BEAR VALLEY WATER DISTRICT
2016 ANNUAL REPORT

ORDER # 5-01-208

JANUARY 30, 2017

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SECTION 1 - INTRODUCTION AND BACKGROUND

1.1 Introduction

The Bear Valley Water District (District) provides sanitary sewer collection, treatment and disposal for approximately 600 residential and commercial connections in the Alpine County community of Bear Valley. The District's service area is comprised of approximately 3000 acres located primarily north of California State Highway 4. The District serves the developed private, residential and commercial areas of the Bear Valley village as well as developed adjoining federal recreational lands including the United States Forest Service's (USFS) Lake Alpine Resort and campgrounds, special use permitted (SUP) residential cabins and the Bear Valley Mountain downhill ski resort. The District's wastewater treatment and disposal facility (WWTF) is regulated by the Central Valley Regional Water Quality Control Board (Regional Board) under Waste Discharge Requirements (WDRs) Order No. 5-01-208 and Order No. R5-2016-0054.

1.2 2016 Facility Operations - Overview

During the 2016 water year (October 2015 to September 2016), an annual daily average flow of approximately 0.06 million gallons per day (MGD) (approximately 21.40 MG total) was received at the District WWTF. WDRs Order No. 5-01-208 currently limit influent flow to 0.1 MGD (annual average basis).

Preliminary treatment at the District's main pump station (headworks) consists of shredding (comminutor) and grit removal before the influent reaches the primary sedimentation tank where the settable solids are allowed to fall to the bottom of the tank. Effluent flow is then measured during transfer via three, 10 HP Paco pumps to a 14.18 million gallon (MG) two cell, aerated treatment lagoon for secondary biological nutrient removal. While in the two cell lagoon system, the constituents are largely consumed and/or sequestered. Air is delivered to the secondary treatment lagoon via one 40 HP, VFD-equipped Gardner Denver positive displacement blower to thirty six (36) - 18" diameter, submerged helixor, coarse bubble diffusers. Inline YSI sensors communicate with the VFD blower by way of the SCADA system to keep dissolved oxygen and suspended solids at optimum levels. Treated effluent from the aerated lagoon is then chlorinated during transfer via (2) - 200 GPM Paco pumps through a 12,000 gallon chlorine contact tank. The chlorinated effluent is then placed into storage and receives further treatment in a 76.4 MG effluent polishing reservoir.

During the irrigation season, typically late spring through early autumn, the polished effluent is disposed of through spray irrigation on approximately 80 acres of sprayfields: 40 acres of land which is authorized by Special Use Permit (SUP) from the USFS and 40 acres under private lease through 2048. Both the leased disposal area and the permitted land have been in service since before the installation of the groundwater monitoring wells (approximately 40 years for the leased land) at the site.

Effluent disposal via spray irrigation involves the disbursement of the effluent through low impact, high uniformity, Nelson sprinkler heads upon soils and vegetation within the disposal area. The average monthly application rates to the 80 acre spray field area during the peak disposal months of 2016 ranged from approximately 2.06 MG - 23.78 MG per month (0.026 MG – 0.297 MG per acre per month). The water is allowed to percolate into the soil and evapotranspirate into the atmosphere. WDRs Order No. 5-01-208 limit application of wastewater to reasonable rates considering soil, climate, and irrigation management system.

1.3 Regulatory Requirements

Discharge at the Bear Valley Water District WWTF is subject to requirements contained in the two wastewater permits: Order No. 5-01-208 and Order No. R5-2016-0054. These include the Standard Provisions and Reporting Requirements for Waste Discharge Requirements effective 1 March 1991, Revised Monitoring and Reporting Program No. 5-01-208 effective 1 July 2002, Monitoring and Reporting Program, NPDES, Appendix E. effective 1 August 2016, and the Water Quality Control Plan for the California Regional Water Quality Control Board, Central Valley Region and associated documents (Basin Plan).

