# Summary of Effectiveness of the Bear Valley Water District Salinity Evaluation and Minimization Plan

June 8, 2020

Prepared for:

Bear Valley Water District

Prepared by:

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# 1.0 INTRODUCTION, PURPOSE, & SCOPE

The Bear Valley Water District (District) has a National Pollutant Discharge Elimination System (NPDES) permit Order No. R5-2016-0045-02 (as amended by Order No. R5-2017-0041 and Order No. R5-2019-0078) adopted by the Central Valley Regional Water Quality Control Board (Regional Water Board) for the District's Wastewater Treatment Facility (WWTF) discharge of treated wastewater (termed "effluent") to Bloods Creek. The WWTF, which produces secondary disinfected effluent through biological treatment and chlorine disinfection, receives wastewater from approximately 650 residential and commercial equivalent dwelling units within the Bear Valley area. The WWTF has a design capacity of 0.5 million gallons per day (mgd) and is permitted to discharge up to 1.0 mgd as a monthly average and up to 2.5 mgd as a daily maximum from January 1 through June 30 with a minimum 20:1 (creek:effluent) dilution.

The District's NPDES permit expires on July 31, 2021 and the District must file a Report of Waste Discharge (ROWD) by February 1, 2021. Along with the submittal of the ROWD, Special Provision VI.C.3.a. of the Order requires a summary of the effectiveness of the District's Salinity Evaluation and Minimization Plan.

This summary includes a brief description of the District's current Salinity Evaluation and Minimization Plan and compares the WWTF effluent water quality to the current applicable water quality objectives. A description of the Central Valley Salinity Alternatives for Long Term Sustainability (CV-SALTS) initiative, which is anticipated to be fully approved this year (2020) is also included, along with a discussion of the District's compliance with the CV-SALTS initiative.

# 2.0 SALINITY EVALUATION AND MINIMIZATION PLAN

The District's Salinity Evaluation and Minimization Plan (Salinity Plan) was prepared by Weber, Ghio & Associates, Inc. in October 2012 to fulfill a requirement included in the District's previous NPDES permit (Order No. R5-2011-0053). The 2012 Salinity Plan is included in Appendix A. The Salinity Plan assessed the District's salinity sources, which include the potable water supply, residential water uses, commercial water uses, and the wastewater collection and treatment processes. After comparing the WWTF's effluent water quality to the applicable salinity water quality objectives, it was determined that the District was capable of complying with applicable salinity water quality objectives because the effluent salinity concentrations were significantly lower than the objectives. The Salinity Plan concluded that the reduction in effluent salinity that could be realized through treatment process modifications, such as reverse osmosis, did not justify the associated high capital and operational costs. Instead, the Salinity Plan recommended that District salinity control efforts focus on public outreach and source control. As a source control effort, the District has added a message to its website emphasizing to District customers the difference between the wastewater utility and a landfill, and what types of wastes belong in each.

# 3.0 EFFLUENT LIMITATIONS AND APPLICABLE WATER QUALITY OBJECTIVES

The current Order does not contain effluent limitations for salinity. The Fact Sheet details the other sources for water quality objectives/criteria for indicators of salinity, including electrical conductivity (EC), total dissolved solids (TDS), chloride, and sulfate. Other sources discussed in the Fact Sheet include the Secondary Maximum Contaminant Levels (SMCLs) established by the State of California and the US Environmental Protection Agency (EPA) National Ambient Water Quality Criteria (NAWQC). **Table 1** shows applicable salinity water quality objectives/criteria discussed in the Fact Sheet.

**Table 1 Salinity Water Quality Objectives/Criteria**

| Parameter | SMCL [1] | US EPA NAWQC |
|---|---|---|
| EC (umhos/cm) | 900-1600-2200 | - |
| TDS (mg/L) | 500-1000-1500 | - |
| Chloride (mg/L) | 250-500-600 | 860 (1-hour)<br>230 (4-day) |
| Sulfate (mg/L) | 250-500-600 | - |

[1] The three SMCL values shown are recommended, upper, and short term SMCLs.

