Groundwater Quality Evaluation at the Lucerne Valley Land Discharge Location

December 22, 2017

Thomas Harder & Co.
Groundwater Consulting

WSC
Water Systems Consulting, Inc.

BBARWA
Big Bear Area Regional Wastewater Agency

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Prepared for

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Prepared by

Thomas Harder
Principal Hydrogeologist

PROFESSIONAL GEOLOGIST • STATE OF CALIFORNIA • THOMAS E. HARDER No: 6512

CERTIFIED HYDROGEOLOGIST • STATE OF CALIFORNIA • THOMAS E. HARDER No: 588

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1 Introduction

This study assesses the groundwater quality beneath Big Bear Area Regional Wastewater Agency's (BBARWA's) Lucerne Valley Land Discharge Location (LVLDL) in Lucerne Valley in San Bernardino County, California (see Figure 1). The LVLDL consists of a 480-acre property of which 190 acres is used to grow various animal feed crops. Beginning in 1980, BBARWA has discharged all of their treated wastewater to the LVLDL, which is primarily used to irrigate the crops, although some of the water is periodically discharged to two unlined basins located on the southern end of the property (see Figure 2). This report has been prepared to assess changes in groundwater quality beneath the LVLDL area since BBARWA began collecting groundwater quality data in 1991.

1.1 Background

BBARWA has been discharging treated recycled water at the LVLDL since 1980. Treated water is conveyed via a pipeline from the BBARWA treatment plant near Big Bear City to the LVLDL located approximately 12 miles to the north (see Figure 1). The delivered water is discharged first to a lined balancing reservoir, located approximately 6,500 ft south of the LVLDL, and then distributed to irrigate crops. Crops grown on the LVLDL typically include alfalfa, fiber and seed crops. During periods of low crop water demand and/or high discharges, some of the water is discharged to two unlined basins on the south end of the property (see Figure 2).

Since 1991, recycled water discharges have been regulated under California Colorado River Regional Water Quality Control Board's (RWQCB's) Order No. 01-156. On June 30, 2016, the RWQCB adopted revised Waste Discharge Requirements (WDRs) for BBARWA in Order R7-2016-0026 (see Appendix A). As part of this new order, the RWQCB is requiring preparation of a study to assess the impacts that historical recycled water discharges have had on groundwater quality beneath the LVLDL (Order R7-2016-0026; Section E, No. 1).

The primary constituents of concern (COCs) of this study are total dissolved solids (TDS) and nitrate (as N). The maximum contaminant levels (MCLs) for TDS and nitrate (as N) are 500 and 10 milligrams per liter (mg/L), respectively. The RWQCB Basin Plan Objective for TDS and nitrate is to maintain the water quality to existing historical conditions where possible and to keep the chemical and physical groundwater quality close to or otherwise below the MCLs (RWQCB, 2006). Specific concentration limits for TDS and nitrate have not been established.

1.2 Site Description

The LVLDL (the Site) consists of approximately 480 acres of mostly cultivated land in Lucerne Valley in San Bernardino County, California (see Figures 1 and 2). The LVLDL is located

southeast of the intersection of Old Woman Springs Road and Camp Rock Road. Crops grown on the LVLDL typically include alfalfa, fiber and seed crops. During periods of low crop water demand and/or high discharges, some of the water conveyed to the LVLDL from BBARWA is discharged to two unlined basins on the south end of the property (see Figure 2).

There are three monitoring wells (MW-1, MW-2, and MW-3) located within the LVLDL. MW-1 is located on the south end of the property and MW-2 and MW-3 are located on the north end (see Figure 2). Groundwater levels and groundwater quality data have been collected from the monitoring wells on a semi-annual to annual basis since they were completed in 1991. Each monitoring well is constructed of 4-inch diameter polyvinyl chloride (PVC) casing to a depth of 250 feet below ground surface (ft bgs). The wells are each constructed with multiple perforation intervals between 135 ft bgs and 250 ft bgs (see Appendix B). The monitoring wells are completed 2.5 ft above ground surface with locking monument casing.

The land use surrounding the LVLDL is predominantly native, undisturbed vegetation with sporadic homes. There are approximately eleven homes in the vicinity of the site, four of which are upgradient of the site (see Figure 4). The homes in this area all discharge their wastewater via individual onsite septic tanks.

1.3 Purpose and Scope

The purpose of this report is to summarize an analysis of historical groundwater quality beneath the LVLDL in the context of historical BBARWA discharges and land use on and surrounding the site.

The report includes:

- An assessment, based on historical records, of ambient (pre-BBARWA discharges) groundwater nitrate and total dissolved solid (TDS) concentrations in the vicinity of the LVLDL;
- Documentation and analysis of historical nitrate and TDS concentrations in recycled water discharges;
- Documentation and analysis of historical trends in nitrate and TDS concentrations in groundwater collected from onsite monitoring wells;
- Analysis of historical groundwater level changes at the LVLDL;
- Analysis of groundwater flow direction and gradient in the vicinity of the LVLDL; and
- An analysis of potential sources of nitrate and TDS in groundwater other than BBARWA recycled water, including, but not limited to, onsite farming practices and potential up gradient sources.

2 Sources of Data

The evaluation of TDS and nitrate concentrations in groundwater beneath the LVLDL is based on existing data, reports, and maps. Since 1991, BBARWA has historically collected groundwater level and groundwater quality data from monitoring wells MW-1 through MW-3 on a semi-annual to annual basis. Groundwater quality constituents analyzed have typically included general minerals, such as TDS, nitrate, etc., and physical properties.

The following sources of data were utilized in the analysis:

- BBARWA
  - Historical monthly wastewater discharge volumes from the BBARWA treatment plant
  - Historical TDS and total inorganic nitrogen (TIN) concentrations in effluent from the BBARWA treatment plant
  - Nitrate and TDS concentrations in groundwater samples collected from MW-1, MW-2, and MW-3
  - Historical groundwater levels measured in MW-1, MW-2, and MW-3
  - Annual total discharges to the unlined ponds (basins) at the LVLDL
  - Annual total discharges to the fields at the LVLDL

- California Department of Water Resources (CDWR), 2016 California Statewide Groundwater Elevation Monitoring (CASGEM)
- Geoscience, 2005. Evaluation of Potential Ground Water Changes from Reductions in Discharge at the BBARWA Discharge Site in Lucerne Valley, California.
- Geoscience, 2006. Refined Estimates of Potential Ground Water Recharge from Crop Irrigation at the BBARWA Discharge Site in Lucerne Valley, California
- Law Environmental, 1992. Well Completion Report, Construction and Water Quality Analyses of Lucerne Valley Monitoring Wells.
- Mojave Water Agency, 2016. Groundwater level database.
- United States Geological Survey, 2000. Geologic Map and Digital Database of the Cougar Buttes 7.5' Quadrangle, San Bernardino County, California – Version 1.0.

The period of record for this analysis is from 1991 through 2016.

3 Description of the Site

3.1 Geology

3.1.1 Regional Geologic Setting

The Lucerne Valley is located on the northern slope of the San Bernardino Mountains (CDWR, 2003; see Figure 1) within the northwestern portion of the Colorado River Basin. The basin formed during the uplift of the San Bernardino mountain range (USGS, 2000). The east-west trending valley is bounded by the Ord Mountains to the north, the Fry Mountains to the east, the San Bernardino Mountains on the south, and the Granite Mountains to the west (Pioneer Consultants, 1977). The most prominent geologic fault in the area is the Helendale Fault, a north-west trending, right lateral, strike-slip fault located southwest of the LVLDL (see Figure 1; Pioneer Consultants, 1977).

3.1.2 Geologic Units

The surrounding and underlying bedrock consists of pre-Tertiary igneous and metamorphic rock (Pioneer Consultants, 1977). Surficial sediments that make up the interior of the basin consist of Quaternary age alluvial fan, washes, and landslides (USGS, 2000). The alluvial fan deposits consist of unconsolidated to semi-consolidated sand, gravel and cobbles. The lowest elevation of the closed basin is the Lucerne Dry Lake, where sediments consist of lacustrine silt and clay deposits.

Borehole logs from the monitoring wells at the LVLDL state that the subsurface is primarily composed of sand and gravel with some minor interbedded silty and clayey sand to a depth of approximately 255 ft bgs (Law Environmental, Inc., 1992).

3.2 Hydrogeology

3.2.1 Regional Hydrogeology

The LVLDL is located within the Lucerne Valley Groundwater Basin (the Basin), as defined by CDWR's Bulletin 118 (CDWR, 2003). Topographically, the Basin is a closed hydrologic system such that all surface water flow terminates within the Basin at Lucerne Dry Lake (see Figure 1). Groundwater flow out of the basin is also assumed to be negligible (Pioneer Consultants, 1977).

The aquifer in the Basin is recharged from precipitation runoff and infiltration along the base of the San Bernardino Mountains and, to a lesser degree, along the Ord and Fry Mountains to the north (Pioneer Consultants, 1977; DWR, 1975). The primary source of groundwater discharge is through evapotranspiration at Lucerne Dry Lake. Previous reports have indicated that the aquifer in the vicinity of the LVLDL is unconfined (Blazevic, et al., 2005).

3.2.2 Local Groundwater Occurrence and Flow

Based on hydrographs from MW-1 through MW-3, groundwater elevations are generally between 2,845 and 2,885 ft above mean sea level (ft amsl; see Figure 3 and Table 1). This corresponds to a groundwater level depth of approximately 125 to 175 ft below ground surface (ft bgs). Groundwater elevations in MW-1 (the upgradient well) are generally 25 ft higher than those in MW-2 and MW-3. Since the onsite groundwater monitoring wells were first constructed in 1991, groundwater levels beneath the LVLDL have generally been rising (see Figure 3). Although there is year-to-year variation associated with precipitation trends, groundwater levels have risen approximately 10 ft beneath the Site between 1991 and 2016.

The groundwater flow direction beneath the LVLDL is generally to the northwest (see Figure 4). Although the groundwater elevations have changed over time as seen on Figure 3, the groundwater flow direction has been consistently towards the Lucerne Dry Lake.

3.2.3 Groundwater Quality

The native groundwater quality within the Lucerne Valley Groundwater Basin varies greatly with respect to location in the Basin. In the southern upgradient portion of the Basin, TDS concentrations in groundwater are generally below 500 mg/L. In the downgradient portion near Lucerne Dry Lake, natural TDS concentrations in groundwater increase significantly as a result of evaporative concentration. Time series plots of TDS concentration for the period between 1952 and 1980 for two wells immediately north of the Site (04N01E06H01S and 05N01E32R01S) show that TDS concentrations before 1980 (prior to BBARWA's discharge operation) were generally between 350 and 500 mg/L but periodically spiked above 500 mg/L (Schlumberger, 2007). The cause of the TDS spikes is unknown, but may be associated with localized pumping depressions that reverse the groundwater flow gradient, resulting in the capture of high TDS groundwater from beneath Lucerne Dry Lake, which is known to have TDS concentrations ranging from 2,000 to 3,000 mg/L (Schlumberger, 2007). The average TDS concentration in the Lucerne Valley Groundwater Basin is reported to be approximately 1,100 mg/L, although the average concentration in the southern portion of the Basin (south of Old Woman Springs Road and including the LVLDL) is likely closer to 500 mg/L.

Data regarding nitrate concentrations in groundwater in the vicinity of the LVLDL was not available for the period prior to 1980 when the facility began operation. The earliest available data, from 1991 through 1998, show nitrate concentrations in groundwater in the Lucerne Valley to be less than 2 mg/L (SWRCB, 2017).

3.3 BBARWA Operations

Treated wastewater from BBARWA's treatment plant near Big Bear City is conveyed to the LVLDL via a pipeline (see Figure 1). The pipeline follows State Highway 18 until Camp Rock

Road, at which time it trends due north to the Site. Between 2000 and 2016, the average monthly discharge to the site was 70 million gallons per month. The average annual flow to the Site for the same time period is approximately 2,580 acre-ft/yr.

Treated water delivered to the LVLDL is either conveyed to an irrigation system for application on crops or discharged to two unlined basins located on the south end of the property. On an annual basis, the volume of water used for irrigating crops is typically approximately two thirds of the water discharged to the basins (see Figure 5). On a monthly basis, the percentage of delivered water discharged to crops is highest during the growing season (March through October) while the opposite is true between November and February (see Figure 6).

4 Analysis of Groundwater Quality Changes at the Lucerne Valley Land Discharge Location

4.1 BBARWA Water Quality

The quality of the water delivered to the LVLDL is addressed herein as it relates to TDS and Nitrate concentrations. The TDS concentration of the water delivered to the LVLDL, based on monthly averages measured at the BBARWA treatment plant, ranges from 318 mg/L to 519 mg/L (see Figure 7). The TDS concentration in the treated water has remained below 500 mg/L except for two months in 2014. Except for periodic outliers, the TDS concentration in the delivered water is typically between 400 and 500 mg/L.

Nitrate (as N) concentrations in the water delivered to the LVLDL from BBARWA have changed over time as a result of nitrate treatment at the BBARWA plant. Between 1990 and 1997, nitrate concentrations in the delivered water were highly variable and ranged from none detected to greater than 20 mg/L (see Figure 8). As the MCL for nitrate is 10 mg/L, BBARWA implemented a nitrate treatment process, which became operational in 1997. Since 1997, nitrate concentrations in the water delivered to the LVLDL have ranged from none detected to 13 mg/L but are typically below the MCL of 10 mg/L (see Figure 8).

4.2 Groundwater Quality

4.2.1 TDS Concentrations in Groundwater

The lowest TDS concentrations detected in groundwater samples collected from the three monitoring wells in the LVLDL area have been from the upgradient well (MW-1). Prior to 2010, the TDS concentration in MW-1 was relatively stable at approximately 300 mg/L (see Figure 7). As this concentration is from the upgradient well, it is likely indicative of the native TDS concentration of the aquifer beneath the Site prior to discharges at the LVLDL. Since 2010, the TDS concentration in samples from MW-1 has steadily increased and has periodically spiked as high as 720 mg/L (see Table 2). The reason for this increase is unknown but, given the well's location on the upgradient portion of the Site, it is likely associated with an upgradient TDS source.

TDS concentrations in samples from the two downgradient monitoring wells at the LVLDL (MW-2 and MW-3) show relatively stable trends between 2000 and 2010 and decreasing trends since 2010. Since 2000, TDS concentrations in these wells have ranged from approximately 500 mg/L to 900 mg/L and more recently the concentrations have been between 500 mg/L and 700 mg/L. It is noted that the TDS concentration detected in MW-2 rose sharply between construction of the well in 1991 and 1998. Concentrations rose as high as 1,200 mg/L before declining again and eventually becoming stable between approximately 700 and 800 mg/L after 2001 (see Figure 7). The reason for this spike in concentration is not clear, as

samples collected and analyzed from the nearby downgradient monitoring well (MW-3) did not show the same TDS concentration or trend. As MW-2 is directly downgradient of an irrigated field, the concentrations may be associated with the leaching of accumulated salts into the groundwater beneath the agricultural fields. This could have occurred during the period of high precipitation preceding 1998 or as a result of irrigation practices.

Prior to the start of BBARWA's discharges to the LVLDL in 1980, TDS concentrations in groundwater to the north and downgradient of the site were known to be relatively high. Time series plots of TDS concentration for the period from 1952 to 1980 for two wells approximately three miles northwest of the Site (04N01E06H01S and 05N01E32R01S; see Figure 2) show that TDS concentrations before 1980 were generally between 350 and 500 mg/L but periodically spiked as high as 1,500 mg/L (Schlumberger, 2007). TDS concentrations further north in the vicinity of Lucerne Dry Lake have been higher, at concentrations greater than 4,000 mg/L. The average TDS concentration in the Lucerne Valley Groundwater Basin is 1,099 mg/L (Schlumberger, 2007). Potential sources of high TDS groundwater northwest and downgradient of the LVLDL may include historical farming operations and evaporative concentration of salts beneath the dry lake. As the downgradient TDS concentrations are equal to or above the TDS concentrations of water delivered to the LVLDL from BBARWA, the current discharges are not predicted to degrade existing groundwater quality or limit existing beneficial uses.

4.2.2 Nitrate Concentrations in Groundwater

Nitrate concentration changes in groundwater samples collected from the upgradient monitoring well MW-1 between 1991 and 2016 are likely associated with historical discharges at the LVLDL basins or an upgradient source(s). The nitrate concentration in the sample collected in 1991 was 4.8 mg/L (see Figure 8). Concentrations in samples from this well rose to 10.5 mg/L (just over the MCL of 10 mg/L) between 1991 and 2000, decreased to between 7 and 8 mg/L between 2004 and 2010, and then started increasing again to as high as 15.7 mg/L in 2015. The initial rise in concentrations between 1991 and 2000 was likely associated with the higher concentration of nitrate in the delivered water that was discharged to the unlined basins between 1991 and 1997. With the delivery of treated water with lower nitrate concentrations in 1997, the nitrate concentration in MW-1 dropped between 2000 and 2010. Since 2010, nitrate concentrations in samples from MW-1 have been increasing, despite the fact that nitrate concentrations in the delivered water remain, for the most part, lower than the concentrations in MW-1. This trend is similar to that observed for TDS and suggests that there is an upgradient source of the nitrate and TDS that is contributing to the concentrations observed in this well.

Nitrate concentration changes in groundwater samples collected from the downgradient monitoring wells MW-2 and MW-3 between 1991 and 2016 are likely associated with irrigation practices and agricultural land use at the LVLDL. Nitrate concentrations between 2000 and 2016 generally range from 14 to 20 mg/L and show a decreasing concentration trend over time

(see Figure 8; Table 2). The decreasing concentrations may be a result of lower concentrations in the delivered BBARWA water, increased irrigation efficiency, or both. The nitrate spike observed in the samples from MW-2 collected between 1997 and 2000 correlate with a similar spike in TDS concentrations observed in the samples from this well during the same time. Nitrate concentrations were detected as high as 70 mg/L during this time. As MW-2 is directly downgradient of an irrigated field, the concentrations may be associated with differential fertilization and/or overirrigation of the crops directly upgradient of this well during this time, cross-contamination during sampling, or some other source. It is noted that WSC (2016) conducted a study of the nitrate demand and historical fertilization practices for the crops grown at the LVLDL and found that there was no evidence of over-fertilization of the fields.