The District's WDRs also contain monitoring and reporting requirements, which include tri-annual monitoring of groundwater. The District's Third Tri-Annual 2016 Groundwater Monitoring Report prepared by Stantec Consulting Services is submitted under separate cover. These requirements and policies are discussed below as they relate to discharges to land and groundwater limitations at the WWTF.

SECTION 2 – GROUNDWATER MONITORING

Please see the ***Bear Valley Water District Third Tri-Annual 2016 Groundwater Monitoring Report*** submitted under separate cover for an evaluation of groundwater quality beneath the wastewater facility as well as a discussion of current groundwater compliance status.

The Monitoring and Reporting Program (MRP) of WDR Order No. 5-01-208 states that the tri-annual reports shall be submitted to the Regional Board by the first day of July (1st Tri-Annual Report), September (2nd Tri-Annual Report), and February (3rd Tri-Annual Report) of each year.

However, these reporting requirements do not take into account the unique climatic factors that control when the District can access and sample their groundwater monitoring wells. Pursuant to email correspondence from Regional Board staff, Regional Board staff will not recommend enforcement to the Executive Officer so long as the 1st and 2nd tri-annual monitoring reports are submitted by September 1st and November 1st of each year, respectively, instead of the dates currently required in the MRP. The third tri-annual report will remain due by February 1st each year.

SECTION 3 - WATER CONSERVATION AND I/I REDUCTION SUMMARY

3.1 Water Conservation Activities

The District's Water Conservation Plan has been fully implemented since its development in 2002. The District is solely a wastewater service provider and does not provide potable water to its service area. Instead, the Lake Alpine Water Company is the water purveyor for 50-60 percent of water used in the service area.

Much of the water conservation promotion is currently being undertaken by the Lake Alpine Water Company. Most significantly, Lake Alpine Water Company installed residential water meters for all its customers in 2008 and since this period water delivered to LAWC customers has decreased dramatically. Decreases have resulted not only from decreased consumption based on new usage fees but from the ability of LAWC to identify and quickly remedy water lost through faulty winterizing of vacation homes in the area as well as through pipe breaks due to freezing.

The water conservation efforts undertaken by Lake Alpine Water Company are consistent with the intent of the District's Water Conservation Plan as a means to minimize extraneous flows into the wastewater system. The District does not believe that it is cost effective to duplicate efforts of the Lake Alpine Water Company; however, it has supplemented those efforts as warranted.

In 2016, the Lake Alpine Water Company notified users in the service area of continued State Water Resources Control Board's Emergency Regulation to Control Water use During Drought. In addition, users were reminded of the water use restrictions required by their covenants, conditions, and restrictions (CC&R), in particular the prohibition on outside irrigation.

It should be noted that water conservation within homes and businesses in the District will continue to reduce the annual volume of water arriving at the WWTF but that wastewater may contain higher concentrations of contaminants, if all other factors in the homes and businesses remain the same. Thus, excessive water conservation measures have the potential to increase the risk for the District of failing to comply with effluent limitations.

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3.2 I/I Reduction Activities

The Bear Valley Water District continues to implement Infiltration and Inflow (I/I) reduction activities to reduce wastewater volume. During 2016, these activities included retrofitting one (1) manhole, including replacing the cone, and re-grading several other manholes, including installing new surface seals.

At the same time, the District has continued annual assessments of the collection system. The assessment consists of video analysis, hydro jetting and flushing of collection lines to identify potential problem areas. In an effort to maximize the I/I reduction program, the District purchased a digital push camera in 2013 to conduct its own collection line video analysis. This investment has enabled the District to increase the frequency of which the entire 83,210 linear feet (15.76 miles) of gravity collection system is assessed on a recurring basis by increasing the length of collection system assessed annually.