# 4.0 CV-SALTS

In an effort to control salt accumulation in residual irrigation water, mitigate adverse impacts on agricultural lands, and ultimately stabilize salinity (and possibly reverse it to some extent), the Regional Water Board developed the CV-SALTS initiative. The objective of the initiative was to develop a salinity (and nitrate) control plan based on input from all stakeholders (e.g., agriculture, cities, industries, environmentalists, economists, etc.). The initiative resulted in recommendations that the Regional Water Board's "Basin Plan" be amended to specify how control of salinity (and nitrate) was to be accomplished. The CV-SALTS proposed Basin Plan amendments were adopted by the Regional Water Board on 31 May 2018 and forwarded to the State Water Resources Control Board (State Water Board) for approval. The State Water Board approved the Basin Plan amendments on 16 October 2019 and forwarded them on to the Environmental Protection Agency (EPA) and the Office of Administrative Law (OAL) for approval. The OAL approved the amendments on 15 January 2020, which becomes the effective date for the Basin Plan amendments and policies identified therein, except for those aspects needing EPA approval, which is pending at this time. Under the amendments, the District will receive a Notice to Comply with the amendments from the Regional Water Board. Though the District has not yet received its

Notice to Comply, the District is committed to following CV-SALTS guidelines and associated Basin Plan amendments, as discussed below.

Key aspects of the Basin Plan amendments relative to regulation of salinity that are believed to be relevant to the District and the District's response to those regulations are presented below.

- The Salt Control Program (SCP) will be implemented in three phases (Phases I, II, and III), with each phase expected to take from 10 to 15 years (i.e., 30 to 45 years total, according to the Basin Plan).
- The SCP will be reviewed in its entirety prior to implementing Phase II, but no later than 15 years after the effective date, which is 15 January 2020.
- The District will receive a Notice to Comply from the Regional Water Board within one year of the effective date of the amendments (i.e., within one year of 15 January 2020).
- The District will decide whether it will comply with either the Conservative Salinity Permitting Approach or the Alternative Salinity Permitting Approach (as shown in Figure S-1 from the Basin Plan amendments). The District will have six months after receiving the Notice to Comply to submit a Notice of Intent of its selected approach to the Regional Water Board.
- It is likely the District will decide to pursue the Conservative Salinity Permitting Approach because the salinity of the District's effluent is significantly lower than the water quality objectives being proposed by the Basin Plan amendments. As discussed further in Section 5.0, the District's recorded measurements of effluent EC have averaged 105 umhos/cm since 2016.
- Phase 1 Conservative Salinity Permitting Approach salinity WQOs for Municipal (MUN) and Agricultural (AGR) beneficial uses are established at 900 umhos/cm and 700 umhos/cm, respectively, for both surface waters and groundwaters. The District currently complies with these requirements.
- A Drought and Conservation Policy will address short-term salinity exceedances caused by factors beyond District control.
- Under the Conservative Salinity Permitting Approach, the District is expected to achieve the following items:
    - Comply with the existing regulatory structure (the District currently complies, including the Antidegradation Policy).
    - Focus on source control to limit salinity impacts to the extent feasible (ongoing efforts are included in the District's current Salinity Plan).

- Use as little salinity assimilative capacity as feasible in surface waters and groundwaters (the District creates salinity assimilative capacity via its effluent discharge to Bloods Creek).
- Need little to no time schedules to achieve compliance with proposed salinity WQOs (the District is in compliance at this time).

In summary, the CV-SALTS Basin Plan amendments are expected to change some aspects of the District's Order but may not change District wastewater utility operations materially. For the District, key themes coming out of the Basin Plan amendments are thought to be 1) continued salinity source control, and 2) continued compliance with the State's Antidegradation Policy.

# 5.0 SALINITY EVALUATION AND MINIMIZATION PLAN EFFECTIVENESS

The California Integrated Water Quality System (CIWQS) contains the District's self-reported water quality data for the required monitoring locations and constituents. The Lake Alpine Water Company Water Quality Reports contain the potable water supply water quality data. Since the District is required to monitor for EC once per week when discharging effluent to Bloods Creek, there are significantly more data available for EC than for TDS, chloride, and sulfate which are only required to be tested once per the permit term. **Tables 2** through **5** show the effluent water quality for EC, TDS, chloride, and sulfate, respectively, in comparison to the potable water supply (if available).

**Table 2 Recent EC of the Potable Water Supply and the Wastewater Effluent**

| Calendar Year | Potable Water Supply EC (umhos/cm) [1] | Wastewater Effluent EC (umhos/cm) [2] | |
|---|---|---|---|
| | | Average | Maximum |
| 2016 | 37 | 100 | 100 |
| 2017 | 32 | 120 | 230 |
| 2018 | 45 | 100 | 124 |
| 2019 | 27 | 82 | 161 |
| 2016 – 2019 Average/Maximum [3] | 35 | 105 | 230 |

[1] Obtained from the Lake Alpine Water Company Water Quality Reports. Each water sample was taken in August of each year.
[2] Obtained from the California Integrated Water Quality System (CIWQS). CIWQS had 1 EC datum point in May 2016, 35 EC data points in March through June 2017, 14 EC data points in April and May of 2018, and 18 EC data points in May and June of 2019.
[3] The potable water supply and the average wastewater effluent EC columns show the average EC measured between 2016 and 2019. The maximum wastewater effluent EC column shows the maximum EC measured between 2016 and 2019.

