CHAPTER 3 – PROJECT DESCRIPTION

All Chapter 3 figures are located at the end of this chapter, not immediately following their reference in the text.

3.1 INTRODUCTION

Together the following agencies—Big Bear Area Regional Wastewater Agency (BBARWA), Big Bear City Community Services District (BBCCSD), Big Bear Lake Department of Water and Power (BBLDWP), and Big Bear Municipal Water District (BBMWD) henceforth referred to jointly as the Project Team—are proposing to implement the Replenish Big Bear Program (Project or Program), previously known as the Bear Valley Water Sustainability Project. The Project includes upgrades and additions to BBARWA's wastewater treatment plant (WWTP) to produce purified water through full advanced treatment to protect the receiving waters and their beneficial uses.

The agency leading the Project Team is BBARWA, who will take the position of Lead Agency for compliance with the California Environmental Quality Act (CEQA) on behalf of this Project. The Project has been awarded federal grants, so compliance with the National Environmental Policy Act (NEPA) is also needed. Therefore, this document has been prepared to meet National Environmental Policy Act (NEPA) standards to enable the Bureau of Reclamation (BOR) and other federal agencies to process this project under a separate NEPA documentation process. The Replenish Big Bear Program would upgrade BBARWA's WWTP to produce full advanced treated water that would be retained within the Big Bear Valley (Valley) watershed to be used to increase the sustainability of local water supplies, consequently, wastewater currently delivered to Lucerne Valley will be modified.

As detailed in this project description, many of the activities that make up the Replenish Big Bear Program are in the planning and design phase. This Program Environmental Impact Report (PEIR) analysis focuses on both the plan level and project level implementation, including site-specific construction and operation details of individual program elements, where individual elements are known. As such, the level of information and analysis provided for each individual action is commensurate with this PEIR approach.

3.2 PROJECT LOCATION

The Valley is located in the San Bernardino Mountains of San Bernardino County, California. The area includes approximately 135 square miles within a 12-mile long valley surrounded by mountain ridges and rugged slopes. Land surface elevations range from 6,000 to 9,900 ft and the area is entirely surrounded by the San Bernardino National Forest. The proposed project is located within the Big Bear Valley Groundwater Management Zone (GMZ or Basin). Big Bear Lake and Baldwin Lake are located in the middle of this Basin. The overall project area consists of the Valley. The BBARWA Sewer Service Area and the Valley potable water service areas are shown on **Figure 3-1** to illustrate the regional context of the proposed Replenish Big Bear Program. The proposed elements of the Replenish Big Bear Program that are located within the Valley are shown on **Figures 3-2 through 3-17**, which depict the project area from a regional and site-specific level. The site-specific Figures depict areas in which new infrastructure is required in support of the project and also depicts portions of the project that will utilize existing infrastructure that will be required in support of project operation.

The project will span just east of Big Bear Lake to the WWTP at Baldwin Lake and then south to Shay Pond, and southeast of Big Bear Lake to the southeast to the Ski Resort Pond and Sand

Canyon Recharge Area. Each of these elements are discussed in further detail below. The project is located within several USGS 7.5-minute topographic maps, including the following: Big Bear City, CA; Big Bear Lake, CA Moonridge, CA; San Gorgonio, CA; and, Lucerne Valley, CA. The central point for this project is the BBARWA WWTP, for which the geographic coordinates of the proposed project are 34.268906, -116.815575, which is located in Section 7, Township 2 North, Range 2 East of the Big Bear City, CA USGS 7.5-minute topographic map.

3.3 PROJECT PURPOSE AND OBJECTIVES

The goal of the Project Team is to partner to recover a water resource that is currently being transported out of the Valley to Lucerne Valley, close the water loop, and keep the water in the Valley for beneficial reuse. This goal will be achieved through development of a multi-benefit water reuse project that:

- Augments natural recharge for water supply sustainability;
- Protects the rare and diverse habitat and species in the Valley;
- Promotes a thriving community through enhanced recreation;
- Creates a new and sustainable water supply;
- Educates the community about the water cycle, recycled water treatment process, and water quality to gain public support;
- Creates a project that benefits all agencies involved;
- Develops a cost-effective project to offset potable water demands; and
- Takes advantage of current outside funding opportunities.

3.3.1 Project Characteristics

The Project Team envisions the facilities described in this Section as a key element in the long-term sustainability of local water supplies for the whole of the Valley. Drought conditions and a long-term decline in precipitation trends have led the local water management agencies to investigate opportunities for supplemental water supplies, which are extremely limited due to its isolated location at the top of the Santa Ana River watershed (**Figure 3-18**). As such, the Replenish Big Bear Program has been designed to retain local water in the Valley to increase the sustainability of water supplies. The following agencies within the Valley have partnered to jointly fund and develop the Replenish Big Bear Program; though the lead agency for this project is BBARWA:

- BBARWA: BBARWA provides wastewater treatment to the entire Valley (79,000 acres).
- BBCCSD: BBBCSD's services include water, wastewater collection, fire protection & emergency medical services, solid waste collection, and street lighting services. BBCCSD's water service area includes Big Bear City and portions of San Bernardino County. BBCCSD's wastewater collection area includes Big Bear City and portions of unincorporated communities such as Sugarloaf, Erwin Lake, Whispering Forest, and Moonridge.
- BBLDWP: BBLDWP was formed in 1989 with the purchase of the retail water system from Southern California Water Company and currently provides water service to the City of Big Bear Lake, located along the south side of Big Bear Lake, as well as the unincorporated communities of Fawnskin, Sugarloaf, Erwin Lake and Lake Williams.
- BBMWD: BBMWD is an independent special district that is responsible for the overall management of the Lake.

Replenish Big Bear includes permitting, design, and construction of full advanced treatment facility upgrades at the existing BBARWA WWTP, more than 7 miles of pipeline for product water and RO brine minimization, three pump stations, a groundwater recharge facility, and up to four monitoring wells. The Program is currently estimated to produce approximately 1,950 acre-feet per year (AFY) of high-quality purified water, and may produce up to 2,210 AFY by 2040 through operation of a high-recovery brine minimization technology. Piloting will be conducted to confirm the feasibility of the higher yield estimates. For the purposes of this document, 2,210 AFY is used to be conservative in evaluating environmental impacts.

The Shay Pond discharge will replace potable water currently discharged to the water body to maintain the water flow through the pond, which is shown on **Figure 3-19**. Up to 80 AFY of purified water will be sent to Shay Pond, and any remaining purified water will be sent to the Stanfield Marsh Wildlife and Waterfowl Preserve (Stanfield Marsh), a tributary of Big Bear Lake (Lake).

For redundancy purposes, BBARWA is also seeking to maintain its current discharge location in Lucerne Valley, where undisinfected secondary effluent is currently conveyed to irrigate crops used for livestock feed.

The Project Team intends to implement the Replenish Big Bear Program, which was first discussed in detail in **Appendix 1** "Bear Valley Water Sustainability Project Final Draft Lake Alternative Evaluation" prepared by WSC, Inc. dated December 19, 2018. Since 2018, some aspects of the Project have been modified. However, the objectives of the Project remain the same and include the following uses and benefits:

- Purified water will be discharged to Shay Pond to sustain habitat for the federally listed Unarmored Threespined Stickleback fish, which is currently sustained using potable groundwater
- Purified water will be discharged to the Stanfield Marsh Wildlife and Waterfowl Preserve (Stanfield Marsh), providing a consistent water source to sustain habitat and increase education opportunities for the community and visitors;
- Purified water will flow through Stanfield Marsh and provide new inflow to the Lake to increase inflows and Lake level, enhance recreational opportunities and aquatic habitat, and support water quality improvements;
- When needed, purified water stored in the Lake will be pumped to Sand Canyon to recharge the groundwater basin to strengthen the sustainability of the groundwater basin;
- Purified water stored in the Lake for can be used for golf course irrigation and dust control by the Big Bear Mountain Resorts (Resorts) in the summer.
- During wet periods, excess purified water stored in the Lake could be stored locally as snow, providing flexibility to further enhance winter recreation, reduce spills from Big Bear Lake, augment spring runoff and increase groundwater recharge. This activity is not currently planned to be implemented as part of the Program, but the Program provides the flexibility to adapt if more extreme hydrologic conditions occur in the future.
- Additional inflow may enable BBMWD to modify their current Big Bear Lake management strategy to minimize spills and optimize releases to enable additional water to be captured downstream for recharge of the San Bernardino Basin, rather than discharged to the ocean.

The Replenish Big Bear Program will require significant upgrades to the treatment process at the WWTP to meet stringent discharge requirements for the Big Bear Lake discharge and the Sand Canyon recharge portion.

3.4 PROJECT BACKGROUND AND EXISTING CONDITIONS

3.4.1 Groundwater Management in Big Bear Valley

The Bear Valley Groundwater Basin (Basin Number 8-009) was initially designated by the California Department of Water Resources (DWR) as a medium priority basin. Medium priority basins that are not in critical overdraft are scheduled to submit a Groundwater Sustainability Plan (GSP) to DWR by January 31, 2022. DWR reclassified the Bear Valley Basin as a very low priority basin, but encouraged the Bear Valley Basin Groundwater Sustainability Agency (BVBGSA) to continue with the planned preparation of the GSP. Given the fact that natural precipitation is the only source of recharge and water supply to the valley, the BVBGSA member agencies have already been proactive in implementing many of the groundwater monitoring and management elements required by Sustainable Groundwater Management Act (SGMA) in an effort to protect this critical resource. Thus, the BVBGSA, a "local agency" comprised of BBCCSD, BBLDWP, BBARWA, and BBMWD, prepared the Bear Valley Basin GSP in January 2022. The GSP is available at https://www.bvbgsa.org/.

Groundwater pumping within the Bear Valley Basin, as a whole, has historically been within the Sustainable Yield resulting in relatively stable long-term groundwater levels. While there have periodically been localized groundwater level declines, pumping sustainability has been maintained through adaptive management of pumping distribution between management areas and implementation of conservation measures. To maintain pumping sustainability into the future, the BVBGSA plans to continue these effective management actions on a routine basis and implement projects as needed that support sustainable management. Additionally, groundwater level Measurable Objectives at each Representative Monitoring Site (RMS) are monitored against the average 2019 groundwater level at that site (refer to **Figure 3-20**). These management actions and monitoring programs are detailed further in the GSP.

3.4.2 Water Demand in Big Bear Valley

Water demands served by BBLDWP are primarily residential, which account for approximately 70 percent of BBLDWP's total demand, while commercial demands account for approximately 19 percent of BBLDWP's total demand. The remaining 11 percent is attributed to unbilled consumption and water loss. BBCCSD provides potable water to all its customers, which are comprised of about 88% residential and 12% commercial accounts. On average, BBCCSD's water uses are about 80% residential, 11% commercial, and 9% losses. The projected water demands for BBLDWP and BBCCSD area are presented in **Table 3-1**.

Table 3-1
WATER DEMAND PROJECTIONS FOR BEAR VALLEY WATER AGENCIES (AFY)

Water Agency	2020	2025	2030	2035	2040	2045
BBLDWP	2,332	2,147	2,164	2,190	2,231	2,283
BBCCSD	1,067	1,185	1,206	1,227	1,249	1,271
Total	**3,399**	**3,332**	**3,370**	**3,417**	**3,480**	**3,554**

Source: BBLDWP 2020 UWMP; BBCCSD 2020 UWMP

3.4.3 Big Bear Lake Water Management

Big Bear Lake is an important resource that provides extensive recreational, economic, ecological, and aesthetic benefits for the local community as well as the larger inland southern California region. Together, Stanfield Marsh and the Lake have a surface area of nearly 3,000 acres, a storage capacity of 73,320 af, and an average depth of 32 feet (ft). Stanfield Marsh and the Lake are both waters of the State of California (State) and United States (U.S.), which have several designated beneficial uses. For reference, **Table 3-2** shows the designated beneficial uses of the Lake and Stanfield Marsh per the 1995 Water Quality Control Plan for the Santa Ana River Basin Plan (Basin Plan), as amended in 2008, 2011, 2016, and 2019. In addition, the Nutrient TMDL was adopted to address concerns with phosphorus and nitrogen impacts on the Lake. **Table 3-3** presents the Lake regulatory limits set to protect the Lake benefits.

Table 3-2
BENEFICIAL USES OF BIG BEAR LAKE AND STANFIELD MARSH

Beneficial Uses	Big Bear Lake	Stanfield Marsh
AGR - Agricultural Supply	✓	
COLD - Cold Freshwater Habitat	✓	✓
GWR - Groundwater Recharge	✓	
MUN - Municipal and Domestic Supply	✓	✓
RARE - Rare, Threatened, or Endangered Species	✓	✓
REC1 - Water Contact Recreation	✓	✓
REC2 - Non-Contact Water Recreation	✓	✓
SPWN - Spawning, Reproduction, and/or Early Development	✓	
WARM - Warm Freshwater Habitat	✓	
WILD - Wildlife Habitat	✓	✓

Table 3-3
LAKE REGULATORY LIMITS FOR CONSTITUENTS OF INTEREST

Constituent	Basin Plan WQO (mg/L)	Nutrient TMDL (mg/L)
Total Dissolved Solids (TDS)	**175**	
Hardness	125	
Sodium	20	
Chloride	10	
Total Inorganic Nitrogen (TIN) (mg/L-N)	**0.15**	
Sulfate	10	
Total Phosphorus (TP) (mg/L-P)	**0.15**	**0.035**
Total Nitrogen (TN) (mg/L-N)		1
Chlorophyll-a (μg/L)		14

Note: **Bolded** constituents were identified as priority in previous regulatory meetings and are specifically evaluated in this study.
WQO = Water Quality Objectives

The Lake is located about 6,743 ft (2,055 m) above mean sea level (MSL) in the San Bernardino Mountains in San Bernardino County. The Lake was formed following construction of the Bear Valley Dam in 1883-1884 to serve as an irrigation supply for the citrus industry in the downstream

Redlands-San Bernardino communities. Since that time, the Lake has served as a vital engine for economic growth in the Valley, and the region has developed into a year-round destination with extensive recreational and commercial activities, primary and secondary residences, vacation properties, hospitality, and other services.

As with all other natural and man-made lakes in Southern California, the Lake is subject to dramatic variability in water surface elevation; surface elevations reached as low as -48.5 ft relative to dam crest (72.33 ft maximum depth) in November 1961, corresponding to a volume of less than 1,000 af and a lake surface area on the order of 200-300 acres during the extended drought in the late 1950's and early 1960's. BBMWD was subsequently formed in 1964 to manage and help stabilize the water level in the Lake. The region's natural hydrology includes severe protracted droughts and is influenced by the Pacific Decadal Oscillation (PDO) and El Nino-La Nina climate systems, which makes lake level stabilization a tremendous challenge. This wide variability in Lake level, in turn, can have dramatic impacts on recreational, economic, and aesthetic values of the Lake, as well as ecological conditions and Lake water quality.

The proposed Replenish Big Bear Program would not only provide purified water to serve existing uses, but it also envisions replenishing the Lake through Stanfield Marsh.

Big Bear Lake, as stated above, is managed by BBMWD, which has rights to the lake bottom, Bear Valley Dam, and the right to utilize and manage the surface of Big Bear Lake from Bear Valley Mutual (BVM or Mutual). Bear Valley Mutual maintains a storage right and ownership of all water inflow into the Lake. BVM has the right to request Lake releases commensurate with what may be reasonably necessary to meet the requirements of Mutual's stockholders, not exceeding 65,000 AF in any ten (10) year period.

BBMWD is able to maintain a higher water level in the lake by delivering water to Mutual from an alternate source of water. This alternate source of water (In-Lieu Water) comes mainly from the State Water Project through a contract executed in 1996 with San Bernardino Valley Municipal Water District (Valley District).
BBMWD's current Lake Release Policy was adopted in 2006 provides guidance on how Mutual demands will be met depending on the Lake level.

- When the Lake is in the top 4 feet, Mutual's demands will be met with Lake releases;
- When the Lake is between 4 and 6 feet below full, Lake releases will be made in the months of November through April and In-Lieu Water will be obtained from May to October
- When the Lake is more than 6 feet below full, In-Lieu Water will be obtained

Snowmaking Withdrawals
BBMWD currently has a contract with the Big Bear Mountain Resorts, allowing the withdrawal of an allocated amount of water from the Lake to use for snowmaking purposes. Currently, Big Bear Mountain Resort is authorized to withdraw a maximum of 11,000 acre-feet (AF) of water from the Lake over a 10-year rolling period, not exceeding 1,300 AF in any single year. It is calculated that about half of the water withdrawn from the lake for this purpose is returned as runoff.

Fish Protection Releases
In 1995, the State Water Resources Control Board (SWRCB) issued Order No. 95-4, which requires BBMWD and Mutual to release water from the Lake for fishery protection in Bear Creek. Sufficient water must be released from the Lake to maintain specific flow standards, which vary by month and by hydrologic year type (normal, above normal or below normal precipitation).

3.4.4 Wastewater Characteristics and Facilities

BBARWA owns and operates a 4.89 million gallon per day (MGD) capacity WWTP located just south of Baldwin Lake on the east side of the Valley. In 2021, the WWTP treated approximately 1.85 MGD of municipal wastewater collected from BBCCSD, the City of Big Bear Lake, and County of San Bernardino Service Area (CSA) 53 in Fawnskin.

The existing treatment process includes the following:

- Preliminary treatment consisting of a mechanical coarse screen and an aerated grit chamber;
- Secondary treatment consisting of extended aeration oxidation ditches and secondary clarifiers; and
- Solids handling through a dewatering belt filter press.

Treated effluent is temporarily stored on-site prior to discharge to Lucerne Valley. Dewatered solids are hauled off-site.

The influent flows to BBARWA's WWTP are comprised of three components:

- Flow from full-time residential homes
- Flows due to tourism, commercial activities and part-time residential homes
- Flows from Infiltration and Inflow (I/I) due to precipitation

These components create a seasonal variation in the wastewater flows treated at the plant. BBARWA's 2010 Sewer Master Plan (2010 SMP) estimated that the full-time residential rate is 38% of the overall customer population within the area. The tourism season is largely concentrated in the months of December through April due the local ski resorts; additionally, the months of June and July also see a slight rise in tourism due to Lake recreation activities. The average daily flow is presently approximately 2.0 MGD and the maximum month flow is 5.4 MGD.

BBARWA's WWTP is located on a 93.5-acre property. The WWTP process components occupy 11.2 acres, and the remaining 82.3 acres include storage ponds and evaporation ponds. Influent flows are conveyed through three BBARWA operated sewer mains and lift stations to the plant. The WWTP currently provides preliminary and secondary treatment.