4.2.3 Analysis of Changes in Groundwater Quality at the LVLDL

The TDS and nitrate concentrations in groundwater directly beneath the LVLDL between 1991 and 2016 appear to be associated with a combination of native groundwater quality, delivered BBARWA water quality, agricultural land use, and upgradient sources. Data from the upgradient well MW-1 suggests that the native TDS beneath the Site was approximately 300 mg/L. The TDS of treated water delivered to the Site from BBARWA has ranged from 400 to 500 mg/L. Although the BBARWA delivered water could account for somewhat higher TDS concentrations in groundwater beneath the site (between 300 and 500 mg/L), even higher concentrations detected in the downgradient monitoring wells (MW-2 and MW-3), which range from 500 to 900 mg/L, appear to be associated with a source other than BBARWA treated water delivered to the site. The same correlation is also true of nitrate for the time period between approximately 2000 and 2016.

The most likely source of the elevated TDS and nitrate concentrations in the groundwater at the downgradient wells is historical return flow from irrigation and fertilization in excess of plant demands. Based on interviews of the farmers of the crops on the LVLDL, as reported in BBARWA's Draft Irrigation Management Plan for the Lucerne Valley Facility (WSC, 2016), the rate of fertilizer application does not exceed the crop demand. As such, it is possible that irrigation practices, such as periodic overwatering, could have leached the nitrogen below the root zones of the plants and into the groundwater before the plants were able to absorb the fertilizer.

Since 2010, increases in TDS and nitrate concentrations in the upgradient monitoring well (MW-1) are likely associated with an upgradient source. There are multiple homes in the vicinity of the LVLDL (see Figure 4). Homes in this area discharge their wastewater through individual onsite septic systems. There are three homes upgradient of the LVLDL and one home is located approximately 1,400 feet upgradient from MW-1. Given that the TDS and nitrate concentrations detected in samples from MW-1 since 2010 generally exceed concentrations in

the delivered water from BBARWA and, in some cases, the concentrations in the downgradient monitoring wells, an upgradient source is likely and discharges via individual septic systems are a plausible source.

Changes in groundwater quality over time from 1991, 1998 and 2001 in wells MW-1 through MW-3 are shown on Figure 9 in the form of a trilinear or piper diagram. A piper diagram presents selected major constituents, including calcium, magnesium, sodium, potassium, bicarbonate, chloride and sulfate and graphically illustrates the results of the water quality analysis. As shown, the general water chemical signature of samples collected from the upgradient well is distinct from the water chemical signature of the samples from the downgradient wells. As the most recent samples were collected in 2001, this likely illustrates the difference between the native water quality and the water quality changes associated with agricultural land use. Changes in the upgradient MW-1 water quality between 1991 and 2001 may be associated with influence from the infiltration of delivered BBARWA water in the unlined basins and/or upgradient sources.

5 Conclusions and Recommendations

Based on the findings of this study, TH&Co has developed the following conclusions:

- Groundwater levels in monitoring wells at the Site have risen steadily since the wells were constructed in 1991 (see Figure 3) and indicate that natural recharge to the aquifer beneath the Site is being supplemented from a combination of irrigation return flow and discharge to the unlined basins.
- With the exception of periodic spikes, TDS and nitrate concentrations in the water delivered to the LVLDL are generally below the secondary MCL for TDS (500 mg/L) and primary MCL for nitrate (10 mg/L). The average TDS concentration in the BBARWA water is 427 mg/L from 1991 to 2015 and the average nitrate concentration from 2002 to 2017 is 2.4 mg/L.
- As the TDS and nitrate concentrations in the delivered water from BBARWA are lower than the TDS and nitrate concentrations detected in samples from the downgradient monitoring wells at the Site (MW-2 and MW-3), it is concluded that the delivered water from BBARWA is not the source of the high TDS and nitrate concentrations in these two wells.
- A possible source of high TDS and nitrate concentrations in groundwater from MW-2 and MW-3 is the leaching of salts and fertilizer in return flow from the agricultural operation.
- Historical TDS concentrations in groundwater downgradient of the LVLDL have been equal to or higher than the TDS concentrations in BBARWA's water delivered to the LVLDL. The downgradient high TDS concentrations were measured prior to BBARWA's discharge at the site and may be related to other farming operations in the area and, to a lesser degree, capture of high TDS groundwater resulting from evaporative concentration of salts beneath Lucerne Dry Lake.
- Recent increases in TDS and nitrate concentrations in the upgradient monitoring well at the Site (MW-1) indicate that an upgradient source is contributing to the elevated TDS and nitrate concentrations in the groundwater beneath the Site. A potential offsite source of the high TDS and high nitrate may be discharges from one or more individual septic systems at homes located upgradient of the Site.

The RWQCB does not currently have a Basin Plan Objective for TDS in groundwater in the Lucerne Valley Groundwater Basin. The secondary MCL for TDS in groundwater is 500 mg/L. Prior to BBARWA's discharges to the LVLDL in 1980, TDS concentrations in wells downgradient of the Site generally ranged from approximately 350 to 500 mg/L but periodically spiked as high as 1,500 mg/L. In the furthest downgradient portion of the Basin beneath Lucerne Dry Lake, the TDS concentrations in groundwater are significantly higher. The average TDS concentration in the Basin as a whole is approximately 1,100 mg/L (Schlumberger, 2007).

As the downgradient TDS concentrations in groundwater are equal to or above the TDS concentrations of water delivered to the LVLDL from BBARWA and the basinwide average TDS concentration is above that of the delivered water, the delivered water is not predicted to degrade the existing groundwater quality or limit existing downgradient beneficial uses. The previous BBARWA effluent limit for TDS is 400 mg/L over the TDS of the domestic source water. Based on the findings of this groundwater quality evaluation, there is no need to change BBARWA's discharge TDS limit from the existing criteria.

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Tables

Groundwater Elevations in Lucerne Valley Monitoring Wells

Well Name	Date	Reference Point Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-1	7-Oct-91	3,050.72	186.6	2,864.12
MW-1	16-Nov-93	3,050.72	184.2	2,866.52
MW-1	20-Nov-95	3,050.72	175.5	2,875.22
MW-1	16-Apr-96	3,050.72	175.3	2,875.42
MW-1	27-Nov-96	3,050.72	174.9	2,875.82
MW-1	15-May-97	3,050.72	174.5	2,876.22
MW-1	18-Nov-97	3,050.72	175.6	2,875.12
MW-1	19-May-98	3,050.72	174.4	2,876.32
MW-1	19-Nov-98	3,050.72	171.8	2,878.92
MW-1	23-Nov-99	3,050.72	171.5	2,879.22
MW-1	8-Aug-00	3,050.72	171.5	2,879.22
MW-1	14-Nov-00	3,050.72	172.0	2,878.72
MW-1	24-Apr-01	3,050.72	172.3	2,878.42
MW-1	19-Nov-01	3,050.72	173.0	2,877.72
MW-1	16-Apr-02	3,050.72	173.9	2,876.82
MW-1	26-Nov-02	3,050.72	174.8	2,875.92
MW-1	1-May-03	3,050.72	174.9	2,875.82
MW-1	18-Nov-03	3,050.72	175.3	2,875.42
MW-1	1-Apr-04	3,050.72	175.4	2,875.32
MW-1	4-Nov-04	3,050.72	175.6	2,875.12
MW-1	5-May-05	3,050.72	173.0	2,877.68
MW-1	3-Nov-05	3,050.72	171.5	2,879.22
MW-1	27-Apr-06	3,050.72	171.6	2,879.12
MW-1	16-Nov-06	3,050.72	171.4	2,879.32
MW-1	27-Apr-07	3,050.72	170.4	2,880.32
MW-1	7-Nov-07	3,050.72	170.4	2,880.32
MW-1	19-Feb-08	3,050.72	172.0	2,878.72
MW-1	15-Apr-08	3,050.72	171.4	2,879.32
MW-1	29-Jul-08	3,050.72	171.2	2,879.52
MW-1	18-Nov-08	3,050.72	171.5	2,879.22
MW-1	13-Apr-09	3,050.72	172.0	2,878.72
MW-1	10-Aug-09	3,050.72	172.5	2,878.22
MW-1	9-Nov-09	3,050.72	172.8	2,877.92
MW-1	18-Feb-10	3,050.72	172.9	2,877.82
MW-1	20-Apr-10	3,050.72	171.7	2,879.02
MW-1	3-Aug-10	3,050.72	170.4	2,880.32
MW-1	1-Nov-10	3,050.72	170.6	2,880.12

Groundwater Elevations in Lucerne Valley Monitoring Wells

Well Name	Date	Reference Point Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-1	7-Feb-11	3,050.72	170.4	2,880.32
MW-1	26-Apr-11	3,050.72	168.9	2,881.82
MW-1	2-Aug-11	3,050.72	168.0	2,882.72
MW-1	1-Nov-11	3,050.72	168.1	2,882.62
MW-1	9-Mar-12	3,050.72	167.5	2,883.22
MW-1	17-Apr-12	3,050.72	167.0	2,883.72
MW-1	9-Aug-12	3,050.72	167.2	2,883.52
MW-1	15-Nov-12	3,050.72	167.9	2,882.82
MW-1	24-Jan-13	3,050.72	167.8	2,882.92
MW-1	23-Apr-13	3,050.72	167.2	2,883.52
MW-1	5-Aug-13	3,050.72	167.7	2,883.02
MW-1	18-Nov-13	3,050.72	168.5	2,882.22
MW-1	18-Feb-14	3,050.72	168.0	2,882.72
MW-1	21-Apr-14	3,050.72	167.9	2,882.82
MW-1	11-Aug-14	3,050.72	168.8	2,881.92
MW-1	20-Nov-14	3,050.72	167.0	2,883.72
MW-1	27-Apr-15	3,050.72	170.4	2,880.32
MW-1	10-Aug-15	3,050.72	171.0	2,879.72
MW-1	17-Nov-15	3,050.72	171.9	2,878.82
MW-1	22-Feb-16	3,050.72	172.3	2,878.42
MW-1	4-Apr-16	3,050.72	172.0	2,878.72
MW-1	26-Jul-16	3,050.72	171.8	2,878.92
MW-1	16-Aug-16	3,050.72	172.0	2,878.72
MW-2	7-Oct-91	2,980.14	-	2,839.14
MW-2	16-Nov-93	2,980.14	137.9	2,842.24
MW-2	20-Nov-95	2,980.14	131.5	2,848.64
MW-2	16-Apr-96	2,980.14	131.1	2,849.04
MW-2	27-Nov-96	2,980.14	129.9	2,850.24
MW-2	15-May-97	2,980.14	130.0	2,850.14
MW-2	18-Nov-97	2,980.14	133.0	2,847.14
MW-2	19-May-98	2,980.14	135.0	2,845.14
MW-2	19-Nov-98	2,980.14	132.6	2,847.54
MW-2	23-Nov-99	2,980.14	130.4	2,849.74
MW-2	8-Aug-00	2,980.14	129.2	2,850.94
MW-2	14-Nov-00	2,980.14	129.6	2,850.54
MW-2	24-Apr-01	2,980.14	127.9	2,852.24
MW-2	19-Nov-01	2,980.14	129.4	2,850.74

Groundwater Elevations in Lucerne Valley Monitoring Wells

Well Name	Date	Reference Point Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-2	16-Apr-02	2,980.14	130.3	2,849.84
MW-2	26-Nov-02	2,980.14	131.0	2,849.14
MW-2	1-May-03	2,980.14	131.0	2,849.14
MW-2	18-Nov-03	2,980.14	131.1	2,849.04
MW-2	1-Apr-04	2,980.14	130.3	2,849.84
MW-2	4-Nov-04	2,980.14	130.2	2,849.94
MW-2	5-May-05	2,980.14	131.6	2,848.54
MW-2	3-Nov-05	2,980.14	131.0	2,849.14
MW-2	27-Apr-06	2,980.14	130.3	2,849.84
MW-2	16-Nov-06	2,980.14	128.7	2,851.44
MW-2	27-Apr-07	2,980.14	128.7	2,851.44
MW-2	7-Nov-07	2,980.14	129.8	2,850.34
MW-2	15-Apr-08	2,980.14	128.9	2,851.24
MW-2	18-Nov-08	2,980.14	129.8	2,850.34
MW-2	13-Apr-09	2,980.14	130.0	2,850.14
MW-2	9-Nov-09	2,980.14	130.6	2,849.54
MW-2	20-Apr-10	2,980.14	131.4	2,848.74
MW-2	1-Nov-10	2,980.14	130.7	2,849.44
MW-2	26-Apr-11	2,980.14	130.4	2,849.74
MW-2	1-Nov-11	2,980.14	128.1	2,852.04
MW-2	17-Apr-12	2,980.14	127.6	2,852.54
MW-2	15-Nov-12	2,980.14	128.0	2,852.14
MW-2	23-Apr-13	2,980.14	127.4	2,852.74
MW-2	18-Nov-13	2,980.14	127.2	2,852.94
MW-2	21-Apr-14	2,980.14	126.3	2,853.84
MW-2	12-May-14	2,980.14	126.4	2,853.74
MW-2	20-Nov-14	2,980.14	126.8	2,853.34
MW-2	27-Apr-15	2,980.14	127.2	2,852.94
MW-2	17-Nov-15	2,980.14	127.3	2,852.84
MW-2	4-Apr-16	2,980.14	127.8	2,852.34
MW-2	26-Jul-16	2,980.14	128.0	2,852.14
MW-2	16-Aug-16	2,980.14	128.0	2,852.14
MW-3	7-Oct-91	2,988.42	-	2,835.82
MW-3	16-Nov-93	2,988.42	148.8	2,839.62
MW-3	20-Nov-95	2,988.42	140.5	2,847.92
MW-3	16-Apr-96	2,988.42	140.8	2,847.62
MW-3	27-Nov-96	2,988.42	141.2	2,847.22

Groundwater Elevations in Lucerne Valley Monitoring Wells

Well Name	Date	Reference Point Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-3	15-May-97	2,988.42	142.8	2,845.62
MW-3	18-Nov-97	2,988.42	143.1	2,845.32
MW-3	19-May-98	2,988.42	144.5	2,843.92
MW-3	19-Nov-98	2,988.42	143.5	2,844.92
MW-3	23-Nov-99	2,988.42	139.8	2,848.62
MW-3	8-Aug-00	2,988.42	140.2	2,848.22
MW-3	14-Nov-00	2,988.42	140.4	2,848.02
MW-3	24-Apr-01	2,988.42	136.6	2,851.82
MW-3	19-Nov-01	2,988.42	138.4	2,850.02
MW-3	16-Apr-02	2,988.42	141.0	2,847.42
MW-3	26-Nov-02	2,988.42	142.4	2,846.02
MW-3	1-May-03	2,988.42	142.3	2,846.12
MW-3	18-Nov-03	2,988.42	141.4	2,847.02
MW-3	1-Apr-04	2,988.42	141.6	2,846.82
MW-3	4-Nov-04	2,988.42	141.4	2,847.02
MW-3	5-May-05	2,988.42	143.3	2,845.12
MW-3	3-Nov-05	2,988.42	142.5	2,845.92
MW-3	27-Apr-06	2,988.42	142.0	2,846.42
MW-3	16-Nov-06	2,988.42	139.5	2,848.92
MW-3	27-Apr-07	2,988.42	140.1	2,848.32
MW-3	7-Nov-07	2,988.42	140.9	2,847.52
MW-3	15-Apr-08	2,988.42	141.8	2,846.62
MW-3	18-Nov-08	2,988.42	142.0	2,846.42
MW-3	13-Apr-09	2,988.42	140.7	2,847.72
MW-3	9-Nov-09	2,988.42	141.6	2,846.82
MW-3	20-Apr-10	2,988.42	143.0	2,845.42
MW-3	1-Nov-10	2,988.42	142.4	2,846.02
MW-3	26-Apr-11	2,988.42	140.7	2,847.72
MW-3	1-Nov-11	2,988.42	140.4	2,848.02
MW-3	17-Apr-12	2,988.42	139.6	2,848.82
MW-3	15-Nov-12	2,988.42	139.8	2,848.62
MW-3	23-Apr-13	2,988.42	139.9	2,848.52
MW-3	18-Nov-13	2,988.42	140.6	2,847.82
MW-3	21-Apr-14	2,988.42	141.0	2,847.42
MW-3	12-May-14	2,988.42	141.2	2,847.22
MW-3	20-Nov-14	2,988.42	142.0	2,846.42
MW-3	27-Apr-15	2,988.42	142.4	2,846.02

Groundwater Elevations in Lucerne Valley Monitoring Wells

Well Name	Date	Reference Point Elevation (ft amsl)	Depth to Water (ft bgs)	Groundwater Elevation (ft amsl)
MW-3	17-Nov-15	2,988.42	141.5	2,846.92
MW-3	4-Apr-16	2,988.42	141.7	2,846.72
MW-3	26-Jul-16	2,988.42	140.9	2,847.52
MW-3	16-Aug-16	2,988.42	140.8	2,847.62

TDS and Nitrate Results in Lucerne Valley Land Discharge Location Monitoring Wells

Well	Date Sampled	TDS (mg/L)	Nitrate as N (mg/L)
MW-1	31-Oct-91	560	4.8
MW-1	27-May-97	310	7.6
MW-1	18-Nov-97	298	8.4
MW-1	19-Nov-98	285	9.8
MW-1	23-Nov-99	296	10.4
MW-1	8-Aug-00	N/A	10.5
MW-1	14-Nov-00	292	10.1
MW-1	24-Apr-01	N/A	10.0
MW-1	19-Nov-01	320	8.8
MW-1	16-Apr-02	318	9.1
MW-1	26-Nov-02	324	8.5
MW-1	1-May-03	278	8.1
MW-1	18-Nov-03	316	8.1
MW-1	1-Apr-04	286	8.0
MW-1	4-Nov-04	322	8.1
MW-1	4-May-05	310	7.7
MW-1	3-Nov-05	320	9.4
MW-1	27-Apr-06	N/A	7.7
MW-1	16-Nov-06	N/A	7.8
MW-1	27-Apr-07	N/A	7.1
MW-1	7-Nov-07	N/A	7.7
MW-1	19-Feb-08	N/A	7.3
MW-1	15-Apr-08	309	7.3
MW-1	29-Jul-08	N/A	N/A
MW-1	18-Nov-08	409	7.5
MW-1	13-Apr-09	348	7.6
MW-1	10-Aug-09	N/A	N/A
MW-1	9-Nov-09	354	8.5
MW-1	18-Feb-10	N/A	N/A
MW-1	20-Apr-10	314	7.4
MW-1	3-Aug-10	N/A	N/A
MW-1	1-Nov-10	N/A	10.0
MW-1	7-Feb-11	N/A	N/A
MW-1	26-Apr-11	N/A	9.7
MW-1	2-Aug-11	N/A	N/A
MW-1	1-Nov-11	425	8.9
MW-1	9-Mar-12	N/A	N/A

TDS and Nitrate Results in Lucerne Valley Land Discharge Location Monitoring Wells

