bear valley WATER DISTRICT

Monitoring Report Submittal Transmittal Form

Kenny Croyle (916) 464-4676
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive #200
Rancho Cordova, CA 95670-6114

Discharger:	Bear Valley Water District
Name of Facility:	Bear Valley Wastewater Treatment and Disposal Facility
WDRs Order Number:	***5-201-208***
County:	Alpine County
Regulator Program:	Waste Discharge to Land (Non15)
Unit:	Compliance
CIWQS Place ID:	209035

The Bear Valley Water District is hereby submitting to the Central Valley Regional Water Quality Control Board the following information:

Check all that apply:

Annual Monitoring Report for the year ____2021________

1st / 2nd / 3rd / 4th (**circle one**) Quarterly Monitoring Report for the year of_________

1st / 2nd (**circle one**) Semi-annual Monitoring Report for the year __________

Monthly Monitoring Report for the year _________

Violation Notification

During the monitoring period, there were / were not **(circle one)** any violations of the WDRs.

1. The violations were:
2. The actions to correct the violations were:

Certification Statement

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Signature: ______________________ Phone: 209-753-2112

Printed Name: Jeff Gouveia Date: January 27, 2021
General Manager

BEAR VALLEY WATER DISTRICT
2021 ANNUAL REPORT

ORDER # 5-01-208

JANUARY 27, 2022

Table of Contents

SECTION 1 - INTRODUCTION AND OVERVIEW 1

1.1 Introduction 1

1.2 Facility Operations - Overview 1

1.3 Regulatory Requirements 2

SECTION 2 – GROUNDWATER MONITORING 3

SECTION 3 - WATER CONSERVATION AND I/I REDUCTION SUMMARY 4

3.1 Water Conservation Activities 4

3.2 I/I Reduction Activities 4

SECTION 4 – HYDRAULIC CAPACITY EVALUATION 6

4.1 Influent Flows 6

4.2 Projected Influent Flows 6

4.3 Storage and Disposal Summary 7

4.4 Projected Water Balance 10

SECTION 5 - LAND DISPOSAL AGREEMENTS 12

SECTION 6 - SLUDGE/SOLID WASTE DISPOSAL 14

SECTION 7 - ANNUAL WATER SUPPLY AND POND MONITORING 16

7.1 Annual Water Supply Monitoring 16

7.2 Annual Pond Monitoring 17

APPENDIX A – 2020 UPDATED WATER BALANCE

SECTION 1 - INTRODUCTION AND BACKGROUND

1.1 Introduction

The Bear Valley Water District (District) provides sanitary sewer collection, treatment and disposal services for approximately 650 residential and commercial equivalent dwelling units (EDUs) 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 the developed adjoining federal recreational lands including the United States Forest Service's (USFS) Lake Alpine Resort and campgrounds, special use permit (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. R5-2019-0078.

1.2 2018 Facility Operations - Overview

During the 2021 water year (October 2020 to September 2021), an annual daily average flow of approximately 0.040 million gallons per day (MGD) (approximately 14.52 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 through an Endress and Hauser magnetic flow tube during transfer via three, 10 horse power (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, variable frequency drive (VFD) equipped Gardner Denver positive displacement blower to twelve (12) Triplepoint Mars T-Series Double Bubble™ fine and coarse bubble diffusers. Inline YSI sensors communicate with the VFD blower by way of the SCADA system to keep dissolved oxygen (DO) and suspended solids (TSS) at optimum levels. Treated effluent from the aerated lagoon is then disinfected by use of chlorine gas during transfer via (2) - 375 gallon per minute (GPM) Paco pumps through a 12,000 gallon chlorine contact tank. The disinfected 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 up to 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.

Based on the volume of effluent in storage and available to apply to land at the beginning of the land application cycle, a determination is made on the number of acres of land to irrigate. At the beginning of the 2021 land disposal season, May 24, 2021, with approximately 24.46 MG of effluent in storage, spray field areas 1 through 4 (29.60 total acres) were placed into operation.

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 29.60 acre spray field area during the peak disposal months of 2021 ranged from approximately 2.063 – 8.003 MG per month (0.067 MG – 0.270 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. R5-2019-0078. 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 2021 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 2020 Groundwater Monitoring Report*** submitted January 24, 2022 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 (LAWC) is the water purveyor for approximately 47 % of the influent the District receives 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.

It should be noted that water conservation within homes and businesses in the District may continue to reduce the annual volume of water arriving at the WWTF and 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.

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 2021, these activities included continued annual systematic assessments of the collection system. The assessment consists of hydro jetting, video analysis and flushing of collection lines to identify potential problem areas.

In an effort to cost effectively maximize the I/I reduction program as it relates to the collection system, the District purchased its first digital push camera in 2013 to conduct its own collection line

CCTV video analysis. Additionally, the District invested in a trailer jetting unit in August 2018 to perform its own pipe segment cleaning. More recently, in July 2021 the District purchased a new 330’ push cam providing for visible access to longer pipe segments previously inaccessible with the District’s older and shorter sewer camera.

Pre-cleaning is performed prior and to enhance the quality of CCTV inspection and allows the District to rely less on costly contract jetting and CCTV services. These investments have 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 linear feet of collection system cleaned and assessed annually.

During 2021, 38,094 linear feet (46 %) of the gravity collection system was flushed, 11,692 linear feet (14 %) of the collection system was hydro-jetted, and 9,980 linear feet (12 %) was investigated by CCTV video using the District’s sewer camera to identify collection system defects, such as root intrusion, cracked pipe, and pipe separations. In 2021, the District’s video analysis found several damaged pipe segments of which all were repaired in August and September 2021.

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 2021 water year (October 2020 to September 2021) total annual influent flow was approximately 14.52 million gallons (MG), with the highest influent flow months being April and May. The highest daily influent flow was 154,000 gallons per day and occurred on April 9, 2021. WY 2021 total influent flows (14.52 MG) were approximately 4.03 MG less than WY 2020 total influent flows of 18.55 MG. WY 2021 influent flows are summarized in Table 1 below.

Table 1 - WY 2021 Influent Flows

Month and Year	Influent Flow (gallons)	Peak Day Flow (gal/day)
October 20200	707,000	42,000
November 2020	622,000	42,000
December 2020	823,000	51,000
January 2021	797,000	54,000
February 2021	1,028.000	64,000
March 2021	1,093,000	56,000
April 2021	3,481,000	154,000
May 2021	2,204,000	123,000
June 2021	1,214,000	56,000
July 2021	1,222,000	63,000
August 2021	783,000	53,000
September 2021	542,000	37,000
Total Water Year	14,520,000	--

4.2 Projected Influent flows

As of this writing, wastewater influent flows for the 2022 water year are anticipated to be similar to or perhaps modestly lower than the 2021 water year. This estimate is a function of early water year (October, November, December) conditions in the region including two significantly large hydraulic or “atmospheric river” events in October and December followed by a long dry period in early 2022. The increase in atmospheric river events as well as the quantity and duration of the snowmelt period remain the controlling factors in determining if available WWTF storage is adequate and if a discharge to surface waters (Bloods Creek) will be utilized as permitted under Order R5-2019-0078.

Current conditions in the region suggest the 2022 water year will result in average to below average snowfall as the region experienced robust early winter precipitation only to be followed by prolonged warmer drought-like conditions more characteristic of previous water years. California's first snow survey of the year found the statewide snowpack to be 160 % of average on January 1. Yet, climatologists are still cautioning stakeholders that, while early season snow and rain was significant, Californian's need only look to last year's disappointing snowpack runoff due to high temperatures, dry soil and evaporation as a reminder that it will take more than an average year to recover from drought.