Treated secondary effluent is discharged to a 480-acre site in Lucerne Valley (LV Site)—about 20 miles north of the Big Bear Valley—for irrigation of fodder and fiber crops that are used as feed for livestock. Use of recycled water for crop irrigation at the LV Site began in 1980 and 100% of the WWTP effluent is currently discharged to the LV Site. Discharge to the LV Site must meet the Colorado River Basin Regional Water Quality Control Board (RWQCB) Waste Discharge Requirement (WDR), which has an effluent limit for TDS of 550 mg/L over a 12-month period.

3.4.5 Shay Pond and Stickleback Fish Habitat

The Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*), also known as UTS (referred to as "Stickleback" herein) is listed as both a Federal and State of California Endangered Species under the respective Endangered Species Acts. There has been a population of Stickleback in the Shay Creek area on the east side of the Valley, as shown in **Figure 3-21**, which includes Shay Pond, Sugarloaf Pond, Juniper Springs, Motorcycle Pond, Shay Creek, Wiebe Pond, and Baldwin Lake. By the summer of 1990, it was thought that the

Stickleback remained in only Shay Pond; however, several years of above-average precipitation in the mid-1990s resulted in the establishment of a pool of water in Baldwin Lake.

There is a long history of study and group effort regarding the Stickleback in the Shay Creek area. The main stakeholders include the United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), the San Bernardino National Forest (SBNF), BBCCSD, BBLDWP, and BBARWA. The Shay Creek Working Group, which includes representatives from the USFWS, CDFW, SBNF, BBCCSD, DWP, and BBARWA, was formed during the process of preparing the USFWS' 2002 Biological Opinion (BO) for the area.

There are habitat threats that are specific to the Shay Creek area, including wetland vegetation growth and encroachment, pollution or eutrophication from contamination from horse manure, and loss of flow in the creek due to property development in the area. To mitigate wetland vegetation growth and encroachment, Shay Pond was dredged by BBCCSD in 2011, and again most recently in 2017. **Photos 3-1** and **3-2** show the pond before and after the 2011 dredging, respectively.

Photo 3-1. Shay Pond Before Dredging

Photo 3-2. Shay Pond After Dredging

The requirements of the 2002 BO state that BBCCSD will continue to provide water to Shay Pond to maintain a minimum 20-gallon-per-minute (gpm) outflow from Shay Pond. To meet this outflow requirement, BBCCSD discharges 50 gpm of potable water into the pond. Based on the average volumes of discharges between 2012 and 2020, BBCCSD discharges approximately 50 AFY of potable water into Shay Pond to maintain the fish population. However, the proposed NPDES permit will permit up to 80 AFY of discharge. The objective is to maintain a minimum pond water level that will support suitable habitat conditions for the fish. BBCCSD currently meets this requirement by discharging potable water into Shay Pond.

3.5 PROJECTED USES OF RECYCLED WATER GENERATED BY THE PROGRAM

The following uses are anticipated as part of the Replenish Big Bear Program and are discussed in more detail in subsequent sections.

- Continuous water supply to Stanfield Marsh Wildlife and Waterfowl Preserve, which will then flow into Big Bear Lake
- Continuous water supply to Shay Pond Unarmored Threespined Stickleback habitat
- Periodic groundwater recharge in Sand Canyon during summer months
- Potential periodic storage in the watershed as snow during wet winter periods
- Irrigation water for Bear Mountain Golf Course
- Potential water supply for downstream users when purified water exceeds needs in the Valley

3.5.1 Stanfield Marsh and Big Bear Lake

The Stanfield Marsh began a transformation in 1982 when BBMWD, working with CDFW, dredged basins, laid culvert pipes to connect to the Lake, and planted the shoreline, followed by numerous other enhancements in subsequent years. Stanfield Marsh is hydrologically connected to the Lake through a set of culverts under Stanfield Cutoff.

Stanfield Marsh is now a scenic 145-acre nature park that includes a gazebo, walking paths, and two boardwalks that extend out into the marsh so that visitors can observe the wildlife in, under and around the water. Stanfield Marsh is home to rare and diverse species of birds, fish, amphibians, and mammals.

As previously stated, rainfall and snowmelt are the only sources of water for Stanfield Marsh, so the water level varies from season to season and throughout longer hydrologic cycles. During wet periods, Stanfield Marsh is a thriving wildlife preserve. During extended drought conditions, the water level recedes dramatically, the boardwalks extend over dry soil, and the wildlife become scarce. In the last 15 years, Stanfield Marsh has been less than half full nearly 40 percent of the time. Full advanced treated water would provide a new, drought proof source of inflow to stabilize the water levels and sustain habitat in Stanfield Marsh even during dry periods.

Water from Stanfield Marsh will also provide new inflow into the Lake and increase Lake levels relative to no Project conditions. The proposed outlets into the Lake at Stanfield Marsh would occur at one of two points just west of the Big Bear Airport, shown on **Figure 3-2**.

Per conversations with the California State Water Resources Control Board Division of Drinking Water (DDW), the Lake may be designated as a non-restricted recycled water impoundment and the subsequent use of purified water in the Lake, such as snowmaking, landscape irrigation, dust control, and groundwater recharge would be subject to recycled water regulations. Additional coordination and studies are being conducted to regulate these uses. It is anticipated that a separate WDR permit will be obtained to regulate the Sand Canyon groundwater recharge project. The non-potable recycled water uses for landscape irrigation, dust control, snowmaking, and nonrestricted impoundment are anticipated to be regulated under the Statewide Water Reclamation Requirements for Recycled Water Use (Oder WQ 2016-0068-DDW).

In 2000, BBARWA was issued a National Pollutant Discharge Elimination System (NPDES) permit (Santa Ana Region Board Order No. 00-12), which included the Marsh and a proposed new Stickleback habitat in Baldwin Lake as authorized discharge points, subject to construction of tertiary treatment and disinfection upgrades. The NPDES permit limited discharges to the Marsh to periods of lower water levels when the Marsh was not hydraulically connected to the Lake. The tertiary treatment upgrades were not completed, and the discharge point was never used so the NPDES permit was not renewed when it expired in 2005. In 2005, the Santa Ana RWQCB issued Order No. R8-2005-0044, which does not allow discharge to the Marsh. A new NPDES permit, which BBARWA is in the process of acquiring, would be required for the Replenish Big Bear Program to address discharges into Stanfield Marsh/Lake, and the Shay Pond Stickleback habitat.

3.5.2 Stickleback Fish Habitat

As stated under **Subsection 3.4.5**, above, the Unarmored Threespine Stickleback (*Gasterosteus aculeatus williamsoni*), is listed as both a Federal and State of California Endangered Species under the respective Endangered Species Acts. There is a long history of study and group effort regarding the Stickleback in the Shay Creek area. While the objective is to maintain a minimum pond water level that will support suitable habitat conditions for the fish, and BBCCSD currently meets this requirement by discharging potable water into Shay Pond, the 2002 BO also states that, should a suitable alternative supply of water be found to be appropriate for the stickleback in the future, BBCCSD may use an 'in-lieu' water supply, which could include the use of tertiary-treated water. Replenish Big Bear would provide an in-lieu water supply (i.e., full advanced treated water, which exceeds tertiary treated water) for Shay Pond to meet the requirements of the 2002 BO, which would enable BBCCSD to recover this potable supply to serve their customers.

3.5.3 Groundwater Recharge at Sand Canyon

Groundwater recharge at Sand Canyon was evaluated by Thomas Harder & Co. (Harder) to assess the feasibility of recharging the groundwater aquifer at Sand Canyon using surface water from Big Bear Lake and estimate the annual recharge capacity. This study can be found in the "Sand Canyon Recharge Evaluation" prepared by Thomas Harder & Co, dated November 29, 2017 (**Appendix 4**). Harder found that the recharge potential at Sand Canyon is approximately 380 AFY over a 6-month period, based on a recharge area of approximately 4.2 acres and a recharge rate of 2.1 ft/day.

The Sand Canyon recharge concept involves extracting purified water stored in the Lake (a blend of surface water and purified water) and discharging it into Sand Canyon, which serves as a flood control channel. The recharge operation would only occur during summer months when needed to supplement groundwater supply and would be operated intermittently as needed to avoid interference with flood flows.

Recharge to Sand Canyon would occur through either constructing a series of small berms along the streambed to create a percolation area, modifying stream channel to create a meandering stream with small natural ponds to slow the water down and enhance percolation, or utilizing inflatable rubber dams in the channel which could be inflated to create percolation ponds during the recharge operation only and deflated at all other times so as not to impact the natural function of the channel. All of these concepts will need to be coordinated with the flood control agency (San Bernardino County Flood Control District) to ensure that the capacity of the flood control channel remains sufficient to meet the primary purpose of providing flood protection. If these improvements resulted in a decrease in surface flow entering the Lake, the impact to surface water rights under the 1977 Judgment will be evaluated.[1]

When water is needed for recharge in Sand Canyon, it is assumed that the existing lake pump station owned by Big Bear Mountain Resort (Ski Resort) could be used to transfer water through an existing pipeline into the existing storage pond located at Bear Mountain Ski Resort. These facilities are used primarily for snowmaking in the winter and are expected to be available for the proposed recharge operation, which would only occur from April through October when the resorts are not making snow. It is anticipated that a separate WDR permit by BBLDWP will be obtained to regulate the Sand Canyon groundwater recharge project.

[1] The Big Bear Dam was originally constructed to provide water storage for BVM which was formed in 1903 by the citrus growers of the Redlands/Highland area to ensure water supply for irrigation needs. The historic operation of the Big Bear Lake as an irrigation reservoir resulted in drastic fluctuations in lake levels, which conflicted with the goals of BBMWD and the community of Big Bear Valley. A legal conflict over the water rights and management of the lake was ultimately settled out of court through the 1977 Judgement. Under the terms of this judgement, BBMWD purchased the lake bottom, Bear Valley Dam, and the right to utilize and manage the surface of Big Bear Lake from BVM. BVM retained a storage right and ownership of all water inflow into the Lake.

3.5.4 Snow Storage

During wet periods, excess water could be stored as snow at the Resorts using their existing snowmaking infrastructure. This would reduce spills from the Lake, keep more of the water in the Valley, and enhance winter recreation by providing additional snowmaking water to the Resorts beyond their current allotment from the Lake. When the snow melts in the spring, runoff would be augmented, which is expected to increase natural groundwater recharge and may improve fish spawning habitat in streams tributary to the Lake. Title 22 provides that disinfected tertiary recycled water may be used for artificial snowmaking for commercial outdoor use. The Replenish Big Bear Program is anticipated to exceed the level of treatment required. This activity is not currently planned to be implemented as part of the Program, but the Program provides the flexibility to adapt if more extreme hydrologic conditions occur in the future.

3.5.5 Golf Course Irrigation

A new proposed use under the proposed Program is to pump purified water stored in the Lake from the Bear Mountain intake pump (also owned by the Ski Resort) for landscape irrigation of the Bear Mountain Golf Course located at 43092 Goldmine Drive, Big Bear Lake, CA 92315. The golf course is typically open to the public from mid-May through October of each year from 7:30 AM to 5:30 PM.

Golf course irrigation would keep additional water in the Valley, the existing snowmaking facilities could also be used to deliver irrigation water to the Bear Mountain Golf Course in the summer, if desired. The water demand for the Bear Mountain Golf Course is estimated to be 120 AFY. This option would allow the Resort to rest its groundwater irrigation wells and reduce pumping from the Basin. Title 22 provides that disinfected tertiary recycled water may be used for irrigation of unrestricted access golf courses, subject to the restriction that irrigation shall not take place within 50 feet of an unshielded domestic water supply well and that recycled water impoundment may not occur within 100 feet of a domestic water supply well. Additionally, some adjustments to irrigation practices may be needed to comply with the site use requirements in Title 22, which would need to be coordinated with the Resort.

3.5.6 Dust Control

A new proposed use under the proposed Program is to use purified water stored in the Lake to provide dust control for a bike park at the Snow Summit Ski Resort. Each spring, the Snow Summit Ski resort is transformed into a bike park. Purified water stored in the Lake could be used from April to October for this purpose. It is estimated that about 120 AFY of purified water stored in the Lake could be utilized in support of this use under the proposed Program.

3.5.7 Downstream Recharge

Additional inflows into the Lake will provide BBMWD with more flexibility in managing Lake releases, while still maintaining high Lake levels. In particular, during wet periods, additional flood control releases are anticipated to flow down the Santa Ana River to the Seven Oaks Dam, which is upstream of the San Bernardino Groundwater Basin area. BBMWD intends to coordinate with San Bernardino Valley Municipal Water District (Valley District) in an effort to optimize the volume of releases from the Lake that can be captured for recharge of the Bunker Hill Basin, rather than flow past to the ocean.

3.6 WASTEWATER TREATMENT UPGRADES

In order to meet the objectives of the Replenish Big Bear Program, the BBARWA WWTP must be upgraded to meet the correlating water quality standards and objectives for the types of uses proposed as part of this Program. As such, the following section discusses the Basin Plan water quality objectives, and the treatment upgrades required to treat wastewater to the degree required to comply with local, state, and federal water quality regulations.

3.6.1 Basin Plan Water Quality Objectives

In order to discharge to the proposed locations, the treated effluent must meet the water quality objectives set by the Santa Ana River Basin Water Quality Control Plan (Basin Plan). The Basin Plan establishes beneficial uses and water quality objectives (WQO) for the ground and surface waters of the region and includes an implementation plan describing the actions by the RWQCB and others that are necessary to achieve and protect the water quality standards. The Basin Plan provides a general narrative regarding the WQO for each water body type and specific numeric objectives for total dissolved solids (TDS), hardness, sodium, chloride, total inorganic nitrogen (TIN), total phosphorus (TP), sulfate, and chemical oxygen demand (COD).

- **Stanfield Marsh** has narrative objectives, as numeric objectives have not been established
- **Inland Surface Stream Rathbone Creek** has a TDS objective of 300 micrograms per Liter(μg/L)
- **Big Bear Lake** has a TDS objective of 175 μg/L-P, a hardness objective of 125 μg/L-P, a sodium objective of 20 μg/L-P, a chloride objective of 10 μg/L-P, a TIN objective of 0.15 μg/L-P, and a Sulfate objective of 10 μg/L-P
    - o In addition to the numeric and narrative WQOs, Big Bear Lake is subject to a Total Maximum Daily Load (TMDL) numeric target of 35 μg/L-P for total phosphorus during dry hydrologic conditions, per Resolution No. R8-2006-0023. By 2020, the total phosphorus numeric target must be achieved at all times.
- **Groundwater Management Zone Big Bear Valley** has a TDS objective of 300 μg/L-P, a hardness objective of 225 μg/L-P, a sodium objective of 20 μg/L-P, a chloride objective of 10 μg/L-P, a TIN objective of 5 μg/L-P, and a Sulfate objective of 20 μg/L-P
- Shay Creek, which flows into **Shay Pond,** has narrative objectives, as numeric objectives have not been established.

The nutrient limits for an NPDES permit to Stanfield Marsh/Big Bear Lake are expected to align with the Basin Plan WQOs and the TMDL numeric targets to protect the beneficial uses of the Lake. The anticipated effluent nutrient limits of 35 μg/L-P for total phosphorus and 0.15 mg/L-N for total inorganic nitrogen would require multiple process treatment steps and consistent treatment through seasonality. In addition, the Replenish Big Bear Project Team is committed to working with the Santa Ana RWQCB and State Water Resources Control Board's Division of Drinking Water (DDW) to protect the municipal (MUN) beneficial use of Big Bear Lake (Lake). As a reflection of that commitment, the Project Team is proposing to implement full advanced treatment and conduct additional monitoring to ensure that the proposed NPDES discharge is protective of the MUN beneficial use.

3.6.2 Groundwater Recharge Requirements

The Groundwater Recharge Regulations require a minimum "response retention time" or minimum groundwater travel time of two months between the point of surface application or injection, and the point of extraction. Harder's preliminary analysis shows that the recharge water will reach the nearest production well (Sheephorn Well) in a little more than approximately 13 months. For preliminary recharge siting purposes, a "credit" of 0.25 was applied for travel time calculations using an analytical model. Thus, the credited retention time is interpreted to be 9.75 months (39 x 0.25). This credited retention time meets/exceeds the minimum retention time of 2 months, indicating that the simulated recharge operation is feasible based on the data assumptions in the analysis. Refer to **Appendix 4**.

Pathogen controls include specific provisions for log reduction of microorganisms and treatment process requirements. The treatment process used to treat recharge water for a Groundwater Replenishment Reuse Project must provide treatment that achieves at least 12-log enteric virus reduction, 10-log Giardia cyst reduction, and 10-log Cryptosporidium oocyst reduction from raw sewage to usable groundwater. The treatment train shall consist of at least three separate treatment processes. For each pathogen (i.e., virus, Giardia cyst, or Cryptosporidium oocyst), a separate treatment process may be credited with no more than 6-log reduction, with at least three processes each being credited with no less than 1.0-log reduction. If the treatment process itself does not achieve the required pathogen control credits, additional credit can be gained through underground retention time prior to extraction.

3.6.3 BBARWA WWTP Treatment Upgrades

BBARWA's existing wastewater facility will be upgraded to meet the water quality objectives identified for Big Bear Lake in the Santa Ana Basin Plan. TIN and TP must be removed through multiple in-series processes because a single process cannot reliably reduce effluent TIN and TP concentrations to the levels required for Big Bear Lake's WQOs. To achieve these strict effluent limits, BBARWA will need to implement a series of upgrades to existing unit processes and integrate new unit processes.

As part of the Replenish Big Bear Program, proposed upgrades to the BBARWA WWTP include:

- Upgrade the existing oxidation ditches to biological nutrient removal process;
- Tertiary filtration and nutrient removal via denitrification filters
- Ultrafiltration (UF) and reverse osmosis (RO) membrane filtration;
- Brine pellet reactor for brine minimization; and
- Ultraviolet disinfection and advanced oxidation process (UV/AOP).

The new facilities would be designed for a treatment capacity of 2.2 MGD, with operational ability to divert a portion of the denitrification filter effluent directly to UV/AOP process depending on effluent water quality targets, treatment performance and discharge permit requirements. However, it is anticipated that 100% of the water discharged will be treated with RO and UV/AOP disinfection. The anticipated completion date is 2027. A detailed summary of the treatment process upgrades is shown in **Table 3-4**.

