.0	62.7	62.7	0.0	0.0	0.0	45.6	45.6	0.0	0.0	0.0	30.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
2052	73.2	73.2	0.0	0.0	0.0	72.7	72.7	0.0	0.0	0.0	52.9	52.9	0.0	0.0	0.0	34.8	34.8	0.0	0.0	0.0	0.0	0.0	0.0
2062	84.9	84.9	0.0	0.0	0.0	84.4	84.4	0.0	0.0	0.0	61.4	61.4	0.0	0.0	0.0	40.4	40.4	0.0	0.0	0.0	0.0	0.0	0.0

AVERAGE GROWTH RATE SCENARIO / MAYBELL CANAL JR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	40.3	0.0	0.0	0.0	40.1	40.1	0.0	0.0	0.0	29.2	29.2	0.0	0.0	0.0	19.2	19.2	0.0	0.0	0.0	0.0	0.0	0.0
2013	41.2	41.2	0.0	0.0	0.0	41.0	41.0	0.0	0.0	0.0	29.8	29.8	0.0	0.0	0.0	19.6	19.6	0.0	0.0	0.0	0.0	0.0	0.0
2014	42.1	42.1	0.0	0.0	0.0	41.9	41.9	0.0	0.0	0.0	30.5	30.5	0.0	0.0	0.0	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0
2015	43.1	43.1	0.0	0.0	0.0	42.8	42.8	0.0	0.0	0.0	31.2	31.2	0.0	0.0	0.0	20.5	20.5	0.0	0.0	0.0	0.0	0.0	0.0
2016	44.0	44.0	0.0	0.0	0.0	43.7	43.7	0.0	0.0	0.0	31.8	31.8	0.0	0.0	0.0	20.9	20.9	0.0	0.0	0.0	0.0	0.0	0.0
2017	45.0	45.0	0.0	0.0	0.0	44.7	44.7	0.0	0.0	0.0	32.5	32.5	0.0	0.0	0.0	21.4	21.4	0.0	0.0	0.0	0.0	0.0	0.0
2018	46.0	46.0	0.0	0.0	0.0	45.7	45.7	0.0	0.0	0.0	33.3	33.3	0.0	0.0	0.0	21.9	21.9	0.0	0.0	0.0	0.0	0.0	0.0
2019	47.0	47.0	0.0	0.0	0.0	46.7	46.7	0.0	0.0	0.0	34.0	34.0	0.0	0.0	0.0	22.3	22.3	0.0	0.0	0.0	0.0	0.0	0.0
2020	48.0	48.0	0.0	0.0	0.0	47.7	47.7	0.0	0.0	0.0	34.7	34.7	0.0	0.0	0.0	22.8	22.8	0.0	0.0	0.0	0.0	0.0	0.0
2021	49.1	49.1	0.0	0.0	0.0	48.8	48.8	0.0	0.0	0.0	35.5	35.5	0.0	0.0	0.0	23.3	23.3	0.0	0.0	0.0	0.0	0.0	0.0
2022	50.2	50.2	0.0	0.0	0.0	49.8	49.8	0.0	0.0	0.0	36.3	36.3	0.0	0.0	0.0	23.8	23.8	0.0	0.0	0.0	0.0	0.0	0.0
2032	62.4	62.4	0.0	0.0	0.0	62.0	62.0	0.0	0.0	0.0	45.1	45.1	0.0	0.0	0.0	29.6	29.6	0.0	0.0	0.0	0.0	0.0	0.0
2042	77.5	77.5	0.0	0.0	0.0	77.0	77.0	0.0	0.0	0.0	56.1	56.1	0.0	0.0	0.0	36.9	36.9	0.0	0.0	0.0	0.0	0.0	0.0
2052	96.4	96.4	0.0	0.0	0.0	95.7	95.7	0.0	0.0	0.0	69.7	69.7	0.0	0.0	0.0	45.8	45.8	0.0	0.0	0.0	0.0	0.0	0.0
2062	119.8	119.8	0.0	0.0	0.0	119.0	119.0	0.0	0.0	0.0	86.6	86.6	0.0	0.0	0.0	57.0	57.0	0.0	0.0	0.0	0.0	0.0	0.0