**Table 3 Recent TDS Concentrations of the Potable Water Supply and the Wastewater Effluent**

| Calendar Year | Potable Water Supply TDS (mg/L) [1] | Wastewater Effluent TDS (mg/L) [2] |
|---|---|---|
| 2016 | 53 | 80 |
| 2017 | 35 | 110 |
| 2018 | 42 | - |
| 2019 | 51 | - |
| 2016 – 2019 Average | 45 | 95 |

[1] Obtained from the Lake Alpine Water Company Water Quality Reports. Each water sample was taken in August of each year.
[2] Obtained from CIWQS. Measured in May 2016 and March 2017.

**Table 4 Recent Chloride Concentrations of the Wastewater Effluent**

| Calendar Year | Wastewater Effluent Chloride (mg/L) [1] |
|---|---|
| 2016 | 11 |
| 2017 | 16 |
| 2016 – 2017 Average | 14 |

[1] Obtained from CIWQS. Measured in May 2016 and March 2017.

**Table 5 Recent Sulfate Concentrations of the Potable Water Supply and the Wastewater Effluent**

| Calendar Year | Potable Water Supply Sulfate (mg/L) [1] | Wastewater Effluent Sulfate (mg/L) [2] |
|---|---|---|
| 2016 | - | 3.1 |
| 2017 | - | 3.2 |
| 2018 | - | - |
| 2019 | 0.52 | - |
| 2016 – 2019 Average | 0.52 | 3.2 |

[1] Obtained from the Lake Alpine Water Company Water Quality Reports. Sulfate was not reported in these annual reports until 2019. The water sample was taken in August 2019.
[2] Obtained from CIWQS. Measured in May 2016 and March 2017.

As expected, there is an increase in salinity from the potable water supply to the wastewater effluent caused largely by residential/commercial uses. However, comparing the most stringent water quality objectives to the maximum measured effluent concentrations of the respective parameters shows that the effluent from the WWTF is well within compliance, as shown in **Table 6**.

**Table 6 Maximum Measured Effluent Concentrations Compared to Most Stringent Water Quality Objective/Criteria**

| Parameter | Maximum Measured Effluent Concentration since May 2016 [1] | Most Stringent Water Quality Objective/Criteria |
|---|---|---|
| EC (umhos/cm) | 230 | 700 [2] |
| TDS (mg/L) | 110 | 500 [3] |
| Chloride (mg/L) | 16 | 230 [4] |
| Sulfate (mg/L) | 3.2 | 250 [5] |

[1] Obtained from CIWQS.
[2] The CV-SALTS WQO.
[3] The TDS SMCL.
[4] The US EPA NAWQC.
[5] The sulfate SMCL.

# 6.0 CONCLUSION

The District has a Salinity Evaluation and Minimization Plan that assessed the District's salinity sources and compared the District's effluent salinity to the applicable water quality objectives. The District continues to monitor its salinity trends. The District's effluent salinity parameters are significantly lower than the most stringent water quality objectives/criteria. The District intends to comply with the applicable water quality objectives and the CV-SALTS Basin Plan amendments.

# APPENDIX A

## BEAR VALLEY WATER DISTRICT

## SALINITY EVALUATION AND MINIMIZATION PLAN

## October 2012

# BEAR VALLEY WATER DISTRICT

# SALINITY EVALUATION
# AND
# MINIMIZATION PLAN

## OCTOBER 2012

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# SALINITY EVALUATION AND MINIMIZATION PLAN

## 1.0 INTRODUCTION

On August 4, 2011 the California Regional Water Board, Central Valley Region (Regional Water Board) adopted Order No. R5-2011-0053 (NPDES Permit No. CA0085146) Waste Discharge Requirements for the Bear Valley Water District. Special Provision V1.C.3.b of the Order requires the District to "…prepare a salinity evaluation and minimization plan to address sources of salinity from the Facility." This report has been prepared to fulfill the requirements of this section of the Order.

