

# Water Supply and Demand Update

Prepared for: Baca Grande Water and Sanitation District

*May 22, 2019*

*AG File #: 18-125*



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**Prepared For:**  
Baca Grande Water and Sanitation District

**Prepared By:**  
Applegate Group, Inc.

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The technical analysis, opinions, and recommendations in this report were prepared by or under the direct supervision of the undersigned, whose seal as a registered Professional Engineer is affixed below. We reserve the right to update, supplement, or revise our analysis, opinions, and recommendations should new or additional information become available.



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Figure 1 – Baca Grande Water & Sanitation District Overview Map

## INTRODUCTION

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Applegate Group, Inc. (Applegate) has completed the following three interrelated evaluations for the Baca Grande Water and Sanitation District (“the District”):

1. Review, evaluate, and update previous water supply studies,
2. Supplement previous reports with analysis of recent water usage data, and
3. Provide recommendations as to how the District will meet its water supply needs in the future.

This report summarizes our findings and recommendations.

## BACKGROUND

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The District is a Title 32 special district established in 1972 and is located just south of Crestone, Colorado. Its stated mission is to provide high quality, reliable, sustainable water and treatment of wastewater in a manner that reduces the District’s carbon footprint while balancing commitment to the highest standards of environmental protection and customer service in the most efficient and economical manner possible.<sup>1</sup>

The service area of the District currently encompasses the following four distinct subdivisions as shown on Figure 1:

- Chalet 1
- Chalet 2
- Chalet 3
- Mobile Home Estates (MHE), aka Casita Park

In the past, the District has considered the possibility that it may also eventually provide water service to the Grants subdivision and the Town of Crestone (both also shown on Figure 1). However, the likelihood of this occurring is considered low, and for the purposes of this study it was decided to focus the estimate of future water demand solely on the District’s current boundaries.<sup>2</sup>

The District leases all of its water rights from the United States of America, Department of Interior, U.S. Fish and Wildlife Service (USFWS) under a water service agreement.<sup>3</sup> This agreement was executed with Cabeza de Vaca Land & Cattle Company, LLC, who owned the leased water rights prior to their conveyance to the USFWS. The water rights leased from the USFWS consists of a mix of both senior and junior groundwater and surface water rights located within the drainages of Crestone, Spanish, and Cottonwood Creeks, although presently the District relies exclusively on four unconfined aquifer wells located in the Crestone Creek drainage to meet its daily water demand. Under the water service agreement, the District has the right to purchase up to 4,000 acre-feet of water annually from the USFWS, which far exceeds the District’s current average annual raw water demand. Although Paragraph 6 of the current water service agreement prohibits the USFWS from curtailing the District’s use of the leased water rights, it should be noted that the USFWS does operate additional senior surface water rights

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<sup>1</sup> Baca Grande Water & Sanitation District, <http://www.bacawater.com/index.html> (February 26, 2018).

<sup>2</sup> Meeting between the District and Applegate, September 6, 2018.

<sup>3</sup> Water Service Agreement between Cabeza de Vaca Land & Cattle Company, LLC and Baca Grande Water and Sanitation District, August 28, 1997.

downstream that could potentially call out the leased surface water rights in the future unless a similar provision prohibiting this is maintained in future agreements.

The Great Sand Dunes Park and Preserve Act of 2000 authorizes the USFWS to sell water rights to the District. The District and USFWS have discussed the possibility of selling water rights to the District in the past, and recently those discussions have also included consideration of compliance obligations under the Rules Governing the Withdrawal of Groundwater in Water Division No. 3 issued by the Colorado Division of Water Resources (DWR) (the “New Rules”). The New Rules were issued September 23, 2015 and were made effective on March 15, 2019 when a decree was entered in Case No. 2015CW2034. In the event the District purchases water rights, the existing water service agreement would be terminated, and the District would seek to acquire a portfolio of water rights physically and legally sufficient to supply the District’s customers at full build-out, as well as any rights necessary for the District to comply with the New Rules.

The District has commissioned prior studies to evaluate the District’s water supply needs, however the most recent was completed in 2012, so they are in need of being updated with the most recent water usage data available from the District. The District’s ultimate goal is to ensure that any purchase of water rights from the USFWS results in a water supply available to the District that is at least as legally and physically reliable as the water supply that is currently contractually available to the District pursuant to the water service agreement with the USFWS, and will provide sufficient water to meet the District’s needs at full build-out.

It is possible that the District will not have a second opportunity to acquire additional water rights to meet its needs, so underestimating the District’s water demand is a significant risk. There are a number of key variables that will determine the District’s ultimate demand at build-out including, but not limited to:

1. Growth rate of the District
2. Rate of lot consolidation
3. Potential for re-subdivision of consolidated lots in the future
4. Future incorporation of subdivisions within the service area currently not supplied by the District’s system
5. Composition of the District’s customer base
6. Customer water use patterns
7. Reductions (or increases) in system losses
8. Climate change and its effects

It is difficult and, in some cases, impossible to accurately predict all of the potential variables which may impact future water demand. Therefore, for the purposes of this study, it was deemed reasonable to estimate demand using a conservative approach. Where assumptions were necessary, they were selected to achieve a conservatively high demand estimate in order to reduce the risk that the District acquires too little water to meet its future needs.

## NEW RULES

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The New Rules require that all groundwater withdrawals be made pursuant to either a Groundwater Management Plan for a local Subdistrict, a decreed Plan for Augmentation, or a temporary Substitute Water Supply Plan (SWSP). All such plans will require replacement of injurious stream depletions from groundwater pumping that impact surface water rights or interfere with Colorado’s ability to fulfill its obligations under the Rio Grande Compact. These injurious stream depletions are to be determined using

the Rio Grande Decision Support System Groundwater Model (RGDSS Model) or alternative method that is considered at least as reliable. Based on the New Rules, the District is located within the San Luis Creek Response Area, and the RGDSS Model has determined that all pumping within this response area results in stream depletions to both Crestone Creek and San Luis Creek (below the Arthur Young Ditch and Kerber Creek). The Subdistrict covering this response area is District No. 4 (San Luis Creek Subdistrict), which was established July 21, 2017 and is operated by the Rio Grande Water Conservation District (RGWCD).

If an entity elects to comply with the New Rules by joining the San Luis Creek Subdistrict, the Subdistrict has one year to develop an approved Groundwater Management Plan with a deadline set by the Division Engineer of May 2020. The Subdistrict then has an additional year to obtain approval of its first Annual Replacement Plan (ARP), which must be submitted by April 15<sup>th</sup> of each year; this means a presumed deadline of April 2021 for wells to join the Subdistrict if they are to be covered by its first ARP. If an entity elects to comply with the New Rules by developing its own Plan for Augmentation or SWSP, it has two years to file the Plan for Augmentation and be operating under an approved SWSP, which gives a presumed deadline of May 2021.

Because of various factors inherent in the RGDSS modeling, including recognition that the District's groundwater pumping impacts both Crestone Creek and San Luis Creek but the District discharges all of its treated wastewater as a point source solely to Crestone Creek, the DWR has expressed confidence that the response functions developed for the San Luis Creek Response Area will demonstrate that the District's operations result in a net increase (or accretion) to streamflows on Crestone Creek.<sup>4</sup> Preliminary runs of the response function simulating the District's water pumping appear to confirm this prediction.<sup>5</sup> This means that the District's operations will not result in injurious stream depletions to Crestone Creek and in fact will have a net beneficial effect to surface flows in the creek. However, injurious stream depletions to San Luis Creek resulting from the District's pumping will still need to be replaced. The San Luis Creek Subdistrict and other groundwater users within the San Luis Creek Response Area will have a need for replacement water on Crestone Creek. It is possible that the District (or USFWS on the District's behalf) could contract with the San Luis Creek Subdistrict or others to trade its excess accretions to Crestone Creek for replacement water that would offset some or all of the District's injurious stream depletions to San Luis Creek. Confirmation of the District's projected accretions and depletions is necessary before such negotiations can begin.

Rule 8 of the New Rules also includes a sustainability component requiring that groundwater users maintain pressure heads within the San Luis Creek confined aquifer system consistent with historic levels existing in the aquifer between 1978 and 2000. Due to a lack of data on the pressure head of the aquifer during that time period, the New Rules have an alternative requirement that overall pumping volumes be maintained at levels that are consistent with pumping over the 1978 to 2000 period. Therefore, for the District to increase its pumping beyond historic levels will require a corresponding decrease in pumping from other well users. This is a critical issue for the District, as during the benchmark period it is likely that the District was relying solely on surface water to meet its needs. Consistent with this assumption, none of the groundwater rights the District has relied on in the recent past have DWR diversion records prior to 2001. This means that all future groundwater pumping by the District may be considered an increase above historic levels observed during the benchmark period, and that a complete offset of the District's groundwater pumping may be required. Contracting with the San Luis Creek Subdistrict (either directly or through the USFWS) could be a method to fulfill this requirement. Alternatively, the District

<sup>4</sup> Telephone conference between Colorado DWR Division 3 Staff and Applegate Group, May 16, 2019.

<sup>5</sup> David Hofmann (Colorado DWR Division 3), e-mail to Applegate Group, May 16, 2019.

(again, either directly or through USFWS) would need to acquire and retire other wells that were active during the 1978 to 2000 period.

It is our understanding that the USFWS and the District mutually agree that the current water service agreement provides fully useable and augmented water, and likewise any sale of water to the District would consist of fully useable and augmented water. Therefore, the burden of complying with the New Rules for groundwater pumping by the District would fall on the USFWS in either scenario.

## PRIOR REPORT REVIEW

The prior reports commissioned by the District consist of the following:

- HRS Water Consultants, Inc., *Final Report: Water Supply Analysis, Water Needs Analysis, Water Structures Map, Prepared for Baca Grande Water & Sanitation District*, May 10, 2010.
- HRS Water Consultants, Inc., *Water Demand & Consumptive Use Analysis, Prepared for Baca Grande Water & Sanitation District*, January 2011.
- Gerstle & CO LLC and HRS Water Consultants, Inc., *Engineer's Joint Recommendations on Water Demand, Growth, and Related Issues*, August 13, 2012.
- Providence Infrastructure Consultants, *Surface Water Treatment Feasibility Study*, March 14, 2018.

A brief summary of each report is provided below.