A comparison of WY Q1 influent flows (October, November and December) for 2021 and 2022 are summarized in Table 2 below. The increase is largely attributable to the October 2021 atmospheric river (AR) event that doused the area initially with rain followed by two feet of snow. This served to surcharge the water table, reinvorgate streamflows and amplified I/I into the District's collection system.

While early season influent flows for WY21 suggest above average effluent totals for the water year, the District's storage reservoir is only 26 % full as of this writing. By comparison, in January 2021 it was only 10 % of reservoir capacity and the District still ended the storage season (October – June) with merely 29 MG of total effluent for disposal at the beginning of the disposal season (July – September). Anemic climatic conditions in January 2022 combined with a forecast for little to no precipitation well into February 2022 highlight the likelihood for below average total effluent to be placed in storage for the remainder of the District's storage season.

Table 2 – Comparison of Q1 WY 2021 v Q1 WY 2022 Influent Flows

Month	2020 Influent Flow (gallons)	2021 Influent Flow (gallons)	% Change
October	707,000	844,000	119 %
November	622,000	1,373,000	221 %
December	823,000	1,785,000	217 %
Q1 Total	2.002.000	2,152,000	186 %

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. In light of the reduced precipitation during WY2021 as well as the quantity and duration of the snowmelt period, the District experienced increased available storage capacity and no surface water discharge to Bloods Creek was necessary during WY2021.

Provision IX.B of the District's Monitoring & Reporting Program (MRP) requires the District to electronically submit self-monitoring reports (eSMRs) using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site. The District submitted monthly SMR's including the results of all required monitoring on or before the due date according to the reporting schedule of the current Order. On December, 2021, the Central Valley Water Board compliance and enforcement unit reviewed the electronic self-monitoring reports (eSMRs) submitted by the Discharger for the June 2021 through November 2021 monitoring periods. No discharge to surface waters occurred during the period reviewed and no violations on the WDRs or MRP were identified from review of the eSMRs.

Effluent land disposal began on May 24, 2021 on Fields 1 – 4 (approximately 29.60 acres) with approximately 24.46 MG in storage. Effluent disposal to land 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 29.60 acre spray field area during the peak disposal months of 2021 ranged from approximately 2.063 – 8.003 MG per month (0.067 MG – 0.270 MG per acre per month). The water is allowed to percolate into the soil and evapotranspirate into the atmosphere.

The disposal season ended on August 26, 2021, 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 2021 is presented in Table 3.

Table 3 - 2021 Land Disposal Season Summary

Month and Year	Monthly Disposal Volume (gal)	Maximum Acreage Applied	End of Month Storage Volume (Million gallons)
May 2021	2,063,000	29.6	22.40
June 2021	8,003,000	29.6	14.40
July 2021	7,947,000	29.6	6.75
August 2021	5,776,000	29.6	0.00
Total 2021 Disposal Season	23,788,000	--	

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 typical minimum pool volume to be approximately 14,000 gallons, significantly less than the estimated volume of 5 MG derived from 1974 Construction Drawings and as reported prior to 2012. Accordingly, the volume of wastewater remaining at the end of the disposal season, and at minimum pool, is considered negligible.

On May 29, 2020 the Division of Safety of Dams (DSOD) performed a routine inspection of the dam, reservoir, valve controls and appurtenances. The dam uses a steel pipe encased in reinforced concrete as a low-level outlet at the north dam. The outlet controls consist of an upstream slide gate and a downstream gate valve. The controls for the upstream slide gate and downstream gate valve appeared well maintained. However, the upstream slide gate control would not operate properly at the time of the inspection and DSOD requested the District make necessary arrangements to cycle all valve controls during the next inspection.

As depicted in photos of the storage reservoir below, as of October 1, 2021 the reservoir was below minimum pool as the District mechanically pumped remaining water out of the reservoir to further investigate the upstream gate valve operational issues. The District resolved the operational issues with the downstream gate valve in October 2021 discovering and repairing an issue with the coupling mechanism. However, due to the early snow received in October 2021, DSOD was unable to perform a follow up inspection of this valve and now anticipates to include this review during its routine 2022 inspection.

Approximate reservoir storage volumes on October 1 for the previous 10 years dating back to 2012 are presented in Table 4 below:

Table 4 – Comparison of Reservoir Volumes on October 1 for Previous 10 Years

DATE	VOLUME (MG)
October 2012	Negligible
October 2013	0.014
October 2014	0.014
October 2015	0.014
October 2016	0.014
October 2017	0.014
October 2018	0.014
October 2019	0.014
October 2020	0.000
October 2021	0.000

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 revised and updated the District's water balance in August 2017 following the adoption of NPDES Order R5-2016-0045 and the collection of valid creek flow data for Bloods Creek for the entire permitted discharge period of January through June. In addition, the first successful surface discharge during the March through June 2017 period provided the District Engineer the opportunity to update its 1-in-100 year water balance on May 21, 2020 ("2020 Update") to verify the assumptions, limitations and capacity determinations which were utilized in previous water balances.

Based on the 2020 updated water balance, the latest projected capacity for the District has been determined to be 1196 additional equivalent dwelling units (EDUs) assuming no infiltration associated with any new connections. Attached as Appendix A is the District's updated 2020 water balance that provides detail on a variety of calculations for this capacity determination including wastewater volume, snow melt, precipitation, percolation, evaporation, irrigation and surface water discharge.

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 surface discharge 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 temporary 10-year, 40 additional acre 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 (lift stations and 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 December 2021, 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 to 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 few years. However, depending on what new projects and priorities the USFS Regional office takes on it may still take several years or longer 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 a network of fine and coarse bubble diffusers strategically positioned in the secondary treatment lagoon. The aeration and mixing strategy employed by the District suspends solids sufficiently for successful floc formation permitting efficient biological consumption of most solids.

The District completed a comprehensive upgrade to the wastewater treatment lagoon in October 2019. The scope of this upgrade included removal of the original and failing coarse bubble diffuser array and installation of twelve (12) new Triplepoint Mars T-Series Double Bubble™ high efficiency fine and coarse bubble diffusers in both cells. Additionally, the original buried air header which carried air to the original diffusers was abandoned and a new CPVC air header was installed. Lastly, the District replaced the original cedar baffle wall that had largely disintegrated over the last 45 years and restored the lagoon to its original two cell design, increasing the lagoon's retention time which has improved effluent quality, modestly reduced overall sludge and significantly reduced energy consumption.

Limited sludge at the WWTF has accumulated at the bottom of the two cell treatment lagoon since the lagoon was brought online in 1974. The sludge depth at the bottom of the treatment pond is measured annually by District staff using a combination of a sludge judge and Secchi Disc. Sludge measurements on September 9 and 15, 2021 revealed that the sludge depth ranged from approximately 6" to as much as 30". According to the solids distribution in the lagoon, there remains accumulation at the inlet, in the far ends and corners of cell 2, near the baffle wall particularly in cell 2 and in cell 2 at the point where effluent passes from cell to cell through the baffle wall. This solids distribution pattern is reasonable based on the location of the inlet and outlet structures and the locations of highest loading correspond roughly to points historically known to trap 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 additional material accumulation of sludge appears to have occurred over the past 45 years. At some point in the distant future the treatment lagoon may require sludge to be mechanically removed and disposed of at an appropriate landfill.

The following table presents results of annual sludge monitoring performed on September 9, 2021 of the District's treatment lagoon.