The wastewater treatment plant (WWTP) receives wastewater from approximately 535 residential (133 year round residents) and 17 commercial connections within the Bear Valley Water District. WWTP influent is comprised primarily of domestic and commercial wastewater with no real industrial sources. The WWTP produces secondary disinfected effluent, with an existing design capacity of 0.5 million gallons per day (Mgal/day) and a permitted capacity of up to 0.1 Mgal/day, both on an average dry weather flow (ADWF) basis. The effluent can be discharged to Bloods Creek from January 1 through June 30 under conditions 1) storage reservoir (polishing pond) has less than 35 MG of unused effluent storage capacity and 2) providing a minimum of 20:1 dilution. Secondary effluent is applied to the District's Designated Land Disposal Area (DLDA) to the extent feasible, but primarily from May 1 through October 31 dependent upon snow melt and weather conditions. Effluent that in real-time cannot be discharged to Bloods Creek or the DLDA is stored until discharge is possible.

Recent monitoring of the potable water supply has yielded an average electrical conductivity (EC) of 78 µmhos/cm. The historical average wastewater effluent EC for the period of 1997 through 2010 is 126 µmhos/cm. The average wastewater effluent EC for 2011 is 60 µmhos/cm, below the historical average EC of 126 µmhos/cm.

### 1.1 Effluent Limitations and Applicable Water Quality Objectives

The Order does not contain a final effluent limitation for annual average electrical conductivity (EC) or total dissolved solids (TDS). The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region includes established and adopted numeric and narrative water quality objectives with respect to salinity. In addition, State Water Board Resolution 68-16, the "Anti-degradation Policy," requires 1) the quality of individual waters of the state be addressed in the permitting of waste discharges, and 2) high quality water should be preserved to the maximum benefit of the people of the state.

Numeric drinking water supply objectives on total dissolved solids (TDS) and EC have been adopted in the form of Secondary Maximum Contaminant Levels (SMCLs) based on duration of discharge to protect municipal and domestic water supply beneficial uses. These SMCLs consist of "Recommended," "Upper," and "Short-term" contaminant ranges. Narrative limitations for the protection of agricultural beneficial uses have also been established. These limitations should take the specific area, including climate and topography, and cropping patterns into account, and thus vary from area to area. Generally, numeric agricultural water quality objectives (WQOs) established by the Food and Agriculture Organization (FAO) that limit detrimental impacts to the most sensitive crops are applied as discharge limitations. A listing of these water quality objectives, effluent limitations, and the average concentration of the effluent is presented in Table 1.

Table 1

Comparison of Effluent Limitations, Applicable Water Quality Objectives, and Effluent Quality, Bear Valley Water District WWTP

| Parameter | Final Effluent Limitation | Secondary MCL [a] | Agriculture WQO | Effluent [b] |
|---|---|---|---|---|
| Electrical Conductivity (μmhos/cm) | --- | 900-1600-2200 | 700 | 126 |
| TDS (mg/L) | --- | 500-1000-1500 | 450 | 140 |

[a] Recommended –Upper-Short term.
[b] Average of polishing pond data 1997-2010.

The average WWTP effluent EC of 126 μmhos/cm (based on 1997 through 2010 monitoring) and 2011 testing result of 60 μmhos/cm are less than the agricultural water quality objective of 700 μmhos/cm, established in the Basin Plan. Based on the long-term effluent average, the District WWTP is currently capable of complying with all applicable salinity water quality objectives. However, increased water conservation in the community, including future State mandated reclamation and water conservation requirements, may inhibit compliance with the final effluent limitation in the future.

## 2.0 SALINITY SOURCES

The Bear Valley Water District WWTP influent wastewater is derived from residential and commercial uses of water. Thus, the salinity of the influent reflects the salinity of the potable water supply, additions from domestic and commercial uses of water, and any salinity contributed to (or diluted in) the collection system through infiltration and inflow. Additional inputs of salinity can occur during the wastewater treatment process, including increases in salinity concentration resulting from evaporation. Potential salinity sources associated with each of these components are discussed in this section.

## 2.1 Potable Water Supply

The potable water within the District's service area is provided by the Lake Alpine Water Company using low salinity surface water from springs and snow melt into Bear Lake. The treatment of this surface water includes microfiltration and disinfection which add salinity to the water. The average salinity of the treated potable water supply based on 2011 testing is 78 μmhos/cm, which is a low salinity water supply.

## 2.2 Residential Uses

The residential use of water contributes salinity to the wastewater within the District's service area primarily by the addition of soluble compounds to the water from excrement and cleaning products (e.g. detergents, soaps, cleansers, disinfectants, etc.). Generally, water softeners are large contributors of salinity to wastewater, but their use in the District's service area is unlikely based on the low hardness of the surface water supply (16 mg/L). Water quality data collected to date does not suggest significant numbers of water softeners in the community. The District may consider passing an ordinance banning the use of water softeners in new construction to prevent ill-informed homeowners from installing the devices when no material benefit will be realized. Swimming pools and hot tubs contribute salinity through maintenance activities and concentrate the salinity through evaporation. Other sources of salinity include the contribution of food particles through dishwashing and garbage disposals.