Table 3-4
SUMMARY OF TREATMENT PROCESS UPGRADES

Treatment Mode	Processes
Biological Nutrient Removal	**Nitrification-Denitrification:** Retrofit existing oxidation ditches to a Modified Ludzack-Ettinger (MLE) configuration with turbo blowers and diffused aeration for nitrogen removal.
Tertiary Filtration & Nutrient Removal	**Denitrification Filter:** Construct denitrification filters for nitrogen and phosphorus removal. Chemical provisions for supplemental carbon and chemical precipitant addition will be provided for denitrification and phosphorus removal, respectively.
Membrane Filtration	**Ultrafiltration and Reverse Osmosis:** Construct skid-mounted pressurized UF membranes and RO membrane facilities capable of high product recovery, high TDS removal, and removal of residual nutrients. Chemical provisions for antiscalant, pH adjustment, and remineralization chemicals will be provided. Brine from the RO system will be conveyed to the Pellet Reactor for brine minimization.
Disinfection	**UV Disinfection:** Construct closed vessel UV disinfection unit process for disinfection of denitrification filter effluent or RO permeate water. UV transmittance will be high for disinfection of the high-quality RO permeate and the UV dose will be higher than standard UV disinfection to provide strong oxidation capacity for the UV/AOP process. **AOP:** Construct a chemical injection and mixing system to dose a strong oxidant downstream of the UV process to destroy trace contaminants. The oxidant would be sodium hypochlorite or hydrogen peroxide, with final oxidant selection depending on final preliminary design decisions.
Brine Minimization	**Pellet Reactor:** Construct a skid-mounted pellet reactor system which provides brine minimization through additional RO membrane filtration and precipitation of partially soluble salts through a fluidized bed reactor.
Brine Management	The RO brine management option included in the preliminary design for Replenish Big Bear is a brine minimization pellet reactor to reduce the volume of brine produced by the RO process. The reduced brine stream from the pellet reactor will be conveyed to evaporation ponds located on BBARWA WWTP property. It is assumed that an RO recovery of 90% at 2.2 MGD influent flow would result in 0.22 MGD of RO brine to be minimized through the pellet reactor and approximately 0.022 MGD of liquid brine to be conveyed to the evaporation pond based on a pellet reactor recovery of 90%. A total evaporation pond area of 23 acres is needed for the brine stream. However, if a higher yield cannot be achieved up to a total evaporation pond area of 57 acres would be required. Site specific treatment performance of the pellet reactor will be evaluated during the piloting phase. Adjustments to total system recoveries and the brine management process could be made based on site-specific piloting results.

For comparison purposes, a schematic of the existing treatment processes is shown in **Exhibit 3-2**, and the proposed upgraded treatment process schematic is shown in **Exhibit 3-3**.

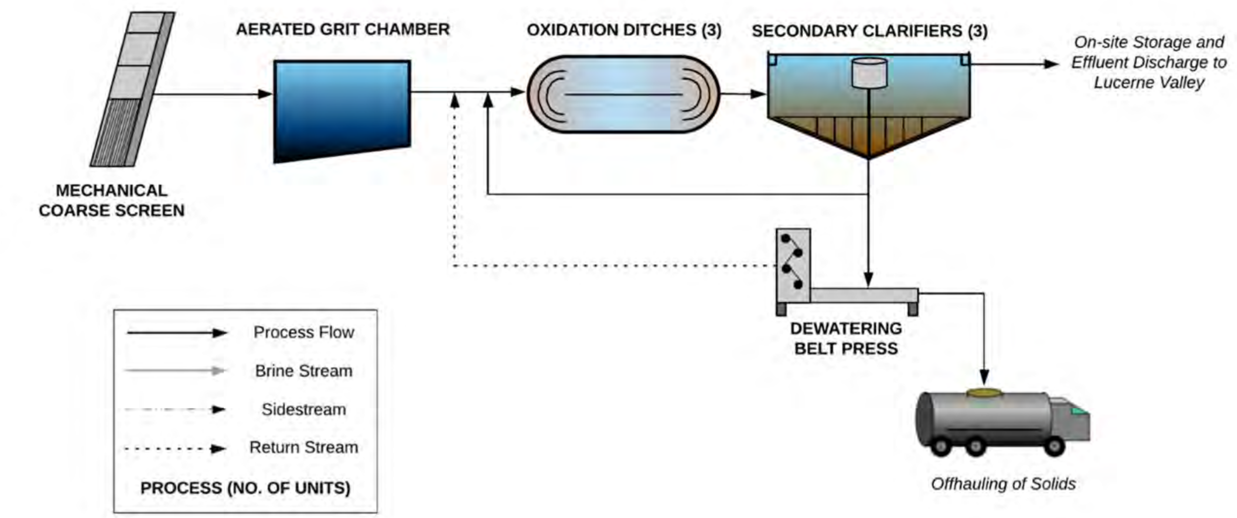

Exhibit 3-2: EXISTING TREATMENT PROCESS SCHEMATIC

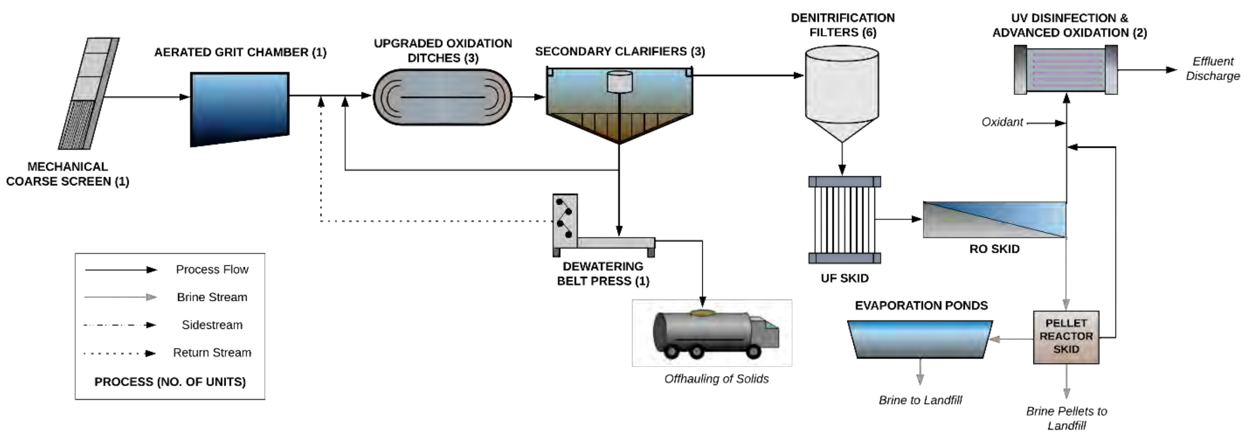

Exhibit 3-3: FUTURE UPGRADED TREATMENT PROCESS SCHEMATIC

The proposed upgrades (i.e., new advanced treatment train) would be designed for a treatment capacity of 2.2 MGD. By 2040, accounting for expected growth, it is estimated that the WWTP could produce 2,210 AFY of full advanced treated effluent, assuming a 99% total recovery rate could be achieved (90% RO recovery and 90% recovery of brine through brine minimization). The WWTP currently produces about 2.0 MGD of undisinfected secondary effluent on an average annual basis.

BBARWA also plans to maintain the existing Lucerne Valley discharge location. All WWTP process water in excess of the new treatment train's 2.2 MGD capacity will continue to be treated to undisinfected secondary levels and conveyed to the existing Lucerne Valley site, consistent with the current permitted discharge requirements of the existing BBARWA WWTP.

More specifically, the treatment upgrades would include the following:

- Modify and upgrade the existing oxidation ditch extended aeration process to a MLE process for increased biological nitrification-denitrification (NDN). Denitrification occurs in anoxic conditions which will be incorporated into the existing infrastructure with modifications to the tankage to provide volume without aeration. If needed, chemical precipitation of soluble phosphorus can be performed through addition of a metal salt within the activated sludge tankage, upstream of clarification.

- Nutrient-laden liquid sidestreams, which are produced during solids handling processes, may require management or treatment due to the potential negative impacts of returning high nutrient loads to other unit processes. Sidestream treatment would require additional on-site tankage and mechanical aeration. The need for side stream treatment will be determined during subsequent phases of the project when piloting and plant-wide process modeling is performed; however, because digestion of solids will not be performed at the upgraded WWTP, sidestream treatment is not likely to be required.
- Retrofit or operational modifications to secondary clarifiers for settling of phosphorus precipitates such as adding a chemical injection and mixing location and modifications to the baffling within the clarifier. Removal of phosphorus through chemical precipitation would increase solids production and require additional operational time of the WWTP's existing sludge dewatering equipment to process the increased solids load. It is anticipated chemical precipitation of phosphorus will not be required, which will be verified during subsequent phases of the project when piloting and plant-wide process modeling is performed.
- Addition of a tertiary filtration and nutrient removal process using biologically active denitrification filter with sand or synthetic media. Chemical precipitation of phosphorus with a metal salt (e.g., polyaluminum chloride or aluminum potassium sulfate) will be incorporated to provide phosphorus removal within the filter. The denitrification process will likely require an external carbon source (e.g., glycerol) to facilitate the reduction of nitrate.
- Low pressure ultrafiltration (UF), to reduce solids upstream of the reverse osmosis (RO) process.
- RO to reduce TDS concentration and nutrient concentrations. The assumed operational recovery for the RO system is 90% of the design flow. Emerging RO technologies that are configured for brine recirculation, multiple pass, or in-series operation to achieve high recoveries (such as closed-circuit reverse osmosis) have been demonstrated to achieve high recovery rates with reduced energy consumption at comparable capital costs to conventional RO. Such technologies would need to be piloted with BBARWA's specific water quality characteristics to verify expected performance for this application. The low-pressure filtration and RO unit processes are expected to provide the physical filtration for reduction of the 0.5 to 2 mg/L of TIN and TP coming from upstream processes. RO is the only unit process capable of removing TDS, making it a critical unit process for compliance with WQOs. It is assumed that 100% of the design flow will need to receive RO treatment to meet the WQOs. RO offers the advantage of removing TDS, organics, inorganics and nutrients to a sufficient level for meeting nutrient WQOs.

Projected treatment performance downstream of each unit process is shown in **Table 3-5**. Potential water quality performance for TIN, TP and TDS constituents are estimated for each unit process; however, the performance of each of these unit processes is highly site specific based on the water quality composition being treated. A pilot test of each unit process is required to refine performance estimates and establish design criteria.

Table 3-5
PROJECTED TREATMENT PERFORMANCE FOR THE PROPOSED TREATMENT PROCESS

Constituent	Primary Treatment	Biological Nutrient Removal	Denitrification Filter	UF/RO	UV/AOP	Water Quality Objectives
TIN (mg/L-N)	30	4	0.8	0.1	0.1	0.15
TP (mg/L-P)	8	2	0.3	0.03	0.03	0.035
TDS (mg/L)	450	450	450	50	50	175

The scope of the upgrades are shown in **Figures 3-22 through 3-28**. **Figure 3-22** shows the location of the BBARWA WWTP overlaid on the Federal Emergency Management Agency Flood Hazard Areas. **Figure 3-23** shows the location within the existing BBARWA WWTP at which the anoxic zone mixers, diffused air grid systems, and 4 turbo blowers in precast buildings are proposed to be located. **Figure 3-24** shows the location within the existing BBARWA WWTP at which the effluent pump station and pipeline will be installed, while **Figure 3-25** shows this same area in more detail, showing a diagram of the facilities and processes located in this building. **Figure 3-26** shows the location within the existing BBARWA WWTP site at which up to 57 acres of evaporation ponds would be installed. **Figure 3-27** shows the site availability at the BBARWA WWTP site, and indicates existing equipment and facilities to remain, to be removed, or with a tentative status. **Figure 3-28** is a continuation of the previous figure showing site availability and areas to be preserved within the BBARWA WWTP.

Anticipated Water Quality and Annual Flow

An analysis of the Lake was completed in 2021 and 2022 to evaluate the water quality impacts of key constituents on Stanfield Marsh and Lake. The analysis assumed that the discharge would be 100% treated and disinfected with RO and UV, which is referred to as “Alternative 3”. Since the completion of this analysis, BBARWA agreed to add AOP to the treatment to protect the MUN use of the Lake. Therefore, the water quality is expected to improve for some constituents. **Table 3-6** presents the Lake discharge flow projections that were considered in the Lake Analysis model (**Appendix 2**) and in the 2022 update to the Lake Analysis provided as an Appendix to the Lake Analysis Model.

Table 3-6
INITIAL AND UPDATED LAKE DISCHARGE FLOW RATE PROJECTIONS

Modeled Scenario	Program Inflow (AFY)	Daily Program Inflow (MGD)
Baseline (No Project)	0	0
Alternative 3 [(a)]	1,920	1.71
High Flow (99% recovery) [(b)]	2,210	1.57-2.18
Mid Flow (90% recovery) [(b)]	2,009	1.42-1.98

Notes: **a)** Alternative 3 was assessed in the 2021 Lake Analysis and assumed that of the total Replenish Big Bear effluent contribution considered in the Lake Analysis (i.e., 2,000 AFY), 80 AFY would be delivered to Shay Pond. Therefore, only 1,920 AFY would be discharged to the Lake at a constant flow. **B)** In the 2022 Lake Analysis update it was assumed that no discharge to Shay Pond would occur and all full advanced treated water would be discharged to the Lake under two different total recovery rates scenarios and monthly fluctuations.

The Lake discharge is expected to vary seasonally, as shown in **Exhibit 3-4**. Inflows to the WWTP are lower in the summer months due to reduced inflow and fewer visitors relative to the winter season.

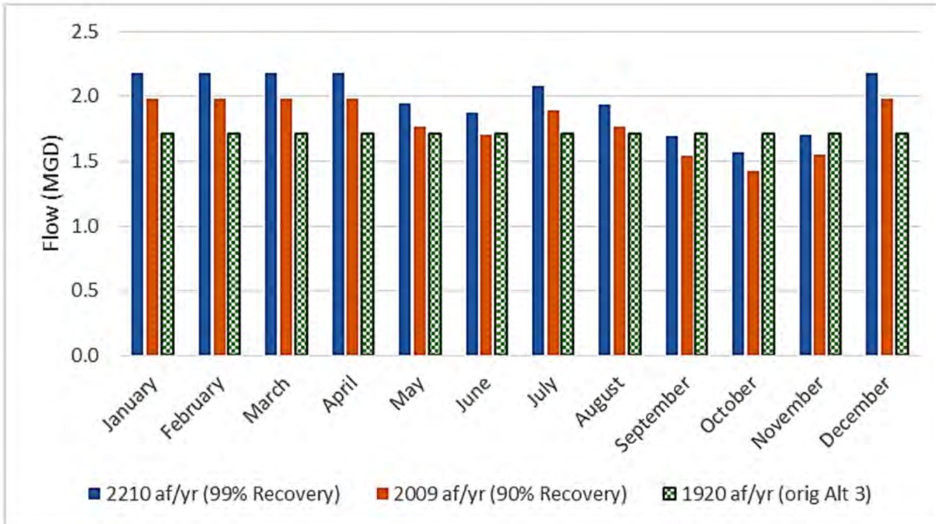

Exhibit 3-4: PROJECTED 2040 MONTHLY BBARWA DISCHARGES TO THE LAKE UNDER THREE INFLOW SCENARIOS

Since the Replenish Big Bear Program proposed Lake discharge has not been assigned a waste load allocation (WLA) for TP in the nutrient TMDL, a TP Offset Program is proposed to attain a net zero TP contribution to be consistent with the Nutrient TMDL assumptions. The TP loads added to the Lake by the Lake Discharge will be offset through triennial alum applications to attain net zero TP loadings for the upcoming three years. In the event of extreme runoff (defined here as exceeding about 25,000 acre-feet per year [AFY][2]), which has the potential to bury the reactive alum cap on the sediments and reduce its effectiveness, an alum treatment will be conducted that following spring-summer and the triennial treatment schedule will be reset.

Effluent Temperature

Lake water temperatures and WWTP effluent temperatures vary seasonally. While they are relatively similar in the summer months, the WWTP effluent temperature is considerably higher than the Lake temperature in the winter. It is expected that the discharge permit for this alternative would include limits for effluent temperature, and/or the allowable temperature change in the Lake caused by the discharge to avoid adverse thermal impacts to aquatic habitat.

[2] Approximately the 80th percentile annual inflow based on WaterMaster data for 1977-2018.

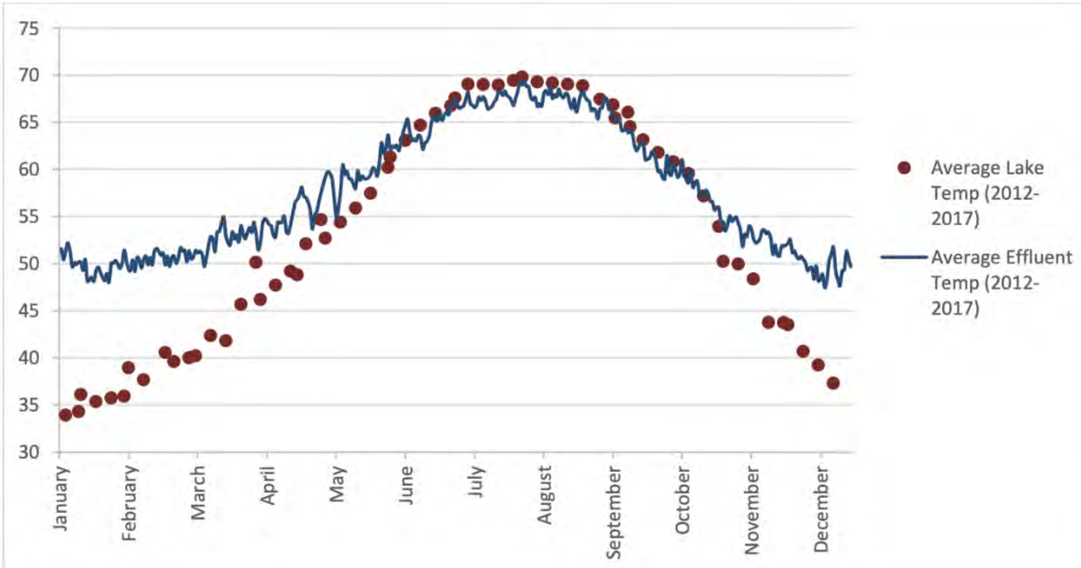

Exhibit 3-5: COMPARISON OF AVERAGE LAKE AND BBARWA EFFLUENT TEMPERATURES (2012-2017)

A supplemental simulation was conducted in 2022, which assessed the influence of the temperature of inflowing water from the Replenish Big Bear project on predicted near-surface (1 m) temperatures in Stanfield Marsh (Segment #4) and the eastern edge of Big Bear Lake (Segment #12) (**Exhibit 3-6**). Segment 4 is approximately 450 m from the inflow, corresponding to about 25% of the total length of Stanfield Marsh (about 1750 m).