Table 5 - Annual Sludge Monitoring

Sampling Date	September 9, 2021
Cadmium (mg/L)	<1.0
Chromium (mg/L)	<1.0
Copper (mg/L)	<2.0
Lead (mg/L)	<2.0
Nickel (mg/L)	<1.0
Zinc (mg/L)	9.5

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. During the past year the District replaced a Chicago comminutor installed at the headworks lift station in 1989 with a new Franklin Miller Taskmaster Model 8524 unit. This unit is anticipated to better grind solids as they pass through this facility and ostensibly reduce the organic loading rates and related sludge accumulation in the District's treatment lagoon. Meanwhile, annual organic solids removal at all four (3) District lift stations is routinely performed each September or October and was completed this year by El Dorado Septic on October 15, 2021.

SECTION 7 - ANNUAL WATER SUPPLY AND POND MONITORING

7.1 Annual Water Supply Monitoring

Annual water supply monitoring was conducted on October 10 and 11, 2021 in which six (6) samples were taken to include all available unique sources of water used by District customers, including three (3) discrete springs, two (2) wells and the surface water treated by the Lake Alpine Water Company sourced from Bear Lake.

The following table presents results of annual water supply monitoring as a percentage of 2021 *calendar year influent* (16.37 MG) received at the District's headworks from various potable water sources including the Lake Alpine Water Company (surface water – about 7.64 MG or 47 % of influent), the Bear Valley Mountain Resort Lodge (spring - 2.4 % of influent), the Lake Alpine Lodge (well - 1 % of influent), the USFS Lake Alpine Campgrounds (well - 1 % of influent), the Old Subdivision (spring) and the Bear Valley Mountain Resort Shop (spring) (percentage of influent not available).

Table 6 - Annual Water Supply Monitoring

	Lake Alpine Water Co. (Surface Water)	Bear Valley Mountain Resort Lodge (Spring)	Old Subdivision (Spring)	Lake Alpine Resort (Well)	Bear Valley Mountain Resort Shop (Spring)	USFS Lake Alpine Campgrounds (Well)
Sampling Date	10/11/21	10/11/21	10/11/21	10/10/21	10/11/21	10/10/21
% of Influent	47 %	2.4 %	N/A	1 %	N/A	1 %
Boron (mg/L)	<0.060	<0.060	<0.060	<0.060	<0.060	<0.060
Sodium (mg/L)	6.2	3.7	3.4	3.0	8.2	6.0
Iron (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Manganese (mg/L)	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060
Calcium (ug/L)	27,000	5,600	9,100	7,600	13,000	14,000
Magnesium (ug/L)	330	2,300	3,000	3,000	1200	140
Chloride (mg/L)	6.6	2.0	0.31	0.27	0.32	0.58
Hardness, Total (mg/L)	69	24	35	31	37	37
Specific Conductance (EC) (umhos/cm)	157.8	70.5	94.4	83.3	118.9	103.7
Total Dissolved Solids (mg/L)	100	53	89	87	85	84

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 No. 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 storage reservoir and treatment lagoon pond monitoring results for these constituents sampled on August 27 and October 20, 2021 respectively.

Table 7 - Annual Pond Monitoring

CONSTITUENT	STORAGE RESERVOIR	TREATMENT POND
Boron (mg/L)	0.092	0.061
Chloride (mg/L)	42	26
Iron (mg/L)	17	0.76
Manganese (mg/L)	0.47	0.054
Sodium (mg/L)	24	25

BEAR VALLEY WATER DISTRICT, 2020 ANNUAL REPORT

Appendix A. 2020 Water Balance - Prepared May 21, 2020

APPENDIX A. 2020 WATER BALANCE

BEAR VALLEY WATER DISTRICT

MEMORANDUM

TO **Jeff Gouveia, District Manager**

FROM **Gary S. Ghio, P.E.**

RE **1 In 100 Year Water Balance – 2020 Update**

DATE **May 21, 2020**

Jeff, as requested, I have updated the District's 1 in 100 year water balance as well as calculations of District capacity based upon precipitation levels experienced since water year 2015/2016 to the present water year.

Table 1 below presents a summary of data from the Bloods Creek gauging station for Maximum Total Precipitation and Maximum Snow Water Content for this time period as well as the Department of Water Resources (DWR) 1 in 100 year levels and what was experienced in water year 2010/2011 (basis of previous 1 in 100 year water balance).

TABLE 1

Water Year	Total Precipitation (Inches)	Maximum Snow Water Content (Inches)
1 in 100	83	60
2010/2011	84.73	60.82
2015/2016	62.94	33.72
2016/2017	98.36	45.84
2017/2018	44.38	13.00
2018/2019	48.73	39.94
2019/2020 (to date)	25.32	23.24

As the can be seen from Table 1, the winter of 2016/2017 once again exceeded the total precipitation criteria for 1 in 100 year storm season. Due to this, the District proceeded with its first ever successful discharge to Bloods Creek; and in addition, obtained valid creek flow data for Bloods Creek for the entire January through June potential discharge period.

2020 WATER BALANCE UPDATE

Table 2 below presents a comparison of the total precipitation and snow water content projected in the 1 in 100-year water balances as well as what occurred during the 2010/2011 and the 2016/2017 precipitation seasons.

TABLE 2

	1 IN 100	2010/2011	2016/2017
Total Precipitation (In Inches)	83.00	84.73	98.36
Snow Water Content (In Inches)	60.00	60.82	45.84

As can be seen by the above comparisons of total precipitation and snow water content for 2010/2011 and 2016/2017, both storm seasons exceeded the 1 in 100 total precipitation level, but total precipitation was significantly higher and the snow water content was significantly lower in 2016/2017 as compared to 2010/2011.

Attached to this memorandum is the 2020 Update of the 2016/2017 water balance with actual flows/precipitation which was calibrated based upon actual storage levels encountered for November 2016 through October 2017 and the resulting 1 in 100 year water balance (see Tables 6 and 7).

As can be seen by the actual precipitation water balance, the estimated storage, predicted by the spreadsheet, tracks very closely with actual storage experienced during this time period which provides verification of the accuracy of the water balances.

As in previous water balances, the 1 in 100 year water balance was performed with updated 90th percentile collection system flows for the time period 2000 thru 2019. Based upon this balance, the District would need to discharge approximated 82 MG of wastewater to ensure the polishing pond did not overflow which is less than the actual 92 MG which was discharged in 2016/2017 as the water year exceeded the 100 year levels.

Bloods Creek Flows and Assimilative Capacity

The capacity of the District to serve additional customers is driven by the assimilative capacity of Bloods Creek flows due to the method of wastewater disposal by stream discharge in accordance with the District's NPDES permit. The following Tables 3 and 4 present summaries of Bloods Creek flows and assimilative capacity (20:1 dilution) for the potential months of discharge for both water years 2010/2011 and 2016/2017.

TABLE 3

BLOODS CREEK TOTAL FLOW (MG)						
YEAR	**JANUARY**	**FEBRUARY**	**MARCH**	**APRIL**	**MAY**	**JUNE**
2010/2011	---	---	232	736	1163	1705
2016/2017	589	806	520	911	1408	732

TABLE 4

20:1 DILUTION BLOODS CREEK FLOWS (MG)						
YEAR	**JANUARY**	**FEBRUARY**	**MARCH**	**APRIL**	**MAY**	**JUNE**
2010/2011	---	---	11.0	35.1	55.4	81.2
2016/2017	28.0	38.4	24.7	43.4	67.1	35.8

The following Table 5 presents the amounts of wastewater discharged in 2016/2017 along with remaining assimilative capacity.