Well	Date Sampled	TDS (mg/L)	Nitrate as N (mg/L)
MW-1	17-Apr-12	370	8.7
MW-1	9-Aug-12	N/A	N/A
MW-1	15-Nov-12	424	9.6
MW-1	24-Jan-13	N/A	N/A
MW-1	23-Apr-13	N/A	9.2
MW-1	5-Aug-13	N/A	N/A
MW-1	18-Nov-13	483	9.9
MW-1	18-Feb-14	N/A	N/A
MW-1	21-Apr-14	454	9.0
MW-1	11-Aug-14	N/A	N/A
MW-1	20-Nov-14	720	12.6
MW-1	27-Apr-15	504	10.3
MW-1	10-Aug-15	N/A	N/A
MW-1	17-Nov-15	674	15.7
MW-1	22-Feb-16	N/A	N/A
MW-1	4-Apr-16	415	7.9
MW-1	26-Jul-16	N/A	N/A
MW-1	16-Aug-16	473	10.0
MW-2	31-Oct-91	460	8.6
MW-2	18-Nov-97	1140	66.6
MW-2	19-May-98	N/A	61.8
MW-2	19-Nov-98	1220	69.5
MW-2	24-May-99	N/A	39.1
MW-2	08-Jun-99	876	30
MW-2	23-Nov-99	957	38
MW-2	08-Aug-00	N/A	28.4
MW-2	14-Nov-00	740	17.9
MW-2	24-Apr-01	N/A	24
MW-2	19-Nov-01	730	23
MW-2	16-Apr-02	716	18.9
MW-2	26-Nov-02	746	17.6
MW-2	01-May-03	660	17
MW-2	18-Nov-03	661	16.7
MW-2	01-Apr-04	688	16.3
MW-2	04-Nov-04	699	15.9
MW-2	04-May-05	697	15.2
MW-2	3-Nov-05	740	18.0

TDS and Nitrate Results in Lucerne Valley Land Discharge Location Monitoring Wells

Well	Date Sampled	TDS (mg/L)	Nitrate as N (mg/L)
MW-2	27-Apr-06	N/A	16.2
MW-2	16-Nov-06	N/A	17.0
MW-2	27-Apr-07	N/A	14.7
MW-2	7-Nov-07	N/A	15.0
MW-2	15-Apr-08	742	14.8
MW-2	18-Nov-08	786	14.4
MW-2	13-Apr-09	761	14.1
MW-2	9-Nov-09	737	15.1
MW-2	20-Apr-10	729	13.8
MW-2	1-Nov-10	N/A	17
MW-2	26-Apr-11	N/A	17
MW-2	1-Nov-11	780	15.4
MW-2	17-Apr-12	726	15.7
MW-2	15-Nov-12	713	15.4
MW-2	23-Apr-13	N/A	15.8
MW-2	18-Nov-13	719	17.0
MW-2	21-Apr-14	691	15.7
MW-2	12-May-14	N/A	N/A
MW-2	20-Nov-14	689	15.7
MW-2	27-Apr-15	688	15.3
MW-2	17-Nov-15	702	16.5
MW-2	4-Apr-16	615	16
MW-2	26-Jul-16	N/A	N/A
MW-2	16-Aug-16	688	16.1
MW-3	31-Oct-91	440	4
MW-3	01-Nov-91	N/A	0.9
MW-3	15-May-97	650	14
MW-3	18-Nov-97	544	12.6
MW-3	19-May-98	N/A	13.7
MW-3	19-Nov-98	620	13.8
MW-3	23-Nov-99	672	18.2
MW-3	08-Aug-00	N/A	20.6
MW-3	14-Nov-00	700	16.3
MW-3	24-Apr-01	N/A	24

TDS and Nitrate Results in Lucerne Valley Land Discharge Location Monitoring Wells

Well	Date Sampled	TDS (mg/L)	Nitrate as N (mg/L)
MW-3	19-Nov-01	860	28
MW-3	16-Apr-02	776	23.1
MW-3	26-Nov-02	829	22.4
MW-3	01-May-03	798	21.7
MW-3	18-Nov-03	776	21.9
MW-3	01-Apr-04	782	21.6
MW-3	04-Nov-04	709	21.6
MW-3	04-May-05	705	21.2
MW-3	3-Nov-05	790	19.0
MW-3	27-Apr-06	N/A	20.5
MW-3	16-Nov-06	N/A	21.0
MW-3	27-Apr-07	N/A	19.3
MW-3	7-Nov-07	N/A	20.1
MW-3	15-Apr-08	687	20.6
MW-3	18-Nov-08	701	20.0
MW-3	13-Apr-09	696	19.6
MW-3	9-Nov-09	686	20.1
MW-3	20-Apr-10	747	18.2
MW-3	1-Nov-10	665	20
MW-3	26-Apr-11	N/A	19
MW-3	1-Nov-11	665	17.5
MW-3	17-Apr-12	660	16.7
MW-3	15-Nov-12	577	16.4
MW-3	23-Apr-13	N/A	16.1
MW-3	18-Nov-13	577	17.0
MW-3	21-Apr-14	568	15.7
MW-3	12-May-14	N/A	N/A
MW-3	20-Nov-14	608	15.6
MW-3	27-Apr-15	602	15.0
MW-3	17-Nov-15	573	16.5
MW-3	4-Apr-16	494	15.4
MW-3	26-Jul-16	N/A	N/A
MW-3	16-Aug-16	573	15.2

Notes:

N/A = Not Available

Data from Big Bear Area Regional Wastewater Agency.

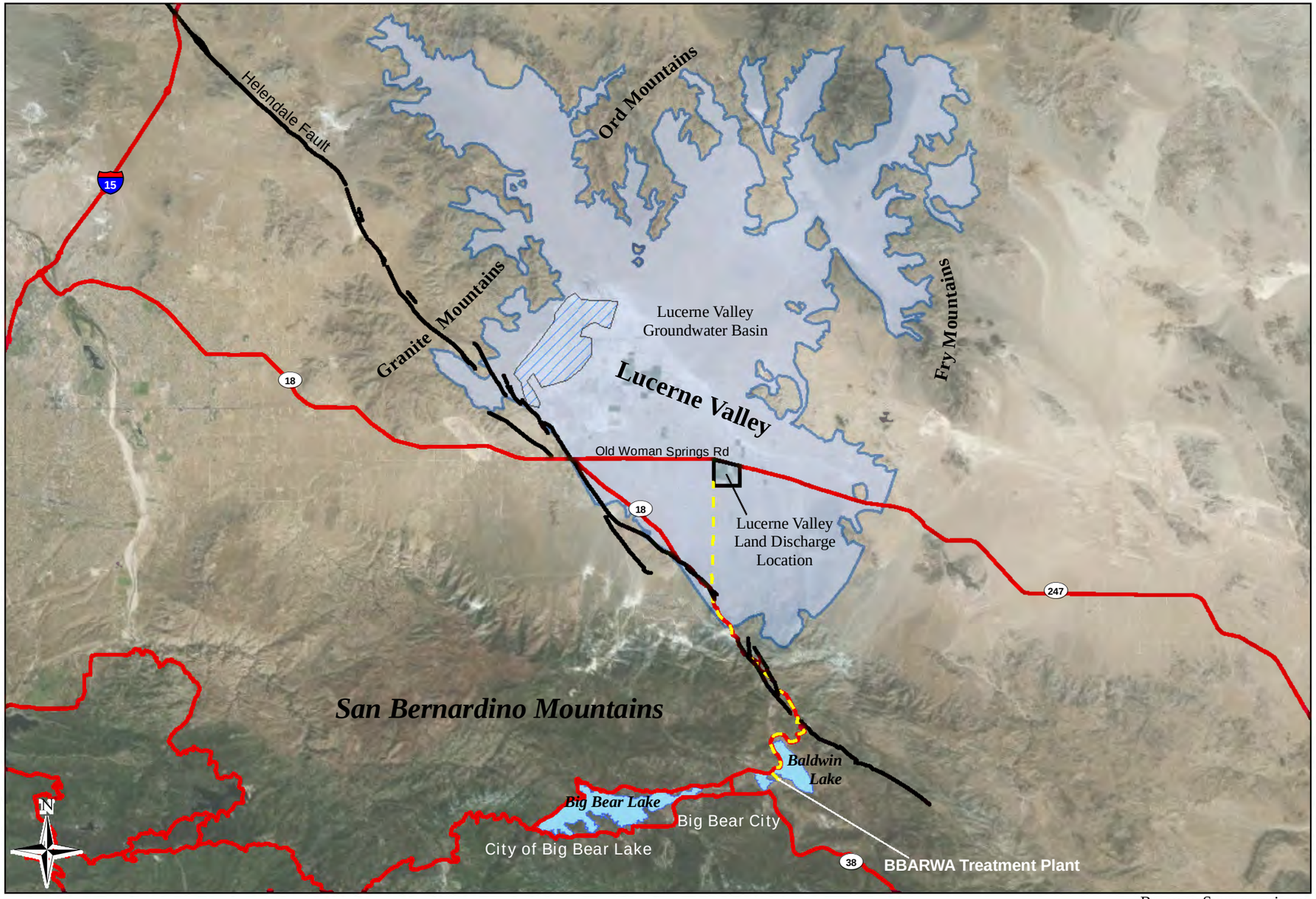
Figures

WSC
Water Systems Consulting, Inc.

BBARWA
BIG BEAR AREA REGIONAL WASTEWATER AGENCY

22-Dec-17

Groundwater Quality Evaluation at the Lucerne Valley Land Discharge Location



Basemap Source: esri.com

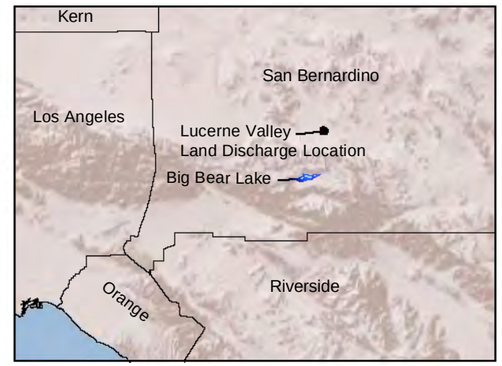
0 2.5 5 10 Miles

NAD 83 UTM Zone 11

Map Features

- Lucerne Valley Groundwater Basin
- Lucerne Valley Land Discharge Location
- Lake
- Lucerne Dry Lake
- Helendale fault
- Discharge Pipeline
- Highway

Regional Location



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Regional Location

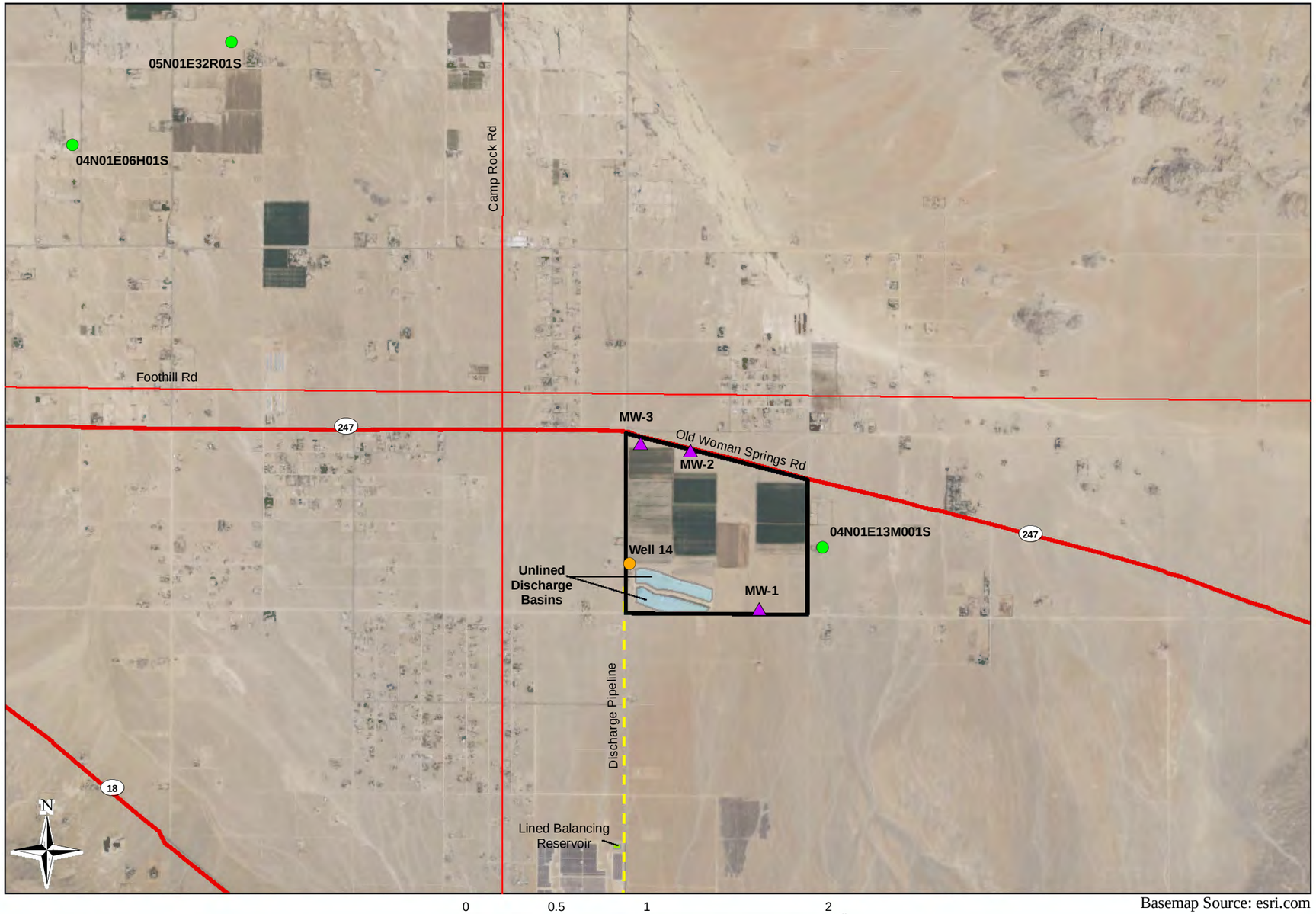
Figure 1

WSC
WATER SYSTEMS CONSULTING, INC.

BBARWA
BIG BEAR AREA REGIONAL WASTEWATER AGENCY

Groundwater Quality Evaluation at the Lucerne Valley Land Discharge Location

22-Dec-17



Basemap Source: esri.com

NAD 83 UTM Zone 11

Map Features

- BBARWA Monitoring Well
- Other Well
- Well 14
- Discharge Pipeline
- Freeway
- BBARWA Property Boundary
- Balancing Reservoir
- Unlined Discharge Basin

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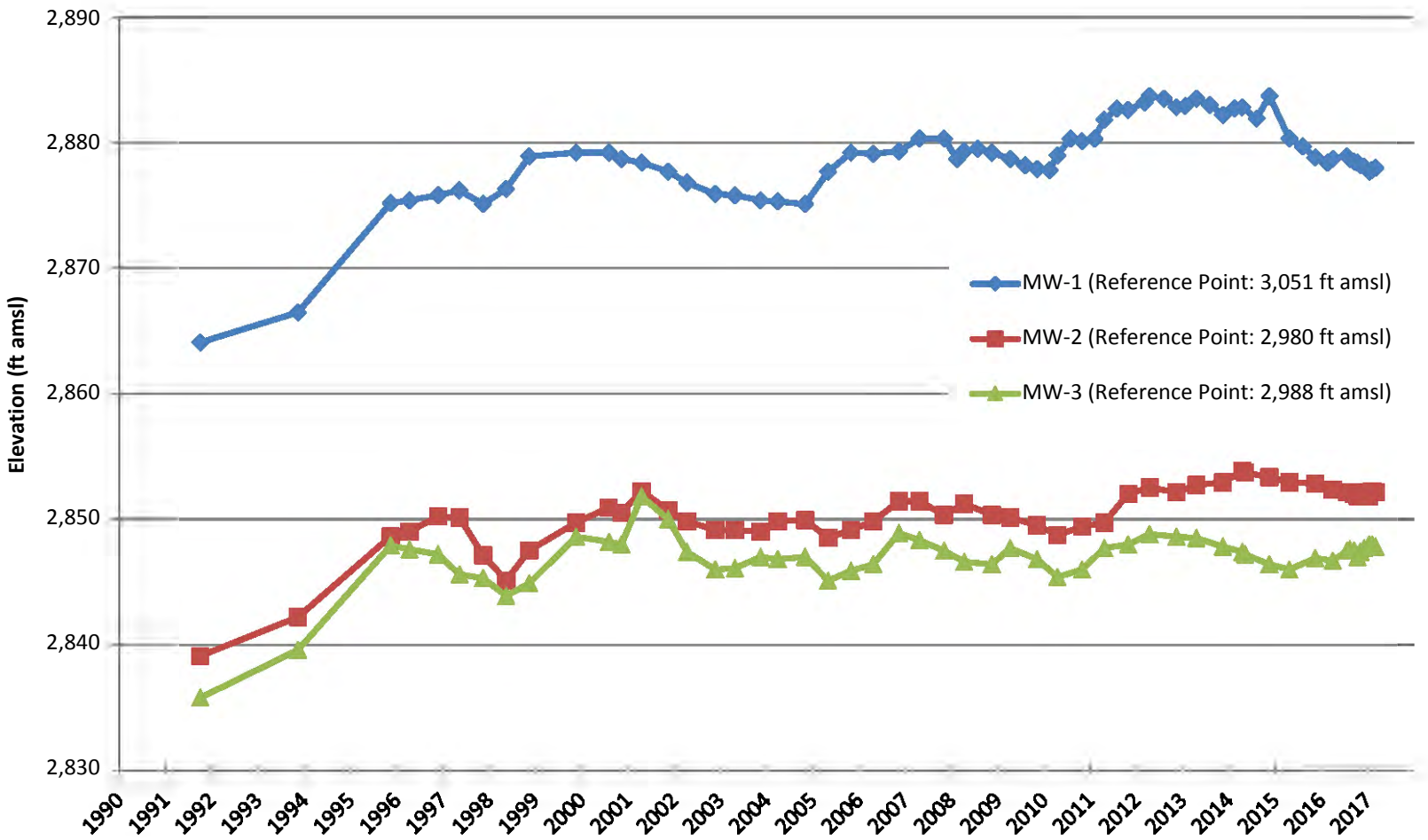
Lucerne Valley Land Discharge Location