HIGH GROWTH RATE SCENARIO / MAYBELL CANAL JR. CALLING WATER RIGHT

	JULY					AUGUST					SEPTEMBER					OCTOBER					SUMMARY		
Year	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Diversion (AF)	Intake In-Priority (AF)	CU Diversion (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)	Total Shortage (AF)	Storage w/o Plan (AF)	Storage w/ Plan (AF)
2012	40.3	40.3	0.0	0.0	0.0	40.1	40.1	0.0	0.0	0.0	29.2	29.2	0.0	0.0	0.0	19.2	19.2	0.0	0.0	0.0	0.0	0.0	0.0
2013	41.6	41.6	0.0	0.0	0.0	41.3	41.3	0.0	0.0	0.0	30.1	30.1	0.0	0.0	0.0	19.8	19.8	0.0	0.0	0.0	0.0	0.0	0.0
2014	42.8	42.8	0.0	0.0	0.0	42.5	42.5	0.0	0.0	0.0	31.0	31.0	0.0	0.0	0.0	20.4	20.4	0.0	0.0	0.0	0.0	0.0	0.0
2015	44.1	44.1	0.0	0.0	0.0	43.8	43.8	0.0	0.0	0.0	31.9	31.9	0.0	0.0	0.0	21.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0
2016	45.4	45.4	0.0	0.0	0.0	45.1	45.1	0.0	0.0	0.0	32.8	32.8	0.0	0.0	0.0	21.6	21.6	0.0	0.0	0.0	0.0	0.0	0.0
2017	46.8	46.8	0.0	0.0	0.0	46.5	46.5	0.0	0.0	0.0	33.8	33.8	0.0	0.0	0.0	22.2	22.2	0.0	0.0	0.0	0.0	0.0	0.0
2018	48.2	48.2	0.0	0.0	0.0	47.9	47.9	0.0	0.0	0.0	34.8	34.8	0.0	0.0	0.0	22.9	22.9	0.0	0.0	0.0	0.0	0.0	0.0
2019	49.6	49.6	0.0	0.0	0.0	49.3	49.3	0.0	0.0	0.0	35.9	35.9	0.0	0.0	0.0	23.6	23.6	0.0	0.0	0.0	0.0	0.0	0.0
2020	51.1	51.1	0.0	0.0	0.0	50.8	50.8	0.0	0.0	0.0	37.0	37.0	0.0	0.0	0.0	24.3	24.3	0.0	0.0	0.0	0.0	0.0	0.0
2021	52.6	52.6	0.0	0.0	0.0	52.3	52.3	0.0	0.0	0.0	38.1	38.1	0.0	0.0	0.0	25.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0
2022	54.2	54.2	0.0	0.0	0.0	53.9	53.9	0.0	0.0	0.0	39.2	39.2	0.0	0.0	0.0	25.8	25.8	0.0	0.0	0.0	0.0	0.0	0.0
2032	72.9	72.9	0.0	0.0	0.0	72.4	72.4	0.0	0.0	0.0	52.7	52.7	0.0	0.0	0.0	34.7	34.7	0.0	0.0	0.0	0.0	0.0	0.0
2042	97.9	97.9	0.0	0.0	0.0	97.3	97.3	0.0	0.0	0.0	70.8	70.8	0.0	0.0	0.0	46.6	46.6	0.0	0.0	0.0	0.0	0.0	0.0
2052	131.6	123.0	8.6	0.0	0.0	130.8	123.0	7.8	0.0	0.0	95.2	95.2	0.0	0.0	0.0	62.6	62.6	0.0	0.0	0.0	0.0	0.0	0.0
2062	176.9	123.0	53.9	0.0	0.0	175.8	123.0	52.8	0.0	0.0	127.9	119.0	8.9	0.0	0.0	84.1	84.1	0.0	0.0	0.0	0.0	0.0	0.0