### MAY 2010 FINAL REPORT

This report described the adequacy of the water supply along with the water rights aspects of the District's water supplies and demand at full build-out. Primary conclusions and recommendations from that report which are pertinent to the current evaluation included the following:

- The District's annual raw water diversion demand at that time was 300 acre-feet.
- The District's annual raw water diversion demand at full build-out was estimated to be 1,485 to 1,782 acre-feet (which excluded potential future demand from the Grants subdivision).
- The two separate water supply systems then operated by the District (one for the Chalets and one for Casita Park) should be integrated into a single system to provide more flexibility and to better serve the District's customers.
- A replacement well for Well No. 17 should be drilled to provide a backup for Well No. 18.
- Comparison of 2009 meter/tap records to raw water demand indicated that there was a significant loss of water within the supply systems (on the order of 69% for the Chalets system and 55% for the Casita Park system), most likely due to a combination of meter inaccuracies and a "leaky" system. The District should investigate/identify meter inaccuracies and repair leaks within the existing infrastructure.
- HRS recommended the District continue to obtain its water supply solely from groundwater sources. Existing surface rights are problematic as water supply sources due to high maintenance costs and water quality issues associated with the existing shallow infiltration galleries. Seasonality of supply is also a concern; a review of stream gage records indicate that little flow may be available in winter months.
- The District should plan future well locations more strategically in response to demand in order to

decrease pumping costs and result in a more efficient system overall.

- New “Ground Water Rules” governing ground water rights in the San Luis Valley were pending; once finalized, administration would become stricter and water rights not in-priority would be prohibited from diverting without a plan for augmentation. Therefore, the District needed to develop and decree a plan for augmentation to replace out-of-priority depletions.

## JANUARY 2011 WATER DEMAND & CONSUMPTIVE USE ANALYSIS REPORT

This report supplemented the May 2010 report and was intended to better estimate the District’s future raw water diversion demand and consumptive use at build-out in order to assist the District in planning for the acquisition of water rights to provide augmentation of the District’s out-of-priority depletions. Primary conclusions and recommendations from that report which are pertinent to the current evaluation included the following:

- The District’s annual raw water diversion demand at the time continued to be 300 acre-feet, with a corresponding annual consumptive use estimate of 63 acre-feet. These two values would increase to 360 acre-feet and 83 acre-feet, respectively, if the Grants and the Town of Crestone were included as potential customers.
- The District’s annual raw water diversion demand at full build-out was estimated to be 1,509 acre-feet, with a corresponding annual consumptive use estimate of 316 acre-feet. These two values would increase to 2,152 acre-feet and 526 acre-feet, respectively, if the Grants and the Town of Crestone were included as potential customers.
- Based on consolidation trends, full build-out was estimated to result in 337 lots at Mobile Home Estates, 2,678 lots within Chalets 1 through 3, and development of an additional 379 lots on the Johnson-Malouff tract within the boundaries of Casita Park. Total lots at build-out were therefore estimated to be 3,394.
- The District’s consumptive use rate was estimated to be 20% of its raw water diversion demand. Most of the consumptive use within the district resulted from the irrigation of golf courses and lawn areas; most of the District’s customers were on sewer taps so household use had a low rate of consumption.
- The District continued to show heavy reliance on Well No. 18, and a backup for that well should be constructed.
- The District should strive to maintain good records for both well pumping and metered customer deliveries.

## AUGUST 2012 ENGINEER’S JOINT RECOMMENDATIONS REPORT

This report was intended to refine the raw water diversion demand and consumptive use at build-out estimates provided in the January 2011 report. Primary conclusions and recommendations from that report which are pertinent to the current evaluation included the following:

- The District’s annual demand at the time was estimated to be 204 acre-feet. This value was less than the prior estimates because it was based not on past diversion records but instead on presumptive needs per lot and did not include allowance for the leaky nature of the District’s delivery system, making it analogous to the customer delivery demand concept adopted for this analysis.
- The District’s annual consumptive use demand at the time was estimated to be 86 acre-feet. This value was estimated assuming 5% consumption for indoor use on lots served by centralized

wastewater treatment, 10% consumption for indoor use on lots served by septic, and 80% consumption for outdoor irrigation use.

- The District's annual demand at full build-out was estimated to be 587 acre-feet. Again, this demand estimate did not include allowances for the leaky nature of the District's delivery system and is analogous to the customer delivery demand at full build-out estimated for this analysis.
- The District's annual consumptive use demand at full build-out was estimated to be 170 acre-feet based on the previously described consumptive use rates.
- Total lots at build-out were estimated to be 2,611 based on future consolidation estimates from the Saguache County Crestone - Baca Planning Commission (SCCBPC, 2011). Possible future development of the Johnson-Malouff tract was not considered in this build-out estimate.

## MARCH 2018 SURFACE WATER TREATMENT FEASIBILITY STUDY

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This report evaluated the feasibility of constructing new surface water treatment facilities on South Crestone and Cottonwood Creeks where the District has surface rights for 1 cfs and 5 cfs, respectively, under the current water services agreement with USFWS. The District previously operated treatment facilities consisting of shallow infiltration galleries on both creeks until the early 2000's when the facilities were taken offline due to maintenance and water quality issues. Primary conclusions and recommendations regarding incorporating the use of surface water treatment facilities in the future were as follows:

- Currently, there is no treatment infrastructure or equipment in place at either location and intake structures no longer exist. New infrastructure and equipment would be necessary at both locations to meet Colorado Department of Public Health and Environment (CDPHE) requirements.
- Cottonwood Creek is recommended as the most cost-effective location for a new treatment facility as the associated 5 cfs surface right would provide a more reliable source than the 1 cfs surface right on Crestone Creek. The Cottonwood Creek location also provides access to a sanitary sewer connection which is helpful for treatment system operation.
- The proposed Cottonwood Creek facility would utilize an alluvial infiltration system which would be less susceptible to season changes, precipitation events, and damage from freezing/flooding.
- The study suggested moving the point of diversion and Cottonwood treatment facility approximately 1,600 feet to the west to a more suitable site.
- Estimated construction costs for a new treatment facility at the proposed Cottonwood Creek location are approximately \$2,000,000. Depending on the provided supply, significant savings in electrical costs associated with pumping could be realized by the District if the treated surface water is used to offset groundwater sources.

## INFRASTRUCTURE UPDATE

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The following section provides a brief update to the infrastructure utilized by the district to operate its water supply system. Water supply sources are shown on Figure 1.

### PHYSICAL WATER SUPPLY SOURCES

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At the time of the prior reports, the District relied solely on the following three unconfined aquifer wells to provide water to its system:

- Golf Course Well (aka Well No. 27): this well serves as a decreed alternate point of diversion (APD) for the Baca No. 4 Irrigating Ditch No. 7 surface water right and has an appropriation date of 5/10/1870. As such, it has no associated well permit and is administered as if it is a surface water right. It has been curtailed by the DWR in the past (specifically in 2010) when the DWR made a determination that water was not available at the original point of diversion. For purposes of administration, the DWR considers water to be available at the original point of diversion if surface water is flowing in North Crestone Creek where it crosses Co Rd T; generally water is flowing at this point from late April/early May until August when flows begin to drop.<sup>6</sup> It has a decreed pumping rate of 600 gpm and may be used for irrigation, municipal, fire protection, recreation, and clear water retention & storage. In combination with Well No. 26 (not constructed), it is limited to a gross combined diversion of 480 acre-feet per year. In the past it has primarily been used to irrigate the 9-hole golf course. However, in 2018 it was not pumped, and irrigation of the golf course was instead performed with potable water supplied by the District's two primary wells (Well Nos. 17 and 18, discussed below).
- Motel Well (aka Casita Park Well, Permit No. 15909-F): this is a groundwater right that has an appropriation date of 12/1/1971. It has a decreed pumping rate of 1,000 gpm and may be used for domestic and municipal purposes. The DWR has previously allowed this well to provide irrigation water to the golf course when the Golf Course Well has been curtailed; in that authorization the DWR observed that the well permitting documents may limit the use of this well to the Casita Park service area.<sup>7</sup> According to a 2014 appraisal of the water right (Wright Water, 2014), this well has a volumetric withdrawal limitation of 1,207 acre-feet per year; the source of this limitation appears to emanate from the intended average diversion amount specified on the map and filing statement associated with the well permit and may not serve as an actual legal limit. In the past this well was used to supply the Casita Park system when that system was separate from the Chalets. When the two systems were interconnected, this well was disconnected and has not been used for many years.
- Well No. 18 (Permit No. 57623-F): this is a groundwater right that has an appropriation date of 12/7/1956. It has a decreed pumping rate of 450 gpm and may be used for municipal, fire protection, irrigation, and domestic uses. Case No. 98CW28 limited the aggregate use of this well and Well No. 17 to a simultaneous pumping rate of 450 gpm, a combined consumptive use of 117 acre-feet per year, and a combined gross diversion of 475 acre-feet per year; furthermore, future uses for irrigation were limited to only that irrigation which was incidental to municipal use (such as lawns, gardens, & landscaping). It was most recently rehabilitated in 2012. The well permit status of this well is complicated. A new well, intended to be a replacement for Well No. 17, was drilled approximately 200 feet to the northeast of the existing Well No. 18. The DWR mistakenly permitted this new well as a replacement well for Well No. 18 (under Permit No. 57623-F-R) and required that the old well be plugged and abandoned. It is not the District's intent to abandon the current Well No. 18, and the District intends to resolve the permitting issues with the DWR once the new well is decreed as an alternate point of diversion for Well No. 17 (see below discussion). This well, along with Well No. 17, is the primary source of supply for the District.

Since the prior reports were issued the District has incorporated the following additional structure into its water supply system:

<sup>6</sup> Meeting between Colorado DWR Division 3 staff and Applegate Group, September 5, 2018.

<sup>7</sup> Corey DeAngelis (DWR), Letter to Bratton Hill Wilderson & Lock, Re: Baca Grande Water and Sanitation District (Crestone, Colorado) Use of Motel Well, May 13, 2010.

- Well No. 17 (aka Horse Pasture Well, Permit No. 6051-R): this is a groundwater right that has an appropriation date of 12/7/1956. It has a decreed pumping rate of 450 gpm and may be used for municipal, domestic, fire protection, and irrigation uses. As described in the information for Well No. 18, Case No. 98CW28 limited the aggregate use of this well in combination with Well No. 18 to certain amounts and uses. A new well intending to replace the old Well No. 17 was drilled in 2012 at a location approximately 1,930 feet east northeast of the original location and assigned Permit No. 57623-F-R. At this time, there is a pending Water Court application under Case No. 2015CW3028 to decree the new well as an alternate point of diversion for Well No. 17. Once that decree is entered, the District intends to resolve the permitting issues with this well to make clear that Well No. 17 and Well No. 18 are separate and distinct structures. Both are currently active and serve as the primary sources of supply to the District.