Although water conservation does not contribute salinity to the wastewater on a mass basis, it does increase the concentration of salts in the wastewater. As water conservation technology continues to be implemented within residential development and existing homes (e.g. there are already dual flush toilets on the market, a lower flush volume for liquid wastes and a higher flush volume for solid wastes), the wastewater salt concentration can be expected to continually increase (counter to the intent of the Order).

## 2.3 Commercial and Industrial Water Use

Commercial sources of salinity are somewhat similar to those from residential use of water. However, the salinity varies with type of business. Potential sources of salinity that are somewhat different than residential use include cooling water blow down, car washes, photo processing wastes, and healthcare facilities. There are no significant industrial wastewater discharges to the District's collection system.

### 2.4 Wastewater Collection and Treatment

Generally, salinity inputs from wastewater collection are attributed to infiltration and inflow (I&I). Infiltration of shallow groundwater, particularly in areas with substantial irrigated agriculture, can contribute salinity to the wastewater stream. Bear Valley is not surrounded by irrigated agricultural lands, and I/I does not appear to cause significant increases in wastewater salinity.

At the WWTP, salt containing chemicals, e.g., chlorine, are used to treat the wastewater. During treatment, incidental evaporation of water occurs, which increases the salt concentration of the effluent.

## 3.0 POTENTIAL METHODS TO REDUCE SALINITY AND ANTICIPATED LOAD REDUCTIONS

The use of water in the District's service area historically contributes a very low amount of salinity, approximately 48 μmhos/cm of EC, including contributions from the treatment process. Therefore, additional reductions in salinity are unlikely. Additional methods available to reduce the salinity of the District's effluent are limited. There is no source of lower salinity potable water. Public outreach and education efforts could be conducted to inform the citizens and businesses served by the District about salinity, and practices that could be employed to reduce effluent salinity. Including information with the utility bill would be a relatively simple and inexpensive method of education. The potential load reduction from these efforts will vary depending on public action, but is anticipated to be minimal.

Thus, any significant further reduction in effluent salinity will likely require modifications in treatment processes. The current chlorination/dechlorination system could be replaced with ultraviolet light disinfection, which could potentially reduce effluent salinity by approximately 50 mg/L. Reverse osmosis (RO) could remove salinity from the effluent, but at a very high cost. The brine stream created by RO would probably need to be shipped to the Bay Area for discharge to the ocean. Based on the cost of these potential treatment process modifications, District salinity reduction efforts will focus on source control rather than on advanced treatment processes.

## 4.0 MONITORING PLAN

The District currently monitors the WWTP effluent for EC twice a year (no discharge to Bloods Creek) and twice per week (during discharge to Bloods Creek) and for TDS monthly. The WWTP influent is monitored for EC monthly and the water supply is monitored by EC and TDS annually. Monitoring influent salinity using EC is problematic due to high levels of volatile (organic) dissolved solids, and monitoring the effluent is sufficient for determining salinity contributions. The continued implementation of this ongoing salinity monitoring program should provide adequate data to quantify the effectiveness of any District-implemented salinity minimization efforts.

## 5.0 SALINITY MINIMIZATION GOALS AND SCHEDULE

The District is currently in compliance with water quality objectives for salinity. The District will conduct its salinity minimization plan for the purpose of continuing to meet the objectives. The primary methods for further achieving salinity minimization include the consideration of implementing a public outreach program as well as continued monitoring. It should be noted that future water conservation programs will likely increase the salinity of the wastewater, and the District may not be capable of meeting these limitations if major accomplishments of “in home” water conservation are realized. If this occurs it is suggested that the order be reopened to recognize the salt concentration effect of water conservation.

## 6.0 CONCLUSION

The current increases in wastewater resource salinity from 1) use of potable water, and 2) the subsequent treatment of the wastewater produced in the Bear Valley Water District are below Regional Water Board objectives, which allow for an increase in effluent EC of 500 µmhos/cm over source water. The District has implemented a salinity monitoring program to track salinity trends and to determine if additional measures are necessary to further reduce effluent salinity. In addition, the necessity of a public education program will be explored, and implemented, if it is determined that the program could result in a measurable reduction in the salinity footprint of the community.