Figure 2

Figure 3

Lucerne Valley Groundwater Elevation



Note: ft amsl = feet above mean sea level

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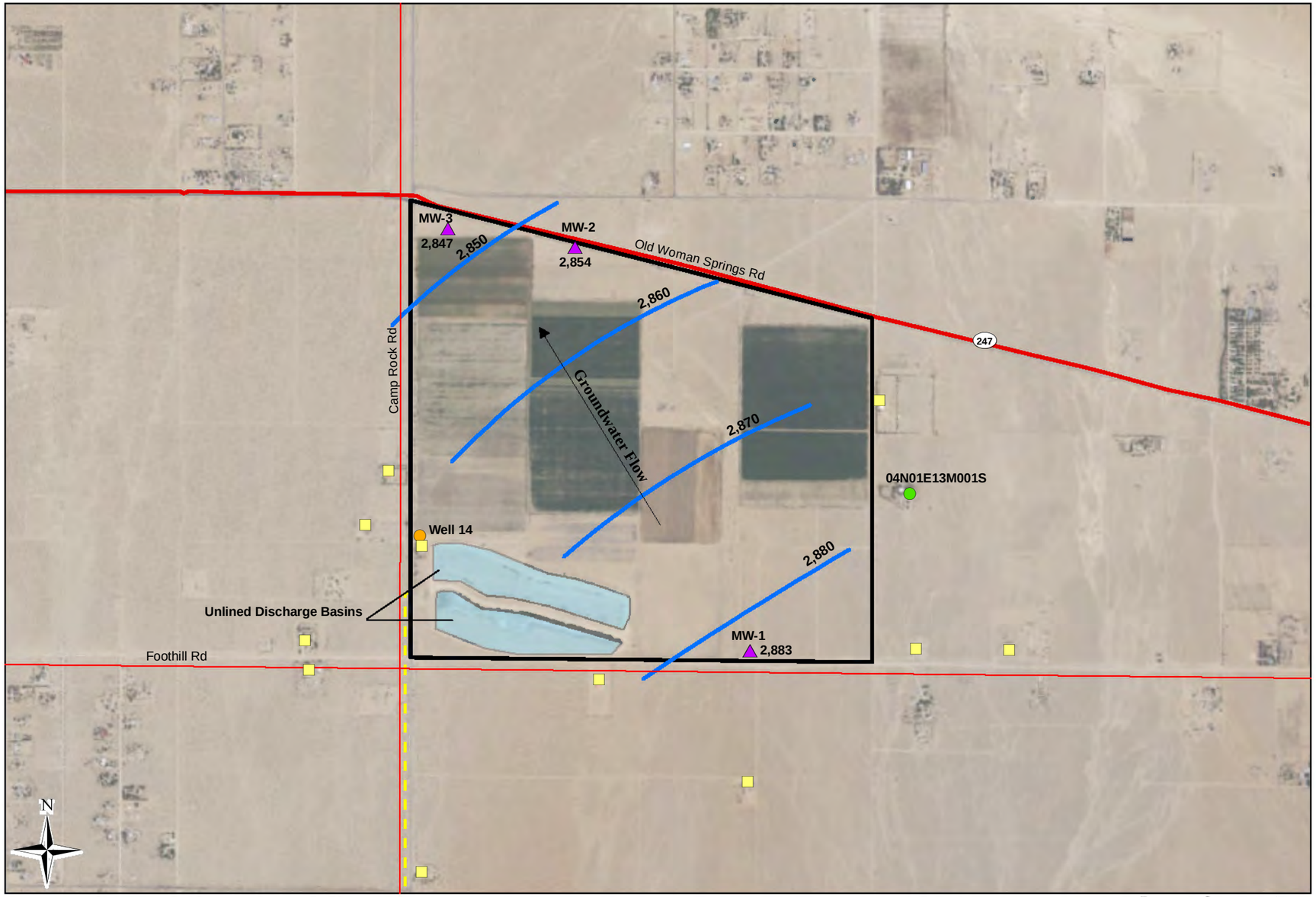
WSC
WATER SYSTEMS CONSULTING, INC.

BBARWA
BIG BEAR AREA REGIONAL WASTEWATER AGENCY

22-Dec-17

Groundwater Quality Evaluation at the Lucerne Valley Land Discharge Location



Basemap Source: esri.com

Map Features

- 2,860 Groundwater Elevation Contour (ft amsl)
- BBARWA Monitoring Well
- Other Well
- House
- Discharge Pipeline
- Highway
- Lucerne Valley Land Discharge Location
- Unlined Discharge Basin

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Groundwater Level Contours April 2014

Figure 4

Figure 5

Total Treated Water Conveyed to the LVLDL from 2000 through 2015

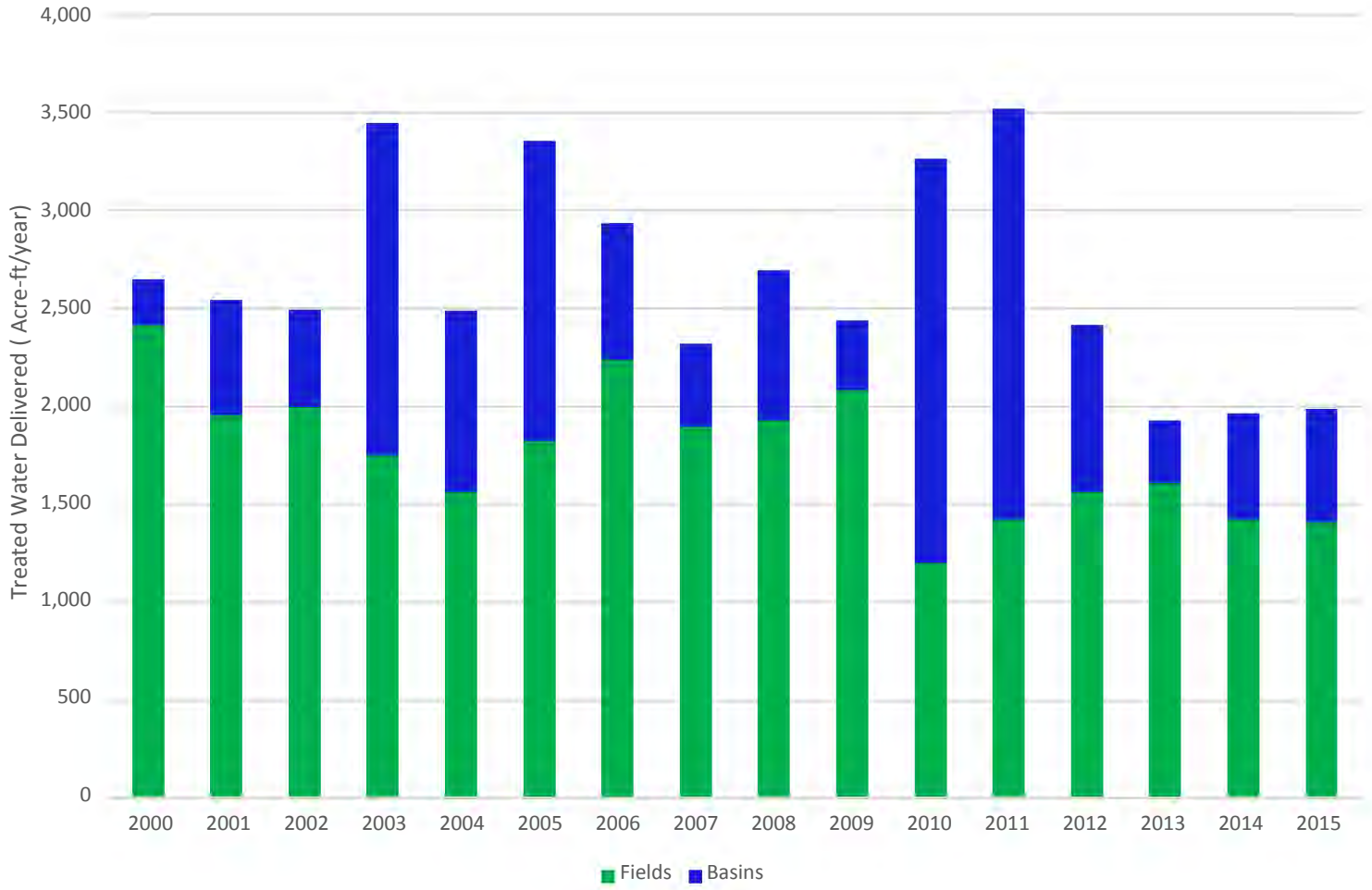

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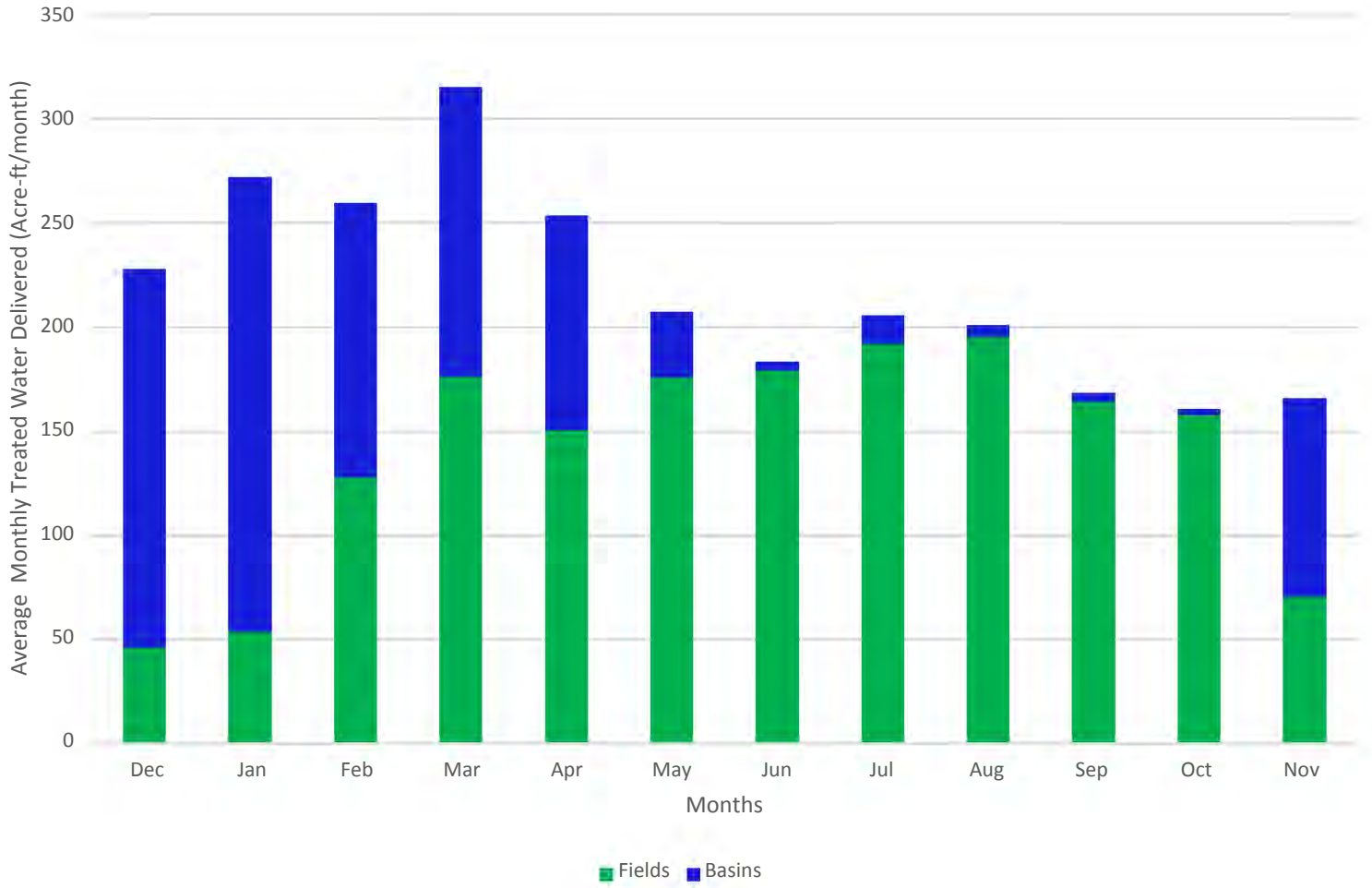
Figure 6

Average Monthly Treated Water Conveyed to Basins and Fields from 2005 through 2015



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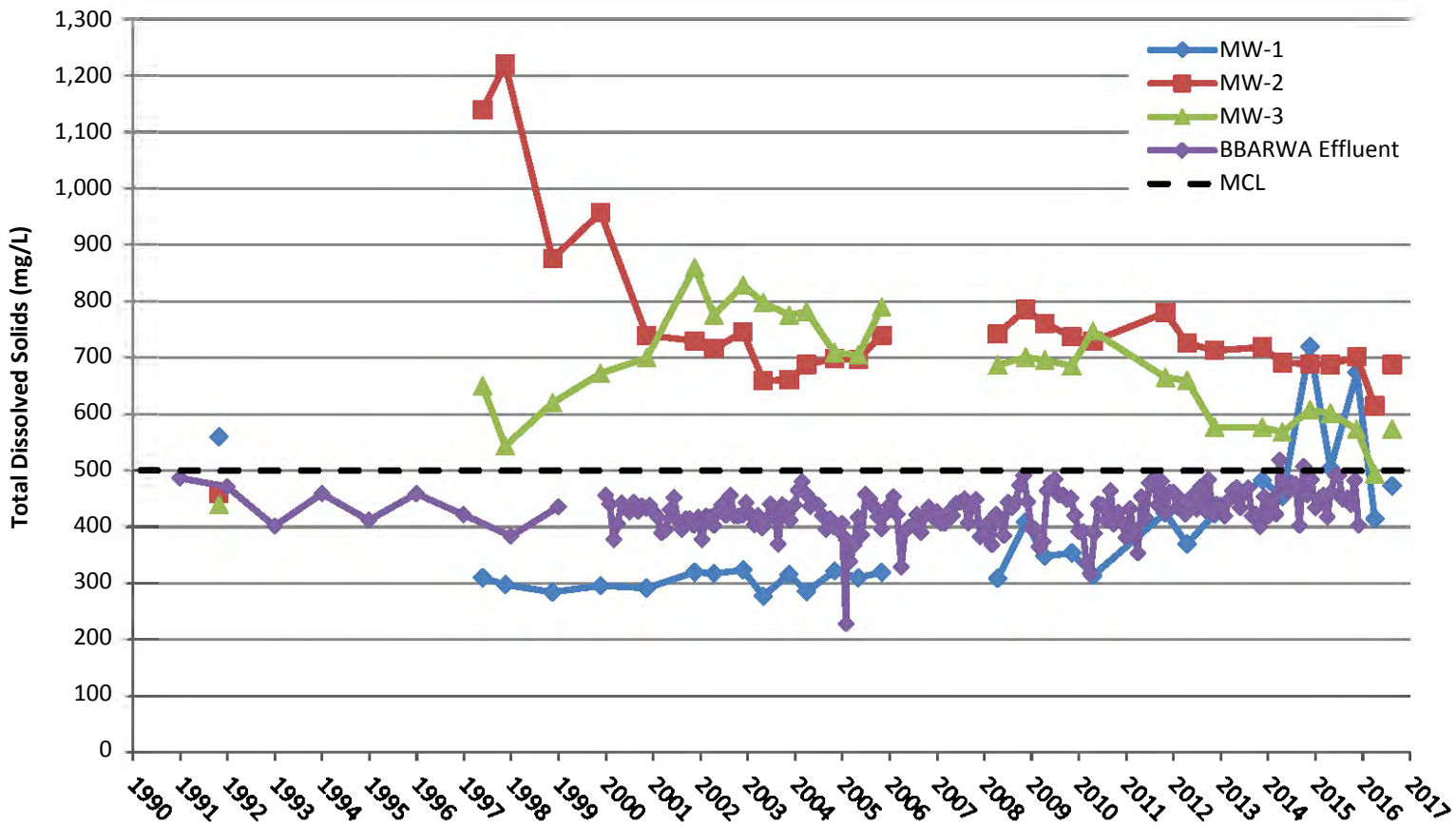
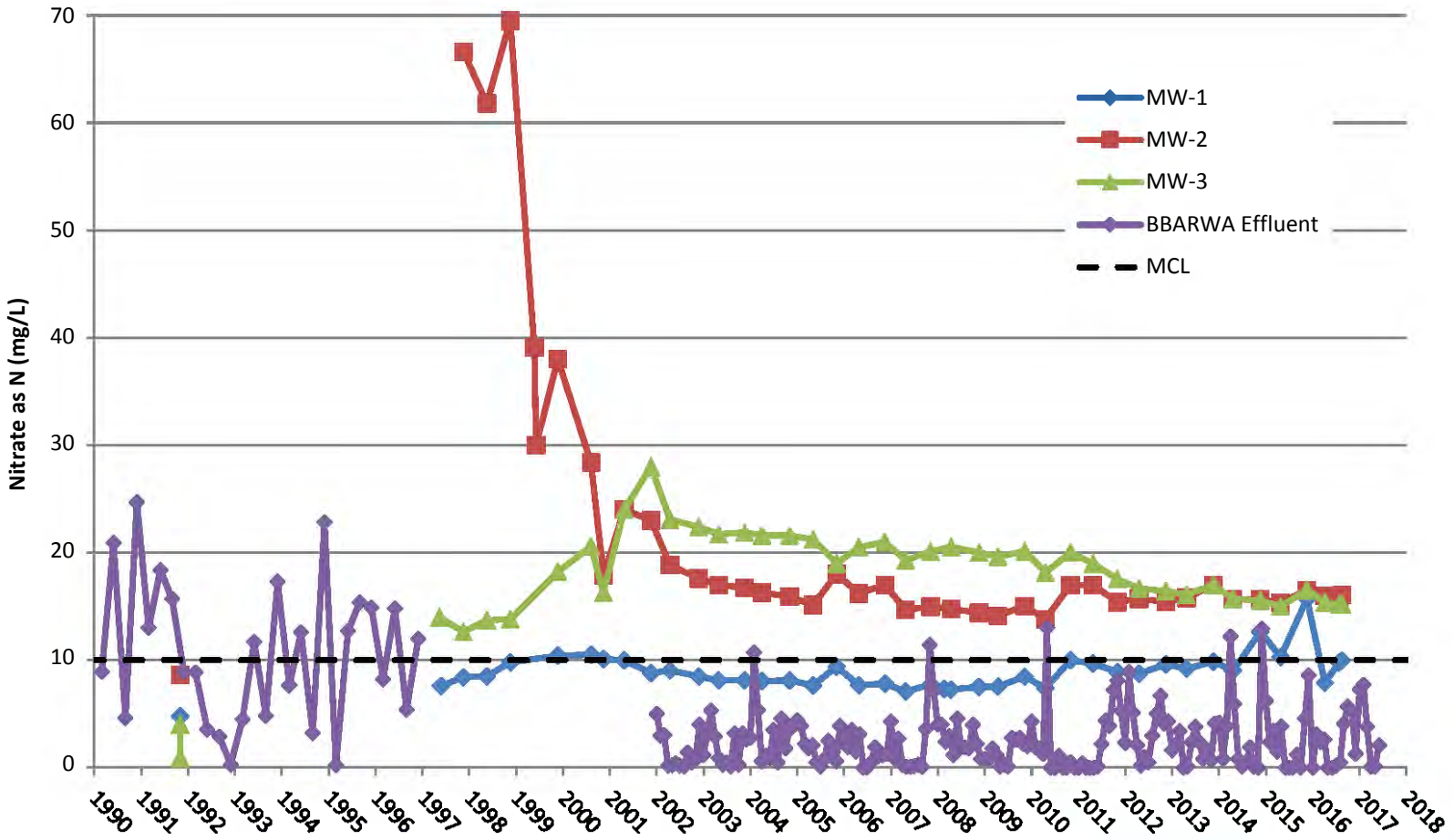
Total Dissolved Solids Concentrations
Lucerne Valley Monitoring Wells