The following additional water supply sources are included in the water service agreement with USFWS but were not in use at the time of the prior reports and remain unused:

- South Crestone Creek Gallery: this gallery serves as an APD for the Baca Grant No. 4 Irrigating Ditch No. 8 surface water right and has an appropriation date of 6/1/1870. It is decreed to divert 450 gpm and may be used for municipal, recreational, fire protection, and irrigation purposes. It was used by the District in the past, but treatment and maintenance costs resulted in discontinuing the use of this source.
- Cottonwood Creek Gallery: this gallery serves as an APD for the Baca Grant No. 4 Irrigating Ditch Nos. 21, 22, & 23 surface water rights and has an appropriation date of 5/10/1870. It is decreed to divert 2,244 gpm and may be used for municipal, recreation, fire protection, and irrigation uses. It was used by the District in the past, but was damaged by high runoff in 2005 and a replacement well (Permit No. 62698-F, temporarily approved as an alternate point of diversion in an emergency Substitute Water Supply Plan) did not produce as expected and so use of this source was also discontinued. The March 2018 surface water feasibility study suggested moving the point of diversion to a new location; given the distances involved, an application to change the point of diversion would need to be submitted to the Water Court for this to happen. A simple location change may not be possible given that the Colorado Water Conservation Board (CWCB) has an instream flow water right on Cottonwood Creek, which creates a risk that this water right could be re-quantified and possibly reduced if the change is sought in Water Court.<sup>8</sup>
- Camper Village Well (aka Well No. 26): this well was conditionally decreed as an APD for the Baca Grant No. 4 Irrigating Ditch No. 7 surface water right with an appropriation date of 5/10/1870. It was conditionally decreed to divert 600 gpm and may be used for municipal, fire protection, irrigation, recreation, water retention, temporary storage, sewage disposal, and industrial use. However, the application for finding of reasonable diligence required by Case No. 95CW5 was not filed within the required time frame, so the Water Court issued an order on July 17, 2002 which cancelled the conditional APD right; a subsequent application in Case No. 02CW67 to re-establish the conditional APD right was voluntarily dismissed by the USFWS/Nature Conservancy. Therefore, this well (which was never constructed) does not currently have any useable water rights. It is unclear from the water service agreement whether the District is authorized to use the Baca Grant No. 4 Irrigating Ditch No. 7 surface water right for which this well was an APD.
- Second Tier Wells: the second tier wells consist of groundwater rights for four wells constructed in the confined San Luis Valley aquifer in the mid 1950's for irrigation use only. Designated

<sup>8</sup> Marcus Lock (Law of the Rockies), telephone conference with Applegate, May 21, 2019.

Grant Well No. 2, 13, 14, and 15, these wells have not been utilized by the District since the mid to late 1980's and their usefulness to the District is limited unless and until their allowed uses are changed in Water Court to include municipal, storage, etc. Until such time, their use would be limited solely to irrigation within the District. According to the water service agreement, the USFWS is responsible for filing the necessary Water Court applications to change the use of these wells to include municipal purposes should the District elect to begin using these wells. If the wells had significant pumping during the 1978 to 2000 time period, the best use of these second tier wells may be to retire them in order to meet the sustainability component of the New Rules.

## UNIFIED WATER SUPPLY SYSTEM

At the time of the prior reports, the District operated two separate water supply systems, where the Motel Well served lots in Casita Park and Well No. 18 served lots in the three Chalet development units. The Golf Course well was separate from both systems and provided water solely for irrigation at the Golf Course.

Following recommendations from prior studies (HRS, 2010), the District has integrated the two separate systems into a single unified water supply system, enabling the water supplied by Well No. 18 and Well No. 17 to serve its entire service area. The increase in redundancy is limited, however, as the Motel Well was physically removed from the distribution system during the inter-connect project. Also, although it is decreed for municipal and other uses, the Golf Course well continues to be separate from the rest of the potable water supply system and (when in use) continues to provide water only to irrigation of the golf course.

## SYSTEM LOSS

The prior studies recognized that the District has a leaky water distribution system; estimates found losses to be as high as 50% of water pumped in some months (HRS, 2010) and such losses were attributable to a combination of meter inaccuracy, unmetered uses, and system leakages (Gerstle, 2012). Our comparison of water diversions to estimated customer water deliveries indicates the system continues to have a high rate of losses. Table 1 below summarizes customer deliveries versus water pumped over the 2015 through 2018 period; average losses over this four-year period were estimated to be 41%.

TABLE 1: ESTIMATED SYSTEM LOSSES

Year	Casita Park / MHE (gal)	Chalets I, II & III (gal)	Large Account Holders (gal)	Non- residential Users (gal)	Total Delivery (gal)	Total Delivery (ac-ft)	Total Pumping (ac-ft)	Estimated Loss
2015	3,257,635	23,519,831	1,596,702	50,198,779	78,572,947	241.13	422	43%
2016	3,172,008	26,670,218	1,581,000	43,096,100	74,519,325	228.69	385	41%
2017	3,302,271	26,796,467	1,591,250	47,692,120	79,382,108	243.61	374	35%
2018	3,385,015	30,355,849	1,504,383	21,761,333	57,006,580	174.95	313	44%
<b>Average</b>	<b>3,279,232</b>	<b>26,835,591</b>	<b>1,568,334</b>	<b>40,687,083</b>	<b>72,370,240</b>	<b>222.10</b>	<b>373</b>	<b>41%</b>

In order to prepare this estimate, average monthly use per development unit was substituted for missing and errant readings in order to estimate total use.

## SURFACE WATER AVAILABILITY

To compliment the feasibility study completed by Providence regarding the construction of new surface water treatment facilities at the South Crestone Creek and Cottonwood Creek galleries, Applegate updated the streamflow analysis performed by HRS in 2010 for both creeks based on DWR stream gage data for the period 01/01/2009 through 01/01/2019. The results of this analysis are summarized in the charts and tables below and confirm the seasonality of supply associated with these two rights. Charts 1 and 2 show the average daily streamflow for South Crestone Creek and Cottonwood Creek based on the 2009-2019 study period. Table 2 summarizes the average daily streamflow for each month based on the same period of record. The results are consistent with the seasonal trend identified by the HRS analysis and the estimated availability of stream flows exceeding the decreed rates for both galleries (5 cfs for the Cottonwood Creek gallery and 1 cfs for the South Crestone Creek gallery).