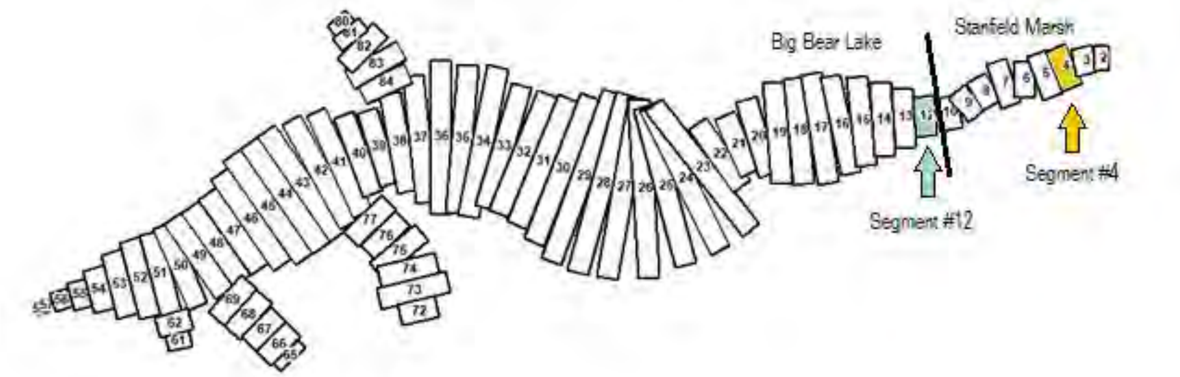

Exhibit 3-6: LAKE MODEL SEGMENTATION HIGHLIGHTING SEGMENT #4 IN STANFIELD MARSH AND SEGMENT #12 AT THE EASTERN EDGE OF BIG BEAR LAKE

Predicted mean temperatures for the two sites under the two different inflow temperature scenarios are summarized in **Table 3-7**.

Table 3-7
PREDICTED AVERAGE NEAR-SURFACE (1 M) TEMPERATURES IN STANFIELD MARSH (SEGMENT 4) AND BIG BEAR LAKE (SEGMENT 12)

Location	Original	+ Heat
Stanfield Marsh (Segment 4)	11.71 ± 6.99	12.51 ± 6.54
Big Bear Lake (Segment 12)	11.99 ± 7.05	12.00 ± 7.07

Notes: See Exhibit 3-6 for segment locations.

While the above analysis is not intended to serve as a detailed evaluation of fine-scale temperature effects on Stanfield Marsh resulting from discharge of advanced treated Replenish Big Bear water, results highlight some important general findings. First of all, warm advanced treated water discharged to the easternmost section of Stanfield Marsh quickly loses heat through exchange with the atmosphere and is diluted with existing water; higher lake levels afford greater opportunity for heat loss and dilution such that temperature effects are more likely at low lake levels. As a result, addition of warm advanced treated water to Stanfield Marsh does not, based on this modeling, meaningfully alter the heat budget for Big Bear Lake and is not predicted to alter lake temperature or duration or intensity of thermal stratification.

3.6.4 Brine Disposal – Solar Evaporation Ponds

Implementation of RO treatment requires management of brine concentrate. The most common brine concentrate disposal options include deep well injection (where permitted), surface water discharge (including the ocean), discharge to a wastewater treatment plant (such as via the Inland Empire Brine Line), land disposal, and solar evaporation or Zero Liquid Discharge with disposal of solids to a landfill.

The Project Team is considering the use of solar evaporation pond(s), while all other methods of brine disposal have been ruled infeasible. Evaporation ponds rely on solar energy to evaporate water from the brine concentrate stream, leaving behind precipitated salts, which ultimately are disposed of in a landfill. Evaporation ponds for brine concentrate disposal are most appropriate for smaller volume flows and for regions having a relatively warm, dry climate with high evaporation rates, level terrain, and low land costs. Evaporation ponds are relatively easy to construct, are low maintenance and have no mechanical equipment except for pumps to convey brine to the ponds. However, pond size requirements can be quite high depending on the brine flow and evaporation rates and the regulatory requirement for impervious liners of clay or synthetic membranes substantially increases the cost of construction. A monitoring well or wells will be required to be installed to verify that seepage from the ponds is not contaminating underlying groundwater.

The preliminary RO brine management option for Replenish Big Bear is a brine minimization pellet reactor to reduce the volume of brine waste from the RO process. The reduced brine stream from the pellet reactor will be conveyed to evaporation ponds located on BBARWA WWTP property. Using an RO recovery of 90% at 2.2 MGD influent flow would result in 0.22 MGD of RO brine to be minimized through the pellet reactor, and approximately 0.022 MGD of brine to be conveyed to the evaporation pond based on a pellet reactor recovery of 90%. A total evaporation pond area of 23 acres is needed for the brine stream. However, if the higher yield cannot be achieved up to a total evaporation pond area of 57 acres would be required. Site specific treatment performance of the pellet will be evaluated during the piloting phase. Adjustments to total system recoveries and the brine management process could be made based on site-specific piloting results.

3.6.5 Treated Water Storage and Distribution

Lake Discharge

The treated water is planned to be discharged continuously to Shay Pond and Stanfield Marsh; therefore, treated water storage at the WWTP is not required. A single effluent pump station is assumed to pump wastewater effluent treated water to meet discharge requirements for both Shay Pond and Stanfield Marsh; the variation in elevation of the two discharge points is approximately 15 feet. The pump station capacity will match the capacity of the advanced treatment facility, which is 2.2 MGD, or approximately 1,520 gpm. A new effluent pump station may be required, but if the existing effluent auxiliary pumps could be used as the primary secondary effluent pump station, the existing secondary effluent pump station may be able to be repurposed to avoid the need for a new effluent pump station.

A new 12-inch pipe will need to be installed from the WWTP to the proposed discharge points in Stanfield Marsh, as shown in **Figure 3-2**, which depicts the proposed alignment alternatives for the lake discharge.

Sand Canyon Recharge

When water is needed for recharge in Sand Canyon, it is assumed that the Resort's existing snowmaking facilities will be used to transfer water into the existing storage pond located at Bear Mountain Ski Resort and a new pump station would be constructed near the pond to convey water through a new pipeline to discharge into Sand Canyon, as shown in **Figure 3-29 and 3-32**. The pump station and pipeline are sized to convey 380 AF of recharge water over a 6-month period, which equates to approximately 471 gpm (refer to **Figure 3-30**). If a joint use arrangement for the Resort's snowmaking facilities cannot be negotiated, constructing new pumping and conveyance facilities to reach Sand Canyon would be required; however, this approach would substantially increase the Program's costs. The Sand Canyon Recharge Evaluation showing the underflow analysis prepared by Thomas Harder & Co. Groundwater Consulting is provided as **Figure 3-31 (refer to Appendix 2)**.

Shay Pond Discharge

As part of the Replenish Big Bear Program, up to 80 AFY of full advanced treated water is proposed for discharge to Shay Pond. The proposed Shay Pond discharge is intended to replace potable water that is currently discharged to the pond to support the Stickleback, which, as previously stated, is a federal and State listed endangered species. There is an existing 6-inch C-900 PVC pipeline that begins at the intersection of Shay Road and Palomino Drive and terminates near Shay Pond that can be used to convey the purified water to Shay Pond, with an extension of approximately 710 feet to reach Shay Pond. This nearby pipeline was constructed in 1986 for future use, but has never been put into service. It is possible that this pipeline may not be useable, and as such, a pipeline traversing this same alignment and sized comparably to the existing pipeline may be required, in addition to the proposed 710 foot extension to reach Shay Pond. The length of this pipeline would be 5,600 feet.

Shay Pond has a surface area of approximately 10 acres and is located about 1.2 miles southeast of the BBARWA WWTP, shown on **Figure 3-33**. According to the Bear Valley Basin Groundwater Sustainability Plan (GSP), *"Shay Pond is a natural surface water body at the southern base of an unnamed ridge that separates it from Baldwin Lake. The nature of this pond is unknown, but it may be fed, in part, from spring flow, surface runoff, and periodically, groundwater intersecting the land surface. Although the pond may have historically been fed from surface water runoff in the ephemeral, upstream segment of Shay Creek, urban development has altered the course of this stream, and it no longer flows into the pond. Surface water exits Shay Pond via the* *downstream segment of Shay Creek, which flows northwards toward Baldwin Lake and intermittently provides water to Baldwin Lake." "Surface water sources to Baldwin Lake are primarily in the form of ephemeral streams with relatively low flow volumes. The only stream where surface water flow periodically has been measured is Shay Creek at its outlet from Shay Pond." "Surface water runoff does not reach Baldwin Lake during most years but percolates into the groundwater system. However, during prolonged precipitation, surface water does flow into Baldwin Lake. All surface water that enters Baldwin Lake is lost to evaporation. The high clay content of the playa sediments prevents vertical migration, and the topographical configuration of the lake prevents outflow from Baldwin Lake."* **Figure 3-21** shows how Baldwin Lake, an ephemeral lake, is connected to Shay Pond via Shay Creek. This figure also shows the population of Stickleback fish in the vicinity of Shay Pond.

The population of Stickleback is unique in that it occurs at a high elevation, about 6,700 ft above mean sea level, while all other Stickleback populations inhabit streams below 3,000 ft. As previously stated, the requirements of the 2002 BO state that BBCCSD will provide water to Shay Pond to maintain a minimum 20-gallon-per-minute outflow from Shay Pond. The objective is to maintain a minimum pond water level that will support suitable habitat conditions for the fish. BBCCSD currently meets this requirement by discharging potable water into Shay Pond, but the 2002 BO also states that, should a suitable alternative supply of water be found to be appropriate for the stickleback in the future, BBCCSD may use an 'in-lieu' water supply, which could include the use of tertiary-treated water. The potable water discharged to Shay Pond represents approximately 5% of BBCCSD's customer water demand and could be reserved for potable use instead of discharging to Shay Pond.

The discharge rate needed to maintain the required outflow, accounting for evaporation and infiltration, has varied from year to year. However, based on the average volume of discharges measured between 2012 and 2020, BBCCSD discharges approximately 50 AFY of potable water to Shay Pond on average. At times, the required discharge has been up to 80 AFY; this maximum volume is used as the basis for the project design and analysis to be conservative. **Figure 3-19** shows an aerial view of Shay Pond and the proposed discharge location.

Applicable Water Quality Standards

Per the Basin Plan, the protection of beneficial uses designated for Shay Creek and Baldwin Lake is primarily provided by narrative water quality objectives. Refer to the "Big Bear Area Regional Wastewater Agency Replenish Big Bear Antidegradation Analysis for Proposed Discharges to Stanfield Marsh/Big Bear Lake and Shay Pond" provided as **Appendix 3** to review beneficial uses of Shay Pond receiving waters—Shay Creek and Baldwin Lake—on Table 12 therein, and also to review a comparison of most stringent water quality objective or criterion to current BBCCSD potable water supply quality and projected effluent quality of proposed discharge on Table 13 therein.

To summarize the outcome of the comparison of WQOs provided in **Appendix 3**, the projected effluent quality of the proposed discharge to Shay Pond is better than the current potable water supply for chloride, hardness, sodium, sulfate, TDS, TN, aluminum, and specific conductance. The projected effluent quality of the proposed discharge is expected to be of similar quality as existing potable water supplies for ammonia, fluoride, MBAS, cadmium, copper, and lead. However, additional data may be needed to confirm these findings. Boron may be the only constituent that could be above the existing potable water supply quality. However, the average boron concentration in the full advanced treated water proposed for discharge to the pond is well below the 0.75 mg/L Basin Plan objective for boron for the protection of sensitive agricultural crops, which is not a use of Shay Pond water. Additional coordination with the CDFW will be conducted to ensure the Stickleback fish are protected.

3.6.6 Replenish Big Bear Overview

The following represents a summary of the facilities required to support the Replenish Big Bear Program:

- The existing BBARWA WWTP will be upgraded to produce full advanced treated water to serve the objectives outlined in this Project Description. These upgrades would treat wastewater to full advanced treatment at a capacity of 2.2 MGD, or approximately 2,210 AFY. Upgrades that would occur within the BBARWA WWTP are as follows:
    - Oxidation Ditches
    - Denitrification Filter
    - UF and RO
    - UV/AOP
    - Pellet Reactor: 0.22 MGD
- Development between 23 and 57 acres of solar evaporation ponds, depending on the total system recovery rate achieved, at BBARWA's WWTP site to accommodate 22,000 gpd to 55,000 gpd of brine concentrate.
- Installation of about 1,350 LF of brine pipeline anticipated to be sized between 8" to 10" from the pellet reactor to the solar evaporation ponds.
- Installation of a 50 gpm brine pump station.
- Installation of one or more monitoring wells at the evaporation pond on the WWTP Site to monitor groundwater quality, as required by the future discharge permit.
- Installation of an anticipated 1,500 to 1,600 gpm pump station at the BBARWA WWTP to pump purified water to Shay Pond and Stanfield Marsh.
- Installation of a new 471 gpm pump station at the snowmaking pond to convey water to Sand Canyon.
- Installation of a new pipeline that will discharge into Sand Canyon that will be 8" in diameter, and 7,210 feet in length.
- Installation of two monitoring wells for groundwater recharge at Sand Canyon, as required by the future discharge permit.
- Installation of about 710 LF of 4" pipeline to reach Shay Pond from either an existing pipeline or a new 6" pipeline that would be 5,600 LF (**Figure 3-34**).
- Installation of a pipeline utilizing one of three alignments shown on **Figure 3-2** from the WWTP to Stanfield Marsh in the amount of about 19,940 LF sized at 12" in diameter.

3.7 SUMMARY OF FACILITY CONSTRUCTION AND OPERATIONS

The Replenish Big Bear Program would, as stated under Subsection 3.3, Project Purpose and Objectives, partner with Big Bear Valley agencies to recover a lost water resource that is currently being transported out of the Valley to Lucerne Valley, close the water loop, and keep the water in the Valley for beneficial reuse. This section of the Project Description is intended to outline operational and construction scenarios for the specific types of facilities and/or improvements that could result from the implementation of the Replenish Big Bear Program.

The implementation of the facilities proposed as part of the Replenish Big Bear Program consists of construction and operation of the various facilities summarized below. These potential facilities are separated into four project categories:

1) Project Category 1: Conveyance Pipelines
2) Project Category 2: Ancillary Facilities including Pump Stations and Monitoring Wells
3) Project Category 3: Evaporation Pond
4) Project Category 4: BBARWA WWTP Upgrades.

Below are general descriptions of the facilities and operations proposed as part of the Replenish Big Bear Program. Each Project Category has been formed utilizing the greatest number, intensity, lengths, and capacities for each type of facility proposed under the Replenish Big Bear Program. For example, the pipeline lengths and sizes considered under Project Category 1 represent the option(s) that would require the greatest pipeline length to achieve that “Component” of the Replenish Big Bear Program.

Project Category 1: Conveyance Pipelines

The Replenish Big Bear Program would ultimately install a total of about 6.59 miles or 34,810 LF of various types of pipelines. Potential alignments include the following:

- Pipeline to Lake: 12” 19,940 LF
- Pipeline to Stickleback: 4” 710 LF, and possible additional 6” 5,600 LF where the existing pipeline cannot be utilized
- Pipeline from Resort Storage Pond to Sand Canyon: 8” 7,210 LF
- Brine Pipeline (within BBARWA WWTP property): 8” 1,350 LF

Project Category 2: Ancillary Facilities including Monitoring Wells and Pump Stations

The Replenish Big Bear Program would ultimately install monitoring wells in order to facilitate project operation as follows:

- Up to four (4) monitoring wells
    - o Two downstream of the Sand Canyon recharge area.
    - o Two near the brine Evaporation Ponds at the BBARWA WWTP site.

The Replenish Big Bear Program would ultimately install three pump stations in order to facilitate project operation as follows:

- Effluent Pump Station @ WWTP 1,520 gpm
- Pump Station @ Resort Storage Pond 471 gpm
- Brine Pump Station @ WWTP: 20 gpm

Project Category 3: Evaporation Pond

The Replenish Big Bear Program would between 23 and 57 acres of evaporation ponds at the BBARWA WWTP site. The ponds would be segmented into different storage basins to allow for evaporation of the brine stream in a cycle of filling with brine, allowing the bring to evaporate, and then removing remaining brine.

Project Category 4: BBARWA WWTP Upgrades

This Project Category includes upgrades to the BBARWA WWTP, to include 2.2 MGD of full advanced treatment, producing up to 2,210 AFY of purified water. The upgrades include the following upgrades and new construction in order of process flow:

- Upgrades to the Oxidation Ditches
- New Denitrification Filter
- New UF and RO filtration membranes
- New UV Disinfection
- New AOP
- New Pellet Reactor: 0.22 MGD

3.7.1 Project Category 1: Conveyance Pipelines

Operational Scenario: Pipelines

Pipelines: Once a pipeline or turnout is installed, operations do not require any visits unless unforeseen circumstances arise that would require maintenance or repair of the pipelines. In the event of routine maintenance one vehicle trip per maintenance event would be required.

Construction Scenario: Pipelines

An estimated 6.59 miles or 34,810 LF of pipeline may be installed in support of the Replenish Big Bear Program. The maximum pipe length that would be installed in a single year would be 29,210 LF. Installation of 29,210 LF of pipeline could occur over a period of one year to coincide with the opening year (2027) of the 2.2 MGD upgraded BBARWA WWTP.

Preliminary analysis has identified that the piping will range from 4-inch to 12-inch diameter. It is assumed that an underground utility installation team can install an average of 200-400 LF of pipeline per day. A team consists of the following:

- 200-400 feet of pipeline installed per day
- 1 Excavator
- 1 Backhoe
- Compaction equipment
- 2 pickup trucks with supplies and hand tools
- 1 Paver
- 1 Roller
- 1 Water truck
- Traffic Control Signage and Devices
- 10 Dump/delivery trucks (up to 80 miles round trip distance)
- Employees (10 members per team, 80-mile round-trip commute)

The emissions calculations are based upon the above assumptions for each pipeline installation team. Typically, up to 400 feet of pipeline trench could be excavated, the pipe installed, backfilled, and compacted each day during pipeline installation in undeveloped areas whereas only 200 ft per day can be installed in developed roadways. In either case equipment would be operated for roughly the same portion of the day and daily equipment emissions would be the same, except, that undeveloped areas would not require pavement removal and reinstallation.

It is assumed that up to of 1,000 LF per day would be installed utilizing multiple teams (up to four teams working on any given day). It is assumed that the proposed pipeline installation will occur for a maximum of 260 days in one calendar year.