During 2016, 4,500 linear feet (6 %) of the collection system was hydro jetted and 625 linear feet (1 %) was investigated using the camera to identify collection system defects, such as root intrusion, cracked pipe, and pipe separations. In 2016, the District's video analysis did not reveal any pipe defects requiring repair or replacement.

In addition to these collection system measures, the District has continued efforts to reduce the influx of storm water into the polishing reservoir. Typically, subsurface and surface flow of snowmelt storm water may contribute as much as 60 % to the storage volume of the reservoir. In late 2011, the consulting firm MWH independently evaluated the existing storm water diversion system and made recommendations for improvements. In 2012, the District re-graded the existing diversion ditch in general conformance with MWH's option 3, as found in their December 2011 Memo, "Bear Valley Water District Polishing Reservoir Influx Mitigation Study." Per MWH's Memo, this improvement is estimated to improve the ditches performance to divert storm water flow from the reservoir by 25 percent, which is an approximate reduction of 10 million gallons during a 1- in-100 water year.

SECTION 4 – HYDRAULIC CAPACITY EVALUATION

4.1 Influent Flows

During the 2016 water year (October 2015 to September 2016) the total annual influent flow was approximately 21.40 million gallons (MG), with the highest influent flow months being March and April. The highest daily influent flow was 207,000 gallons per day and occurred on March 6, 2016. WY 2016 total influent flows were approximately 5.4 MG more than WY 2015 total influent flows of 15.96 MG. WY 2016 influent flows are summarized in Table 1 below.

Table 1 - WY 2016 Influent Flows

Month and Year	Influent Flow (gallons)	Peak Day Flow (gal/day)
October 2015	483,000	40,000
November 2015	551,000	39,000
December 2015	930,000	82,000
January 2016	1,388,000	128,000
February 2016	2,518,000	130,000
March 2016	3,685,000	207,000
April 2016	4,303,000	187,000
May 2016	3,071,000	128,000
June 2016	1,526,000	65,000
July 2016	1,337,000	80,000
August 2016	981,000	57,000
September 2016	623,000	66,000
Total Water Year	21,396,000	--

4.2 Projected Influent flows

As of this writing, wastewater influent flows for the 2017 water year are anticipated to be significantly higher than the 2016 water year. This is a result of the large hydraulic events of October and December 2016 as well as the massive snowfall in January 2017. While the last several years have been characterized by extreme drought conditions for the western part of the country, these weather events appear to have had a major impact on the drought.

The quantity and duration of the snowmelt period remains the controlling factor in determining if available WWTF storage is adequate and if a discharge to surface waters (Bloods Creek) may be necessary.

It is anticipated that the 2017 water year will result in above average snowfall. A corresponding greater influx of tourism resulting in proportionally increased commercial and residential waste generation is anticipated as well as increased runoff into the polishing reservoir directly and from snowmelt on adjacent land.

4.3 Storage and Disposal Summary

Land discharge at the Bear Valley Water District WWTF is required to be maximized in order to minimize the potential for a surface water discharge to Bloods Creek. The magnitude of the discharge is largely controlled by the amount of precipitation, particularly snowfall, and the timing of the snowmelt period. No discharge to Bloods Creek was necessary during WY2016. Notably, through a combination of water conservation activities, I/I reduction efforts and a concerted effort to maximize land disposal and achieve minimum pool by October 1 each year, the District has yet to exercise its permitted surface water discharge option.

Effluent land disposal began on June 1, 2016 on Fields 1 through 9 (approximately 80 acres). Effluent disposal via spray irrigation involves the disbursement of the effluent through low impact, high uniformity, Nelson sprinkler heads upon soils and vegetation within the disposal area. The average monthly application rates to the 80 acre spray field area during the peak disposal months of 2016 ranged from approximately 2.06 MG - 23.78 MG per month (0.026 MG – 0.297 MG per acre per month). The water is allowed to percolate into the soil and evapotranspirate into the atmosphere.