CHART 1: SOUTH CRESTONE CREEK AVERAGE DAILY STREAMFLOW

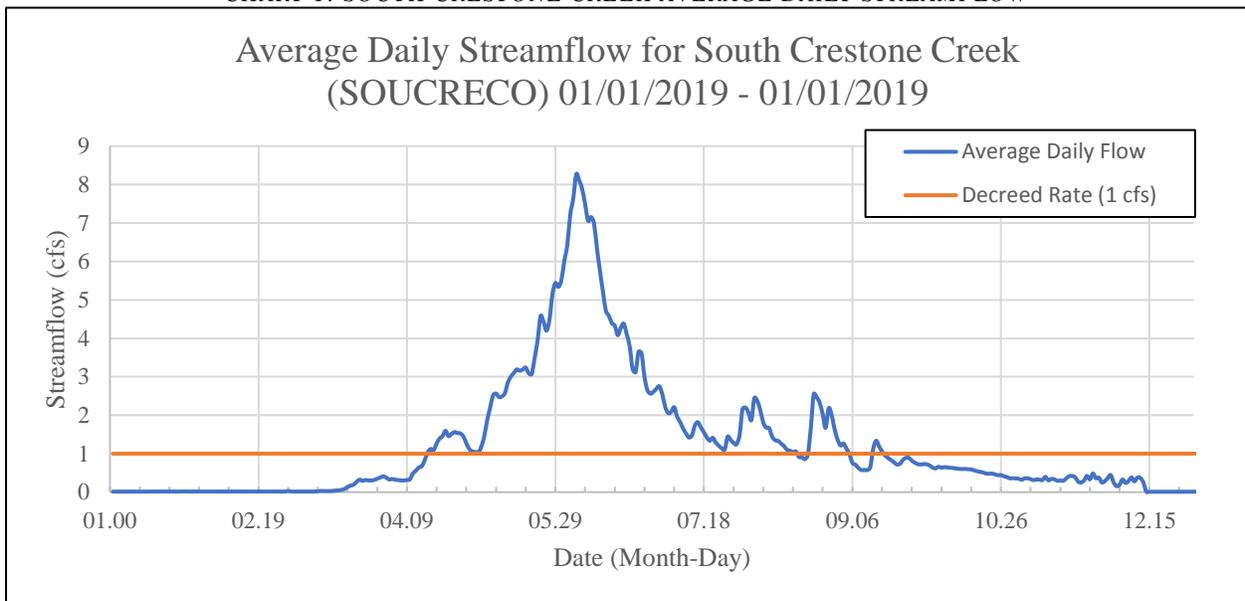


CHART 2: COTTONWOOD CREEK AVERAGE DAILY STREAMFLOW

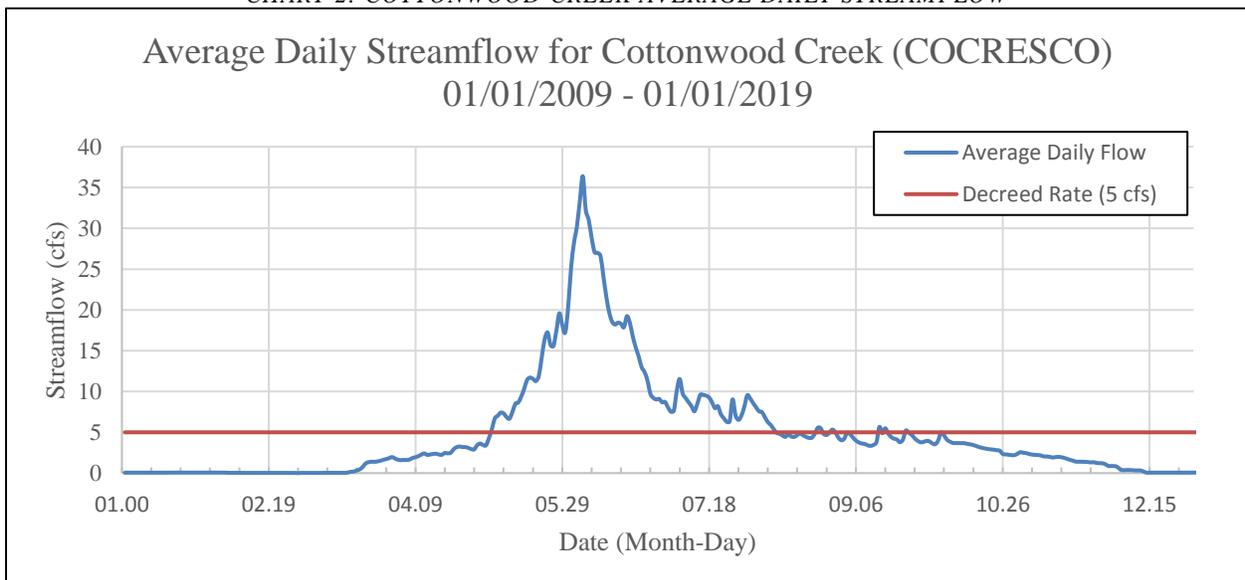


TABLE 2: STREAMFLOW SUMMARY

Month	South Crestone Creek (SOUCRECO) Average Daily Streamflow (cfs)		Cottonwood Creek (COCRESCO) Average Daily Streamflow (cfs)	
	2009-2019 (AG)	1967-2008 (HRS)	2009-2019 (AG)	1967-2008 (HRS)
Jan	0.017	0.050	0.062	1.080
Feb	0.018	0.030	0.037	0.970
Mar	0.173	0.130	0.515	1.120
Apr	0.916	0.900	2.394	2.230
May	3.162	4.210	10.804	12.770
Jun	5.272	3.450	21.029	16.770
Jul	1.741	1.950	8.387	11.330
Aug	1.657	2.180	5.485	9.650
Sep	0.875	1.050	4.250	6.680
Oct	0.546	0.660	3.298	3.760
Nov	0.339	0.320	1.792	2.050
Dec	0.158	0.120	0.246	1.350

## CURRENT WATER DEMAND

The purpose of the following analysis is to summarize the District’s current delivery and diversion demand, as well as to provide an estimate of the District’s current consumptive use demand. As these terms are used in this report, diversion demand represents how much raw water the District requires to supply its water system. Delivery demand represents how much of the diversion demand that the District delivers to its customers after deducting for system losses (such losses may be considered non-consumptive and result in return flows to the stream and aquifer system). Consumptive use demand represents the portion of the District’s delivery demand that ultimately gets consumed through application of the water to its intended use, either indoor or outdoor.

## CURRENT CUSTOMER DELIVERY DEMAND

The customer base currently served by the District was separated into 4 categories in accordance with the District’s account numbering methodology:

- Chalets I, II & III (residential ¾” taps)
- Casita Park / Mobile Home Estates (residential ¾” taps)
- Commercial Businesses, Religious Centers and Townhomes (non-residential ¾” taps)
- Non-Residential Users (all taps larger than ¾”)

The Non-Residential Users were further subdivided into four subcategories based on tap size (1”, 1.5”, 2”, and 3”); these taps are high-volume users which provide water for religious centers and irrigation of parks and ball fields. Residential customers were separated into the above categories based on account number. Account numbers beginning with ‘41’ are users located in Casita Park, account numbers beginning with ‘42’ are taps serving the Chalets and account numbers beginning with ‘43’ are businesses, religious centers and townhomes. This analysis was completed by reviewing the District’s customer delivery records (metering records) for the period January 2015 through November 2018 in order to

calculate the total delivery demand for each customer type. Results are based on the average monthly deliveries for each customer type over the four years of available data. As shown in Table 3, the District’s current delivery demand is approximately 222 acre-feet per year.

TABLE 3: CURRENT WATER DELIVERY DEMAND

All values in ac-ft

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)	All Customers
<i>Quantity</i>	625	61	21	7	4	6	1	725
January	4.30	0.50	0.16	0.13	0.16	0.08	0.00	<b>5.33</b>
February	3.49	0.58	0.14	0.19	0.10	0.08	0.00	<b>4.59</b>
March	4.26	0.59	0.21	0.08	0.13	0.09	0.00	<b>5.36</b>
April	5.03	0.64	0.29	1.08	0.15	0.13	3.87	<b>11.19</b>
May	6.08	0.79	0.32	2.41	0.31	0.19	10.25	<b>20.35</b>
June	11.35	1.17	0.77	3.20	0.44	0.29	19.00	<b>36.22</b>
July	11.68	1.42	0.80	4.23	0.35	0.28	20.71	<b>39.47</b>
August	10.59	1.30	0.76	3.99	0.27	0.24	15.22	<b>32.37</b>
September	9.17	1.10	0.64	3.90	0.22	0.23	18.60	<b>33.88</b>
October	6.90	0.85	0.38	1.99	0.12	0.17	10.49	<b>20.89</b>
November	5.33	0.61	0.20	0.33	0.06	0.12	0.50	<b>7.14</b>
December	4.17	0.51	0.15	0.19	0.12	0.17	0.00	<b>5.31</b>
Annual Total (acre-feet)	82.36	10.06	4.81	21.73	2.41	2.08	98.64	<b>222.10</b>

### CURRENT RAW WATER DIVERSION DEMAND

This analysis was completed by reviewing the District’s well pumping and water treatment system delivery records for wells that were in use during the 2015 to 2018 period. A summary of the diversions from each of the active wells is provided in Table 4 below. Per this data, the District’s current diversion demand is approximately 373 acre-feet per year. This data is based on information provided by the District and may differ from information reported by the DWR.

TABLE 4: CURRENT DIVERSION DEMAND

Year	All values in Acre Feet				
	Motel Well	Grant Well 17	Grant Well 18	Golf Course Well	Total
	WDID = 2505403	WDID = 2505420	WDID = 2505421	WDID = 2505043	
2015	69	80	107	166	<b>422</b>
2016	0	126	159	100	<b>385</b>
2017	0	102	152	120	<b>374</b>
2018	0	111	202	0	<b>313</b>
Average	17	105	155	97	<b>373</b>

## CURRENT CONSUMPTIVE USE DEMAND

For this analysis, system losses were considered to be non-consumptive given that leaks in the delivery system (a primary source of such losses) would return water directly to the stream and aquifer system. Therefore, the consumptive use demand was estimated by applying presumptive consumption factors to the delivery demand. According to District personnel, most customers are on centralized wastewater treatment.<sup>9</sup> As such, indoor use was assumed to result in 5% consumption of water deliveries, which is a typical consumption rate assumed for centralized sewer systems and is consistent with assumptions made in the prior studies. Outdoor use, which consists predominantly of irrigation, was assumed to result in 80% consumption of water deliveries, which is a typical efficiency rate for sprinkler irrigation systems and is also consistent with assumptions made in the prior studies.

For all customer categories except the golf course, water deliveries during the non-irrigation season months of November through March were assumed to be solely indoor use resulting in a 5% consumption rate. For the remaining months of the year, indoor use was assumed to be the average of the deliveries during these five non-irrigation season months or the delivery during the month in question, whichever was less. Outdoor use was assumed to be all deliveries in excess of the indoor use each month and resulted in an 80% consumption rate. Part-time residential occupation of the District's customer base may have an impact on the split between indoor use and outdoor use during the irrigation season, but the method adopted above to estimate the split is considered reasonable given the purpose of this study. For the golf course, all water use is for outdoor irrigation and was assigned a consumption rate of 80%.

TABLE 5: CURRENT CONSUMPTIVE USE DEMAND

*All values in ac-ft*

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)	All Customers
<i>Quantity</i>	625	61	21	7	4	6	1	725
January	0.21	0.03	0.01	0.01	0.01	0.00	0.00	<b>0.27</b>
February	0.17	0.03	0.01	0.01	0.00	0.00	0.00	<b>0.23</b>
March	0.21	0.03	0.01	0.00	0.01	0.00	0.00	<b>0.27</b>
April	0.80	0.09	0.11	0.72	0.03	0.02	3.09	<b>4.86</b>
May	1.63	0.21	0.13	1.79	0.16	0.07	8.20	<b>12.20</b>
June	5.85	0.51	0.49	2.42	0.27	0.15	15.20	<b>24.89</b>
July	6.11	0.71	0.51	3.25	0.20	0.14	16.57	<b>27.49</b>
August	5.24	0.62	0.48	3.05	0.13	0.11	12.18	<b>21.81</b>
September	4.11	0.46	0.38	2.98	0.10	0.11	14.88	<b>23.02</b>
October	2.29	0.26	0.17	1.45	0.01	0.05	8.39	<b>12.63</b>
November	0.27	0.03	0.01	0.02	0.00	0.01	0.40	<b>0.73</b>
December	0.21	0.03	0.01	0.01	0.01	0.01	0.00	<b>0.27</b>
Annual Total (acre-feet)	27.10	3.01	2.32	15.71	0.92	0.68	78.91	<b>128.66</b>

<sup>9</sup> Meeting between the District and Applegate Group, September 6, 2018.

As shown in Table 5, based on the assumed consumptive use factors and distribution of indoor versus outdoor water use, the District’s current consumptive use demand is approximately 129 acre-feet per year.

Based on this analysis, the District’s current estimated annual consumptive use rate is roughly 34% of total diversions. In comparison, the consumptive use rate for all municipal well pumping in Division 3 has been estimated in the RGDSS model to be approximately 40%.<sup>10</sup> It is likely that the District’s relatively high rate of system loss partially explains why the District has a somewhat lower consumptive use rate than typical municipal well pumping determined for the RGDSS model. If the 40% consumptive use rate estimated for the RGDSS model for municipal well pumping was applied to the District’s current diversion demand, the District would have a current consumptive use demand of approximately 149 acre-feet per year.

## PROJECTED LOTS SERVED AT BUILD-OUT

The purpose of this section is to document the current number of lots within the District’s service area and to provide an estimate of how many lots may exist at build-out given lot consolidation trends and possible rates of development.

### LOT CONSOLIDATIONS

Information on the number of lots originally platted on each development unit served by the District was obtained from the Baca Grande Property Owner’s Association (BGPOA) and confirmed by review of the original plat maps made available online by the BGPOA.<sup>11</sup> The total number of lots within these four development units was 9,244 at the time they were platted. This number has dropped considerably as lots have been consolidated or vacated. As of August 2017, the total lots within these development units had dropped to 2,669.<sup>12</sup> Note that this estimate includes only those lots that are members of the BGPOA; there are a number of properties within the original boundaries of MHE that are no longer part of BGPOA and thus aren’t included in this calculation, including the Baca Grande Ranchettes (10 lots), the Dragon Mountain tract (~140 acres in size), the Johnson-Malouff tract (~171 acres), and the Elk Park subdivision (9 lots). Table 6 summarizes the number of lots by development unit platted originally and as of August 2017.