Ground disturbance emissions assume roughly half an acre of land would be actively excavated on a given day. It is anticipated that installation of pipeline in developed locations will require the use of a backhoe, compactor, roller/vibrator, pavement cutter, grinder, haul truck, and two dump trucks operating 6 hours per day; a water truck and excavator operating 4 hours per day and a paving machine and compacter operating 2 hours per day. Installation of pipeline in undeveloped locations would require the same equipment without the paving equipment (cutter, grinder, paving machine). Pipeline trenches will have a depth of approximately 4.5’ to 6’. Trench widths could be as small as 1.5’ for 4” piping and could be as wide as 4.5’ for 12” piping.

The pipelines that would be installed in support of Replenish Big Bear are anticipated to use push-on joints (e.g., gasketed bell-and-spigot) that do not require welding. However, the Contractor may occasionally use a portable generator and welder for equipment repairs or incidental uses.

3.7.2 Project Category 2: Ancillary Facilities including Monitoring Wells and Pump Stations

Operational Scenario: Ancillary Facilities including Monitoring Wells

Monitoring Wells: The Replenish Big Bear Program anticipates the installation of up to four new monitoring wells; 2 for the Sand Canyon and 2 for evaporation ponds. The four monitoring wells will be visited by a field technician on a monthly to quarterly frequency. There is negligible energy consumption in obtaining groundwater levels from a monitoring well.

Pump Stations: Pump stations that are incorporated into the project will be operated to convey the water or brine generated by the proposed BBARWA WWTP Upgrades, the capacity and amounts of water pumped varies. A total of 3 pump stations will be installed.

It is assumed that the brine pump station would be 20 gpm capacity with 5 HP pumps and the effluent pump station would be 1,500 to 1,600 gpm with 25 HP pumps.

Construction Scenario: Well Development

Four new monitoring wells will be drilled and constructed approximately one year prior to the initiation of the Program in 2027.

The depth of a new wells are anticipated to range between 250 and 750 feet below ground surface, or as directed by the hydrogeologist. The average area of disturbance required to drill and construct each new well is anticipated to be half an acre or less. Drilling of up to 4 new wells during a given year, with flexibility to construct the four wells over a period of two or more years, will require the delivery and set up of the drilling rig at each site. It is anticipated these wells may be drilled concurrently, or at different times and the drilling equipment will be transported to and from the sites on separate occasions. For the purposes of this evaluation, it is forecast that delivery of the drilling equipment 4 times in a year will result in four 80-mile round-trips for the drill rigs.

It is anticipated that about five persons will be on a given well site at any one time to support drilling and well construction: three drillers, the hydrogeologist inspector, and a foreman. During the course of well drilling and construction at any given site, trips to and from the well site will include: one roundtrip for the drilling rig; between 2 and 3 roundtrips for cement trucks; about 5 trips to deliver pipe; and about 4 round trips per day for employees.

For analysis purposes it is assumed that each well would be drilled using the direct rotary or fluid reverse circulation rotary drilling methods. The average area of disturbance to drill and construct each well is estimated to be one-half an acre or less. Access to the drilling site for the drilling rig and support vehicles would be from adjacent roadways. Typically, site improvements to allow well drilling requires only minimal earth movement and/or grading.

The drilling and development of each well will require drilling to—in most cases—between 250 and 750 feet below ground surface (bgs). The proposed schedule for constructing each well would be as follows: drilling, construction, and testing, where required, of each well would require approximately six weeks to complete (about 45 days, of which 15 to 20 days would include 24-hour, 7-day a week drill activity). For planning purposes, a construction and testing schedule duration of 60 days per well is assumed to account for unforeseen circumstances (e.g., extreme weather, equipment breakdowns, etc.) that could affect the drilling and testing schedule. The well casings are expected to be flush-threaded PVC wells and it will be assumed that well development and installation will require a two week use of a diesel generator.

The borehole for the well would be drilled using at least two separate drilling passes. The first pass, or pilot borehole, would be drilled to an estimated maximum depth below the ground surface, which would correspond to the top of the consolidated bedrock in the area, or a depth selected by the project hydrologist/hydrogeologist. Upon completion of the geophysical logs, the pilot borehole would be enlarged (reamed) to a diameter of 24 inches to approximately the same depth to accommodate the well casing, screen and filter pack.

Once each well is constructed it would immediately be developed through a process of swabbing and airlifting. During this process, drilling fluids and suspended sediment would be removed from the well. After the drilling fluids are removed along with most of the suspended sediment, the well would be further developed through pumping.

Each monitoring well will be completed at the surface with either a flush mounted, traffic rated manhole cover that is bolted in place or a 12-inch diameter steel monument that extends approximately 3 feet above the ground. The monument will be fitted with a locking lid and surrounded by four traffic bollards. The final footprint of the completed monitoring well will be approximately 10’ by 10’.

Construction Scenario: Pump Stations

The total number of pump stations to be constructed in support of the Replenish Big Bear Program is anticipated to be three.

It is forecasted that, at each site, no more than 0.5 acre will be actively graded on a given day for site preparation of each pump station. Construction of each pump station will require the delivery and installation of equipment and materials. It is anticipated that grading activities will occur over a 5-day period and this phase of construction will result in 6 truck trips on the worst-case day with an average round trip of 80 miles delivering construction materials and equipment (concrete, steel, pipe, etc.). Installation of the pump station will require the use a crane, forklift, backhoe and front loader operating 4 hours per day. Calculations assume five workers will each commute 80 miles round-trip to the work site.

Each pump station is assumed to be housed within a CMU building, and will require a transformer to be installed to provide electric power to the pumps. The proposed pump station building may include a pump room and electric control room. Construction of the pump stations would involve site preparation and grading, construction of structural wet wells and foundations, installation of piping and electrical equipment, pump and motor installation, and final sitework.

Two of the pump stations proposed are located at the BBARWA WWTP site and one is located offsite (Sand Canyon). The onsite pump stations will have the same backup power that supplies the BBARWA WWTP process equipment, and the Sand Canyon pump station will have a portable backup generator.

3.7.3 Project Category 3: Evaporation Pond

Operational Scenario: Evaporation Pond

Operations at this evaporation pond consists of storage and evaporation of the brine stream from the pellet reactor process. The energy required to pump brine from the pellet reactor process to the onsite evaporation ponds is presently unknown, but it is expected to be low since the pump station is only sized for 50 gpm and it is conveying brine to a lower elevation than the pellet reactor process. The evaporation pond will be segmented into different basins so they can rotate in cycles of filling with brine, evaporating the water from the brine, and performing maintenance to remove the brine from basins that have completed the evaporation stage. Basin maintenance is expected to occur approximately 2-3 times a year, consisting of removal of the brine, maintenance of liners and grading, removal of vegetation, and vector management.

Construction Scenario: Evaporation Pond

The Replenish Big Bear Program would install between 23 and 57 acres of solar evaporation ponds at the BBARWA WWTP Site shown on **Figure 3-26**, depending on total system recovery**.**

With respect to new evaporation pond, it is forecast that for site preparation, no more than 8 acres will be actively graded on a given day. Each new pond is anticipated to be 8 to 10 feet deep with berms built up from the existing grade to create pond areas. Given the area required to install the new evaporation ponds, it is anticipated that the time required for the construction is about 3-6 months.

The pellet reactor process will “reject” a brine stream with high dissolved solids content (i.e., brine). Single basin dimensions would range from about 400 to 800 feet long and 400 to 800 feet wide, or about 3.75 to 7.5 acres to provide 6 to 10 ponds to accommodate the brine discharged from the treatment process. The berms would be built up so that the top of the berms are level with the existing grade of the WWTP. This would provide protection from flooding in that area without requiring excavation much below the existing grade in that area.

As stated above, the evaporation ponds would be constructed using large construction equipment; earthen berms would be installed; and the basins would be lined with an impermeable liner to prevent percolation of the brine into the underlying soil. Periodically, the residual solids (primarily consisting of salts left after evaporation) would be collected and disposed of at an appropriately licensed disposal facility.

It is anticipated that grading activities will occur over a 90 to 120-day period and will require two bulldozers, two front end loaders, two water trucks, several scrapers, two excavators and four dump/haul trucks operating 6-8 hours per day. Calculations assume 10 workers will each commute 80 miles round-trip to the evaporation pond construction site at the BBARWA WWTP.

Construction of the new evaporation ponds will require the delivery and installation of equipment and materials. It is not known whether each site will require import or export of soil, as the new evaporation ponds will require some excavation of the existing area to provide fill dirt for the earthen berms to create the pond areas. Given the size of the proposed 6 to 10 ponds (400 feet to 800 feet wide x 400 feet to 800 feet long x 10 feet in depth), it is anticipated that a cut amount from 1 to 2-feet of the existing grade will provide enough fill dirt to create the earthen berms of the ponds. However, it is anticipated that no more than a total of 175,000 CY of materials would be hauled off site by 15 to 30 CY trucks, as an estimated one half of the cut material will be used as fill material to enhance flood control from installation of the proposed basins. No more than 100 round trips per day at an 80 mile round-trip distance would be required to accomplish the effort to remove excess materials off-site. This would occur over the 30+ year Program horizon of construction for the Replenish Big Bear Program with some periods without hauling activities, and other periods that would reach 100 round trips per day. An estimated total of 8,000 round trips total (trucks and employees) would be required to haul excess materials to a soil receiving facility.

In addition to the above construction equipment, heavy duty trucks will be employed for on-site deliveries. Smaller trucks and automobiles will be utilized for on-site supervision and employee commuting. The diesel delivery trucks are assumed to require 100 on-road miles per day for a total of 30 days.

3.7.4 Project Category 4: BBARWA WWTP Upgrades

Operational Scenario: BBARWA WWTP Upgrades

Please refer to Exhibit 3-3, which depicts the proposed modifications to the BBARWA WWTP to enable the installation of the proposed advanced water treatment facility.

The Operational Scenario for the upgrades to the BBARWA WWTP include 2.2 MGD of advanced treatment, producing up to 2,210 AFY of advanced treated water. The updates include:

- Oxidation Ditches
- Denitrification Filter
- UF and RO
- UV Disinfection
- Pellet Reactor: 0.22 MGD

The advanced treatment plant will operate 100% of the time at 70%-100% capacity. The existing facility uses about 3,250 MW-hours/year, and the advanced treatment plant will use an additional 3,800 MW-hours/year.

Construction Scenario: BBARWA WWTP Upgrades

The construction activities to install upgrades at the BBARWA WWTP consists of the following range of activities: demolition of existing concrete basins, grading activities to prepare site for new construction, construction of concrete foundations and supports, installation of piping, equipment, and instrumentation, connection to existing electrical equipment and onsite utility water system construction of building foundations and building structures, and installation of treatment equipment.

Civil and site work for the proposed BBARWA WWTP Upgrades would include demolition, grading, drainage, and site improvements. The area around new structures and processes would be backfilled to match existing finished surfaces. All disturbed areas would be paved, covered with crushed stone, or landscaped with ground cover. Areas that require routine vehicle access would be bituminous concrete roadways, consisting of a 12-inch gravel base course, a 2.5-inch bituminous concrete binder course and a 1.5-inch bituminous concrete top course. Areas that require routine pedestrian access would have concrete sidewalks. The sidewalk would consist of 4 inches of reinforced concrete on an 8-inch gravel base course. Painted steel bollards (approximately 4 inches in diameter and 42 inches high) would be provided as needed to protect equipment or structures that are near roadways.

Standard construction equipment will be used, ranging from dozers, graders and cranes, to backhoes. It is anticipated that the maximum number of construction personnel on the WWTP project site on any given day will be 50 persons. A maximum number of truck deliveries, probably during pouring of concrete for facilities, are forecasted at 25 per day. Construction of the WWTP Upgrades is expected to require about 24 months.

3.8 ENTITLEMENTS, APPROVALS AND OTHER AGENCY PARTICIPATION

There are a wide range of other agencies that may have an interest in or may be involved in the review and approval of the facilities outlined above. The following list is not intended to be exhaustive, but it provides a sense of the agencies that may participate in the review or approval of this program and specific projects. The potential participating agencies are arranged based on the individual topics contained in the standard CEQA Initial Study Environmental Checklist Form.

Aesthetics: Local jurisdictions, San Bernardino County, City of Big Bear Lake

Air Quality: South Coast Air Quality Management District (SCAQMD), permit the operation of the Upgraded BBARWA WWTP and possibly individual pieces of equipment (ex: stand-by emergency generator)

Biology: The U.S. Fish and Wildlife Service and/or California Department of Fish and Wildlife (CDFW) may have to issue incidental take permits. Local jurisdictions issue plant removal permits. The Corps of Engineers, CDFW and Colorado River Basin Regional Water Quality Control Board (CRBWQCB) and Santa Ana Regional Water Quality Control Board (SARWQCB) will participate in review of discharge of fill into or alteration of a streambed.

Hydrology & Water Quality: A wide range of participation will occur for these issues. The CRBRWQCB will issue a modified WDR to BBARWA, as will the SARRWQCB will issue a WDR and Water Recycling Requirements (WRR) for use of recycled water. The California Department of Public Health must also review and approve the future use of recycled water. The County and local jurisdictions must ensure that stormwater discharges from each of the facility sites meet the current municipal separate stormwater sewer standards (MS4); and Stormwater Pollution Prevention Plan(s) (SWPPP) must be implemented for each location where disturbance exceeds one acre. To construct the facilities a Notice of Intent must be submitted to the State Water Resources Control Board for a General Construction Permit, which is then enforced by the CRBRWQCB, only for construction of any facilities located within Lucerne Valley and the SARWQCB for all other facilities proposed as part of the Program within Big Bear Valley. NPDES Permit(s) are required and will be implemented through the SARWQCB; the NPDES Permit Program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Finally, if any flood hazard areas are affected by the proposed project, County Flood Control, the City, and FEMA may perform reviews for this project.

Noise: Compliance with local jurisdiction Noise Element and Noise Ordinance may be necessary due to proximity of facilities to sensitive noise receptors.

Transportation: The proposed project may require encroachment permits from San Bernardino County, City of Big Bear Lake, and possibly Caltrans to construct the pipeline within existing road rights-of-way.

Other: The proposed project has been awarded a grant for the project from the BOR. The proposed project may seek grants or loan from other federal agencies, such as the United States Environmental Protection Agency (EPA).

No other reviewing or permitting agencies have been identified.

3.9 CEQA RESPONSIBLE AGENCIES

Partner Agencies
BBCCSD
BBLDWP
BBMWD

Other Potential Responsible Agencies
San Bernardino County
City of Big Bear Lake
SARRWQCB
CRRWQCB
CDFW
USFWS
SCAQMD
USACOE
DDW
San Bernardino County Flood Control District
Big Bear City Airport

Federal Agencies
BOR
EPA

3.10 USES OF THIS ENVIRONMENTAL IMPACT REPORT

Before any of the proposed facilities can be implemented, BBARWA must approve the proposed projects and the remaining entities that make up the Project Team and CEQA Responsible Agencies will utilize the Draft EIR as CEQA Responsible Agencies. This document has also been prepared in order to meet National Environmental Policy Act (NEPA) standards to enable the BOR and EPA to process this project under a separate NEPA documentation process.

The County, City and or Caltrans may issue encroachment or development permits for the proposed upgrades and additions to BBARWA's WWTP, proposed recycled water conveyance lines, brine storage basins, monitoring wells, and pump stations. These approvals can rely upon this Draft EIR as the basis for compliance with the CEQA. The City and County would also utilize the Draft EIR as CEQA Responsible Agencies.

Other agencies listed under Section 3.9 may use this document as CEQA Responsible Agencies to grant other approvals or entitlements.

ACRONYMS

AF	Acre Feet
AFY	Acre Feet per Year
BBARWA	Big Bear Area Regional Wastewater Agency
BBCCSD	Big Bear City Community Services District
BBLDWP	Big Bear Lake Department of Water and Power
BBMWD	Big Bear Municipal Water District
BO	Biological Opinion
BVM	Bear Valley Mutual
BVWSP	Bear Valley Water Sustainability Project
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
COD	Chemical Oxygen Demand
CRBRWQCB	Colorado River Basin Regional Water Quality Control Board
DEIR	Draft Environmental Impact Report TDS – Total Dissolved Solids
EIR	Environmental Impact Report
FEMA	Federal Emergency Management Agency
GMZ	Groundwater Management Zone
GPD	Gallons per Day
GPM	Gallon Per Minute
LV Site	Lucerne Valley Site
MF	Microfiltration
MGD	Million Gallon(s) per Day
MS4	Municipal Separate Stormwater Sewer Standards
NDN	Nitrification-Denitrification
NHF	National Heritage Foundation
NPDES	National Pollutant Discharge Elimination System
PEIR	Program Environmental Impact Report
PFD	Process Flow Diagram
RO	Reverse Osmosis
RWQCB	Regional Water Quality Control Board
SARWQCB	Santa Ana Regional Water Quality Control Board
SBNF	San Bernardino National Forest
SMP	Sewer Master Plan
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TIN	Total Inorganic Nitrogen
TNC	The Nature Conservancy
TP	Total Phosphorus
UF	Ultrafiltration
μg/L	Micrograms per Liter
USFWS	U.S. Fish and Wildlife Service
UV	Ultraviolet
WDR	Waste Discharge Requirement

WQO	Water Quality Objective
WRR	Water Recycling Requirements
WWTP	Wastewater Treatment Plant