TABLE 5

2016/2017 WATER YEAR : EXCESS ASSIMILATIVE CAPACITY (MG)							
	JANUARY	**FEBRUARY**	**MARCH**	**APRIL**	**MAY**	**JUNE**	**TOTAL**
Discharge Amount	0	0	15.8	29.9	29.7	16.9	
Remaining Capacity	28.0	38.4	8.9	13.5	37.4	18.9	145.1

As can be seen by Table 5 there was a total of approximately 145 MG of remaining assimilative capacity in Bloods Creek in water year 2016/2017 to support District growth and additional amounts of discharge.

District Capacity

The Regional Water Quality Control Board criteria to perform 1 in 100 year projections is to utilize a historical DWR monitoring site in order to derive the 100 year monthly distribution of precipitation. As no DWR site currently exists near Bear Valley which has this data, the previous water balances and capacity determinations were based on the monthly distribution of precipitation that was experienced in 2010/2011 which was the last year of 1 in 100 year total precipitation exceedance at that time.

The 2016/2017 precipitation year also exceeded the 1 in 100 year total precipitation amount, but the pattern differed significantly from what was experienced in 2010/2011. The 2016/2017 1 in 100 year water balance projections which are attached to this memorandum (see Table 8 and Table 9) were performed utilizing both precipitation patterns reduced down to 1 in 100 year levels along with updated 90th percentile collection system flows for 2000 thru 2019. This analysis was performed to ensure the water balances' basis is the worst case precipitation level and pattern based upon available data.

In comparing Table 8 and Table 9, the 2016/2017 precipitation pattern would have been a worst year in terms of volume of discharge required (121.5 MG) as compared to 2010/2011 (114.8 MG) but not of such significance that it would alter the previous capacity determination in 2016 of an additional 1,196 EDUs. In addition, it is anticipated that sufficient assimilative capacity exists in Bloods Creek to support this level of discharge based upon the 145 MG of excess assimilative capacity in water year 2016/017.

Should you have any questions regarding any of the information contained in this memo please let me know.

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TABLE 6

BEAR VALLEY WATER DISTRICT WASTEWATER TREATMENT AND DISPOSAL SYSTEM 6/8/2020 9:26

(2020 update) 2016/2017 Water Year - Actual Flows/Precipitation

INPUT DATA

TREATMENT POND CHARACTERISTICS		STORAGE RESERVOIR		IRRIGATION AREA CHARACTERISTICS		CLIMATOLOGICAL FACTORS	
GROSS AREA (ac)...................................	3.2	GROSS AREA (ac).........................	18.6	DISTRICT DISPOSAL LAND (AC)..	**80**		
WATER SURFACE AREA (ac).................	2.9	MAX. WATER SURFACE (ac)............	14.2	SOIL WATER DEFICIT BEFORE IRRIGATION (IN).................	n/a	OCT-APR EVAP/AVG EVAP RATIO....................................	0.76
				FRACT OF LAND IRRIGATED	n/a	MAY-SEP EVAP/AVG EVAP RATIO....................................	1.00
		STORAGE CAPACITY (MG)..............	76.43	IRRIGATION EFFICIENCY (DECIMAL FRACT)..	n/a	PAN COEFFICIENT...	0.80
		FRAC EST. PERC.........	1.0	FRACTION OF EST. PERC RATE	n/a	LAND PRECIP COLLECTED (FRAC).........	0.9

PARAMETER / MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
DAYS IN MONTH	30	31	31	28	31	30	31	30	31	31	30	31	365
AVG PAN EVAP (IN)	0.89	0.61	0.76	0.83	2.14	3.69	5.34	6.64	7.63	6.87	5.17	3.05	43.62
ACTUAL PRECIP (IN)	3.47	9.29	33.72	26.04	6.27	10.16	1.20	2.09	0.37	1.98	3.27	0.50	98.36
ACTUAL SNOW ACCUM (IN Water)(g)	2.28	4.56	27.72	43.32	40.56	39.24	0.00	0.00	0.00	0.00	0.00	2.76	
ACTUAL SNOW MELT IN MONTH (IN Water)	0.84	1.08	0.00	1.32	8.40	10.56	39.24	0.00	0.00	0.00	0.00	0.71	62.15
ACTUAL NEW SNOW IN MONTH (IN Water)	3.12	3.36	23.16	16.92	5.64	9.24	0.00	0.00	0.00	0.00	0.00	3.47	64.91
ESTIMATED MAX PERCOLATION (IN)(a)	10.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
ACTUAL INFLUENT FLOW (Avg. GAL/D)	32,967	93,548	152,032	212,250	121,032	156,800	186,581	108,700	61,097	34,742	25,633	15,032	

CALCULATIONS

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
WASTEWATER VOLUME (gal)	989,010	2,899,988	4,712,992	5,943,000	3,751,992	4,704,000	5,784,011	3,261,000	1,894,007	1,077,002	768,990	465,992	36,251,984
EVAPORATION (IN)	0.5	0.4	0.5	0.5	1.3	2.2	4.3	5.3	6.1	5.5	4.1	1.9	32.6
PRECIPITATION (IN)	3.47	9.29	33.72	26.04	6.27	10.16	1.20	2.09	0.37	1.98	3.27	0.50	98.36
TREATMENT POND													
PERCOLATION (IN)	8.38	5.41	12.69	7.74	5.73	21.66	15.57	17.29	4.18	2.11	2.81	2.97	106.55
PERC VOLUME (gal)	659,620	426,378	999,502	609,371	451,372	1,705,370	1,226,247	1,361,614	329,361	166,362	221,115	233,864	8,390,176
EVAP. VOLUME (gal)	39,374	31,499	39,374	39,374	102,372	173,244	338,614	417,361	480,359	433,111	322,864	149,620	2,567,166
PRECIP. VOLUME (gal)	298,694	799,675	2,902,587	2,241,499	539,716	874,564	103,295	179,905	31,849	170,437	281,479	43,040	8,466,739
TREATMENT DISPOSAL(GAIN)/ (gal)	(400,299)	341,798	1,863,711	1,592,754	(14,028)	(1,004,051)	(1,461,566)	(1,599,070)	(777,871)	(429,036)	(262,501)	(340,445)	(2,490,604)
POLISHING RESERVOIR													
PERCOLATION (IN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERC VOLUME (gal)	0	0	0	0	0	0	0	0	0	0	0	0	0
W.S. AREA (ac)(b)	7.16	8.28	9.48	11.44	13.13	12.76	11.50	10.65	9.14	7.98	4.74	3.98	
EVAP. VOLUME (gal)	97,240	89,947	128,649	155,286	463,341	762,439	1,342,302	1,532,791	1,513,460	1,192,525	528,252	205,171	8,011,403
PRECIP. VOLUME (gal)	1,647,361	4,438,600	16,220,186	12,664,636	3,078,178	4,977,915	583,815	1,012,012	177,639	944,417	1,530,949	233,047	47,508,757
MONTHLY AVAIL. SNOWMELT (IN)(c)	0.84	1.08	0.00	1.32	8.40	10.56	39.24	0.00	0.00	0.00	0.00	0.71	62.15
ESTIMATED SNOW CONTR. (%)(d)	100%	100%	100%	100%	40%	40%	30%	0%	0%	0%	0%	0%	
ESTIMATED AREA OF INFLUENCE (ac)	50	50	50	50	50	50	50	50	50	50	50	50	
ESTIMATED INFLUX TO STORAGE (gal)(e)	1,140,480	1,466,331	0	1,792,183	4,561,920	5,734,985	15,983,013	0	0	0	0	0	30,678,912
RESERVOIR DISPOSAL(GAIN) (gal)	2,690,601	5,814,985	16,091,537	14,301,533	7,176,758	9,950,461	15,224,525	(520,779)	(1,335,820)	(248,108)	1,002,697	27,876	70,176,266
IRRIGATION													
IRRIGATION DISPOSAL (gal)(f)	0	0	0	0	0	0	0	0	7,486,000	6,228,000	2,337,000	0	16,051,000
STORAGE													
BEGINNING STORAGE (gal)	5,800,000	9,079,312	18,136,083	40,804,324	62,641,611	57,733,484	41,522,884	31,387,854	15,667,005	7,961,321	2,133,178	1,305,365	
CALCULATED STORAGE GAIN (gal)	3,279,312	9,056,771	22,668,241	21,837,287	10,914,721	13,650,410	19,546,970	1,141,151	-7,705,685	-5,828,142	-827,814	153,424	
PROJECTED ESTIMATED STORAGE (gal)	9,079,312	18,136,083	40,804,324	62,641,611	73,556,332	71,383,894	61,069,854	32,529,005	7,961,321	2,133,178	1,305,365	1,458,788	=CARRYOVER
AMOUNT DISCHARGED TO BLOODS CREEK (gal)	0	0	0	0	15,822,848	29,861,010	29,682,000	16,862,000	0	0	0	0	92,227,858
ESTIMATED STORAGE (gal)	9,079,312	18,136,083	40,804,324	62,641,611	57,733,484	41,522,884	31,387,854	15,667,005	7,961,321	2,133,178	1,305,365	1,458,788	
ACTUAL STORAGE (gal)	6,700,000	17,830,000	41,740,000	64,200,000	56,340,000	39,880,000	27,490,000	13,250,000	6,850,000	1,790,000	0	980,000	