The disposal season ended on September 12, 2016, when the effluent storage reservoir was essentially empty (e.g., no carryover) and could no longer be feasibly pumped by existing equipment. A summary of irrigation disposal operations during 2016 is presented in Table 2.

Table 2 - 2016 Land Disposal Season Summary

Month and Year	Monthly Disposal Volume (gal)	Maximum Acreage Applied	Storage Volume (Million gallons)
June 2016	10,851,390	80.0	43.37
July 2016	23,782,240	80.0	23.24
August 2016	15,880,010	80.0	6.29
September 2016	2,058,591	66.6	Negligible
Total 2016 Disposal Season	52,572,231	--	

Note that the naturally irregular bottom of the reservoir, coupled with limitations to measuring elevations of effluent occurring in low spots, prevents exact estimates of the small amount of wastewater remaining in storage when the reservoir is nearly empty and cannot be pumped with existing equipment.

However, District staff assessed the storage reservoir minimum pool volume on October 2, 2013, and, with the assistance of the District engineer, determined the minimum pool volume to be approximately 14,000 gallons, significantly less than the estimated volume of 5 MG derived from 1974 Construction Drawings. Accordingly, the volume of wastewater remaining at the end of the disposal season, and at minimum pool, is considered negligible.

As of October 1, 2016 the reservoir was at or below minimum pool with a calculated volume of approximately 14,000 gallons. Approximate reservoir storage volumes on October 1 for the previous 10 years dating back to 2006 are presented in Table 3 below:

Table 3 – Comparison of Reservoir Volumes on October 1 for Previous 10 Years

DATE	VOLUME (MG)
October 2006	2 MG
October 2007	8 MG
October 2008	8 MG
October 2009	8 MG
October 2010	8 MG
October 2011	50 MG
October 2012	Negligible
October 2013	0.014
October 2014	0.014
October 2015	0.014
October 2016	0.014

4.4 Projected Water Balance

The District's storage reservoir was aerial surveyed on September 23, 2013 and several discrepancies were identified between the actual reservoir and the 1974 construction drawings, which previously formulated the basis for the storage reservoir size and capacity.

The 2013 aerial survey and analysis indicates that the reservoir is only 18.6 acres in gross area (not 21.3 acres) and the total storage capacity is 76.4 million gallons (not 106 million gallons). These values suggest that input from I/I into the ponds (directly and from snowmelt on adjacent land) may be less than previously estimated. The District has incorporated the 2013 surveyed storage capacity into their evaluation of maximum wastewater flows, including I/I, which will be contained during a maximum precipitation year with a 1-in-100 year return frequency.

The District Engineer last updated the District's water balance in 2013 following the aerial survey based upon the current NPDES permit, 2011 water year, and September 2013 survey data. Based on the updated water balance, the latest projected capacity of the District has been determined to be 245 single-family equivalent units (EDUs). Attached as Appendix B. find the 2016 updated

water balance that provides detail on treatment and disposal calculations for this capacity determination.

SECTION 5 - LAND DISPOSAL AGREEMENTS

Current Land Disposal Agreements are as follows:

1. United States Forest Service (USFS) Special Use Permit (SUP) #1029-01
    a. 40 acres of Sprayfield - Expired July 1, 2015 (In Renewal Phase)
    b. 20 Acres of Buildings and Transmission Lines - Expired July 1, 2015 (In Renewal Phase)
2. C. Bruce Orvis and TBH Partners - 118 acres - Expires December 7, 2048.
3. C. Bruce Orvis and TBH Partners - Sewer Line Easement - Expires December 7, 2048. (Applies to outfall facilities outside of long-term lease land)

The USFS and BVWD have been working closely to maintain continued land use within federally permitted limits. Following the June 16, 2011 expiration of the 10-year, 40 additional acre, temporary amendment to SUP #1029-01 ratified in 2001, the USFS and BVWD have been working to better craft the District's remaining 40 acre SUP to better match actual land use. To this end, the USFS performed a site visit in 2012 and, together with District staff, used global positioning (GPS) technology to better identify the District's current land disposal array. This visit yielded a map which now defines the active SUP.