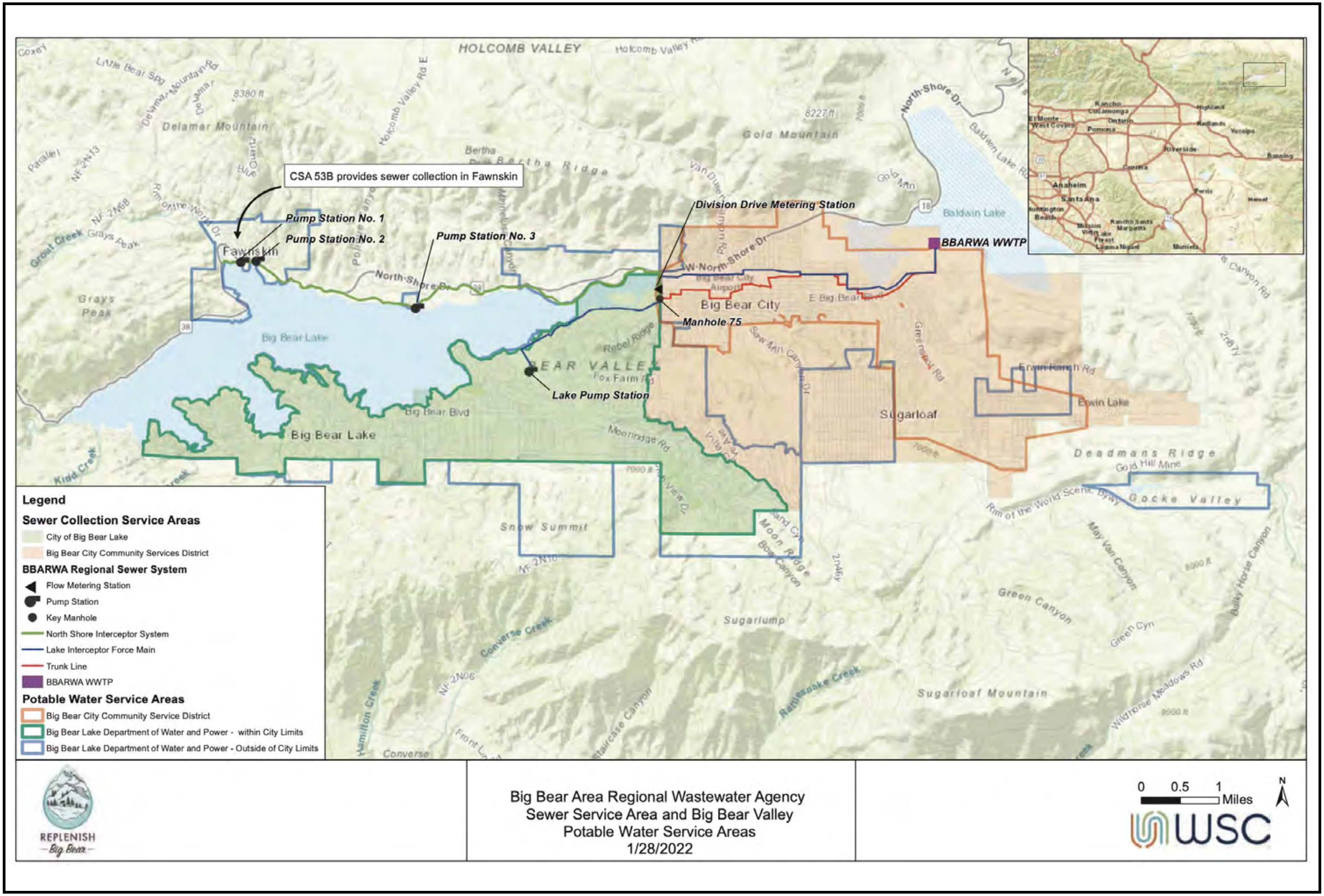

FIGURE 3-1

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BBARWA and BBCCSD Service Areas

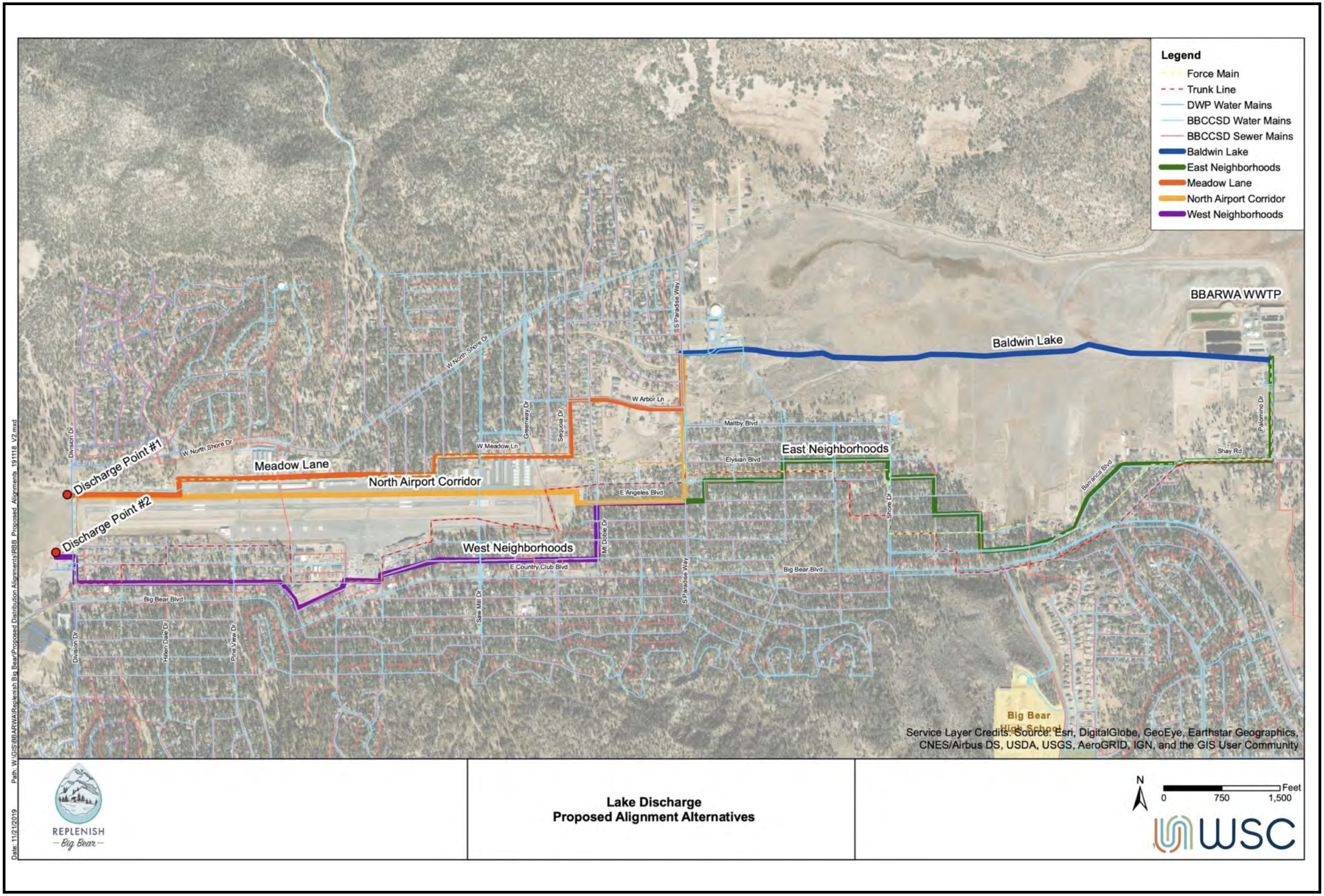

FIGURE 3-2

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Lake Discharge Pipeline Alignment Alternatives

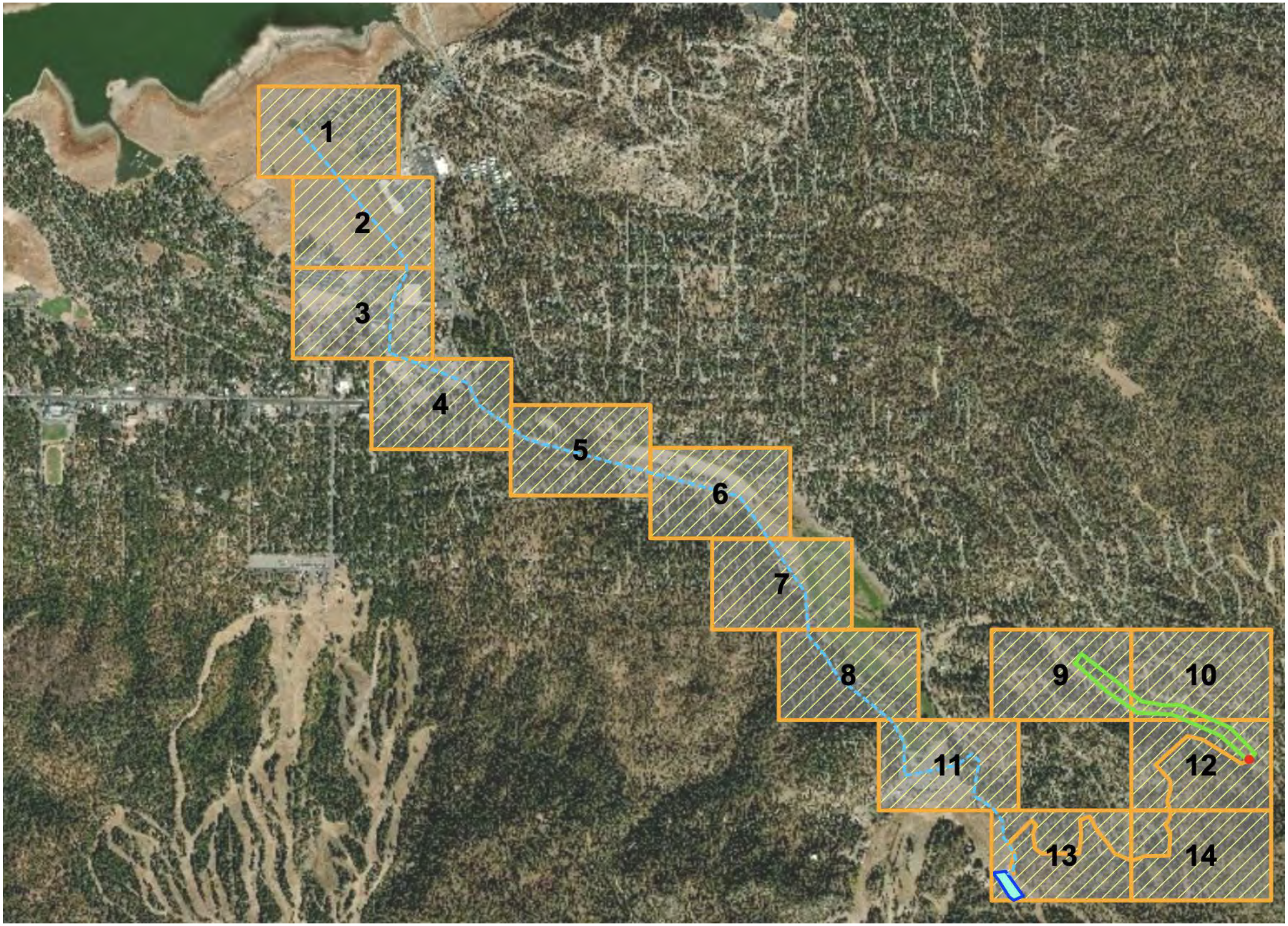

FIGURE 3-3

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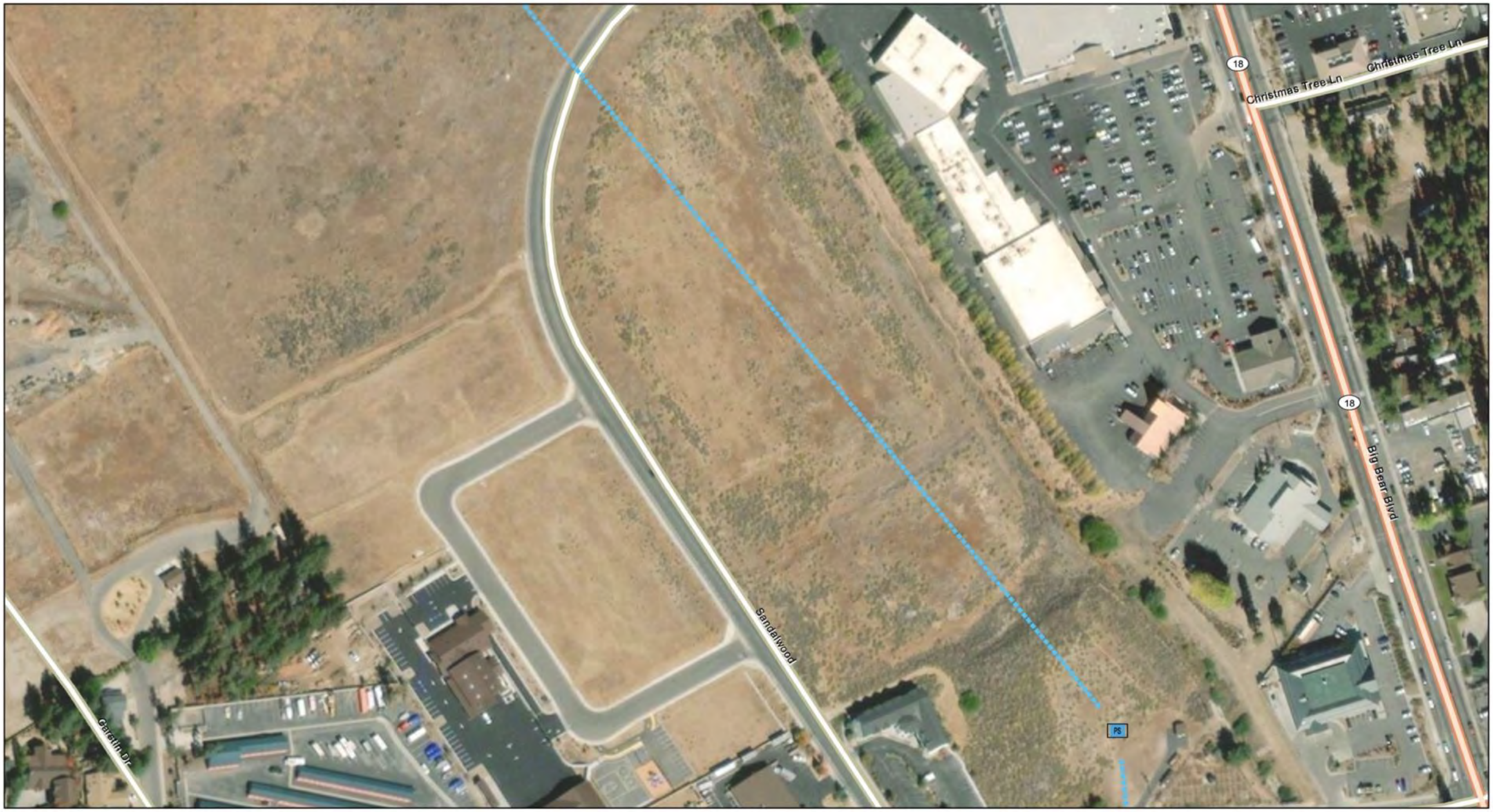
Replenish Big Bear Program West Overview

FIGURE 3-4

Tom Dodson & Associates
Environmental Consultants

Replenish Big Bear Program West Existing Pipeline Alignment



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-5

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Replenish Big Bear Program West Existing Pump Station and Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
Big Bear

WSC

FIGURE 3-6

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Replenish Big Bear Program West Existing Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-7

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Replenish Big Bear Program West Existing Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-8

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Replenish Big Bear Program West Existing Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH Big Bear

WSC

FIGURE 3-9

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Replenish Big Bear Program West Existing Pipeline Alignment

FIGURE 3-10

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Replenish Big Bear Program West Existing Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

FIGURE 3-11

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Replenish Big Bear Program West Existing Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-12

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Replenish Big Bear Program Sand Canyon Recharge Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

Feet
0 200 400
1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-13

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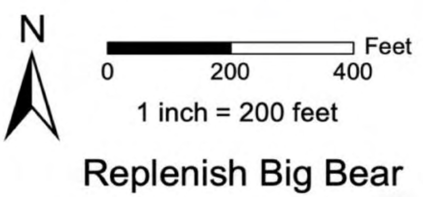
Replenish Big Bear Program Sand Canyon Recharge Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



REPLENISH
— Big Bear —

WSC

FIGURE 3-14

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Replenish Big Bear Program Sand Canyon Recharge Area

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

Feet
0 200 400
1 inch = 200 feet

Replenish Big Bear

FIGURE 3-15

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Replenish Big Bear Program Sand Canyon Recharge Area and Proposed Pipeline Alignment

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
Big Bear

WSC

FIGURE 3-16

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Replenish Big Bear Program West Existing and Proposed Pipeline Alignments, Proposed Pump Station, and Existing Bear Mountain Resort Recharge

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

N

0 200 400 Feet

1 inch = 200 feet

Replenish Big Bear

REPLENISH
— Big Bear —

WSC

FIGURE 3-17

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Replenish Big Bear Program West Proposed Pipeline Alignment