MAXIMUM STORAGE (MG)....................................	62.64
AVAILABLE STORAGE (MG).....................	76.43

SUMMARY

ANNUAL INFLOW (MG)	
WASTEWATER	36.25
PRECIPITATION..	55.98
SNOW INFLUX (MG)..	30.68
TOTAL	122.91

ANNUAL OUTFLOW POTENTIAL (MG)	
AMOUNT DISCHARGED TO BLOODS CREEK........	92.23
EVAPORATION..	10.58
PERCOLATION...	8.39
IRRIGATION...	16.05
TOTAL	127.25

OVERALL BALANCE	
UNUSED DISPOSAL CAPACITY (MG)............................	-1.46
(MUST NOT BE NEGATIVE)	
UNUSED STORAGE CAPACITY (MG)..............................	13.79
(MUST NOT BE NEGATIVE)	

(a) Estimated percolation based upon measured inflow components, estimated evaporation, and actual reservoir levels in 2011 - in Storage Reservoir only.
(b) Reservoir water surface area is a function of storage volume at start of month.
(c) Estimated snowmelt volume available for influx to storage reservoir.
(d) Estimated percentage of snowmelt contributing to influx to reservoir.
(e) Estimated based on fraction of accumulated snow within reservoir "area of influence" entering the reservoir during snowmelt months.
(f) Disposal capacity based on maximum estimated land disposal volumes.
(g) Per Bloods Creek Gauging Station
(h) Not used in calculations

TABLE 7

BEAR VALLEY WATER DISTRICT WASTEWATER TREATMENT AND DISPOSAL SYSTEM 6/8/2020 9:26

(2020 update) 2016/2017 water year: 1 in 100 Year Water Balance Projection - 2000 thru 2019 90TH Percentile monthly ADF

INPUT DATA

TREATMENT POND CHARACTERISTICS		STORAGE RESERVOIR		IRRIGATION AREA CHARACTERISTICS		CLIMATOLOGICAL FACTORS	
GROSS AREA (ac)......................................	3.2	GROSS AREA (ac).........................	18.6	DISTRICT DISPOSAL LAND (AC)..	**80**		
WATER SURFACE AREA (ac)..................	2.9	MAX. WATER SURFACE (ac)...........	14.2	SOIL WATER DEFICIT BEFORE IRRIGATION (IN).................	n/a	OCT-APR EVAP/AVG EVAP RATIO......................................	0.76
				FRACT OF LAND IRRIGATED	n/a	MAY-SEP EVAP/AVG EVAP RATIO......................................	1.00
		STORAGE CAPACITY (MG).............	76.43	IRRIGATION EFFICIENCY (DECIMAL FRACT)...	n/a	PAN COEFFICIENT...	0.80
		FRAC EST. PERC..........	1.0	FRACTION OF EST. PERC RATE	n/a	LAND PRECIP COLLECTED (FRAC).........	0.9

PARAMETER / MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
DAYS IN MONTH	30	31	31	28	31	30	31	30	31	31	30	31	365
AVG PAN EVAP (IN)	0.89	0.61	0.76	0.83	2.14	3.69	5.34	6.64	7.63	6.87	5.17	3.05	43.62
ESTIMATED PRECIP (IN)	3.17	8.48	30.79	22.56	5.72	9.28	1.10	1.91	0.00	0.00	0.00	0.00	83.00
ESTIMATED SNOW ACCUM (IN Water)(g)	2.23	4.46	27.12	42.39	39.69	38.40	0.00	0.00	0.00	0.00	0.00	0.00	
ESTIMATED SNOW MELT IN MONTH (IN Water)	0.82	1.06	0.00	1.29	8.10	10.33	38.40	0.00	0.00	0.00	0.00	0.00	60.00
ESTIMATED NEW SNOW IN MONTH (IN Water)	3.05	3.29	22.66	16.56	5.40	9.04	0.00	0.00	0.00	0.00	0.00	0.00	60.00
ESTIMATED MAX PERCOLATION (IN)(a)	10.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
90TH PERCENTILE EXISTING FLOWS (Avg. GAL/D)	37135	77828	98766	131156	125459	186046	188872	127254	73229	61715	38479	31386	