TABLE 6: NUMBER OF LOTS

<b># of Lots (per Baca POA)</b>					
<b>Year</b>	<b>CHALET ONE</b>	<b>CHALET TWO</b>	<b>CHALET THREE</b>	<b>MHE</b>	<b>Total</b>
Original	2,420	2,032	2,172	2,620	9,244
August 2017	1,411	916	47	295	2,669
Estimated Lots Lost	1,009	1,116	2,125	2,325	6,575

Consolidation data from 1990 to 2018 was obtained from Saguache County, corrected for errors, and summarized in order to estimate the trend in lot consolidations. Table 7 provides a summary of estimated consolidations that occurred during the 1990 to 2018 timeframe.

<sup>10</sup> Derived from Table 4, RGDSS Memorandum Phase 6 – Non-Irrigation Pumping and Return Flows, June 3, 2016.

<sup>11</sup> Baca Grande Property Owner’s Association, <https://www.bacapoa.org/> (November 27, 2018).

<sup>12</sup> Baca Grande Property Owners’ Association, telephone call with Jared Dains (Applegate Group), November 27, 2018.

From the lot consolidation data, we estimate that as of the end of 2018 approximately 2,610 lots remained in the four development units; 2,320 lots in the Chalets and 290 lots in MHE. The number of lot reductions at final build-out previously estimated in the August 2012 Engineer’s Joint Recommendations Report has been surpassed and additional consolidations are likely, with the trend in lot consolidations being generally constant since 2007 at 29 lots lost per year (27 lots in the Chalets and 2 lots in MHE). In order to estimate the future number of lots within the development units, it was assumed that this linear trend would continue into the future as shown in Chart 3.

TABLE 7: LOT CONSOLIDATIONS

Year	Total		CHALET ONE		CHALET TWO		CHALET THREE		MHE	
	Consolidation Transactions	# of Lots Removed	Consolidation Transactions	# of Lots Removed	Consolidation Transactions	# of Lots Removed	Consolidation Transactions	# of Lots Removed	Consolidation Transactions	# of Lots Removed
1990	2	38	2	38	0	0	0	0	0	0
1991	2	54	2	54	0	0	0	0	0	0
1992	1	13	1	13	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0
1994	1	3	1	3	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0
1996	7	24	7	24	0	0	0	0	0	0
1997	7	13	6	11	1	2	0	0	0	0
1998	9	14	8	12	0	0	1	2	0	0
1999	73	135	19	36	29	52	0	0	25	47
2000	92	198	47	113	27	48	3	8	15	29
2001	81	144	48	82	23	43	2	8	8	11
2002	63	83	29	41	22	28	1	1	11	13
2003	63	131	47	107	14	22	0	0	2	2
2004	48	80	25	43	21	35	0	0	2	2
2005	54	85	30	47	22	36	2	2	0	0
2006	44	953	26	30	11	16	2	3	5	904
2007	36	47	22	30	12	14	0	0	2	3
2008	15	20	10	11	4	8	0	0	1	1
2009	15	22	9	12	3	4	0	0	3	6
2010	27	36	19	28	8	8	0	0	0	0
2011	17	24	13	20	2	2	0	0	2	2
2012	16	21	11	15	4	5	0	0	1	1
2013	14	25	8	15	6	10	0	0	0	0
2014	18	24	10	12	7	10	0	0	1	2
2015	21	27	15	19	6	8	0	0	0	0
2016	13	22	7	9	6	13	0	0	0	0
2017	23	33	21	31	2	2	0	0	0	0
2018	26	49	12	27	12	17	0	0	2	5
Total	788	2,318	455	883	242	383	11	24	80	1,028

## LOTS SERVED

At present there are approximately 725 active customers served by the District. These consist of the following categories:

- 625 residential ¾” taps serving the Chalets (~86.3% of the total customer base)
- 61 residential ¾” taps serving MHE (~8.4% of the total)
- 21 non-residential ¾” taps serving businesses, religious centers, and townhomes (~2.9% of the total)
- 7 non-residential 2” taps (~1.0% of the total)
- 4 non-residential 1.5” taps (~0.6% of the total)
- 6 non-residential 1” taps (~0.8% of the total)
- 1 non-residential 3” tap size serving the golf course

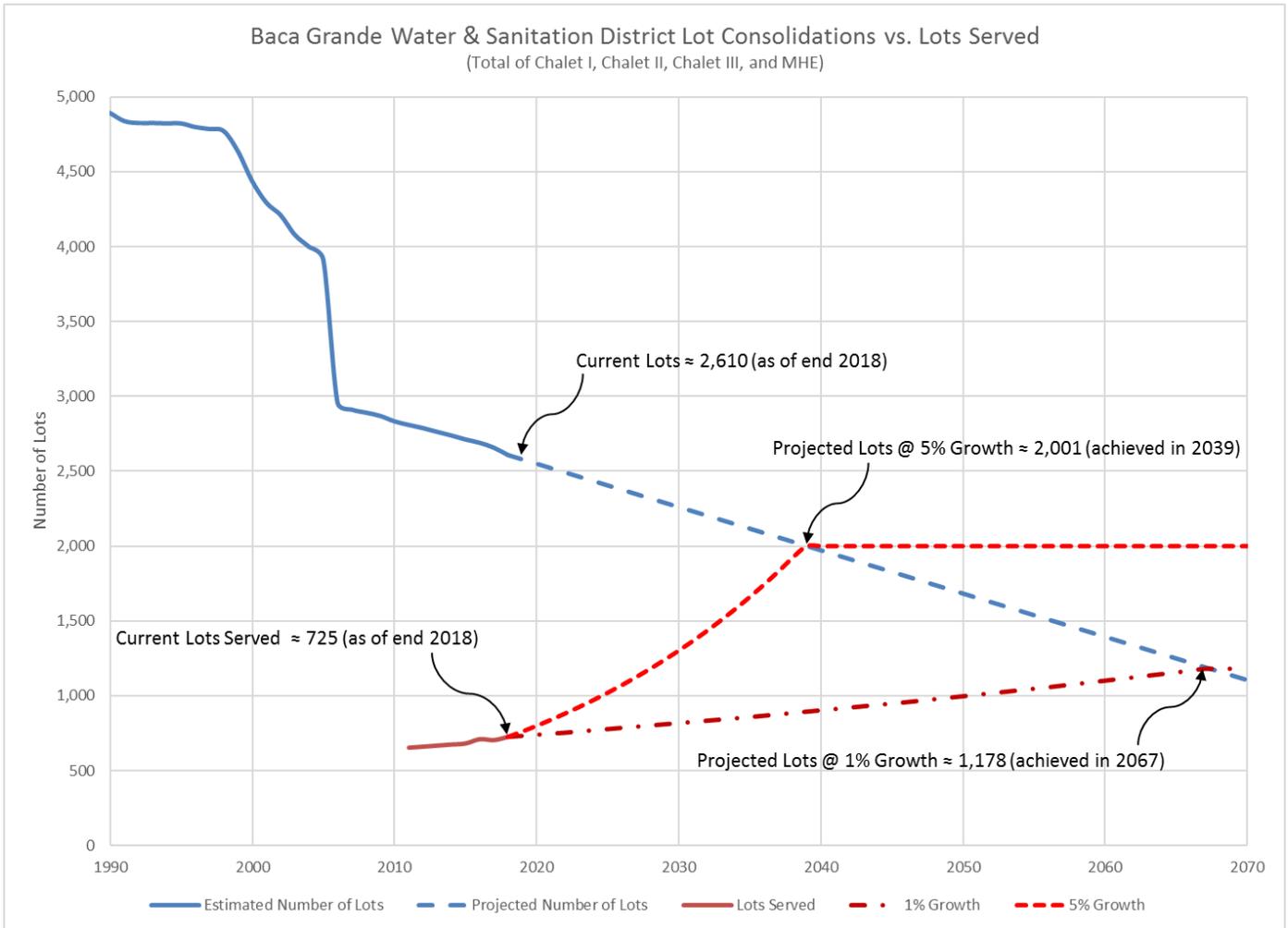
For the purposes of this analysis, each customer is assumed to occupy one developed lot. There is limited data available on the number of lots served by the District in prior years, making development of a trend line difficult. The data that was available is compiled in Table 8.

TABLE 8: LOTS SERVED

End-of-Year	Total Lots Served	Source	Annual Growth Rate
2011	654	Current occupied lots reported in August 13, 2012 "Engineer's Joint Recommendations" report by Gerstle & HRS	-
2012	661	Estimated due to lack of data	1%
2013	668	Estimated due to lack of data	1%
2014	675	Estimated due to lack of data	1%
2015	682	Total metered accounts as of November 11, 2015 as reported in the November 20, 2015 Administrative Report	1%
2016	710	Usage customers billed in November 2016 as reported in the December 9, 2016 Administrative Report	4%
2017	704	Usage customers billed in November 2017 as reported in the November 2017 Status Report	-1%
2018	725	Count of individual customers in 2018 meter data provided by the District	3%
<b>Average Annual Growth Rate =</b>			<b>1%</b>

The annual increase in lots served since 2011 has varied, from no growth to 4%. This trend generally matches with prior findings that the District’s growth since 1990 varied from virtually nothing to 5% growth (Gerstle, 2012). In order to develop a projection of the number of lots served in futures years, two scenarios were analyzed: a normal-growth scenario at the current rate of 1% per year and a high-growth scenario at an accelerated rate of 5% per year. The intersection of these growth scenarios with the trend of lot consolidations provide an estimate of the total number of lots of build-out. As shown in Chart 3, this analysis estimates that (given current trends) within the four development units the District will ultimately serve 1,178 lots at build-out in the normal-growth scenario (achieved in the year 2067) and 2,001 lots at build-out in the high-growth scenario (achieved in the year 2039).

CHART 3: CONSOLIDATION TRENDS AND GROWTH PROJECTIONS



A number of factors could impact this estimate of future served lots, including changes in the rate of lot consolidations, the rate of growth of the District, the possible re-subdivision of consolidated lots, or the provision of water service to other subdivisions not currently served by the District but within its service area. For example, as described in prior reports there were once plans to re-subdivide the Johnson-Malouff tract within Casita Park into 379 new lots (HRS, 2011). These plans were never realized<sup>13</sup> but there is the potential they could be revived in the future. Additionally, the District could possibly provide service to the Elk Park subdivision or Baca Grande Ranchettes in the future, which are both within the original boundaries of the MHE plat but are no longer considered part of MHE. Given these variables and the purpose of this study, we calculated our estimate for the number of future lots to be served at build-out using the high-growth scenario.