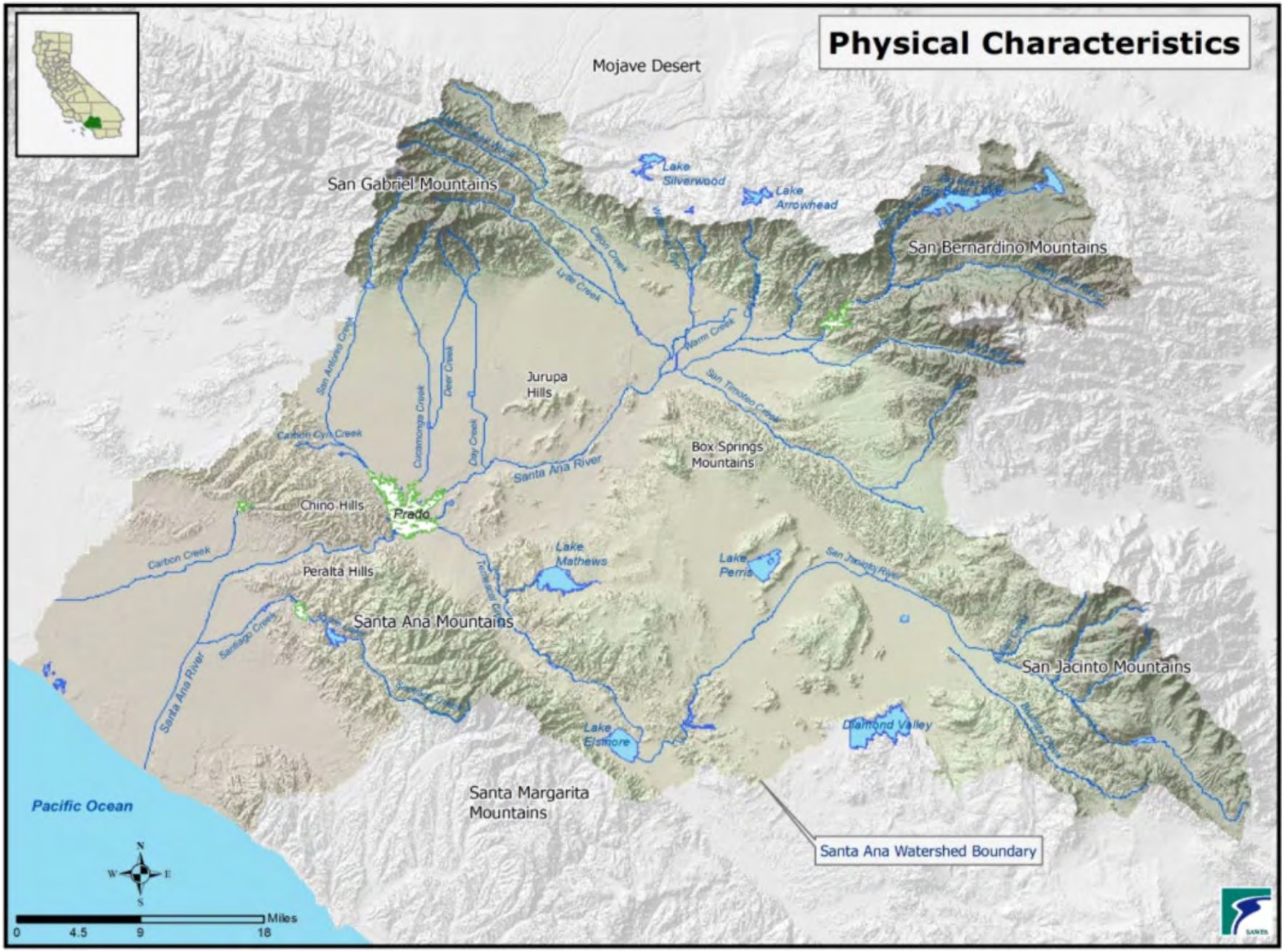

FIGURE 3-18

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Santa Ana Watershed

FIGURE 3-19

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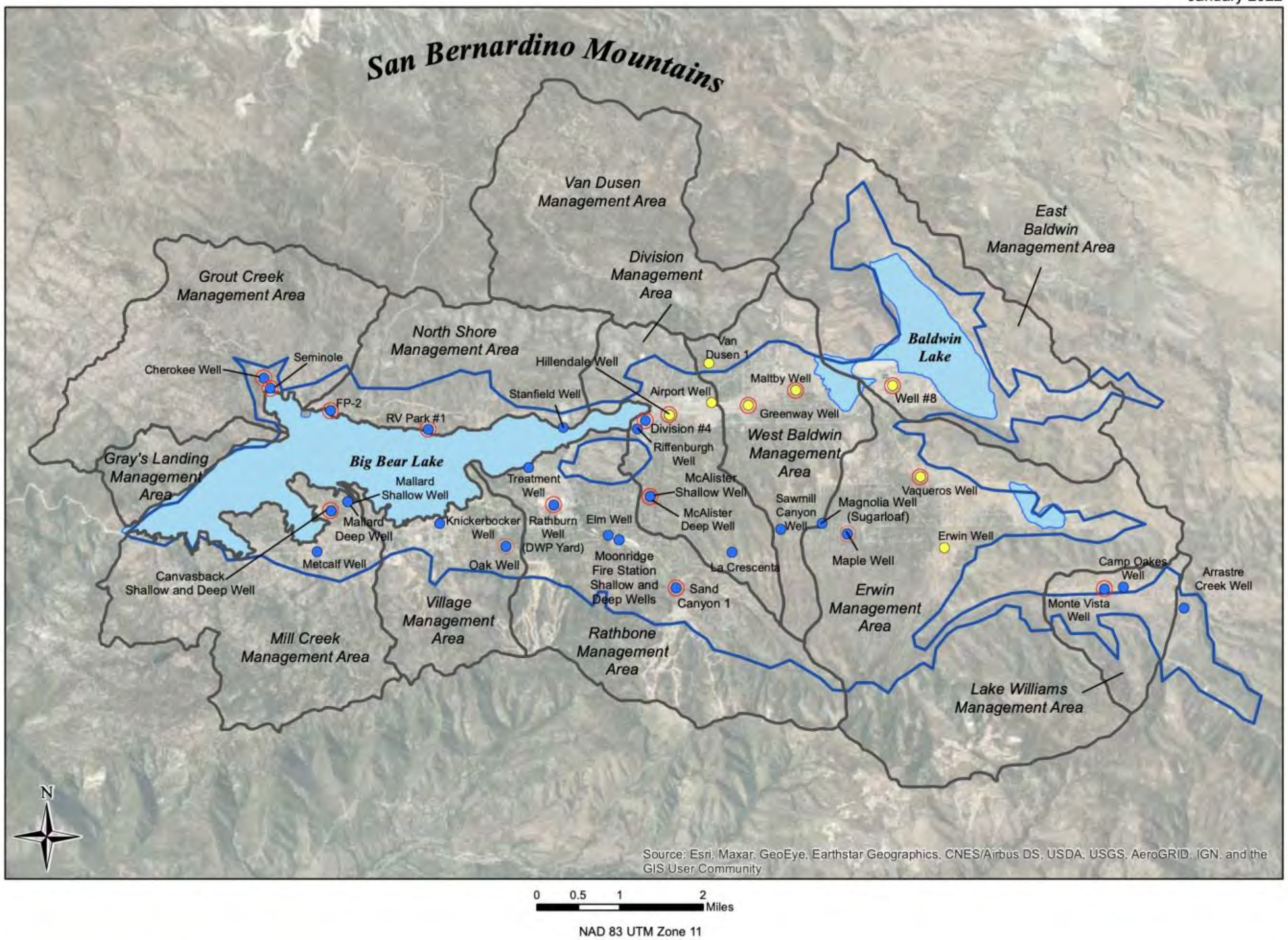
Shay Pond Discharge Location

Bear Valley Basin Groundwater Sustainability Plan

January 2022



Thomas Harder & Co.
Groundwater Consulting

Bear Valley Basin Monitoring Network
Figure 2-31

FIGURE 3-20

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Bear Valley Basin Groundwater Monitoring Network

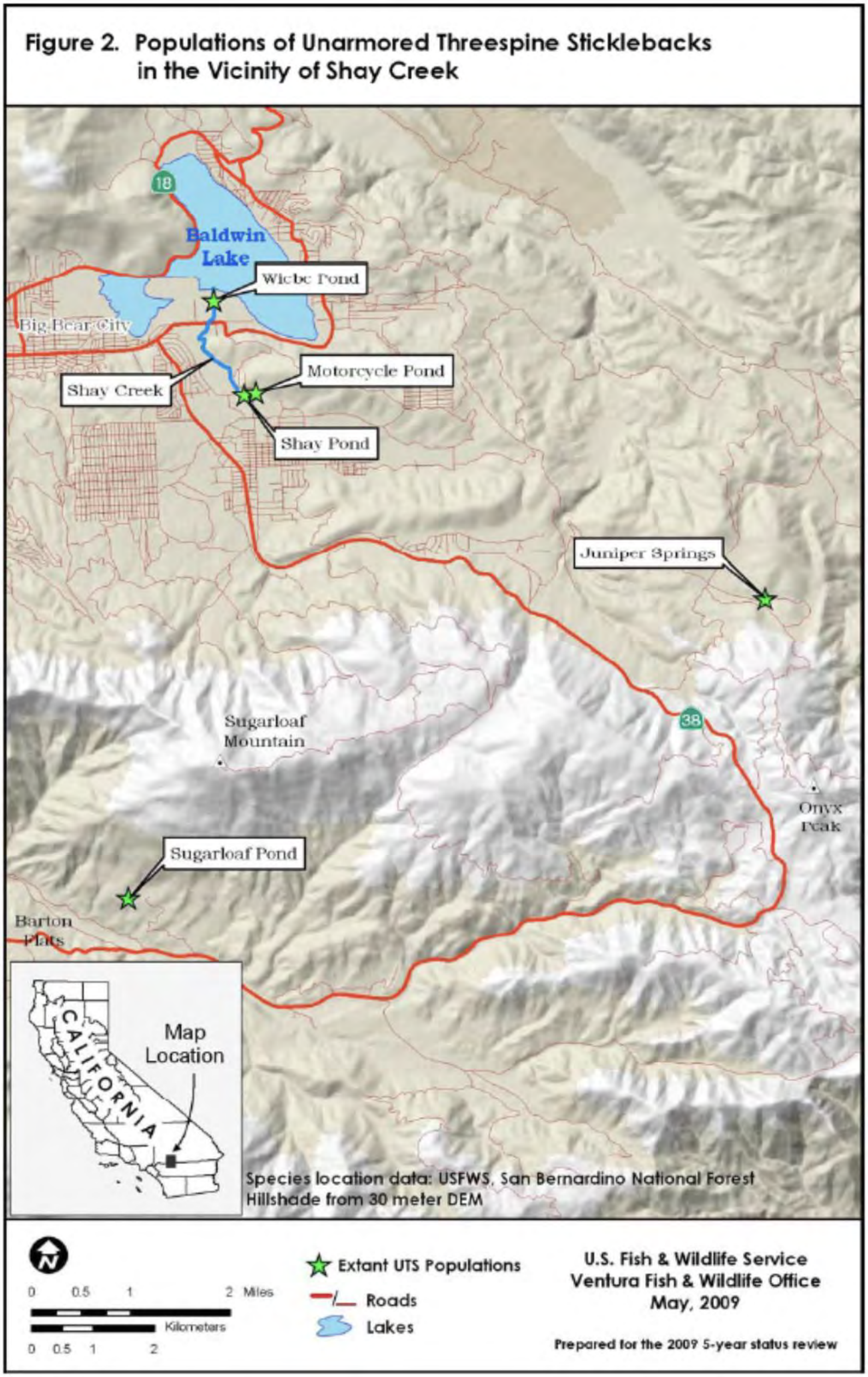

FIGURE 3-21

Threespine Sticklebacks Populations

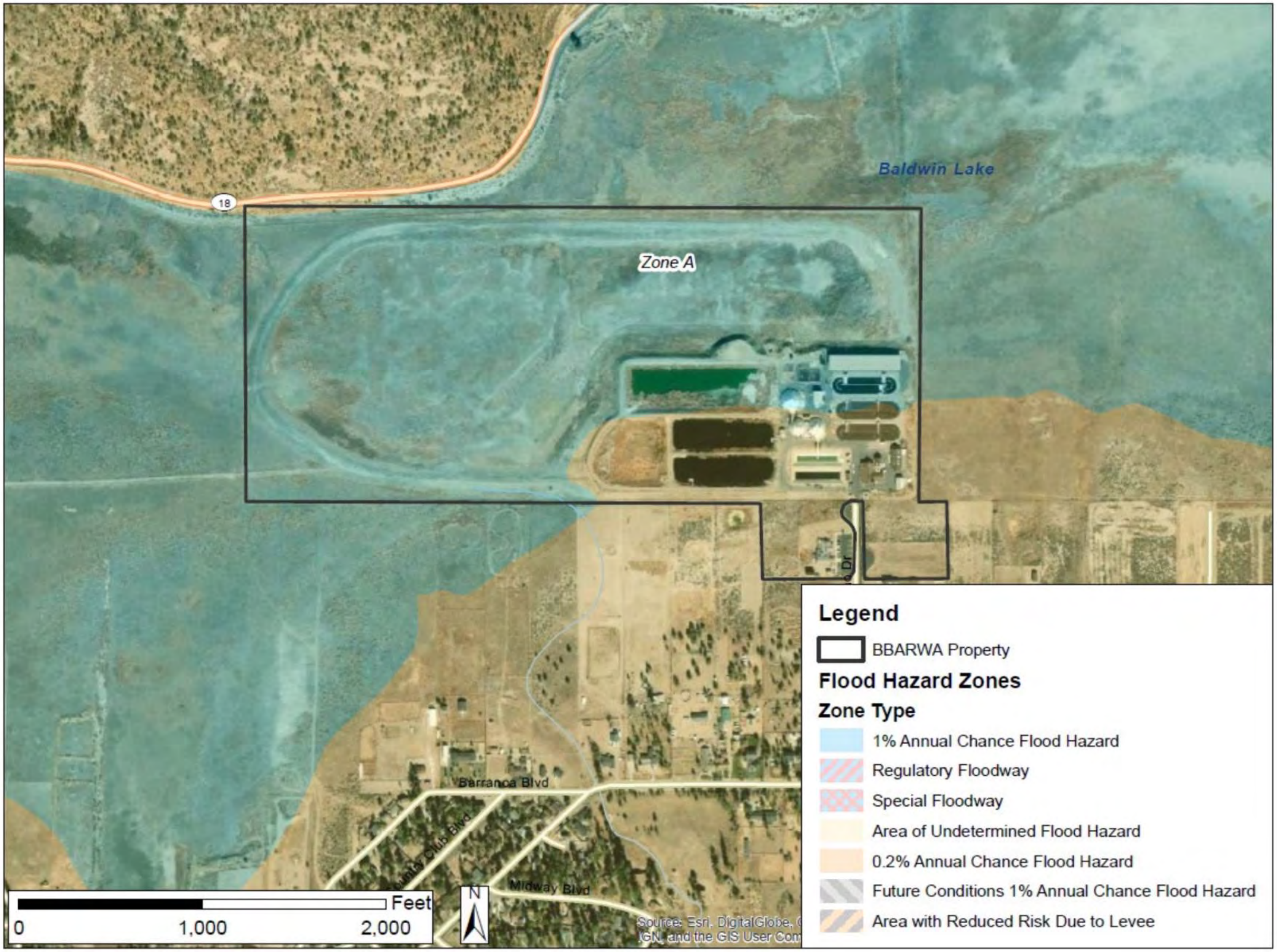

FIGURE 3-22

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BBARWA Property Flood Map

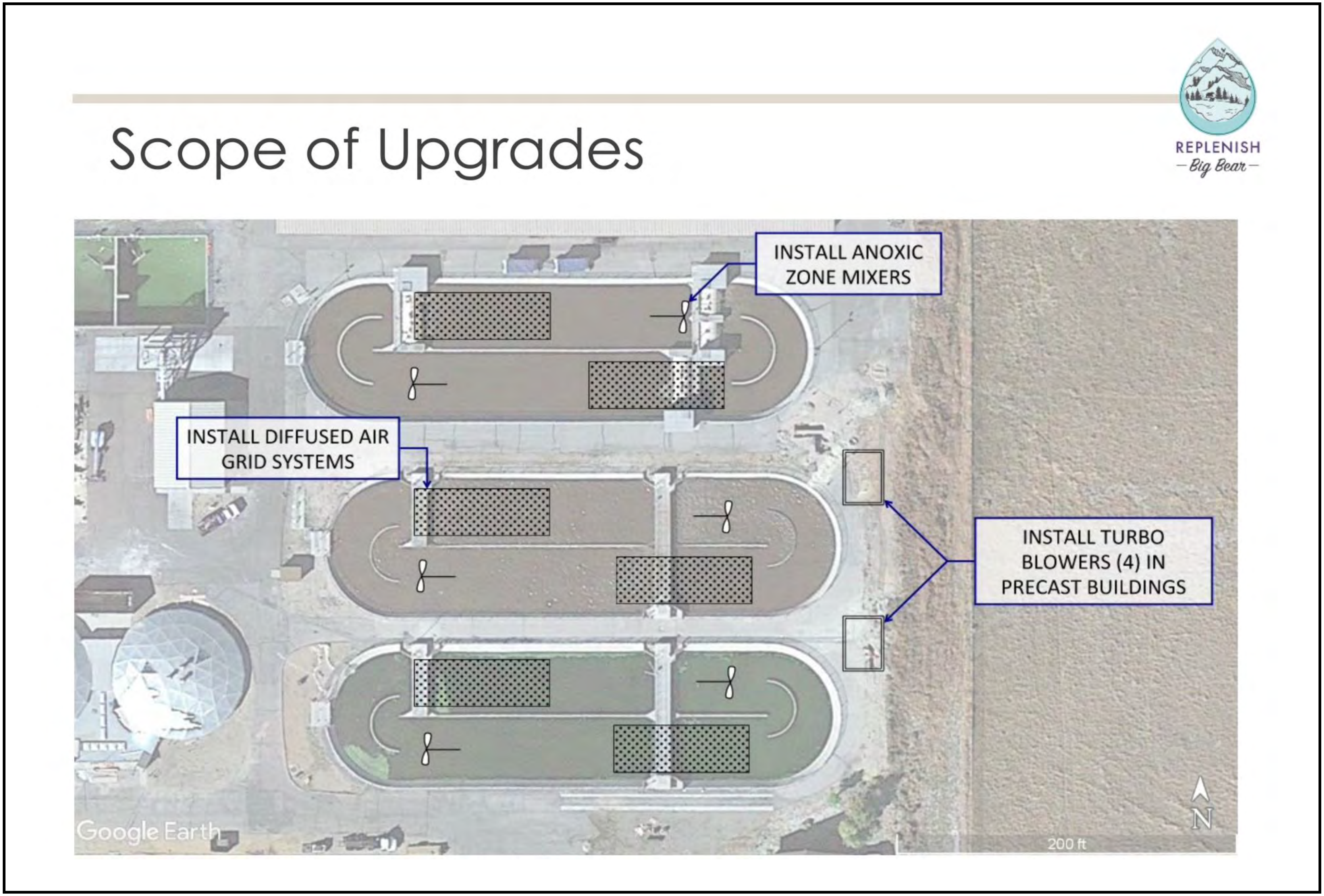

FIGURE 3-23

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BBARWA Wastewater Treatment Plant Upgrades

Scope of Upgrades

REPLENISH
— Big Bear —

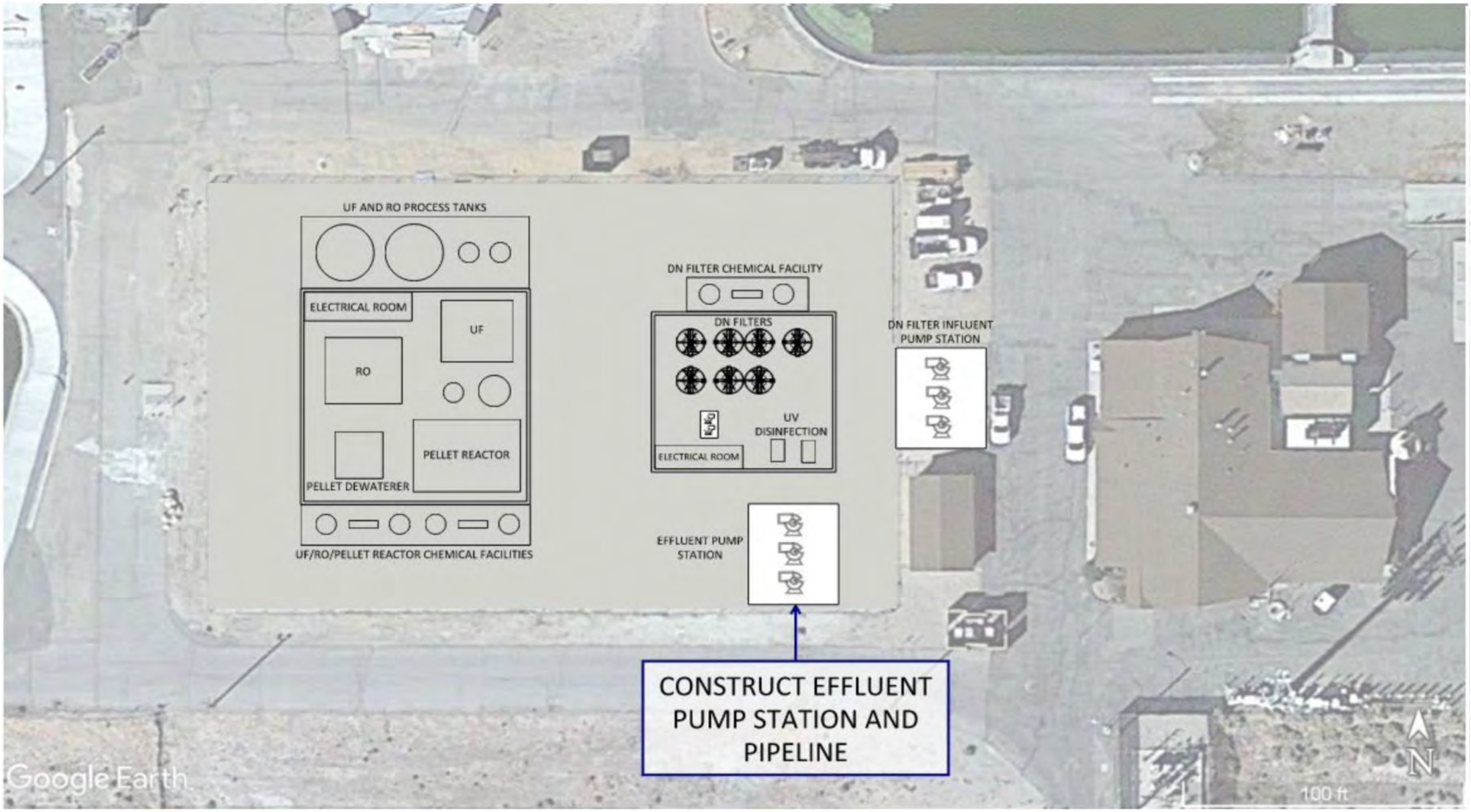

FIGURE 3-24

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BBARWA Wastewater Treatment Plant Upgrades