CALCULATIONS

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
WASTEWATER VOLUME (gal)	1,114,050	2,412,668	3,061,746	3,672,368	3,889,229	5,581,380	5,855,032	3,817,620	2,270,099	1,913,165	1,154,370	972,966	35,714,693
EVAPORATION (IN)	0.5	0.4	0.5	0.5	1.3	2.2	4.3	5.3	6.1	5.5	4.1	1.9	32.6
PRECIPITATION (IN)	3.17	8.48	30.79	22.56	5.72	9.28	1.10	1.91	0.00	0.00	0.00	0.00	83.01
TREATMENT POND													
PERCOLATION (IN)	8.38	5.41	12.69	7.74	5.73	21.66	15.57	17.29	4.18	2.11	2.81	2.97	106.55
PERC VOLUME (gal)	659,620	426,378	999,502	609,371	451,372	1,705,370	1,226,247	1,361,614	329,361	166,362	221,115	233,864	8,390,176
EVAP. VOLUME (gal)	39,374	31,499	39,374	39,374	102,372	173,244	338,614	417,361	480,359	433,111	322,864	149,620	2,567,166
PRECIP. VOLUME (gal)	272,871	729,951	2,650,375	1,941,944	492,372	798,814	94,687	164,411	0	0	0	0	7,145,425
TREATMENT DISPOSAL(GAIN)/ (gal)	(426,123)	272,074	1,611,500	1,293,199	(61,372)	(1,079,801)	(1,470,174)	(1,614,564)	(809,720)	(599,473)	(543,979)	(383,484)	(3,811,918)
POLISHING RESERVOIR													
PERCOLATION (IN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERC VOLUME (gal)	0	0	0	0	0	0	0	0	0	0	0	0	0
W.S. AREA (ac)(b)	6.20	7.76	9.10	10.93	12.34	12.08	11.08	10.50	9.09	2.76	2.64	2.57	
EVAP. VOLUME (gal)	84,162	84,320	123,611	148,393	435,664	721,775	1,293,979	1,511,261	1,504,881	412,533	293,500	132,594	6,746,672
PRECIP. VOLUME (gal)	1,496,647	4,039,668	14,779,755	10,941,027	2,795,985	4,529,604	533,927	924,078	0	0	0	0	40,040,690
MONTHLY AVAIL. SNOWMELT (IN)(c)	0.82	1.06	0.00	1.29	8.10	10.33	38.40	0.00	0.00	0.00	0.00	0.00	60.00
ESTIMATED SNOW CONTR. (%)(d)	100%	100%	100%	100%	40%	40%	30%	0%	0%	0%	0%	0%	
ESTIMATED AREA OF INFLUENCE (ac)	50	50	50	50	50	50	50	50	50	50	50	50	
ESTIMATED INFLUX TO STORAGE (gal)(e)	1,115,930	1,434,767	0	1,753,604	4,399,951	5,611,532	15,638,956	0	0	0	0	0	29,954,738
RESERVOIR DISPOSAL(GAIN) (gal)	2,528,414	5,390,114	14,656,145	12,546,237	6,760,272	9,419,361	14,878,904	(587,183)	(1,504,881)	(412,533)	(293,500)	(132,594)	63,248,756
IRRIGATION													
IRRIGATION DISPOSAL (gal)(f)	0	0	0	0	0	0	0	0	14,950,000	1,010,000	376,000	506,500	16,842,500
STORAGE													
BEGINNING STORAGE (gal)	4,060,000	7,276,341	15,351,197	34,680,588	52,192,392	48,856,553	36,500,069	29,644,089	15,159,962	165,459	56,619	0	
CALCULATED STORAGE GAIN (gal)	3,216,341	8,074,856	19,329,390	17,511,804	10,588,129	13,920,940	19,263,762	1,615,873	-14,994,503	-108,841	-59,109	-49,613	
PROJECTED ESTIMATED STORAGE (gal)	7,276,341	15,351,197	34,680,588	52,192,392	62,780,521	62,777,493	55,763,831	31,259,962	165,459	56,619	0	0	
AMOUNT DISCHARGED TO BLOODS CREEK (gal)	0	0	0	0	13,923,968	26,277,424	26,119,742	16,100,000	0	0	0	0	82,421,134
ESTIMATED STORAGE (gal)	7,276,341	15,351,197	34,680,588	52,192,392	48,856,553	36,500,069	29,644,089	15,159,962	165,459	56,619	0	0	

MAXIMUM STORAGE (MG)..................................... 52.19
AVAILABLE STORAGE (MG)..................... 76.43

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER	35.71	AMOUNT DISCHARGED TO BLOODS CREEK........	82.42	UNUSED DISPOSAL CAPACITY (MG)............................	0.05
PRECIPITATION..	47.19	EVAPORATION..	9.31	(MUST NOT BE NEGATIVE)	
SNOW INFLUX (MG)..	29.95	PERCOLATION...	8.39	UNUSED STORAGE CAPACITY (MG)...............................	24.24
		IRRIGATION..	16.84	(MUST NOT BE NEGATIVE)	
TOTAL	112.86	TOTAL	116.97		

(a) Estimated percolation based upon measured inflow components, estimated evaporation, and actual reservoir levels in 2011 - in Storage Reservoir only.
(b) Reservoir water surface area is a function of storage volume at start of month.
(c) Estimated snowmelt volume available for influx to storage reservoir.
(d) Estimated percentage of snowmelt contributing to influx to reservoir.
(e) Estimated based on fraction of accumulated snow within reservoir "area of influence" entering the reservoir during snowmelt months.
(f) Disposal capacity based on maximum estimated land disposal volumes.
(g) Per Bloods Creek Gauging Station
(h) Not used in calculations

TABLE 8

BEAR VALLEY WATER DISTRICT WASTEWATER TREATMENT AND DISPOSAL SYSTEM 6/8/2020 9:26

(2020 update- 2010/2011 Precip. Pattern) 1 in 100 Year Water Balance Projection - 2000 thru 2019 90TH Percentile monthly ADF plus 1196 EDU (201 gpd/EDU) - Assumes no infiltratin with new EDUs

INPUT DATA

TREATMENT POND CHARACTERISTICS		STORAGE RESERVOIR		IRRIGATION AREA CHARACTERISTICS		CLIMATOLOGICAL FACTORS	
GROSS AREA (ac)...................................	3.2	GROSS AREA (ac).........................	18.6	DISTRICT DISPOSAL LAND (AC)..	**80**		
WATER SURFACE AREA (ac).................	2.9	MAX. WATER SURFACE (ac)...........	14.2	SOIL WATER DEFICIT BEFORE IRRIGATION (IN)..................	n/a	OCT-APR EVAP/AVG EVAP RATIO..................................	0.76
				FRACT OF LAND IRRIGATED	n/a	MAY-SEP EVAP/AVG EVAP RATIO..................................	1.00
		STORAGE CAPACITY (MG)..............	76.43	IRRIGATION EFFICIENCY (DECIMAL FRACT)...	n/a	PAN COEFFICIENT..	0.80
		FRAC EST. PERC..........	1.0	FRACTION OF EST. PERC RATE	n/a	LAND PRECIP COLLECTED (FRAC).........	0.9

PARAMETER / MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
DAYS IN MONTH	30	31	31	28	31	30	31	30	31	31	30	31	365
AVG PAN EVAP (IN)	0.89	0.61	0.76	0.83	2.14	3.69	5.34	6.64	7.63	6.87	5.17	3.05	43.62
ESTIMATED PRECIP (IN)	10.66	20.00	2.84	10.62	21.42	3.37	4.65	1.57	1.66	0.00	1.86	4.35	83.00
ESTIMATED SNOW ACCUM (IN Water)(g)	7.82	23.83	26.08	36.04	53.71	41.62	22.88	0.00	0.00	0.00	0.00	2.96	
ESTIMATED SNOW MELT IN MONTH (IN Water)	0.00	0.00	0.36	0.12	0.71	13.40	21.11	22.88	0.00	0.00	0.00	1.42	60.00
ESTIMATED NEW SNOW IN MONTH (IN Water)	7.82	16.01	2.61	10.08	18.27	1.30	2.37	0.00	0.00	0.00	0.00	1.53	60.00
ESTIMATED MAX PERCOLATION (IN)(a)	10.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
# OF ADDITIONAL CONNECTIONS (RLU)	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	
ADDITIONAL INFLUENT FLOW (GAL/D)	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	
90TH PERCENTILE EXISTING FLOWS (Avg. GAL/D)	37,135	77,828	98,766	131,156	125,459	186,046	188,872	127,254	73,229	61,715	38,479	31,386	
TOTAL INFLUENT FLOW (GAL/D)	277,531	318,224	339,162	371,552	365,855	426,442	429,268	367,650	313,625	302,111	278,875	271,782	