On May 28, 2014, the District provided a copy of communication with a USFS representative reflecting their intent to renew the special use permit in accordance with Order No. R5-2011-0053, Special Provision VI.C.2.c. Subsequently, a meeting was held with the USFS Calaveras District Ranger, Forest Supervisor, and three other USFS representatives on January 9, 2015 to further discuss District use of federal land for effluent spray field application. All indications from the USFS representatives were that the 20 year permit expiring in 2015 would be renewed in the form of a two permits: one, 40 year permit for permanent infrastructure and conveyance systems (collection lines) and one, 10 year permit for effluent spray field application. With respect to the 10 year permit, the USFS recommended the District begin to consider purchasing the land from the federal government through the Townsite Act to ensure long term, sustainable control of these areas for spray field purposes.

On March 17, 2015, in advance of the July 1, 2015 expiration date, the District submitted Standard Form 299, "Application for Transportation and Utility Systems and Facilities on Federal Lands" to the USFS to trigger the SUP reissuance process.

As of October 6, 2016, the USFS informed the District that the Stanislaus National Forest has pushed the project as far as they were capable and that the renewal is now on a list of projects at the USFS regional office in Vallejo to conduct and finish the NEPA review prior to permit renewal. According officials at the Stanislaus National Forest, as resources become available the project is expected to be added to the program of work at the regional office in the next year or two. However, depending on what new projects and priorities the USFS Regional office takes on it may still take several years for this renewal project to be accepted and listed as a priority.

SECTION 6 - SLUDGE/SOLID WASTE DISPOSAL

6.1 Treatment Lagoon

Effluent is transferred from the District's headworks following preliminary treatment to a 14.18 million gallon (MG) two cell, aerated treatment lagoon for secondary biological nutrient removal. While in the two cell lagoon system, the solids are largely consumed and/or sequestered as air is delivered to the secondary treatment lagoon to thirty six (36) - 9' high, 18" diameter, submerged helixor, coarse bubble diffusers. The aeration and mixing strategy employed by the District suspends solids sufficiently for successful floc formation permitting efficient biological consumption of most solids.

Limited sludge at the WWTF has accumulated at the bottom of the two cell treatment lagoon since 1972. The sludge depth at the bottom of the treatment pond is measured with a sludge judge annually. Sludge measurement in September 2016 revealed that the sludge has not exceeded six inches on average and is more commonly one to three inches in most portions of the 270' x 280' square lagoon.

In July 2016, staff also performed a sonar scan and analysis of the bottom of the treatment lagoon. This scan revealed some sludge accumulation on the sides of the baffle wall as well as around the (36) 9' high, 18" diameter helixors where ostensibly the mixers cannot properly suspend the solids.

In general, the organic solids loading rate on the pond system appears to be so low compared to their natural decay and consumption rate that no material accumulation of sludge appears to have occurred over the past 40+ years. At some point in the distant future, the treatment ponds may require sludge to be removed and disposed of at an appropriate landfill.

The following table presents results of sludge monitoring of the District's treatment lagoon performed on September 20, 2016.

Table 4 - Annual Sludge Monitoring

Sampling Date	9/20/2016
Cadmium (mg/L)	<0.10
Chromium (mg/L)	<0.10
Copper (mg/L)	<0.10
Lead (mg/L)	<0.10
Nickel (mg/L)	<0.10
Zinc (mg/L)	2.1

6.2 Lift Stations

At the headworks of the WWTF, the most common materials generated generally include grease, sediment, and minor non-organic solid waste. The items not shredded during pretreatment are removed as necessary from the waste stream and disposed of in local, municipal waste transfer stations bound for landfill. Meanwhile, annual organic solids removal at all four (4) District lift stations, totaling approximately 1500 – 2000 gallons, is routinely performed each September or October and was completed this year by El Dorado Septic on September 29, 2016.