Note: mg/L = milligrams per liter

Nitrate (as N) Concentrations
Lucerne Valley Monitoring Wells



Note: mg/L = milligrams per liter

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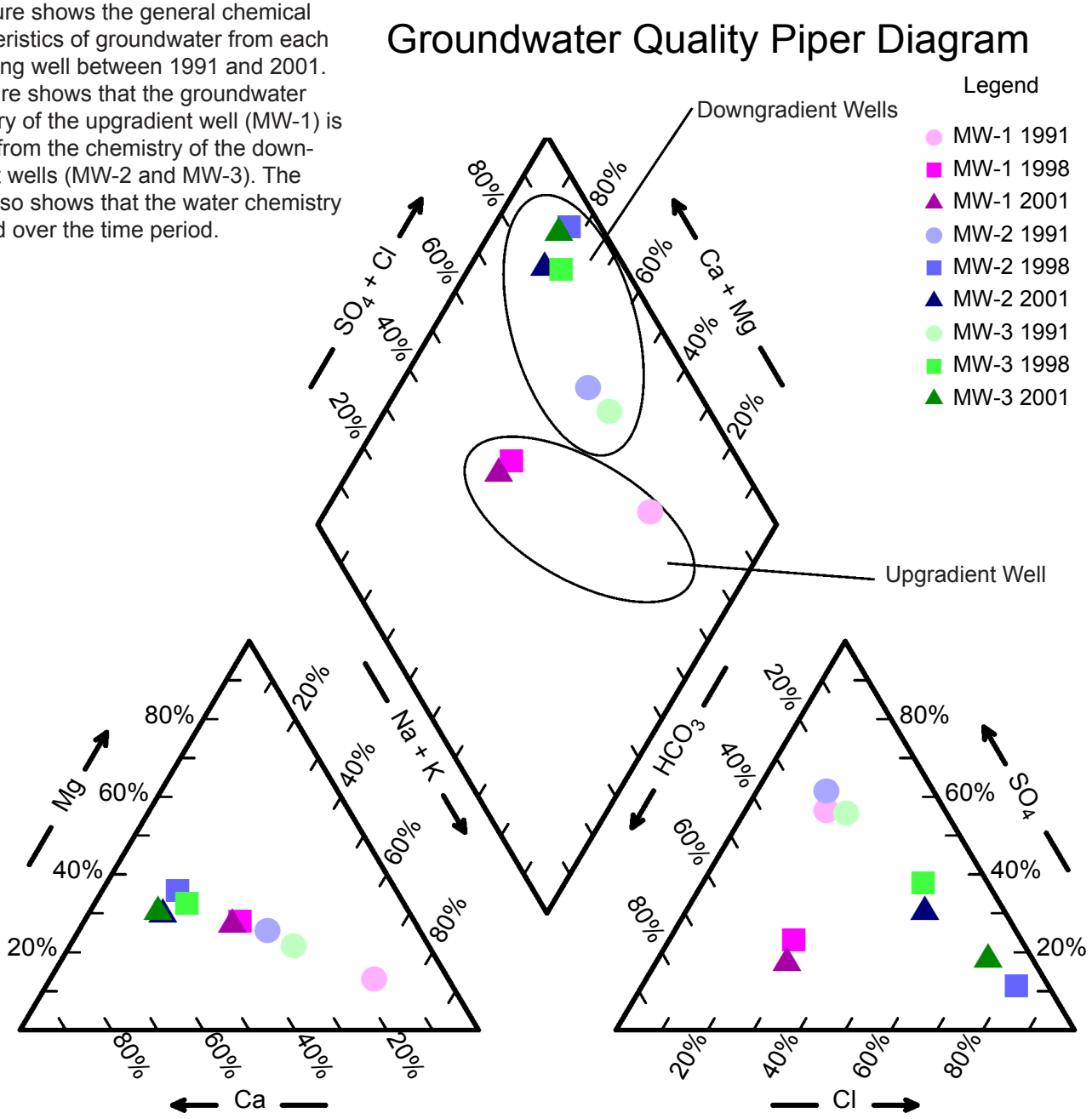
Groundwater Consulting

Water Systems Consulting, Inc./
Big Bear Area Regional Water Agency
Groundwater Quality Evaluation at the Lucerne Valley Land Discharge Location

Figure 9

Monitoring Wells Piper Diagram

This figure shows the general chemical characteristics of groundwater from each monitoring well between 1991 and 2001. The figure shows that the groundwater chemistry of the upgradient well (MW-1) is distinct from the chemistry of the down-gradient wells (MW-2 and MW-3). The figure also shows that the water chemistry changed over the time period.



Appendix A

RWQCB's Investigative Order No. R7 to 2016 to 0026

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

BOARD ORDER R7-2016-0026

WASTE DISCHARGE REQUIREMENTS
FOR
BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
EXPORT OF RECYCLED WATER TO LUCERNE VALLEY
Lucerne Valley – San Bernardino County

The California Regional Water Quality Control Board, Colorado River Basin Region (Colorado River Basin Water Board) finds that:

1. Big Bear Area Regional Wastewater Agency (BBARWA or Discharger), P. O. Box 517, Big Bear City, California 92314, owns 480 acres in the Lucerne Valley, of which 340 acres are irrigated with recycled water from the Discharger's Wastewater Treatment Plant (WWTP). There are an additional 140 acres available for irrigation, also in the Lucerne Valley. BBARWA's WWTP provides sewerage service to the City of Big Bear Lake, Big Bear City Community Services District, and County Service Area 53-B. The WWTP is located at 122 Palomino Drive, Big Bear City, California 92314, and has a design treatment capacity of 4.89 million gallons-per-day (MGD) and a hydraulic capacity of 9.2 MGD.

2. The WWTP is located outside the boundary of the Colorado River Basin Water Board and is regulated by the California Regional Water Quality Control Board, Santa Ana Region (Santa Ana Water Board) under Waste Discharge Requirements (WDRs) Order R8-2005-0044.

3. The WWTP consists of: preliminary treatment, secondary treatment, and sludge drying and treatment. Secondary treated wastewater from the WWTP is disposed through three possible discharge points that are designated in Board Order R8-2005-0044 as Point 001, Point 002 and Point 003. The discharges from the WWTP at Points 002 and 003 are regulated by the Santa Ana Water Board. Most of the treated wastewater is discharged through Discharge Point 001 into the Lucerne Valley to irrigate fodder, fiber, and seed crops.

4. This Board Order regulates the discharge from the WWTP at Point 001. Infrastructure associated with this discharge includes a concrete-lined reservoir and two overflow ponds that are used to dispose of treated recycled wastewater by percolation and evaporation in the Lucerne Valley (Lucerne Valley Facility) located on Assessor's Parcel Number (APN) 0449-082-040000.

5. The Lucerne Valley Facility has been subject to WDRs adopted in Colorado River Basin Water Board Order 01-156 adopted November 14, 2001.

6. The WDRs are being updated to comply with current laws and regulations as set forth in the California Water Code (CWC) and the California Code of Regulations (CCR) and to incorporate any changes in ownership or operation undertaken by the Discharger.

7. The Lucerne Valley Facility is assigned California Integrated Water Quality System (CIWQS) number CW- CW-208930; Waste Discharger Identification (WDID) number 7A360100011, and GeoTracker Global ID number WDR100027897.

Wastewater Treatment and Discharge

8. The Lucerne Valley Facility is located on 480 acres owned by BBARWA and located near the intersection of State Hwy 247 (Old Woman Springs Road) and Camp Rock Road in the Lucerne Valley of San Bernardino County in Section 14, Township 4 North, Range 1 East, San Bernardino Base & Meridian, as shown in Attachment A, Vicinity Map, incorporated herein, and made part of this Board Order by reference.

9. Wastewater that is discharged at the Lucerne Valley Facility goes through preliminary and secondary treatment at the WWTP before it is sent via gravity to the concrete reservoir at the Lucerne Valley Facility. The WWTP components that are used for treatment are described below:

   a. Preliminary Treatment. Untreated wastewater flows to the preliminary treatment system, which consists of bar screens, aerated grit chamber with grit washer, and a flow bypass channel. This treatment stage removes screenings, rag material and grit.

   b. Secondary Treatment. Effluent flows by gravity from the preliminary treatment system to three parallel oxidation ditches for secondary (biological) treatment and timed processes for nutrient (nitrogen) removal. The number of ditches in operation depends on the seasonal fluctuations of the influent flow. The effluent from the oxidation ditches flows into a system of three secondary clarifiers for removal of floatable and settleable solids/materials. The secondary treated effluent flows to two cement-lined balancing chambers and then flows to equalization storage ponds at the WWTP until pumped for offsite irrigation disposal. A process flow diagram of the WWTP is shown on Attachment B, incorporated herein, and made part of this Board Order by reference.

   c. Offsite Irrigation/Disposal. Undisinfected secondary treated wastewater is pumped from the WWTP's main pump building (5.2 MGD) or auxiliary pump building (9.2 MGD) approximately 16.5 miles to an offsite 2.26-million gallon concrete-lined reservoir (undisinfected secondary recycled water reservoir). This reservoir is located one mile south of the irrigation site. Wastewater from the reservoir flows by gravity through an outfall line connected to the irrigation system. In the event of an overflow at the concrete-lined reservoir, the wastewater flows by gravity to earthen overflow ponds located adjacent to the irrigation site.

10. Approximately 2.01 MGD of undisinfected secondary recycled water (as defined in Title 22 California Code of Regulations Section 60301.900) is discharged to the Lucerne Valley Facility for irrigation of fodder and fiber crops. Undisinfected secondary wastewater has been approved by the California Department of Public Health (DPH) [now State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW)] for irrigation use at this site. Approximately 340 acres are being irrigated at the Lucerne Valley Facility, with an additional 140 acres available for irrigation at the site. The effluent discharge limit of 4.8 MGD in this Board Order is based on the capacity of the irrigated crops to take up nitrogen. The Lucerne Valley Facility site layout is shown in Attachment C, incorporated herein, and made part of this Board Order by reference.

11. The SWRCB's Division of Drinking Water has established statewide reclamation criteria in Title 22 CCR Section 60301 et seq. for the use of recycled water and has developed guidelines for specific uses. Title 22 CCR Section 60304(d)(4) allows the use of undisinfected secondary recycled water for the surface irrigation of fodder and fiber crops and pasture for animals not producing milk for human consumption. BBARWA's Title 22

Engineering Report was initially approved on November 3, 1980, by the California DHS, (now DDW). The Title 22 report was last updated November 4, 1998, to allow for the use of tertiary treated wastewater in the Big Bear Area.

12. The grazing of sheep on the irrigation site has been allowed under certain conditions, as outlined in a letter from Colorado River Basin Water Board staff dated November 15, 1994, and under the conditions shown in Discharge Specification D.22 of this Order.

13. No sewage sludge is discharged at the recycled water reuse site.

14. BBARWA's Self-Monitoring Reports (SMRs) from April 2011 through March 2016 characterize the WWTP effluent as follows:

Constituent	Units	Average	Maximum	Minimum
Flow	MGD	2.01	4.18	1.42
20^{o} C BOD_5[1]	mg/L[2]	6	17	2
TSS[3]	mg/L	13	48	5
pH	s.u.[4]	7.8	8.0	7.4
TDS[5]	mg/L	450	519	354
Nitrate as N	mg/L	3.5	21.6	0.1
Total Nitrogen	mg/L	6.9	28	1.9
Chloride	mg/L	52	61	34
Sulfate	mg/L	40	48	26
Fluoride	mg/L	0.37	0.54	0.24
Boron	mg/L	0.18	0.25	<0.1

Hydrogeologic Conditions at the Lucerne Valley Facility

15. BBARWA installed one groundwater monitoring well in 1979 and three more groundwater monitoring wells in 1991 (MW-1, MW-2 and MW-3). Monitoring well MW-3 replaced the 1979 monitoring well, which was never monitored because the groundwater level is below the bottom of the well. Previous monitoring did not require depth to groundwater monitoring; however, the Discharger's reports indicate that MW-1 is the upgradient well. This Board Order will require depth to groundwater monitoring in order to establish the groundwater gradient.

[1] 5-day biochemical oxygen demand at 20 degrees Celsius.
[2] milligrams per Liter
[3] Total Suspended Solids
[4] Standard pH units
[5] Total Dissolved Solids

16. An irrigation well (14M1) was installed immediately northwest of the overflow ponds in 1986. The distance from well 14M1 to the nearest overflow pond is 180 feet.

17. BBARWA has reported that the depth to groundwater at the Lucerne Valley Facility is a minimum 150 feet below ground surface.

18. Groundwater monitoring data collected from monitoring wells MW-1, MW-2 and MW-3 during the period from 2009 to the present show the following average characteristics:

Constituent	Units	MW-1	MW-2	MW-3
Depth to Groundwater[6]	ft	176	130	141
TDS	mg/L	464	718	619
Total Nitrogen	mg/L	10.6	16.2	17.6
Nitrate as Nitrogen	mg/L	9.4	15.6	17.2
Sulfate	mg/L	63.3	203	173
Chloride	mg/L	106	122	135
Fluoride	mg/L	0.25	0.14	0.25
Boron	mg/L	<0.01	<0.01	<0.01
VOCs – MTBE	ug/L	9.0	ND	ND
VOCs – Methylene Chloride	ug/L	ND	1.4	1.1
VOCs – Bromomethane	ug/L	ND	ND	1.3

19. An analysis of groundwater monitoring data in monitoring wells MW1, MW2 and MW3 from 2000 to the present indicates that concentrations for nitrate, sulfate and chloride are decreasing in the downgradient wells (MW2 and MW3) and increasing in the upgradient well (MW1). This Board Order will require that the Discharger submit a technical report providing an analysis of the water quality impacts by nitrogen and TDS to groundwater resulting from the discharge and to report annual trend monitoring of the data collected in the groundwater monitoring network. The monitoring frequency for total nitrogen and nitrate in the groundwater monitoring wells will be increased from annually to monthly for 12 months and quarterly thereafter to establish groundwater gradient and flow direction. In addition, this Board Order will require annual reporting of nitrogen application of fertilizers and in farming practices and provide a nitrogen and water use balance for the recycled water used on-site.

20. Annual precipitation in the Lucerne Valley region averages about 5.5 inches. Annual evapotranspiration rate is approximately 68 inches.

21. The project lies beyond the toe of a large alluvial fan emanating from the mouth of Cushenbury Canyon in the eastern portion of Lucerne Valley.

[6] Measurement made in 2004.

22. There are several domestic wells in the vicinity of the on-site evaporation/percolation ponds.

23. Water supply to the Big Bear area communities is from numerous groundwater production wells located in Big Bear Valley. TDS in the water supply averages about 280 mg/L based on data reported in the BBARWA's SMRs from 2008 through 2015.

24. Regional groundwater flow in the irrigation and disposal area is generally to the northwest.

25. BBARWA conducted a geotechnical study referenced as *Geotechnical Study, Irrigation Site, Lucerne Valley Area, San Bernardino County, California for Big Bear Area Regional Wastewater Agency, July 29, 1977,* as an initial investigation of the site for use for irrigation. The report shows that the site is underlain by soils consisting of fine to coarse, clean to silty sands containing various amounts of grave from 5 to 24 feet below ground surface. Beneath this, to a depth of 60 to 100 feet below ground surface, the soil consists of fine to medium silty sands containing varying amounts of gravel, and is locally cemented with calcium carbonate accumulated during deposition of the sediments. Bedrock underlies the older alluvium at a depth of 400 to 600 feet.

Basin Plan, Beneficial Uses, and Regulatory Considerations

26. The Water Quality Control Plan for the Colorado River Basin Region of California (Basin Plan), which was adopted on November 17, 1993, and amended on November 13, 2012, designates the beneficial uses of ground and surface waters in this Region, and contains implementation programs and policies to achieve water quality objectives, including narrative objectives for ground water quality, in Chapter 3, section IV, Ground Water Objectives.

27. The discharge is within the Lucerne Hydrologic Unit. The beneficial uses of groundwater in the Lucerne Hydrologic Unit include:

    a. Municipal supply (MUN),

    b. Industrial supply (IND), and

    c. Agricultural supply (AGR).

28. These WDRs implement numeric and narrative water quality objectives for ground and surface waters established by the Basin Plan. The numeric objectives for groundwater designated for municipal and domestic supply are the maximum contaminant levels (MCLs) specified in sections 64431, 64444, and 64678 of Title 22 of the California Code of Regulations (CCR), and the bacteriological limits specified in section 64426.1 of Title 22, CCR.

29. It is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes. This order promotes that policy by requiring discharges to meet maximum contaminant levels designed to protect human health and ensure that water is safe for domestic use.

30. Section 13267 of the CWC authorizes the Colorado River Basin Water Board to require technical and monitoring reports. The Monitoring and Reporting Program (MRP) establishes monitoring and reporting requirements to implement federal and state

requirements.

31. This Order establishes WDRs pursuant to Division 7, Chapter 4, Article 4, of the CWC for discharges that are not subject to regulation under Clean Water Act (CWA) section 402 (33 U.S.C. section 1342).

32. Pursuant to CWC section 13263(g), the discharge of waste is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

33. The discharge authorized by this Board Order, and treatment and storage facilities associated with discharges of treated municipal wastewater, except for discharges of residual sludge and solid waste, are exempt from the requirements of the Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste, as set forth in Title 27, CCR, Division 2, Subdivision 1. This exemption is based on section 20090(a) of Title 27, which states in relevant part that discharges of domestic sewage or treated effluent are exempt provided that such discharges are regulated by WDRs, or for which WDRs have been waived, and which are consistent with applicable water quality objectives, and treatment or storage facilities.