CALCULATIONS

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
WASTEWATER VOLUME (gal)	8,325,930	9,864,944	10,514,022	10,403,456	11,341,505	12,793,260	13,307,308	11,029,500	9,722,375	9,365,441	8,366,250	8,425,242	123,459,233
EVAPORATION (IN)	0.5	0.4	0.5	0.5	1.3	2.2	4.3	5.3	6.1	5.5	4.1	1.9	32.6
PRECIPITATION (IN)	10.66	20.00	2.84	10.62	21.42	3.37	4.65	1.57	1.66	0.00	1.86	4.35	83.00
TREATMENT POND													
PERCOLATION (IN)	8.38	5.41	12.69	7.74	5.73	21.66	15.57	17.29	4.18	2.11	2.81	2.97	106.55
PERC VOLUME (gal)	659,620	426,378	999,502	609,371	451,372	1,705,370	1,226,247	1,361,614	329,361	166,362	221,115	233,864	8,390,176
EVAP. VOLUME (gal)	39,374	31,499	39,374	39,374	102,372	173,244	338,614	417,361	480,359	433,111	322,864	149,620	2,567,166
PRECIP. VOLUME (gal)	917,603	1,721,582	244,465	914,160	1,843,814	290,087	400,268	135,144	142,891	0	160,107	374,444	7,144,564
TREATMENT DISPOSAL(GAIN)/ (gal)	218,609	1,263,705	(794,411)	265,415	1,290,070	(1,588,528)	(1,164,593)	(1,643,831)	(666,829)	(599,473)	(383,872)	(9,040)	(3,812,778)
POLISHING RESERVOIR													
PERCOLATION (IN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERC VOLUME (gal)	0	0	0	0	0	0	0	0	0	0	0	0	0
W.S. AREA (ac)(b)	6.20	9.38	11.22	11.76	12.28	12.56	11.13	10.91	10.36	10.13	8.53	3.36	
EVAP. VOLUME (gal)	84,162	101,860	152,374	159,611	433,572	750,075	1,299,758	1,570,694	1,716,787	1,513,309	949,396	173,416	8,905,014
PRECIP. VOLUME (gal)	5,032,887	9,615,218	1,379,589	5,174,256	10,466,832	1,649,245	2,257,681	761,343	802,510	0	889,921	2,020,240	40,049,722
MONTHLY AVAIL. SNOWMELT (IN)(c)	0.00	0.00	0.36	0.12	0.71	13.40	21.11	22.88	0.00	0.00	0.00	1.42	60.00
ESTIMATED SNOW CONTR. (%)(d)	0%	0%	0%	0%	0%	0%	45%	28%	50%	50%	50%	50%	
ESTIMATED AREA OF INFLUENCE (ac)	50	50	50	50	50	50	50	50	50	50	50	50	
ESTIMATED INFLUX TO STORAGE (gal)(e)	0	0	0	0	0	0	12,897,727	8,697,780	0	0	0	966,122	22,561,629
RESERVOIR DISPOSAL(GAIN) (gal)	4,948,725	9,513,358	1,227,215	5,014,645	10,033,260	899,170	13,855,650	7,888,429	(914,277)	(1,513,309)	(59,476)	2,812,946	53,706,336
IRRIGATION													
IRRIGATION DISPOSAL (gal)(f)	0	0	0	0	0	0	0	0	10,796,000	22,361,000	17,521,000	11,999,000	62,677,000
STORAGE													
BEGINNING STORAGE (gal)	4,060,000	17,553,265	38,195,271	44,742,097	51,425,613	54,990,448	37,094,350	34,492,715	28,066,813	25,412,082	10,303,741	705,643	
CALCULATED STORAGE GAIN (gal)	13,493,265	20,642,007	10,946,826	15,683,516	22,664,835	12,103,902	25,998,365	17,274,097	-2,654,731	-15,108,340	-9,598,098	-769,852	
PROJECTED ESTIMATED STORAGE (gal)	17,553,265	38,195,271	49,142,097	60,425,613	74,090,448	67,094,350	63,092,715	51,766,813	25,412,082	10,303,741	705,643	0	
AMOUNT DISCHARGED TO BLOODS CREEK (gal)	0	0	4,400,000	9,000,000	19,100,000	30,000,000	28,600,000	23,700,000	0	0	0	0	114,800,000
ESTIMATED STORAGE (gal)	17,553,265	38,195,271	44,742,097	51,425,613	54,990,448	37,094,350	34,492,715	28,066,813	25,412,082	10,303,741	705,643	0	

MAXIMUM STORAGE (MG)....................................	54.99
AVAILABLE STORAGE (MG)....................	76.43

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER	123.46	AMOUNT DISCHARGED TO BLOODS CREEK........	114.80	UNUSED DISPOSAL CAPACITY (MG)............................	0.06
PRECIPITATION...	47.19	EVAPORATION...	11.47	(MUST NOT BE NEGATIVE)	
SNOW INFLUX (MG)..	22.56	PERCOLATION..	8.39		
		IRRIGATION..	62.68	UNUSED STORAGE CAPACITY (MG)...............................	21.44
TOTAL	193.22	TOTAL	197.34	(MUST NOT BE NEGATIVE)	

(a) Estimated percolation based upon measured inflow components, estimated evaporation, and actual reservoir levels in 2011 - in Storage Reservoir only.
(b) Reservoir water surface area is a function of storage volume at start of month.
(c) Estimated snowmelt volume available for influx to storage reservoir.
(d) Estimated percentage of snowmelt contributing to influx to reservoir.
(e) Estimated based on fraction of accumulated snow within reservoir "area of influence" entering the reservoir during snowmelt months.
(f) Disposal capacity based on maximum estimated land disposal volumes.
(g) Per Bloods Creek Gauging Station
(h) Not used in calculations

TABLE 9

BEAR VALLEY WATER DISTRICT WASTEWATER TREATMENT AND DISPOSAL SYSTEM 6/8/2020 9:26

(2020 update - 2016-2017 Precip. Pattern) 1 in 100 Year Water Balance Projection - 2000 thru 2019 90TH Percentile monthly ADF plus 1196 EDU (201 gpd/EDU) - Assumes no infiltratin with new EDUs

INPUT DATA

TREATMENT POND CHARACTERISTICS		STORAGE RESERVOIR		IRRIGATION AREA CHARACTERISTICS		CLIMATOLOGICAL FACTORS	
GROSS AREA (ac)……………………………	3.2	GROSS AREA (ac)……………………	18.6	DISTRICT DISPOSAL LAND (AC)……………………………………………	**80**		
WATER SURFACE AREA (ac)………………	2.9	MAX. WATER SURFACE (ac)………..	14.2	SOIL WATER DEFICIT BEFORE IRRIGATION (IN)………………	n/a	OCT-APR EVAP/AVG EVAP RATIO…………………………….	0.76
				FRACT OF LAND IRRIGATED ……………………………………	n/a	MAY-SEP EVAP/AVG EVAP RATIO…………………………….	1.00
		STORAGE CAPACITY (MG)…………..	76.43	IRRIGATION EFFICIENCY (DECIMAL FRACT)…………………………………	n/a	PAN COEFFICIENT…………………………………………………….	0.80
		FRAC EST. PERC……….	1.0	FRACTION OF EST. PERC RATE …………………	n/a	LAND PRECIP COLLECTED (FRAC)………	0.9