SECTION 7 - ANNUAL WATER SUPPLY AND POND MONITORING

7.1 Annual Water Supply Monitoring

Annual water supply monitoring was conducted in September and October 2016 in which six (6) samples were taken to include all unique sources of water used by District customers, including three discrete springs, two wells and the surface water treated by the Lake Alpine Water Company sourced from Bear Lake.

The following table presents results for potable water from the BVWD office served by Lake Alpine Water Company (surface water - about 50.14 % of influent), Bear Valley Mountain Lodge spring

(about 22 % of influent), the Lake Alpine Lodge well (about 8.26 % of influent), the Old Subdivision spring, Bear Valley Mountain Resort Shop spring, and USFS Lake Alpine Campground well (about 19.6 % of influent),

Table 4 - Annual Water Supply Monitoring

	Lake Alpine Water Co. (Surface Water)	**Bear Valley Mountain Resort (Spring)**	**Old Subdivision Home #407 (Spring)**	**Lake Alpine Resort (Well)**	**Bear Valley Mountain Resort Shop (Spring)**	**USFS Lake Alpine Campgrounds (Well)**
Sampling Date	10/15/16	10/19/16	10/15/16	9/21/16	10/19/16	9/21/16
% of Influent	50.14	22.01	NA	8.26	NA	19.6
Boron (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sodium (mg/L)	23	2.9	4.8	2.2	7.7	6.1
Copper (ug/L)	5.0	97	12	230	28	<50
Lead (ug/L)	<1.0	<1.0	<1.0	<5.0	<1.0	<5.0
Iron (ug/L)	22	<100	<100	<100	<100	<100
Manganese (ug/L)	38	<20	<20	<20	1.8	<20
Calcium (mg/L)	7.4	5.0	8.8	4.8	13	14
Magnesium (mg/L)	0.63	2.1	3.1	1.7	2.2	<1.0
Chloride (mg/L)	9.6	0.39	0.30	<.50	0.47	<.50
Specific Conductance (EC) (umhos/cm)	140	54	87	56	120	98
Total Dissolved Solids (mg/L)	120	67	97	79	95	110
Hardness, Total (mg/L)	21	21	35	19	43	35

7.2 Annual Pond Monitoring

Municipal wastewater contains numerous dissolved inorganic waste constituents which are forms of salinity that may pass through the treatment process and soil profile. Effective control of long term impacts on groundwater quality relies on monitoring and effective source control. As described in Order No. 05-01-208, even in the best of circumstances, long-term land discharge of treated municipal wastewater may potentially degrade groundwater with salt and the individual components of salts (e.g. sodium, chloride).

Order #05-01-208 stipulates annual pond monitoring, including sampling and analysis, of boron, chloride, iron, manganese, and sodium. Certain constituents (e.g. sodium, chloride, boron) are useful indicator parameters for evaluating the extent to which effluent reaches and potentially degrades groundwater. Other constituents (e.g. iron, manganese) are useful indicators to determine whether components of the WWTF with high-strength waste constituents, such as sludge handling facilities, may be ineffective in containing waste.

The following table summarizes the annual pond monitoring results for these constituents sampled on October 15, 2016.

TABLE 5 - Annual Pond Monitoring

CONSTITUENT	STORAGE RESERVOIR	TREATMENT POND
Boron (mg/L)	0.046	0.054
Chloride (mg/L)	28	19
Iron (ug/L)	1800	710
Manganese (ug/L)	530	48
Sodium (mg/L)	26	28

BEAR VALLEY WATER DISTRICT, 2016 ANNUAL REPORT

Appendix A 2016 UPDATED WATER BALANCE
January 30, 2017

APPENDIX A 2016 UPDATED WATER BALANCE