Groundwater Degradation

34. State Water Board Resolution 68-16, "Policy with Respect to Maintaining High Quality Waters of the State"(Resolution 68-16) states:

    "Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."

    Resolution 68-16 further states:

    "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control [BPTC] of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

35. Some degradation of groundwater from the discharge to the evaporation/percolation ponds is consistent with Resolution 68-16, provided that the degradation:

    a. Is confined to a reasonable area;

    b. Is minimized by means of full implementation, regular maintenance, and optimal operation of BPTC measures;

    c. Is limited to waste constituents typically encountered in domestic wastewater; and

    d. Does not result in the loss of any beneficial use as prescribed in the applicable basin plan, or violation of any water quality objective.

36. The discharge of wastewater as permitted by Order R7-2016-0026 and Order R8-2005-

0044 reflects BPTC. The controls assure the discharge does not create a condition of pollution or nuisance, and that water quality will be maintained, which is consistent with the anti-degradation provisions of Resolution No. 68-16. The Discharger incorporates:

a. A WWTP that provides treatment to secondary standards and nitrification/denitrification processes;

b. An operation and maintenance manual;

c. Staffing to assure proper operation and maintenance;

d. A network of groundwater monitoring wells at the recycle site;

e. A requirement for an Irrigation Management Plan; and

f. A standby emergency power generator of sufficient size to operate the treatment plant and ancillary equipment during periods of loss of commercial power.

Accordingly, the discharge as authorized is consistent with the anti-degradation provisions of Resolution 68-16 and the applicable water quality objectives.

Constituents of Concern

37. Constituents in domestic wastewater effluent that present the greatest risk to groundwater quality are nitrogen, coliforms (pathogen-indicator organisms), and TDS. Recycled water used for irrigation at the Lucerne Valley Facility is treated to secondary standards and has undergone substantial removal of soluble organic matter, solids, and nitrogen treatment.

38. Title 22, CCR, section 64431, Maximum Contaminant Level (MCL) for Nitrate plus Nitrite as Nitrogen is 10 mg/L. To account for the fate of transport for the various components of Total Nitrogen, as a conservative value it is assumed that all nitrogen present converts to nitrate/nitrite. BBARWA's SMRs report an average of 6.9 mg/L for Total Nitrogen between April 2011 and March 2015. Prior to the operation of nitrification/denitrification processes at the WWTP, groundwater analyses at the irrigation and disposal site demonstrated degradation by nitrates. This Board Order will require the Discharger to provide a technical report in the form of a study that analyses the impacts to groundwater by the discharge and an evaluation of water quality trends. In addition, this Board Order will implement a monthly average effluent limitation of 10 mg/L for total nitrogen as a means to mitigate groundwater degradation.

39. While secondary treatment reduces fecal coliform densities by 90 to 99%, the remaining organisms in effluent are still 10^5 to 10^6 MPN/100 ml (United States Environmental Protection Agency, Design Manual, Municipal Wastewater Disinfection; October 1986). Given the depth to groundwater, it is not likely that pathogen-indicator bacteria will reach groundwater at densities exceeding those prescribed in Title 22, CCR.

40. The typical incremental addition of dissolved salts from domestic water usage is 150 to 380 mg/L. Domestic water supply to the Big Bear area communities showed an average concentration of about 280 mg/L during the period of 2011 to 2016. From April 2011 to March 2016 treated wastewater discharged had an average TDS concentration of approximately 450 mg/L. Thus, the average TDS increase over the domestic water supply in the discharge during the same time period was about 170 mg/L. Treated wastewater discharged by the WWTP has a TDS limit of a maximum of 400 mg/L above the domestic source water as regulated by Board Order 01-156. This Board Order will

require the Discharger to provide a technical report in the form of a study that analyzes the impacts to groundwater by the discharge and an evaluation of water quality trends. The results of the study will be used to establish an appropriate effluent limitation for TDS.

CEQA and Public Participation

41. In accordance with section 15301, Chapter 3, Title 14, CCR, the issuance of these WDRs, which govern the operation of an existing facility involving negligible or no expansion of use beyond that previously existing, is exempt from the provisions of the California Environmental Quality Act (CEQA, Pub. Resources Code, section 21000 et seq.).

42. The Colorado River Basin Water Board has notified the Discharger and all known interested agencies and persons of its intent to draft WDRs for this discharge, and has provided them with an opportunity for a public meeting and an opportunity to submit comments.

43. The Colorado River Basin Water Board, in a public meeting, heard and considered all comments pertaining to this discharge.

IT IS HEREBY ORDERED, that Board Order 01-156 is rescinded upon the effective date of this Order, except for enforcement purposes, and, in order to meet the provisions contained in Division 7 of the California Water Code, and regulations adopted thereunder, the Discharger shall comply with the following:

A. Effluent Limitations

1. Effluent discharged into the overflow evaporation/percolation ponds for disposal shall not exceed the following effluent limits:

Constituent	Units	30-Day Arithmetic Mean	7-Day Arithmetic Mean	Daily Maximum
20^{o} C BOD_5	mg/L	30	45	-----
Total Suspended Solids	mg/L	30	45	-----
Chloride	mg/L	60	-----	80
Sulfate	mg/L	60	-----	80
Boron	mg/L	-----	-----	0.75
Total Nitrogen	mg/L	10	-----	-----

2. The 30-day average daily dry weather discharge for irrigation shall not exceed 4.8 MGD.

3. Effluent discharge for irrigation shall not have a pH below 6.0 or above 9.0.

B. Groundwater Limitations

1. Discharge at the Lucerne Valley Facility shall not cause groundwater to:

   a. Contain constituents in excess of California MCLs, as set forth in the California Code

of Regulations, Title 22, section 64426.1 for bacteriological constituents; section 64431 for inorganic chemicals; section 64444 for organic chemicals; and section 64678 for determination of exceedances of lead and copper action levels.

b. Contain taste or odor-producing substances in concentrations that adversely affect beneficial uses as a result of human activity.

C. Discharge Prohibitions

1. Discharge of waste classified as "hazardous", as defined in Title 23, CCR, section 2521(a), or "designated", as defined in California Water Code section 13173, is prohibited.

2. Discharge of treated wastewater at a location other than the designated disposal areas or as recycled water used for irrigation at approved use areas, is prohibited.

3. The discharge of recycled water to any drainage courses or surface waters is prohibited.

4. Discharge of waste to land not owned or authorized for such use by the Discharger is prohibited.

5. Surfacing or ponding of wastewater outside of the designated disposal locations is prohibited.

6. Bypass, overflow, discharge, or spill of untreated or partially treated waste is prohibited.

7. Application recycled water and fertilizers containing nitrogen at a rate greater than the agronomic uptake rate of the crops grown is prohibited.

D. Discharge Specifications

1. The discharge shall not cause pollution or nuisance as defined in sections 13050(l) and 13050(m) of Division 7 of the California Water Code, respectively.

2. A minimum depth of freeboard of two (2) feet shall be maintained at all times in the overflow earthen basins and concrete-lined reservoir.

3. The overflow ponds shall be managed to prevent breeding of mosquitoes. In particular:
    a. An erosion control program should assure that small coves and irregularities are not created around the perimeter of the water surface.
    b. Weeds shall be minimized through control of water depth, harvesting, or herbicides.
    c. Dead algae, vegetation, and debris shall not accumulate on the water

4. All storage and disposal areas shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

5. The overflow ponds shall have sufficient capacity to accommodate allowable wastewater flow, design seasonal precipitation, ancillary inflow, and infiltration during the non-irrigation season. Design seasonal precipitation shall be based on total

annual precipitation using a return period of 100 years, distributed monthly in accordance with historical rainfall patterns.

6. Public contact with non-disinfected wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives. The non-disinfected wastewater is not approved for off-site distribution. Conspicuous signs shall be posted in a prominent location in each area where non-disinfected wastewater is stored on-site. Each sign or label with "Non-disinfected wastewater - No body contact or drinking" wording shall be displayed as well as the international warning symbol.

7. Objectionable odors originating at the Lucerne Valley Facility shall not be perceivable beyond the limits of the wastewater treatment and disposal area.

8. The overflow ponds and concrete-lined reservoir shall be maintained so they will be kept in aerobic conditions.

9. The dissolved oxygen content in the upper zone (one foot) of the concrete reservoir and overflow ponds shall not be less than 1.0 mg/L.

10. There shall be no surface flow of wastewater away from the designated disposal areas.

11. On-site wastes, including windblown spray from recycled water application, shall be strictly confined to the lands specifically designated for the disposal operation, and on-site irrigation practices shall be managed so there is no runoff of effluent from irrigated areas.

12. No irrigation with, or impoundment of, undisinfected secondary recycled water shall take place within 150 feet of any domestic water supply well.

13. No spray irrigation of any recycled water shall take place within 100 feet of a residence or a place where public exposure could be similar to that of a park, playground or schoolyard.

14. Except as allowed under Section 7604 of Title 17, California Code of Regulations, no physical connection shall be made or allowed to exist between any recycled water system and any separate system conveying potable water.

15. Undisinfected secondary recycled water, as defined in Title 22, Section 60301.900 is limited only for irrigation in the following applications:

    a. Orchards where the recycled water does not come into contact with the edible portion of the crop,

    b. Vineyards where the recycled water does not come into contact with the edible portion of the crop,

    c. Non-food bearing trees (Christmas tree farms are included in this category provided no irrigation with recycled water occurs for a period of 14 days prior to harvesting or allowing access by the general public),

    d. Fodder and fiber crops and pasture for animal not producing milk for human consumption,

e. Seed crops not eaten by humans,

f. Food crops that must undergo commercial pathogen-destroying processing before being consumed by humans, and

g. Ornamental nursery stock and sod farms provided no irrigation with recycled water occurs for a period of 14 days prior to harvesting, retail sale, or allowing access by the general public.

16. No recycled water used for irrigation, or soil that has been irrigated with recycled water, shall come into contact with edible portions of food crops eaten raw by humans.

17. The storage, delivery, or use of recycled water shall not individually or collectively, directly or indirectly, result in pollution, or adversely affect water quality, as defined in the CWC.

18. The delivery or use of recycled water shall be in conformance with the reclamation criteria contained in Title 22, or amendments thereto, for the irrigation of food crops, irrigation of fodder, fiber, and seed crops, landscape irrigation, supply of recreational impoundments and ground water recharge.

19. Prior to delivering recycled water to any new user, BBARWA shall submit to the Colorado River Basin Water Board a report discussing any new distribution system being constructed by the Discharger to provide service to the new user.

20. Recycled water shall not be delivered to any new user who has not first received a discharge permit from the Colorado River Basin Water Board and approval from the SWRCB's Division of Drinking Water.

21. Treated or untreated sludge or similar solid waste materials shall be disposed at locations approved by the Colorado River Basin Water Board's Executive Officer.

22. Grazing of sheep on the irrigation site is allowed only under the following conditions, unless otherwise approved by the Colorado River Basin Water Board 's Executive Officer:

    a. Grazing will only be conducted in October or November after the last cutting of hay has been baled;

    b. Grazing animals will not be allowed into a portion of the site until 10 days after it was last irrigated;

    c. Temporary fences will be erected to contain the grazing animals in an area of 40 acres or less;

    d. Only ewes that are about to lamb or ewes with newly born will be grazed;

    e. No animals will be sold for slaughter within 90 days after grazing.

    f. No milk produced by sheep that have grazed at the irrigation site shall be used for human consumption.

E. Special Provisions

1. Within **three months** of the adoption of this Board Order, the Discharger shall submit a technical report that is a work plan, for approval by the Colorado River Basin Water

Board's Executive Officer, to conduct a study of the groundwater in the vicinity of the recycled water irrigation use site. The objective of the study shall be to address the impacts that the discharges to unlined ponds and the irrigation area have on areal groundwater quality. The Discharger shall submit the final technical report containing the results of the study within **18 months** of the adoption of this Board Order and shall propose recommendations to mitigate the effects of nitrogen loading to groundwater and propose an appropriate effluent limit for TDS.

2. Within six months of the adoption of this Board Order, the Discharger shall prepare and submit an Irrigation Management Plan that includes a water balance and nutrient balance to assure that recycled water is applied at appropriate rates. The Irrigation Management Plan shall be submitted for approval by the Colorado River Basin Water Board's Executive Officer.

3. Within **nine months** of the adoption of this Order, the Discharger shall submit to the Colorado River Basin Water Board office a technical report that includes a copy of the Maintenance and Operations Manual for the Lucerne Valley Facility.

F. Standard Provisions

1. The Discharger shall comply with all of the conditions of this Board Order. Noncompliance is a violation of the Porter-Cologne Water Quality Control Act (CWC, section 13000 et seq.), and is grounds for enforcement action.

2. The Discharger shall comply with Monitoring and Reporting Program R7-2016-0026 and future revisions thereto as specified by the Colorado River Basin Water Board's Executive Officer.

3. The Discharger shall comply with the Electronic Submittal of Information (ESI) requirements by submitting all correspondence and reports required under Monitoring and Reporting Program (MRP) R7-2016-0026, and future revisions thereto, including groundwater monitoring data and discharge location data (latitude and longitude), correspondence, and pdf monitoring reports to the State Water Resources Control Board GeoTracker https://geotracker.waterboards.ca.gov/ database. Documents that are normally mailed by the Discharger, such as regulatory documents, narrative technical monitoring program reports, and such reports submissions, materials, data, and correspondence, to the Colorado River Basin Water Board shall also be uploaded into GeoTracker in the appropriate Microsoft software application, such as word, excel, or an Adobe Portable Document Format (PDF) file. Large documents are to be split into manageable file sizes appropriately labelled and uploaded into GeoTracker.

4. All technical reports required in conjunction with this Order are required pursuant to Section 13267 of the CWC, and shall include a statement by the Discharger, or an authorized representative of the Discharger, certifying under penalty of perjury under the laws of the State of California, that the report is true, complete, and accurate.

5. In accordance with California Business and Professions Code Sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of California registered professionals (i.e., civil engineer, engineering geologist, geologist, etc.) competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain work plans, that describe the conduct of investigations and studies, or that contain technical conclusions and

recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professionals, even if not explicitly stated. Each technical report submitted by the Discharger shall contain a statement of qualifications of the responsible licensed professionals as well as the professional's signature and/or stamp of the seal. Additionally, to the extent that preparation of a required technical report involves field activities, field activities shall be conducted under the direct supervision of one or more of these professionals.

6. The Discharger shall not cause degradation of any water supply in accordance with State Water Board Resolution 68-16.

7. Standby power generating facilities shall be available to operate the plant during a commercial power failure.

8. Adequate measures shall be taken to assure that flood or surface drainage waters do not erode or otherwise render portions of the discharge facilities inoperable.

9. The use of recycled water at the Lucerne Valley Facility shall be supervised by persons possessing certification of appropriate grade pursuant to section 3680, Chapter 26, Division 3, Title 23 of the California Code of Regulations.

10. The Discharger shall at all times properly operate and maintain all systems and components of collection, treatment and control, installed or used by the Discharger to achieve compliance with this Board Order. Proper operation and maintenance includes effective performance, adequate process controls, and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities/systems when necessary to achieve compliance with this Board Order. All systems in service or reserved shall be inspected and maintained on a regular basis. Records of inspections and maintenance shall be retained, and made available to the Colorado River Basin Water Board's Executive Officer on request.

11. The Discharger shall ensure that all site-operating personnel are familiar with the content of this Board Order, and shall maintain a copy of this Board Order at the site.

12. The Discharger shall allow the Colorado River Basin Water Board, or an authorized representative, upon presentation of credentials and other documents as may be required by law, to:

    a. Enter the premises regulated by this Board Order, or the place where records are kept under the conditions of this Board Order;

    b. Have access to and copy, at reasonable times, records kept under the conditions of this Board Order;

    c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Board Order; and

    d. Sample or monitor at reasonable times, for the purpose of assuring compliance with this Board Order or as otherwise authorized by the California Water Code, any substances or parameters at this location.

13. Ponds shall be managed to prevent breeding of mosquitoes. In particular,

    a. An erosion control program should assure that small coves and irregularities are not

created around the perimeter of the water surface.

b. Weeds shall be minimized through control of water depth, harvesting, or herbicides.

c. Dead algae, vegetation, and debris shall not accumulate on the water surface.

14. Disposal of oil and grease, biosolids, screenings, and other solids collected from liquid wastes shall be pursuant to Title 27, and the review and approval of the Colorado River Basin Water Board Executive Officer.

15. Any proposed change in use or disposal of biosolids requires the approval of the Colorado River Basin Water Board Executive Officer, and U.S. Environmental Protection Agency Regional Administrator, who must be notified at least 90 days in advance of the change.

16. Sludge use and disposal shall comply with Federal and State laws and regulations, including permitting requirements, and technical standards in 40 CFR Part 503. If the State and Colorado River Basin Water Boards are delegated the authority to implement 40 CFR Part 503 regulations, this Order may be revised to incorporate appropriate time schedules and technical standards. The Discharger shall comply with the standards and time schedules in 40 CFR part 503, whether or not part of this Order.

17. The Discharger shall provide a plan as to the method, treatment, handling and disposal of sludge that is consistent with all State and Federal laws and regulations and obtain prior written approval from the Colorado River Basin Water Board specifying location and method of disposal, before disposing of treated or untreated sludge, or similar solid waste.

18. The Discharger shall maintain a permanent log of all solids hauled away from the treatment facility for use/disposal elsewhere and shall provide a summary of the volume, type (screenings, grit, raw sludge, digested sludge), use (agricultural, composting, etc.), and the destination in accordance with the MRP of this Board Order. Sludge that is stockpiled at the treatment facility shall be sampled and analyzed for those constituents listed in the sludge monitoring section of the MRP of this Board Order and as required by Title 40, Code of Federal Regulations, Part 503. The results of the analyses shall be submitted to the Colorado River Basin Water Board as part of the MRP.

19. The Discharger shall provide a report to the Colorado River Basin Water Board when it determines that the plant's average dry-weather flow rate for any month exceeds 80 percent of the design capacity. The report should indicate what steps, if any, the Discharger intends to take to provide for the expected wastewater treatment capacity necessary when the plant reaches design capacity.

20. Prior to implementing a modification that results in a material change in the quality or quantity of wastewater treated or discharged, or a material change in the location of discharge, the Discharger shall report all pertinent information in writing to the Colorado River Basin Water Board, and obtain revised requirements.

21. Prior to a change in ownership or management of the Lucerne Valley Facility, the Discharger shall transmit a copy of this Board Order to the succeeding owner/operator, and forward a copy of the transmittal letter to the Colorado River Basin Water Board.