The high-growth scenario predicts that the 2,001 lots at build-out will consist of 1,753 lots in the Chalets and 248 lots in MHE. In order to assign the projected number of lots at ultimate buildout to the various customer categories and subcategories, Applegate has assumed that the number of customers in each category at ultimate buildout will be proportional to the current customer base. The one exception to this rule is the 3” golf course tap; it is assumed that no additional golf courses will be developed. Based on

<sup>13</sup> Wendi Maez (Saguache County), telephone conversation with Jared Dains (Applegate Group), March 25, 2019.

these assumptions, Table 9 summarizes the projected number of lots at ultimate build-out grouped by development unit and lot type.

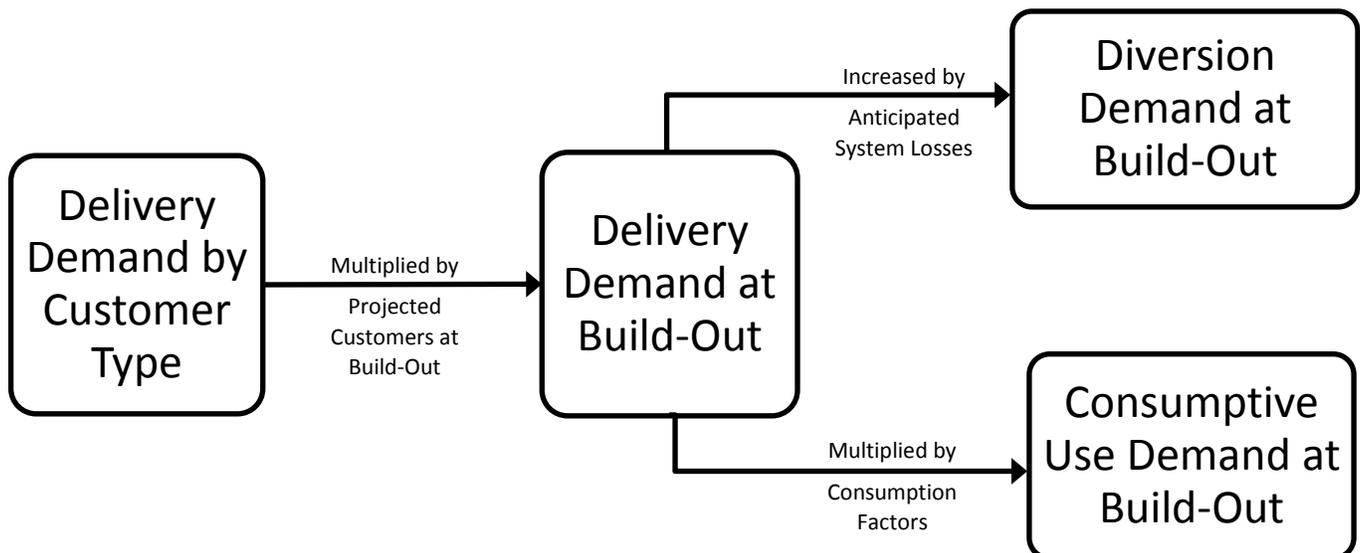
TABLE 9: PROJECTED LOTS AT BUILD-OUT

Customer Type:	Chalets (Residential 3/4" Tap)	MHE (Residential 3/4" Tap)	Business / Religious Centers / Townhomes (3/4" Tap)	Non- Residential 2" Tap	Non- Residential 1.5" Tap	Non- Residential 1" Tap	Non- Residential 3" Tap (Golf Course)	Total
Current # of Customers	625	61	21	7	4	6	1	725
% of Customer Base	86.3%	8.4%	2.9%	1.0%	0.6%	0.8%	n/a	-
Projected # of Customers at Buildout	1,726	169	58	19	11	17	1	2,001

## PROJECTED WATER DEMAND AT BUILD-OUT

The purpose of the following analysis is to estimate what the District’s diversion, delivery, and consumptive use water demand will be at ultimate build-out. This analysis was completed by reviewing the District’s customer delivery records (metering records) for the period January 2015 through November 2018 in order to calculate the delivery demand for each customer type on a per customer basis. Delivery rates per customer type were then multiplied by the projected number of customers within each category at ultimate build-out to calculate the District’s projected delivery demand at ultimate build-out. The diversion demand was then estimated by increasing the delivery demand to account for anticipated losses in the water supply system. The consumptive use demand was estimated by applying consumption factors to the monthly breakdown of the estimated delivery demand. A graphical representation of this analysis process is provided in Chart 4.

CHART 4: BUILD-OUT DEMAND CALCULATION ANALYSIS PROCESS



## DELIVERY DEMAND BY CUSTOMER TYPE

Given the purpose of this study, the analysis for delivery demand at build-out focused on determining peak average monthly use by category and subcategory, which was calculated by first determining the average use by tap type during each month of the study period and then taking the peak monthly amount over the four years of available data. For this analysis, missing meter readings (i.e., cells containing no data) and anomalies indicating monthly use in the hundreds of thousands of gallons (and millions in some cases) for individual taps were ignored. In the case of errant meter readings indicating abnormally high use, these records were simply deleted so as not to affect the calculated average monthly use for that category.

Table 10 summarizes peak average monthly use over the period January 2015 through November 2018 on a per customer basis for each category. Charts 5 and 6 graph the peak average use for each customer type in each month of the year.

TABLE 10: PEAK AVERAGE MONTHLY DELIVERY DEMAND BY CUSTOMER TYPE

All values in gallons unless noted otherwise

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)
<i>Quantity</i>	625	61	21	7	4	6	1
January	2,430	3,090	3,620	9,580	24,500	6,840	0
February	2,000	3,290	2,350	25,000	16,250	6,000	0
March	2,760	3,750	4,580	4,580	19,750	6,000	0
April	2,790	3,680	6,320	80,290	19,250	9,670	3,258,600
May	4,250	4,500	6,860	149,720	28,250	13,340	5,539,500
June	6,810	7,770	13,340	228,290	59,750	24,400	9,123,900
July	6,830	9,140	16,300	287,290	42,000	17,670	8,798,000
August	6,020	7,750	13,850	282,290	31,750	16,340	8,472,200
September	5,270	6,630	10,950	258,860	26,750	15,000	9,449,700
October	4,380	6,240	7,850	150,150	12,750	13,500	6,191,200
November	3,830	3,890	3,530	43,290	5,250	10,500	651,800
December	2,320	2,890	2,390	17,580	11,250	14,670	0
Annual Total (gallons)	49,690	62,620	91,940	1,536,920	297,500	153,930	51,484,900
(acre-feet)	0.15	0.19	0.28	4.72	0.91	0.47	158.00

CHART 5: RESIDENTIAL PEAK AVERAGE MONTHLY USE

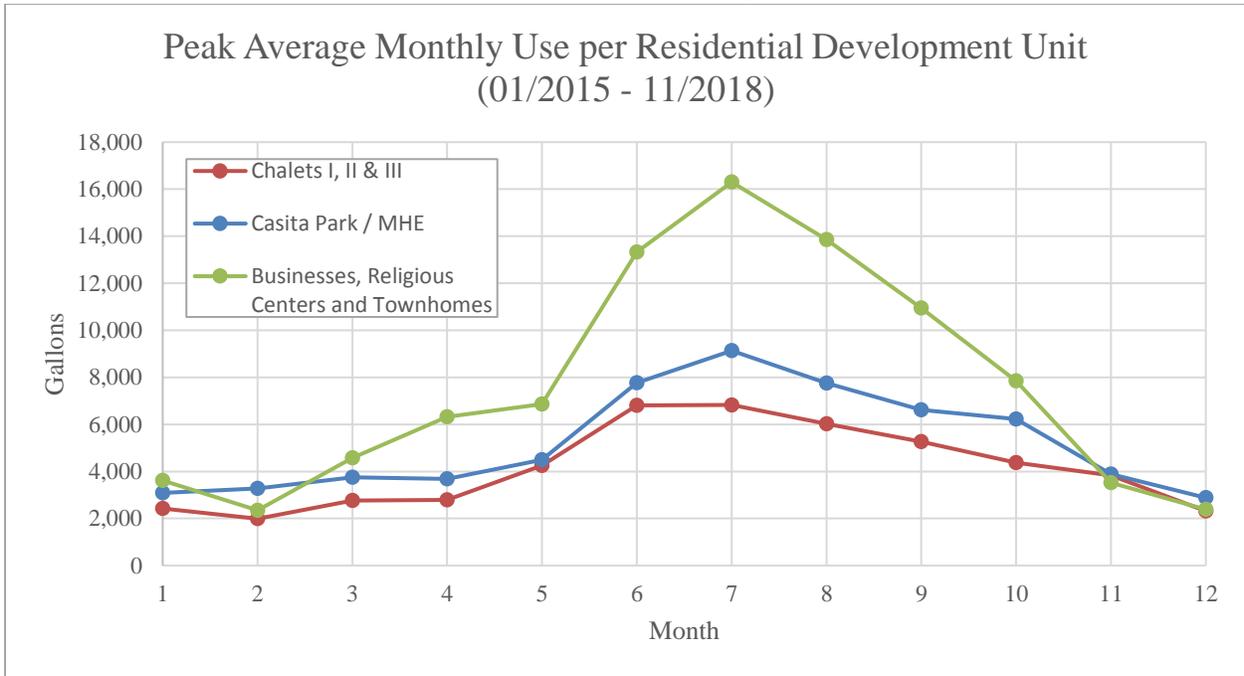
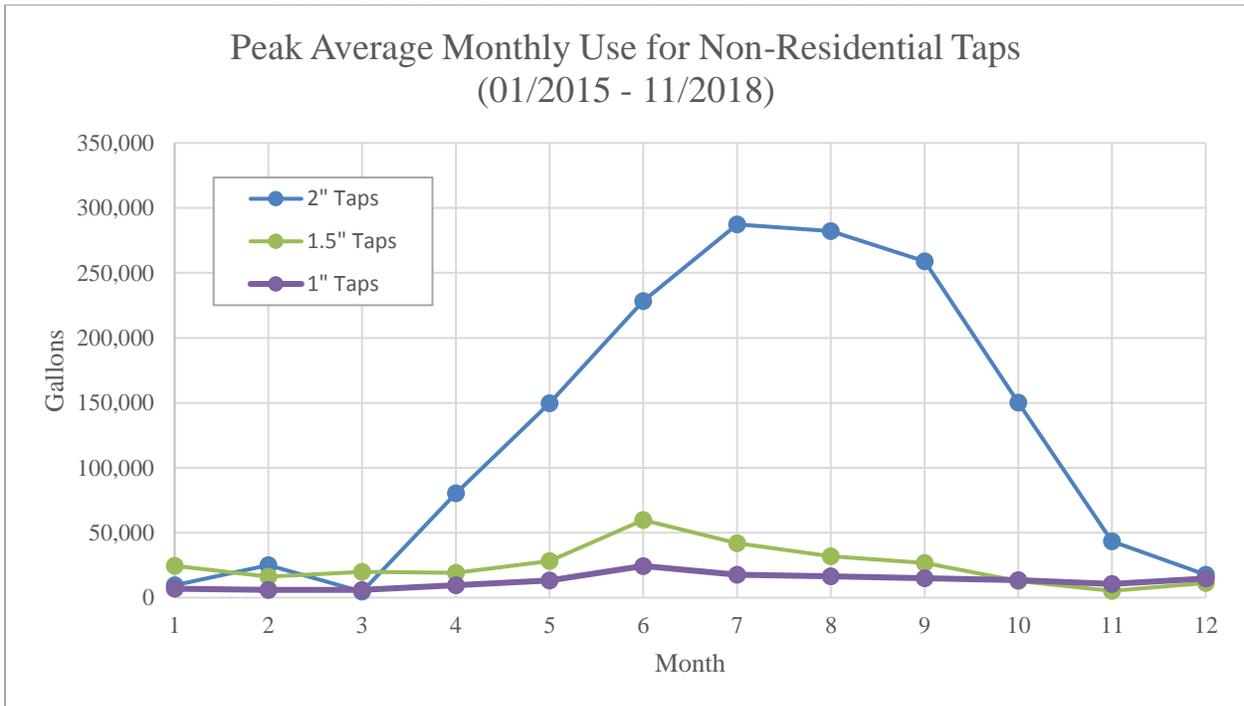