PARAMETER / MONTH	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
DAYS IN MONTH	30	31	31	28	31	30	31	30	31	31	30	31	365
AVG PAN EVAP (IN)	0.89	0.61	0.76	0.83	2.14	3.69	5.34	6.64	7.63	6.87	5.17	3.05	43.62
ESTIMATED PRECIP (IN)	2.93	7.84	28.46	21.98	5.29	8.57	1.01	1.76	0.31	1.67	2.76	0.42	83.00
ESTIMATED SNOW ACCUM (IN Water)$_{(g)}$	2.23	4.46	27.12	42.39	39.69	38.40	0.00	0.00	0.00	0.00	0.00	0.00	
ESTIMATED SNOW MELT IN MONTH (IN Water)	0.81	1.04	0.00	1.27	8.11	10.19	37.88	0.00	0.00	0.00	0.00	0.70	60.00
ESTIMATED NEW SNOW IN MONTH (IN Water)	2.88	3.11	21.41	15.64	5.21	8.54	0.00	0.00	0.00	0.00	0.00	3.21	60.00
ESTIMATED MAX PERCOLATION (IN)$_{(a)}$	10.0	29.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
# OF ADDITIONAL CONNECTIONS (RLU)	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	1,196	
ADDITIONAL INFLUENT FLOW (GAL/D)	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	240,396	
90TH PERCENTILE EXISTING FLOWS (Avg. GAL/D)	37,135	77,828	98,766	131,156	125,459	186,046	188,872	127,254	73,229	61,715	38,479	31,386	
TOTAL INFLUENT FLOW (GAL/D)	277,531	318,224	339,162	371,552	365,855	426,442	429,268	367,650	313,625	302,111	278,875	271,782	

CALCULATIONS

	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	ANNUAL
WASTEWATER VOLUME (gal)	8,325,930	9,864,944	10,514,022	10,403,456	11,341,505	12,793,260	13,307,308	11,029,500	9,722,375	9,365,441	8,366,250	8,425,242	123,459,233
EVAPORATION (IN)	0.5	0.4	0.5	0.5	1.3	2.2	4.3	5.3	6.1	5.5	4.1	1.9	32.6
PRECIPITATION (IN)	2.93	7.84	28.46	21.98	5.29	8.57	1.01	1.76	0.31	1.67	2.76	0.42	83.00
TREATMENT POND													
PERCOLATION (IN)	8.38	5.41	12.69	7.74	5.73	21.66	15.57	17.29	4.18	2.11	2.81	2.97	106.55
PERC VOLUME (gal)	659,620	426,378	999,502	609,371	451,372	1,705,370	1,226,247	1,361,614	329,361	166,362	221,115	233,864	8,390,176
EVAP. VOLUME (gal)	39,374	31,499	39,374	39,374	102,372	173,244	338,614	417,361	480,359	433,111	322,864	149,620	2,567,166
PRECIP. VOLUME (gal)	252,212	674,860	2,449,811	1,892,018	455,358	737,698	86,940	151,499	26,685	143,752	237,578	36,153	7,144,564
TREATMENT DISPOSAL(GAIN)/ (gal)	(446,782)	216,983	1,410,935	1,243,273	(98,386)	(1,140,917)	(1,477,921)	(1,627,476)	(783,036)	(455,721)	(306,401)	(347,331)	(3,812,778)
POLISHING RESERVOIR													
PERCOLATION (IN)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERC VOLUME (gal)	0	0	0	0	0	0	0	0	0	0	0	0	0
W.S. AREA (ac)$_{(b)}$	6.20	9.01	10.49	12.22	13.34	13.11	12.41	12.23	10.59	10.29	8.88	6.10	
EVAP. VOLUME (gal)	84,162	97,827	142,398	165,937	470,867	783,345	1,448,972	1,760,416	1,754,119	1,536,916	988,934	314,810	9,548,703
PRECIP. VOLUME (gal)	1,383,336	3,761,261	13,768,250	10,736,865	2,600,122	4,207,034	493,883	859,780	150,056	807,011	1,323,189	198,183	40,288,970
MONTHLY AVAIL. SNOWMELT (IN)$_{(c)}$	0.81	1.04	0.00	1.27	8.11	10.19	37.88	0.00	0.00	0.00	0.00	0.70	60.00
ESTIMATED SNOW CONTR. (%)$_{(d)}$	100%	100%	100%	100%	40%	40%	30%	0%	0%	0%	0%	0%	
ESTIMATED AREA OF INFLUENCE (ac)	50	50	50	50	50	50	50	50	50	50	50	50	
ESTIMATED INFLUX TO STORAGE (gal)$_{(e)}$	1,099,749	1,412,023	0	1,724,297	4,404,425	5,534,043	15,429,065	0	0	0	0	0	29,603,603
RESERVOIR DISPOSAL(GAIN) (gal)	2,398,923	5,075,457	13,625,852	12,295,225	6,533,680	8,957,733	14,473,976	(900,636)	(1,604,063)	(729,905)	334,255	(116,627)	60,343,870
IRRIGATION													
IRRIGATION DISPOSAL (gal)$_{(f)}$	0	0	0	0	0	0	0	0	10,796,000	22,361,000	17,521,000	11,999,000	62,677,000
STORAGE													
BEGINNING STORAGE (gal)	4,060,000	14,338,071	29,495,455	50,646,264	65,588,219	62,465,019	53,075,095	50,778,458	30,679,846	27,219,122	13,037,937	3,911,041	
CALCULATED STORAGE GAIN (gal)	10,278,071	15,157,384	25,550,810	23,941,954	17,776,800	20,610,076	26,303,363	8,501,388	-3,460,724	-14,181,185	-9,126,896	-4,037,716	
PROJECTED ESTIMATED STORAGE (gal)	14,338,071	29,495,455	55,046,264	74,588,219	83,365,019	83,075,095	79,378,458	59,279,846	27,219,122	13,037,937	3,911,041	0	
AMOUNT DISCHARGED TO BLOODS CREEK (gal)	0	0	4,400,000	9,000,000	20,900,000	30,000,000	28,600,000	28,600,000	0	0	0	0	121,500,000
ESTIMATED STORAGE (gal)	14,338,071	29,495,455	50,646,264	65,588,219	62,465,019	53,075,095	50,778,458	30,679,846	27,219,122	13,037,937	3,911,041	0	

MAXIMUM STORAGE (MG)……………………………… 65.59
AVAILABLE STORAGE (MG)………………… 76.43

SUMMARY

ANNUAL INFLOW (MG)		ANNUAL OUTFLOW POTENTIAL (MG)		OVERALL BALANCE	
WASTEWATER ………………………………………………	123.46	AMOUNT DISCHARGED TO BLOODS CREEK……..	121.50	UNUSED DISPOSAL CAPACITY (MG)………………………	0.13
PRECIPITATION…………………………………………	47.43	EVAPORATION……………………………………………	12.12	(MUST NOT BE NEGATIVE)	
SNOW INFLUX (MG)………………………………………	29.60	PERCOLATION……………………………………	8.39		
		IRRIGATION…………………………………………………	62.68	UNUSED STORAGE CAPACITY (MG)…………………………	10.84
TOTAL	200.50	TOTAL	204.68	(MUST NOT BE NEGATIVE)	

(a) Estimated percolation based upon measured inflow components, estimated evaporation, and actual reservoir levels in 2011 - in Storage Reservoir only.
(b) Reservoir water surface area is a function of storage volume at start of month.
(c) Estimated snowmelt volume available for influx to storage reservoir.
(d) Estimated percentage of snowmelt contributing to influx to reservoir.
(e) Estimated based on fraction of accumulated snow within reservoir "area of influence" entering the reservoir during snowmelt months.
(f) Disposal capacity based on maximum estimated land disposal volumes.
(g) Per Bloods Creek Gauging Station
(h) Not used in calculations