22. The Discharger shall provide adequate notice to the Colorado River Basin Water Board

Executive Officer of the following:

a. Any substantial change in the volume or character of pollutants introduced into any treatment facility described in the Findings of this Board Order, by an existing or new source; and

b. Any planned physical alteration or addition to the facilities described in this Board Order, or change planned in the Discharger's sludge use or disposal practice, where such alterations, additions, or changes may justify the application of Board Order conditions that are different from or absent in the existing Board Order, including notification of additional disposal sites not reported during the Board Order application process, or not reported pursuant to an approved land application plan.

23. The Discharger shall report orally, any noncompliance that may endanger human health or the environment. The noncompliance shall be reported immediately to the Colorado River Basin Water Board's Executive Officer at (760) 346-7491, and the California Office of Emergency Services at (800) 852-7550 as soon as:

    a. The Discharger has knowledge of the discharge,

    b. Notification is possible, and

    c. Notification will not substantially impede cleanup or other emergency measures.

    During non-business hours, the Discharger shall leave a message on the Colorado River Basin Water Board's office voice recorder at the above listed number. Incident information shall be provided orally as soon as possible and within 24 hours from the time the Discharger becomes aware of the incident. A written report shall also be provided within five (5) business days of the time the Discharger becomes aware of the incident. The written report shall contain a description of the noncompliance and its cause, the period of noncompliance, the anticipated time to achieve full compliance, and the steps taken or planned, to reduce, eliminate, and prevent recurrence of the noncompliance. The Discharger shall report all intentional or unintentional spills in excess of one thousand (1,000) gallons occurring within the Colorado River Basin Water Board's jurisdiction, including the Lucerne Valley Facility or disposal line, in accordance with the above time limits.

24. The Discharger shall report all instances of noncompliance. Reports of noncompliance shall be submitted with the Discharger's next scheduled SMRs or earlier if requested by the Colorado River Basin Water Board's Executive Officer, or if required by an applicable standard for sludge use and disposal.

25. By-pass (i.e., the intentional diversion of waste streams from any portion of the treatment facilities, except diversions designed to meet variable effluent limits) is prohibited. The Colorado River Basin Water Board may take enforcement action against the Discharger for by-pass unless:

    a. By-pass was unavoidable to prevent loss of life, personal injury, or severe property damage. Severe property damage means substantial physical damage to property, damage to the treatment facilities that causes them to be inoperable, or substantial and permanent loss of natural resources reasonably expected to occur in the absence of a by-pass. Severe property damage does not mean economic loss caused by delays in production; and

    There were no feasible alternatives to by-pass, such as the use of auxiliary treatment

facilities or retention of untreated waste. This condition is not satisfied if adequate back-up equipment was not installed to prevent by-pass occurring during equipment downtime, or preventive maintenance.

b. By-pass is:

   i. Required for essential maintenance to assure efficient operation; and

   ii. Neither effluent nor receiving water limitations are exceeded; and

   iii. The Discharger notifies the Colorado River Basin Water Board ten (10) days in advance.

26. In the event of an unanticipated by-pass, the Discharger shall immediately report the incident to the Colorado River Basin Water Board. During non-business hours, the Discharger shall leave a message on the Colorado River Basin Water Board office voice recorder. A written report shall be provided within five business days the Discharger is aware of the incident. The written report shall include a description of the by-pass, any noncompliance, the cause, period of noncompliance, anticipated time to achieve full compliance, and steps taken or planned, to reduce, eliminate, and prevent recurrence of the noncompliance.

27. Federal regulations for storm water discharges require specific categories of facilities which discharge storm water associated with industrial activity (storm water) to obtain National Pollutant Discharge Elimination System (NPDES) permits and to implement Best Conventional Pollutant Technology (BCT) and Best Available Technology Economically Achievable (BAT) to reduce or eliminate industrial storm water pollution.

28. All storm water discharges from this facility must comply with the lawful requirements of municipalities, counties, drainage districts, and other local agencies, regarding discharges of storm water to storm water drain systems or other courses under their jurisdiction.

29. Storm water discharges from the facility shall not cause or threaten to cause pollution or contamination.

30. Storm water discharges from the facility shall not contain hazardous substances equal to or in excess of a reportable quantity listed in 40 CFR Part 117 and/or 40 CFR Part 302.

31. The Discharger is the responsible party for the waste discharge requirements and the monitoring and reporting program for the facility. The Discharger shall comply with all conditions of these waste discharge requirements. Violations may result in enforcement actions, including Colorado River Basin Water Board Orders or court orders, requiring corrective action or imposing civil monetary liability, or in modification or revocation of these waste discharge requirements by the Colorado River Basin Water Board.

32. This Board Order does not authorize violation of any federal, state, or local laws or regulations.

33. This Board Order does not convey property rights of any sort, or exclusive privileges, nor does it authorize injury to private property or invasion of personal rights, or infringement of federal, state, or local laws or regulations.

34. This Board Order may be modified, rescinded, or reissued, for cause. The filing of a

request by the Discharger for a Board Order modification, rescission or reissuance, or notification of planned changes or anticipated noncompliance, does not stay any Board Order condition. Causes for modification include a change in land application plans, or sludge use or disposal practices, and adoption of new regulations by the State or Colorado River Basin Water Board (including revisions to the Basin Plan), or Federal government.

I, Jose L. Angel, Executive Officer, do hereby certify the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Colorado River Basin Region, on June 30, 2016.

Jose L. Angel

JOSE L. ANGEL P.E.
Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

MONITORING AND REPORTING PROGRAM R7-2016-0026
FOR
BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
EXPORT OF RECYCLED WATER TO LUCERNE VALLEY
Lucerne Valley – San Bernardino County

Location of Discharge:
Section 14, T4N, R1E, SBB&M

A. Monitoring

1. This Monitoring and Reporting Program (MRP) describes requirements for monitoring a wastewater system and groundwater quality (when needed). This MRP is issued pursuant to California Water Code (CWC) section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer.

2. Water Code section 13267 states, in part:

   "In conducting an investigation specified in subdivision (a), the Colorado River Basin Water Board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the Colorado River Basin Water Board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the Colorado River Basin Water Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports."

3. Water Code section 13268 states, in part:

   "(a) (1) Any person failing or refusing to furnish technical or monitoring program reports as required by subdivision (b) of section 13267, or failing or refusing to furnish a statement of compliance as required by subdivision (b) of section 13399.2, or falsifying any information provided therein, is guilty of a misdemeanor, and may be liable civilly in accordance with subdivision (b). (b) (1) Civil liability may be administratively imposed by a Colorado River Basin Water Board in accordance with Article 2.5 (commencing with section 13323) of Chapter 5 for a violation of subdivision (a) in an amount which shall not exceed one thousand dollars ($1,000) for each day in which the violation occurs."

4. BBARWA owns and operates the wastewater system that is subject to Board Order R7-2016-0026. The reports are necessary to ensure that the Discharger complies with the Order. Pursuant to Water Code section 13267, the Discharger shall implement the MRP and shall submit the monitoring reports described herein.

5. All samples shall be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each grab sample shall be recorded

on the sample chain of custody form. If composite samples are collected, the basis for sampling (time or flow weighted) shall be approved by Colorado River Basin Water Board staff.

6. Field test instruments (such as those used to test pH, dissolved oxygen, and electrical conductivity) may be used provided that:
   a. The user is trained in proper use and maintenance of the instruments;
   b. The instruments are field calibrated prior to monitoring events at the frequency recommended by the manufacturer;
   c. Instruments are serviced and/or calibrated by the manufacturer at the recommended frequency; and
   d. Field calibration reports are submitted as described in the "Reporting" section of this MRP.

7. The collection, preservation and holding times of all samples shall be in accordance with U. S. Environmental Protection Agency (USEPA) approved procedures. Unless otherwise approved by the Colorado River Basin Water Board's Executive Officer, all analyses shall be conducted by a laboratory certified by the State Water Resources Control Board, Division of Drinking Water. All analyses shall be conducted in accordance with the latest edition of the "Guidelines Establishing Test Procedures for Analysis of Pollutants" (40 CFR Part 136), promulgated by the USEPA.

8. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. In the event that continuous monitoring equipment is out of service for period greater than 24-hours, the Discharger shall obtain representative grab samples each day the equipment is out of service. The Discharger shall correct the cause(s) of failure of the continuous monitoring equipment as soon as practicable. The Discharger shall report the period(s) during which the equipment was out of service and if the problem has not been corrected, shall identify the steps which the Discharger is taking or proposes to take to bring the equipment back into service and the schedule for these actions.

9. The Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Board Order, and records of all data used to complete the application for this Board Order, for a period of at least five (5) years from the date of the sample, measurement, report or application. This period may be extended by request of the Colorado River Basin Water Board's Executive Officer at any time. Records of monitoring information shall include:
   a. The date, exact place, and time of sampling or measurement(s);
   b. The individual(s) who performed the sampling or measurement(s);
   c. The date(s) analyses were performed;
   d. The individual(s) who performed the analyses;
   e. The analytical techniques or method used; and
   f. The results of such analyses.

10. Samples shall be collected at the location specified in the WDRs. If no location is

specified, sampling shall be conducted at the most representative sampling point available.

11. Given the monitoring frequency prescribed by MRP R7-2016-0026, if only one sample is available for a given reporting period, compliance with monthly average, or weekly average Discharge Specifications, will be determined from that sample.

12. If the facility is not in operation, or there is no discharge during a required reporting period, the Discharger shall forward a letter to the Colorado River Basin Water Board indicating that there has been no activity during the required reporting period.

Effluent Monitoring

13. Representative samples of the undisinfected secondary recycled water shall be taken at the WWTP. The samples shall be analyzed for the following constituents:

Constituent	Units	Type of Sample	Monitoring Frequency	Reporting Frequency
Irrigation Flow	MGD	Flow Meter Reading	Daily	Monthly
20°C BOD_5	mg/L	24 Hr. Composite	2x/Month	Monthly
Total Suspended Solids	mg/L	24 Hr. Composite	2x/Month	Monthly
pH	s.u. [1]	Grab	Daily	Monthly
Dissolved Oxygen[2]	mg/L	Grab	Monthly	Monthly
Total Dissolved Solids	mg/L	24 Hr. Composite	Monthly	Monthly
Sulfate (SO_4)	mg/L	24 Hr. Composite	Monthly	Monthly
Chloride	mg/L	24 Hr. Composite	2x/Month	Monthly
Fluoride (F)	mg/L	24 Hr. Composite	Monthly	Monthly
Nitrate (NO_3-N) as N	mg/L	24 Hr. Composite	Monthly	Monthly
Total Nitrogen	mg/L	24 Hr. Composite	Monthly	Monthly
VOCs[3]	µg/L[4]	24 Hr. Composite	Annually	Annually

Overflow Pond Monitoring

14. During months when the overflow evaporation/percolation ponds are not used, the Discharger shall report that there has been no activity. During months when the overflow evaporation percolation ponds are in use, the ponds shall be monitored according to the following schedule:

[1] standard pH units
[2] Dissolved Oxygen shall be monitored at the upper one foot layer of the storage or percolation ponds.
[3] Analysis of Volatile Organic Compounds is to be accomplished using the USEPA test methods 601, 602 or 624
[4] micrograms per liter

Constituent	Units	Type of Sample	Monitoring Frequency	Reporting Frequency
Flow Quantity	MGD	Flow Measurement	Daily	Monthly
Dissolved Oxygen	mg/L	Grab	Twice Monthly	Monthly
pH	s.u.	Grab	Twice Monthly	Monthly
Total Dissolved Solids	mg/L	Grab	Twice Monthly	Monthly
Freeboard	ft	Measurement	Twice Monthly	Monthly

Groundwater Monitoring

15. The groundwater monitoring wells shall be monitored according to the following schedule:

Constituent	Units	Type of Sample	Monitoring[5] Frequency	Reporting Frequency
Depth to Groundwater	ft (msl)[6]	Measurement	Monthly	Monthly
Groundwater Gradient[7]	NA	Direction	Monthly	Monthly
Total Nitrogen	mg/L	Grab	Monthly	Monthly
Nitrate as N	mg/L	Grab	Monthly	Monthly
Chloride	mg/L	Grab	Monthly	Monthly
Fluoride	mg/L	Grab	Monthly	Monthly
Sulfate	mg/L	Grab	Monthly	Monthly
Total Dissolved Solids	mg/L	Grab	Monthly	Monthly
Boron	mg/L	Grab	Monthly	Monthly
VOCs	µg/L	Grab	Annually	Annually

Domestic Water Supply Monitoring

16. The domestic water supply shall be a flow weighted composite sample monitored at the water supply production wells in Big Bear Valley and include notations of which wells are non-operating for a reporting period and in accordance to the following schedule:

Constituent	Units	Type of Sample	Monitoring Frequency	Reporting Frequency
Total Dissolved Solids	mg/L	Grab	Annually	Annually

[5] Groundwater monitoring shall be performed monthly for the first 12 months and quarterly thereafter.
[6] Above mean sea level.
[7] Groundwater flow direction.

B. Reporting

1. The Discharger shall inspect and document any operation/maintenance problems by inspecting each unit process. Operation and Maintenance reports shall be submitted to the Colorado River Basin Water Board Office annually, containing documentation showing the calibration of flow meters and equipment as performed in a timely manner, modifications and updates to the Operation and Maintenance Manual, and modifications and updates to the Agency's waste water ordinance or rules and regulations.

2. The Discharger shall annually report a trend monitoring analysis for total nitrogen and nitrates in the groundwater in the vicinity of the recycled water use site. The analysis shall be reported with the Discharger's annual Self-Monitoring Report (SMR).

3. The Discharger shall provide an annual nitrogen balance for the recycled water use site which includes nitrogen loading by application of recycled water and the use of fertilizers for farming. Nitrogen balance shall consider nitrogen uptake by crops grown and provide documentation of crop-specific nitrogen uptake rates. The analysis shall be reported with the Discharger's annual SMR.

4. The Discharger shall provide an operator certification status update including number of staff and grade certification annually.

5. SMRs shall be certified under penalty of perjury to be true and correct, and shall contain the required information at the frequency designated in this MRP.

6. Each Report must contain an affirmation in writing that:

   "All analyses were conducted at a laboratory certified for such analyses by and in accordance with current USEPA procedures or as specified in this Monitoring and Reporting Program."

7. Each Report shall contain the following completed declaration:

   "I certify under the penalty of law that this document, including all attachments and supplemental information, was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. I have personally examined and am familiar with the information submitted in this document, 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 a fine and imprisonment.

   Executed on the _____day of _____ at _____

   _____(Signature)

   _____(Title)"

8. The SMRs, and other information requested by the Colorado River Basin Water Board, shall be signed by a principal executive officer or ranking elected official.

9. A duly authorized representative of the Discharger may sign the documents if:

   a. The authorization is made in writing by the person described above;

b. The authorization specified an individual or person having responsibility for the overall operation of the regulated disposal system; and

c. The written authorization is submitted to the Colorado River Basin Water Board's Executive Officer.

10. The Discharger shall attach a cover letter to the SMRs. The information contained in the cover letter shall clearly identify violations of the WDRs; discuss corrective actions taken or planned and the proposed time schedule of corrective actions. Identified violations should include a description of the requirement that was violated and a description of the violation.

11. Daily, weekly, and monthly monitoring shall be included in the monthly monitoring report. Monthly monitoring reports shall be submitted to the Colorado River Basin Water Board by the 15th day of the following month. Quarterly monitoring reports shall be submitted by January 15th, April 15th, July 15th and October 15th. Annual monitoring reports shall be submitted by January 31st of the following year.

12. The Discharger shall comply with the Electronic Submittal of Information (ESI) requirements by submitting all correspondence and reports required under Monitoring and Reporting Program (MRP) R7-2016-0026, and future revisions thereto, including groundwater monitoring data and discharge location data (latitude and longitude), correspondence, and pdf monitoring reports to the State Water Resources Control Board GeoTracker database. Documents that are 2.0 MB or larger should be broken down into smaller electronic files, labelled properly and uploaded into GeoTracker.