CHART 6: NON-RESIDENTIAL PEAK AVERAGE MONTHLY USE



**GOLF COURSE DELIVERY DEMAND**

As shown in Table 10, the 3” tap serving the golf course has an annual delivery demand of 158 acre-feet per year based on past peak average monthly deliveries. In 2018, a water conservation plan was implemented at the golf course for the first time due to severe drought conditions. This resulted in a large decrease in water use, as is apparent in the record of metered golf course deliveries summarized in Table

11. Note that in 2018 there were deliveries to the golf course despite zero pumping from the Golf Course Well; this is because the potable water system was used to supply water to the golf course in that year.

TABLE 11: GOLF COURSE DELIVERIES

Year	Golf Course Delivery [ac-ft]
2015	166
2016	100
2017	120
2018	46

Based on discussions with District personnel, it is likely that conservation efforts at the golf course will continue and therefore the delivery demand estimated from the past peak monthly deliveries should not be considered representative of future use. For the purposes of this study, future deliveries to the golf course were assumed to be 95 acre-feet per year based on water conservation guidelines for golf courses.<sup>14</sup> This annual amount was distributed monthly based on the pattern established by past peak monthly deliveries.

### PROJECTED CUSTOMER DELIVERY DEMAND AT BUILD-OUT

The projected delivery demand at ultimate build-out was estimated by multiplying the projected lots at build-out established in Table 9 with the per customer delivery demand values established in Table 10.

TABLE 12: DELIVERY DEMAND AT BUILD-OUT

All values in ac-ft

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)	All Customers
<i>Quantity</i>	<i>1,726</i>	<i>169</i>	<i>58</i>	<i>19</i>	<i>11</i>	<i>17</i>	<i>1</i>	<i>2,001</i>
January	12.87	1.60	0.64	0.56	0.83	0.36	0.00	<b>16.86</b>
February	10.59	1.71	0.42	1.46	0.55	0.31	0.00	<b>15.04</b>
March	14.62	1.94	0.82	0.27	0.67	0.31	0.00	<b>18.63</b>
April	14.78	1.91	1.12	4.68	0.65	0.50	6.01	<b>29.66</b>
May	22.51	2.33	1.22	8.73	0.95	0.70	10.22	<b>46.67</b>
June	36.07	4.03	2.37	13.31	2.02	1.27	16.84	<b>75.91</b>
July	36.18	4.74	2.90	16.75	1.42	0.92	16.23	<b>79.14</b>
August	31.89	4.02	2.47	16.46	1.07	0.85	15.63	<b>72.39</b>
September	27.91	3.44	1.95	15.09	0.90	0.78	17.44	<b>67.52</b>
October	23.20	3.24	1.40	8.76	0.43	0.70	11.42	<b>49.15</b>
November	20.29	2.02	0.63	2.52	0.18	0.55	1.20	<b>27.38</b>
December	12.29	1.50	0.43	1.03	0.38	0.77	0.00	<b>16.38</b>
Annual Total (acre-feet)	263.20	32.48	16.36	89.62	10.04	8.03	95.00	<b>514.73</b>

<sup>14</sup> Cichocki, Josh (Baca Grande Water & Sanitation District). e-mail to Dave Breindel (Applegate Group), "Re: Baca Grande Pumping Records and Usage Data." October 4, 2018.

As shown in Table 12, the projected delivery demand at build-out is approximately 515 acre-feet per year. This value represents an estimate of the quantity of water the District can expect to meter to its customers once full lot development of the service area has been achieved.

## PROJECTED RAW WATER DIVERSION DEMAND AT BUILD-OUT

The District’s raw water diversion demand was estimated by increasing the delivery demand to account for estimated system losses. It was assumed that the District’s system will continue to be subject to large losses due to leaks, inaccurate meters, and unmetered usage. For the purposes of this analysis, a 40% loss rate was assumed, which is in line with past estimates and reflects the magnitude of losses determined from analysis of the District’s 2015 through 2018 delivery and pumping data.

TABLE 13: DIVERSION DEMAND AT BUILD-OUT

All values in ac-ft

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)	All Customers
<i>Quantity</i>	1,726	169	58	19	11	17	1	2,001
January	21.45	2.67	1.07	0.93	1.38	0.59	0.00	28.10
February	17.66	2.84	0.70	2.43	0.91	0.52	0.00	25.06
March	24.37	3.24	1.36	0.45	1.11	0.52	0.00	31.04
April	24.63	3.18	1.87	7.80	1.08	0.84	10.02	49.43
May	37.52	3.89	2.04	14.55	1.59	1.16	17.04	77.78
June	60.12	6.72	3.96	22.19	3.36	2.12	28.06	126.52
July	60.30	7.90	4.84	27.92	2.36	1.54	27.06	131.91
August	53.15	6.70	4.11	27.43	1.79	1.42	26.05	120.65
September	46.52	5.73	3.25	25.16	1.51	1.30	29.06	112.53
October	38.67	5.39	2.33	14.59	0.72	1.17	19.04	81.91
November	33.81	3.36	1.05	4.21	0.30	0.91	2.00	45.64
December	20.48	2.50	0.71	1.71	0.63	1.28	0.00	27.31
Annual Total (acre-feet)	438.67	54.13	27.27	149.36	16.74	13.38	158.33	857.89

As shown in Table 13, the projected raw water diversion demand at build-out is approximately 858 acre-feet per year. This value represents an estimate of the quantity of raw water the District can expect to divert once build-out of the service area has been achieved.

## PROJECTED CONSUMPTIVE USE DEMAND AT BUILD-OUT

The District’s consumptive use demand at build-out was estimated in a similar manner as the District’s current consumptive use demand. System losses were considered non-consumptive, so the projected consumptive use demand at build-out was estimated by applying the presumptive consumption factors to the delivery demand. Indoor uses were assumed to result in a 5% consumption of water deliveries, while outdoor uses were assumed to result in an 80% consumption of water deliveries. For all customer categories except the golf course, water deliveries during the non-irrigation season months of November

through March were assumed to be solely indoor use resulting in a 5% consumption rate. Indoor use during the remaining months of the year was assumed to be the average of the deliveries during these five non-irrigation season months or the delivery during the month in question, whichever was less. Outdoor use was assumed to be all deliveries in excess of the indoor use each month and resulted in an 80% consumption rate. For the golf course, all water use is for outdoor irrigation and was assigned a consumption rate of 80%.

TABLE 14: CONSUMPTIVE USE DEMAND AT BUILD-OUT

All values in ac-ft

Customer type	Chalets I, II & III	Casita Park / MHE	Businesses, Religious Centers, Townhomes	Non-Residential 2-inch	Non-Residential 1.5-inch	Non-Residential 1-inch	Non-Residential 3-inch (Golf Course)	All Customers
<i>Quantity</i>	1,726	169	58	19	11	17	1	2,001
January	0.64	0.08	0.03	0.03	0.04	0.02	0.00	0.84
February	0.53	0.09	0.02	0.07	0.03	0.02	0.00	0.75
March	0.73	0.10	0.04	0.01	0.03	0.02	0.00	0.93
April	1.22	0.21	0.46	2.87	0.13	0.06	4.81	9.76
May	7.41	0.55	0.54	6.11	0.37	0.21	8.18	23.37
June	18.26	1.91	1.46	9.77	1.22	0.67	13.47	46.77
July	18.34	2.48	1.88	12.53	0.74	0.39	12.99	49.35
August	14.91	1.90	1.53	12.29	0.47	0.34	12.51	43.95
September	11.73	1.44	1.12	11.20	0.33	0.28	13.95	40.05
October	7.96	1.27	0.68	6.13	0.02	0.22	9.14	25.42
November	1.01	0.10	0.03	0.13	0.01	0.03	0.96	2.27
December	0.61	0.07	0.02	0.05	0.02	0.04	0.00	0.82
Annual Total (acre-feet)	83.37	10.20	7.82	61.19	3.42	2.29	76.00	244.29

As shown in Table 14, the projected consumptive use demand at build-out is approximately 244 acre-feet per year. This value represents an estimate of the amount of water the District’s customers will consume once full build-out of the service area has been achieved.

As a percentage of its diversion demand at full build-out, the District’s estimated consumptive use rate at build-out is approximately 28%. If the 40% consumptive use rate estimated for the RGDSS model for municipal well pumping was applied to the District’s projected diversion demand at full-build out, the District would have a projected consumptive use demand at build-out of approximately 343 acre-feet per year.