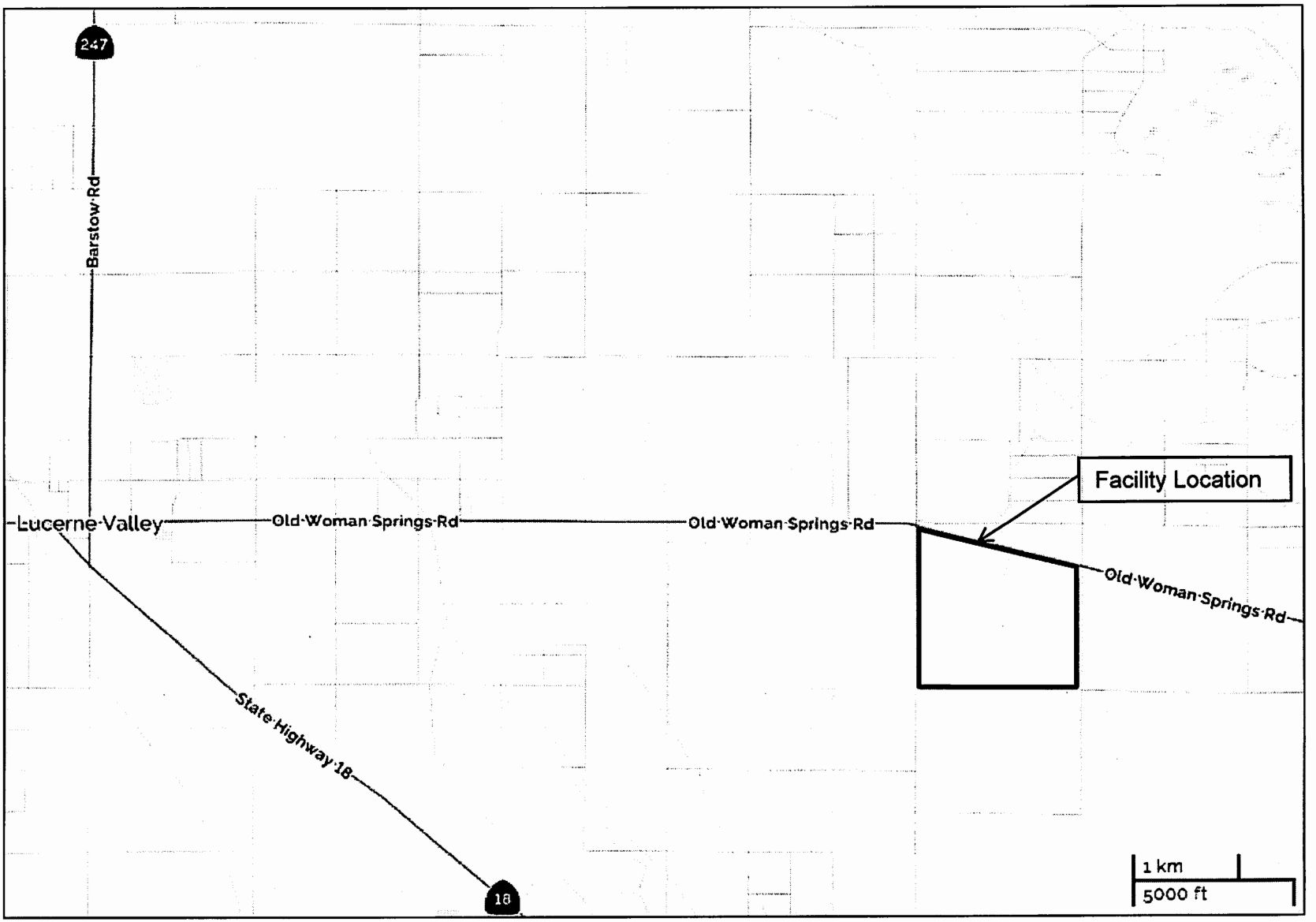
Jose L. Angel

JOSE L. ANGEL P.E.
Executive Officer

6/30/2016

Date

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION



BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
EXPORT OF RECYCLED WATER TO LUCERNE VALLEY
Lucerne Valley – San Bernardino County
Section 14, T4N, R1E, SBB&M

ATTACHMENT A – VICINITY MAP

Board Order R7-2016-0026

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
COLORADO RIVER BASIN REGION

BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
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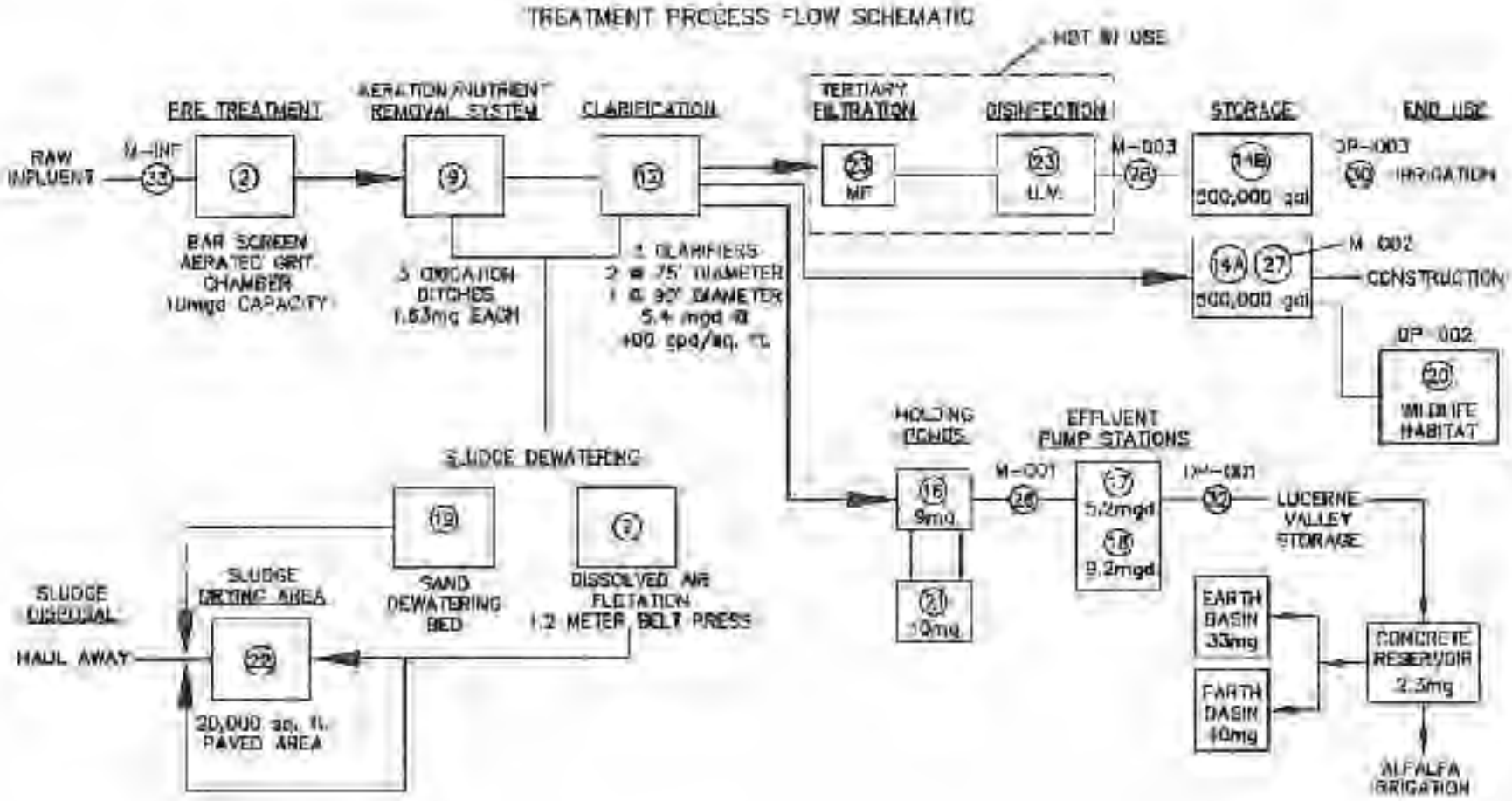
ATTACHMENT A – VICINITY MAP

Board Order R7-2016-0026



BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
EXPORT OF RECYCLED WATER TO LUCERNE VALLEY
Lucerne Valley – San Bernardino County

BIG BEAR AREA REGIONAL WASTEWATER AGENCY, OWNER/OPERATOR
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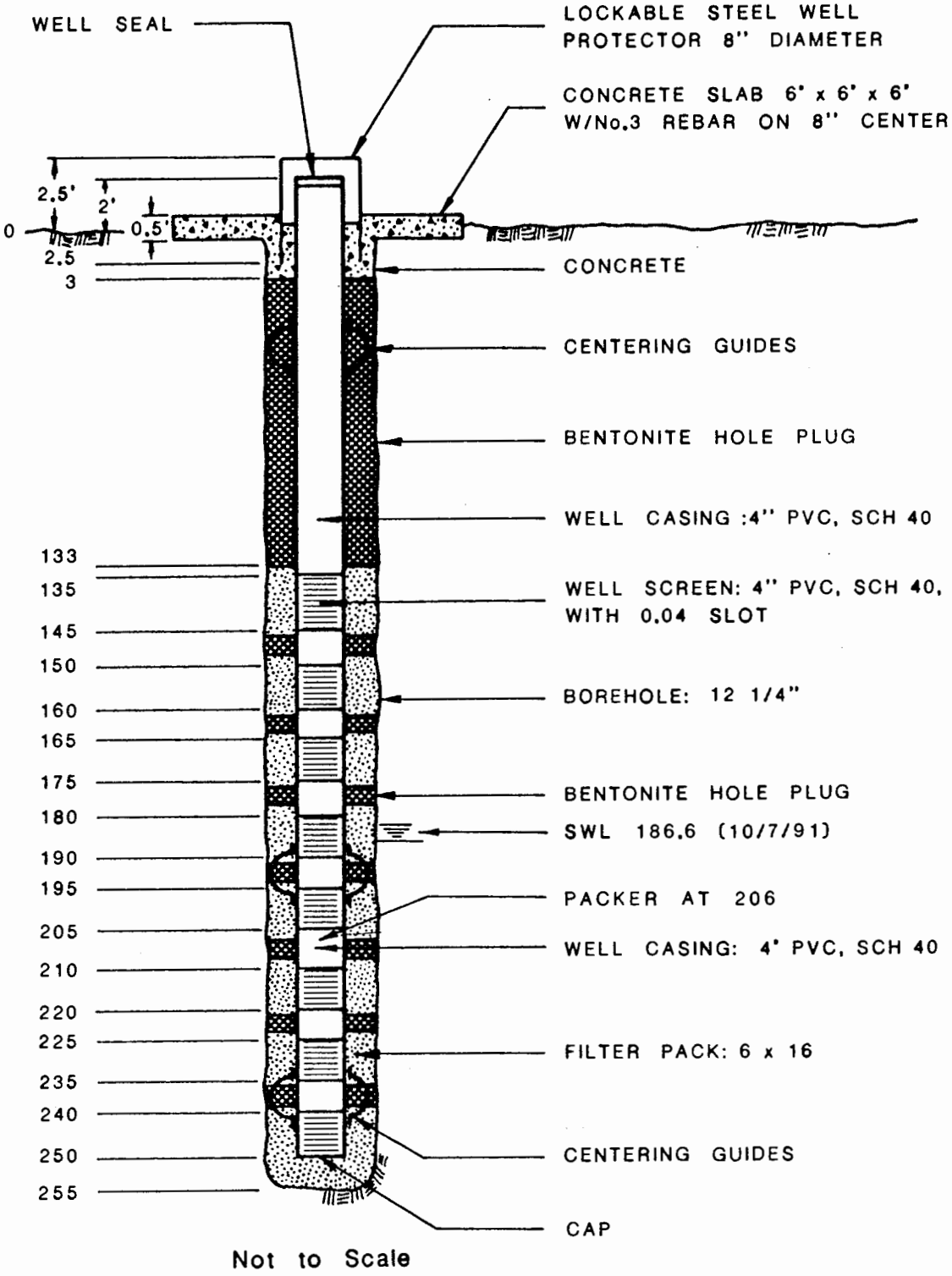
Lucerne Valley – San Bernardino County

Appendix B

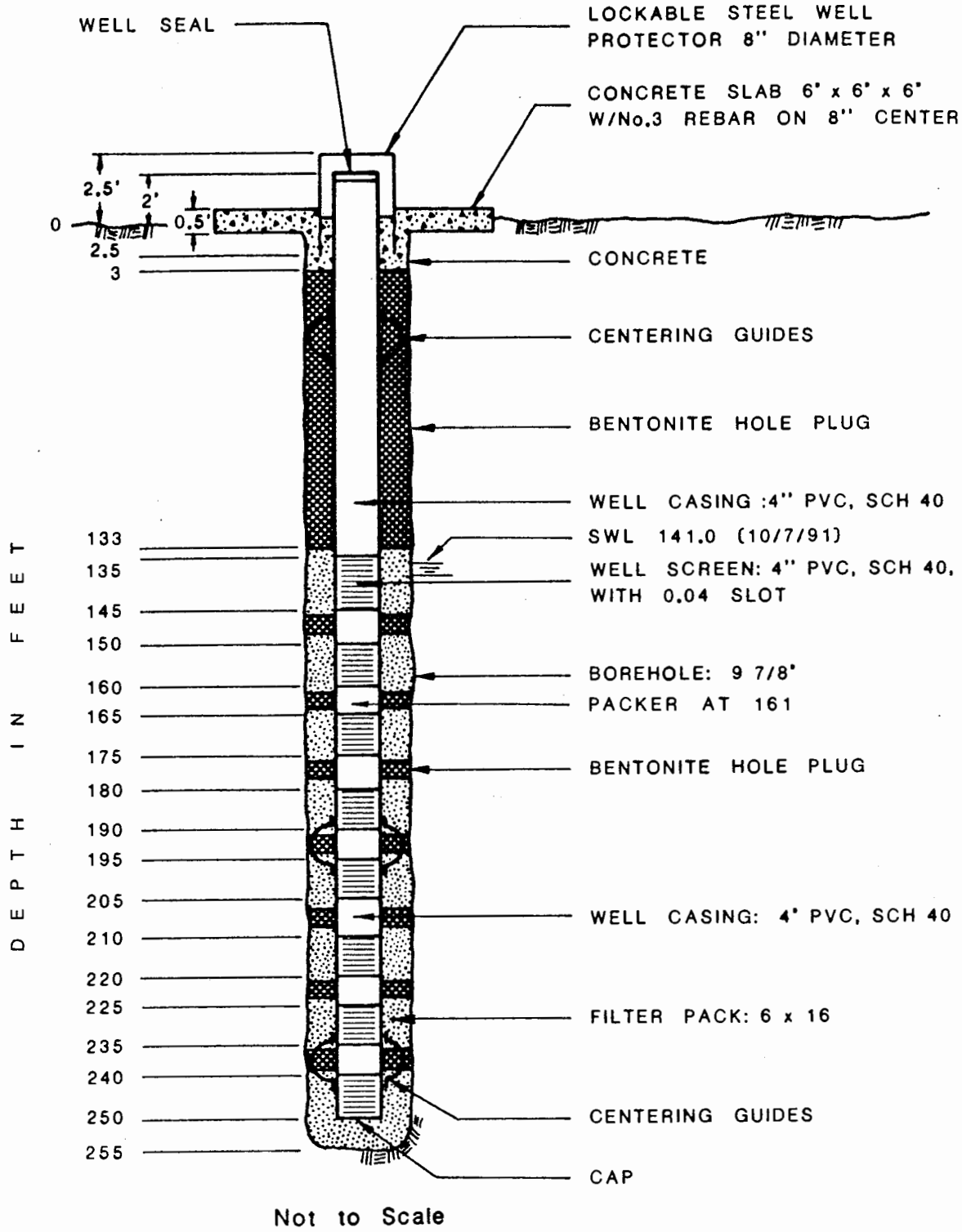
MW-1, MW-2 and MW-3 Well Construction Diagrams



Not to Scale

PROJECT No. 58-9660 DATE 1/7/92 PROJ. MGR. R.S. DFTR. M.N.

BIG BEAR REGIONAL WASTEWATER LUCERNE VALLEY, CALIFORNIA	TYPICAL MONITORING WELL CONSTRUCTION DETAILS MW-1	PROJ. NO. 58-9660.01 LAW ENVIRONMENTAL, INC.



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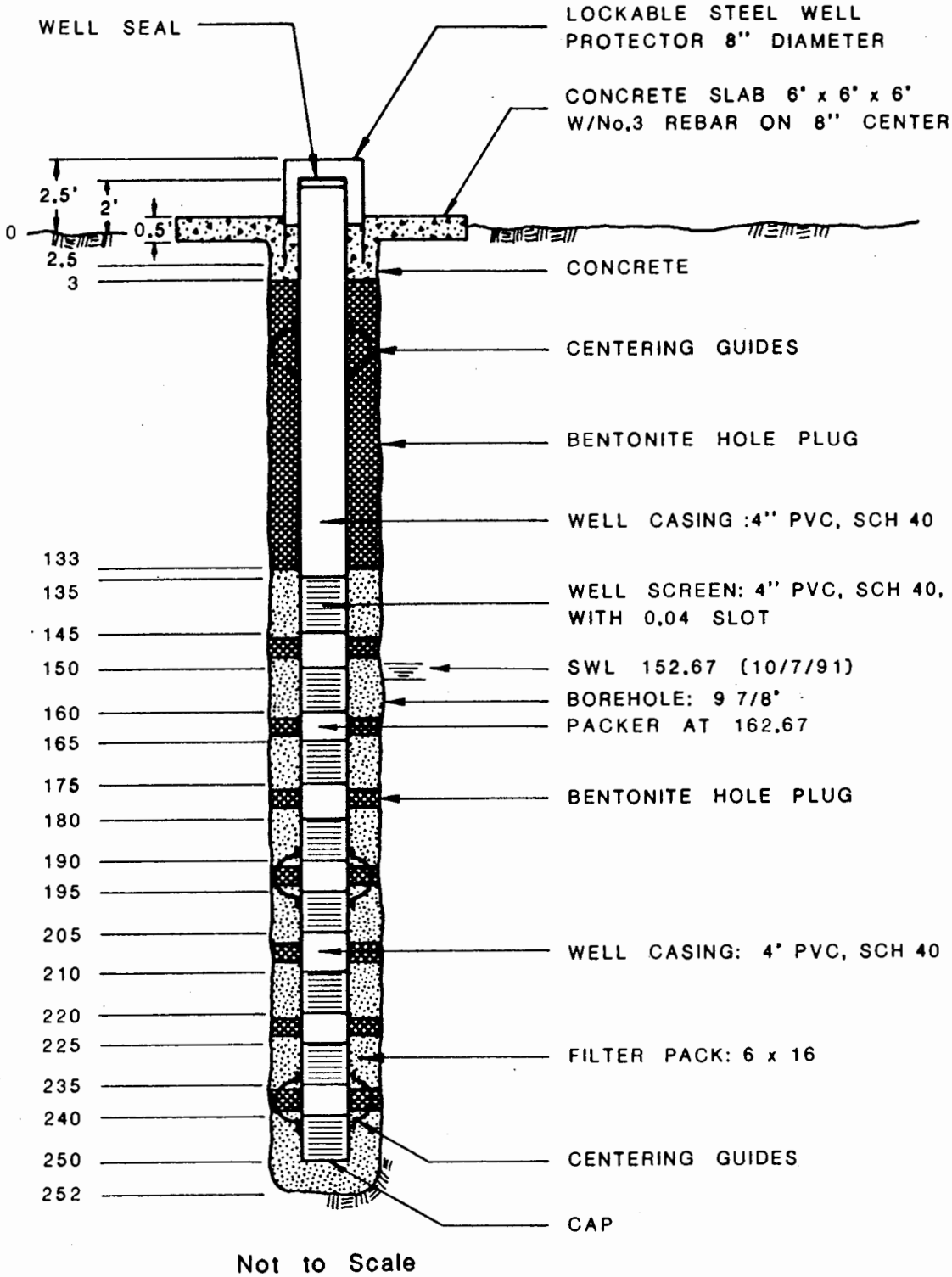
PROJECT No. 58-9660 DATE 1/7/92 PROJ. MGR. R.S. DFTR. M.N.

BIG BEAR REGIONAL WASTEWATER LUCERNE VALLEY, CALIFORNIA	TYPICAL MONITORING WELL CONSTRUCTION DETAILS MW-2	PROJ. NO. 58-9660.01 LAW ENVIRONMENTAL, INC.



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PROJECT No. 58-9660 DATE 1/7/92 PROJ. MGR. R.S. DFTR. M.N.

BIG BEAR REGIONAL WASTEWATER LUCERNE VALLEY, CALIFORNIA	TYPICAL MONITORING WELL CONSTRUCTION DETAILS MW-3	PROJ. NO. 58-9660.01 LAW ENVIRONMENTAL, INC.

Thomas Harder & Co.
Groundwater Consulting

1260 N. Hancock St.
Suite 109
Anaheim, CA 92807
(714) 779-3875
THarder@ThomasHarderCompany.com