## SUMMARY AND RECOMMENDATIONS

The purpose of this section is to provide guidance to the District on how to meet its water supply needs in the future. Given the results of this study, we offer the following summary and recommendations:

- We estimate that the District’s current water demands are as follows:
  - Raw water diversion demand = 373 ac-ft/year
  - Customer delivery demand = 222 ac-ft/year
  - Consumptive use demand = 129 to 149 ac-ft/year
  
- At full build-out, we estimate that the District’s water demands will increase to the following:
  - Raw water diversion demand = 858 ac-ft/year
  - Customer delivery demand = 515 ac-ft/year
  - Consumptive use demand = 244 to 343 ac-ft/year
  
- We estimate that the District’s current rate of system loss is on the order of 40%. Additional efforts should be made to reduce the District’s high rate of system loss. The current rate of system loss was incorporated into the estimate of diversion demand at full build-out, and therefore increasing the efficiency of the system by reducing these losses will free up additional water for delivery to customers should future delivery demand ultimately outstrip the current estimate.
  
- Due to the history of use and investment in certain structures, the District should seek to permanently acquire or continue to lease from the USFWS the water rights associated with the following water sources:
  - Well Nos. 17 and 18: these ground water rights are fully integrated into the District’s delivery system and are at this time the sole source of treated water. From a legal perspective, combined they are limited to meeting 475 acre-feet per year of the District’s raw water diversion demand and 117 acre-feet per year of the District’s consumptive use demand. By themselves they will not be sufficient to meet the District’s diversion or consumptive use demand at full build-out.
  - Golf Course Well: this surface water right is used by the District for irrigation of the golf course. Because the Golf Course Well is also decreed for municipal and other uses, the District may want to investigate the feasibility of treating water from this well for delivery into the potable water system as a backup for its primary wells. From a legal perspective, it is limited to meeting 480 acre-feet per year of the District’s raw water diversion demand. Administratively, the DWR limits operation of this well to periods when water is available at the original point of diversion; generally, this means the well can be operated from late April/early May until August when flows in North Crestone Creek begin to drop. As an APD for a surface water right, withdrawals from this well may be considered exempt from the New Rules.<sup>15</sup>

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<sup>15</sup> Note that Rule 3.2.5 specifies that groundwater withdrawals from wells decreed as APDs for surface water rights are exempt only when the surface water right is in-priority and surface water is physically available at the original point of diversion. If the well results in lagged depletions, these may be considered injurious stream depletions if they occur when the surface water right is not in-priority or surface water is not physically available. This may have a bearing on whether all of the withdrawals from the Golf Course Well are exempt from the New Rules.

- Motel Well: this ground water right was the primary source of water to the District's Casita Park delivery system when that system was separate from the Chalets. Although now disconnected from the combined system, the District may want to investigate the feasibility of treating water from this well for delivery into the potable water system as a backup for its primary wells. From a legal perspective, this well is limited to meeting 1,207 acre-feet per year of the District's raw water diversion demand based on Wright Water's 2014 appraisal of the water right. Note that, although no such restriction is included in the decree for this water right, the DWR may seek to limit the use of the Motel Well to the Casita Park service area based on recorded well permitting documents.
  - South Crestone Creek Gallery and Cottonwood Creek Gallery: these two surface water rights were used to deliver water to District customers in the past, and they may have value to the District in the future given the need to augment depletions from groundwater withdrawals under the New Rules. As surface water rights, there would be no need to provide augmentation for withdrawals from these structures or under these rights provided they are operated in-priority. Note that the supply under these two rights will be limited by seasonality and drought conditions as well as the availability of water at the original point of diversion.
- Any future lease or sale agreement between the USFWS and the District should clarify that the water being provided to the District is useable and fully augmented water, and that the USFWS has the burden of ensuring compliance with the New Rules for all groundwater withdrawals by the District of the sold or leased water. If the USFWS wishes to contract with the San Luis Creek Subdistrict, the District will likely want to assist by offering the excess credit it generates on Crestone Creek as part of the contracting arrangement.
  - If the USFWS is unwilling to assume responsibility for complying with the New Rules for the District's groundwater withdrawals, the burden of complying with the New Rules will fall on the District.
    - In this case the District should consider contracting with the San Luis Creek Subdistrict directly and trading the excess credit it will likely have on Crestone Creek for augmentation on San Luis Creek, or acquiring additional senior surface water rights on San Luis Creek that were historically used for irrigation which could be retired in order to generate the necessary replacement credit on San Luis Creek for the District's injurious stream depletions.
    - The District will also need to consider how to meet the sustainability requirements of the New Rules. In order to allow for an increase in the District's groundwater pumping in excess of historic levels observed during the period 1978 to 2000, it will need to cause a corresponding decrease in pumping at other wells within the San Luis Creek Response Area. Potentially the District would need to offset all of its groundwater pumping, as groundwater use during the benchmark period was likely minimal. This could be done by contracting with the San Luis Creek Subdistrict, or by acquiring and retiring other wells that pumped during the 1978 to 2000 period.
  - Should the District acquire surface water rights from the USFWS under a new agreement, it should ensure that the new agreement continues to include a provision that prohibits the USFWS from placing a call on its own downstream surface water rights against the upstream surface water rights held by the District.

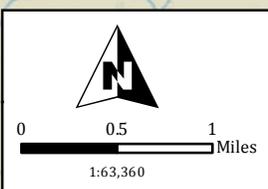
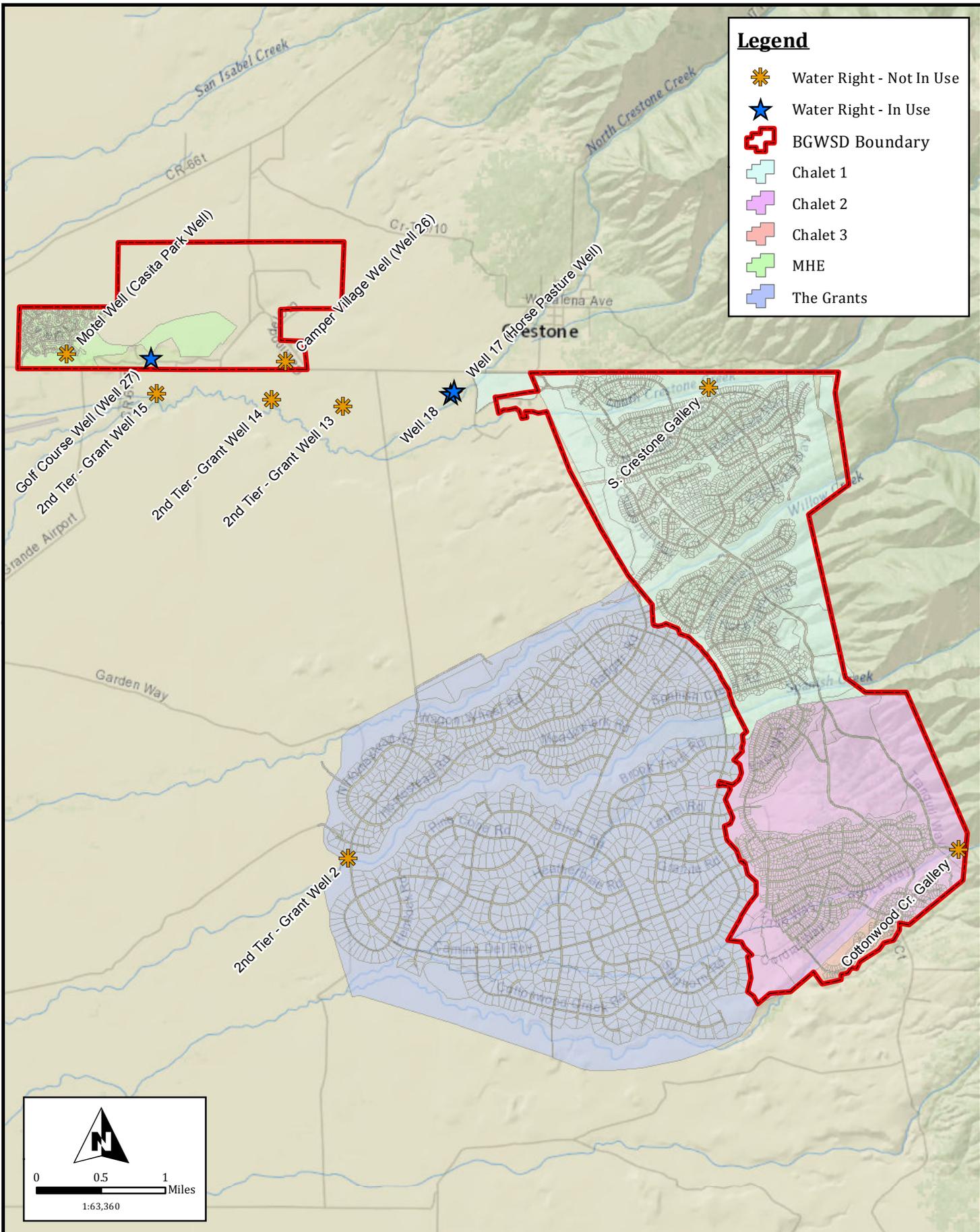
- Except as noted in Rule 3.2.5 of the New Rules, the amount of injurious stream depletions requiring replacement can be reduced through the use of surface water rights such as the Golf Course Well (and potentially the South Crestone Creek and Cottonwood Creek galleries), as water diverted in-priority at these structures does not require augmentation and is not subject to the New Rules. The District should consider maximizing the use of surface water rights in order to reduce its replacement needs for groundwater withdrawals and its sustainability requirements under the New Rules.

## REFERENCES

- Water Service Agreement between Cabeza de Vaca Land & Cattle Company, LLC and Baca Grande Water and Sanitation District, August 28, 1997.
- Leland Consulting Group, *Crestone-Baca Sub-Area Comprehensive Plan*, December 1995.
- HRS Water Consultants, Inc., *Final Report: Water Supply Analysis, Water Needs Analysis, Water Structures Map, Prepared for Baca Grande Water & Sanitation District*, May 10, 2010.
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- Saguache County Crestone – Baca Planning Commission (SCCBPC), *Crestone Baca Comprehensive Plan Background Issue Report*, May 2011.
- Gerstle & CO LLC and HRS Water Consultants, Inc., *Engineer's Joint Recommendations on Water Demand, Growth, and Related Issues*, August 13, 2012.
- Wright Water Engineers, Inc., *Baca National Wildlife Refuge Water Rights Appraisal*, April 30, 2014.
- Providence Infrastructure Consultants, *Surface Water Treatment Feasibility Study*, March 14, 2018.

**Legend**

-  Water Right - Not In Use
-  Water Right - In Use
-  BGWSD Boundary
-  Chalet 1
-  Chalet 2
-  Chalet 3
-  MHE
-  The Grants



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**BACA GRANDE WATER AND SANITATION DISTRICT**  
**Overview Map**

Date: 30 Apr 2019  
 Job #: 18-125  
 Drawn By: JMD

Figure:  
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