Scope of Upgrades

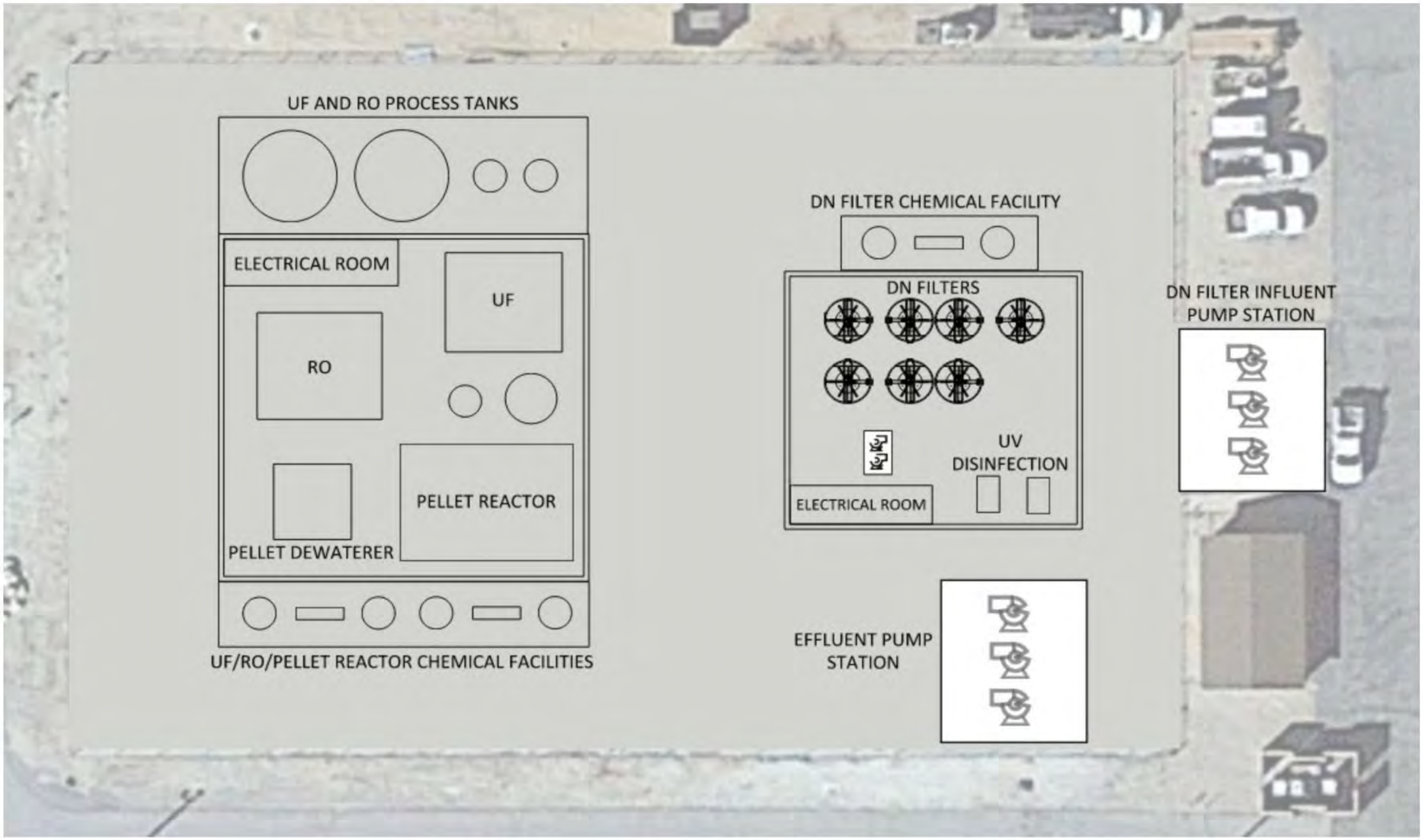

FIGURE 3-25

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BBARWA Wastewater Treatment Plant Upgrades

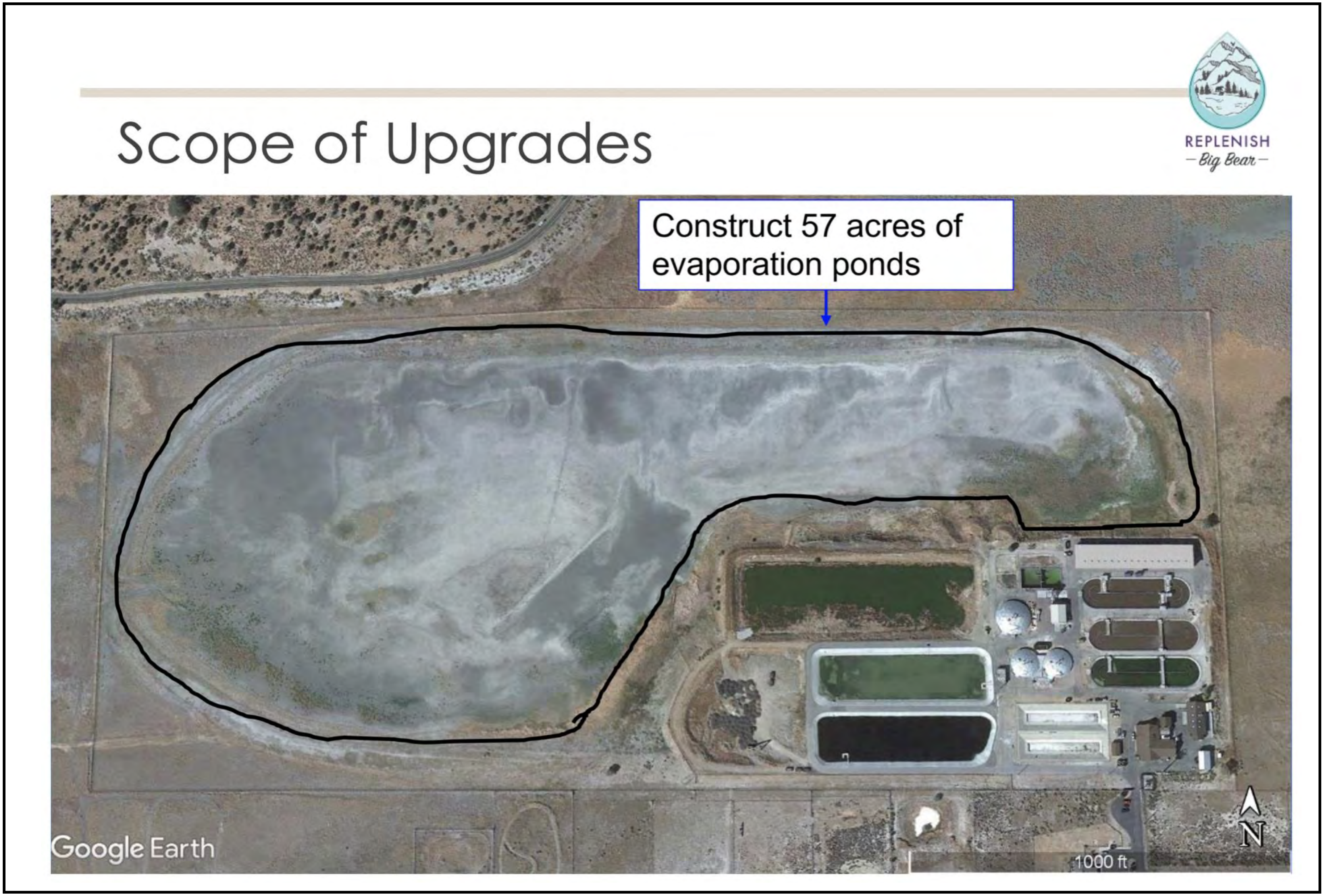
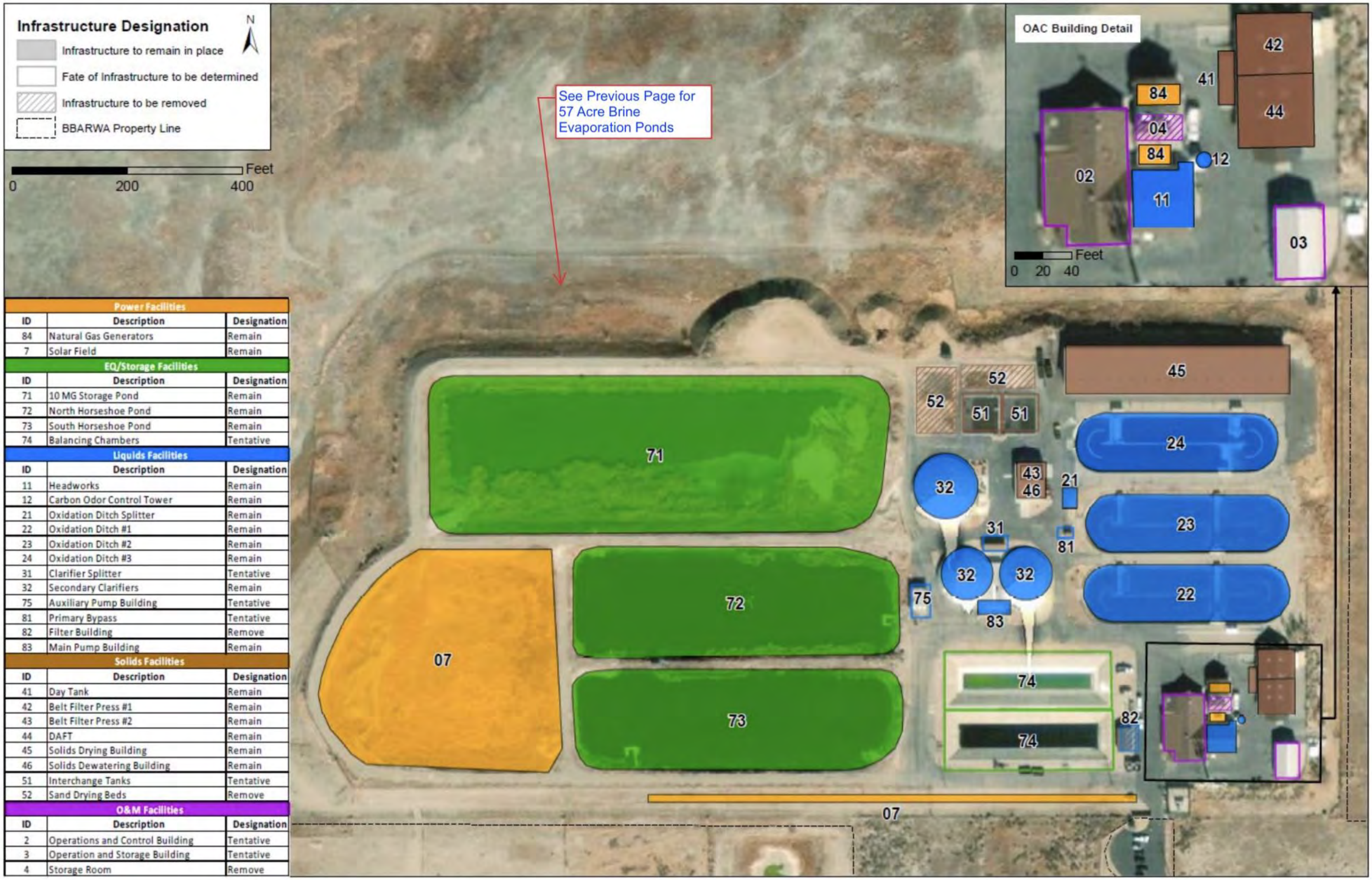


FIGURE 3-26

BBARWA Evaporation Pond Development Area



Power Facilities		
ID	Description	Designation
84	Natural Gas Generators	Remain
7	Solar Field	Remain
EQ/Storage Facilities		
ID	Description	Designation
71	10 MG Storage Pond	Remain
72	North Horseshoe Pond	Remain
73	South Horseshoe Pond	Remain
74	Balancing Chambers	Tentative
Liquids Facilities		
ID	Description	Designation
11	Headworks	Remain
12	Carbon Odor Control Tower	Remain
21	Oxidation Ditch Splitter	Remain
22	Oxidation Ditch #1	Remain
23	Oxidation Ditch #2	Remain
24	Oxidation Ditch #3	Remain
31	Clarifier Splitter	Tentative
32	Secondary Clarifiers	Remain
75	Auxiliary Pump Building	Tentative
81	Primary Bypass	Tentative
82	Filter Building	Remove
83	Main Pump Building	Remain
Solids Facilities		
ID	Description	Designation
41	Day Tank	Remain
42	Belt Filter Press #1	Remain
43	Belt Filter Press #2	Remain
44	DAFT	Remain
45	Solids Drying Building	Remain
46	Solids Dewatering Building	Remain
51	Interchange Tanks	Tentative
52	Sand Drying Beds	Remove
O&M Facilities		
ID	Description	Designation
2	Operations and Control Building	Tentative
3	Operation and Storage Building	Tentative
4	Storage Room	Remove

FIGURE 3-27

Property Availability Within the BBARWA WWTP Site

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FIGURE 3-28

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Available Areas for Construction & Areas of Preservation at the BBARWA WWTP

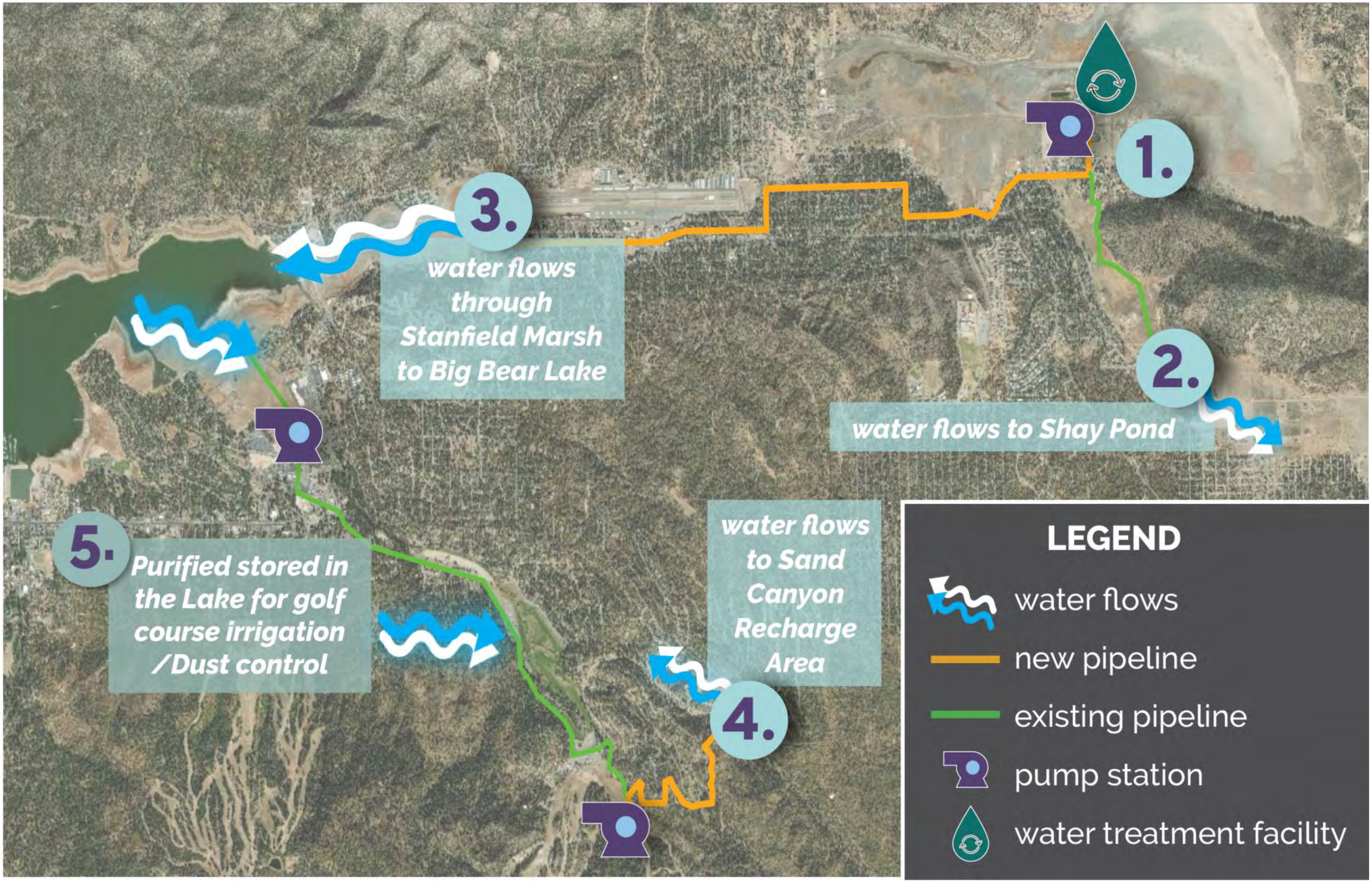

FIGURE 3-29

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Replenish Big Bear Program Overview

FIGURE 3-30

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Sand Canyon Groundwater Recharge Proposed Pipeline Alignment and Booster Pump Station

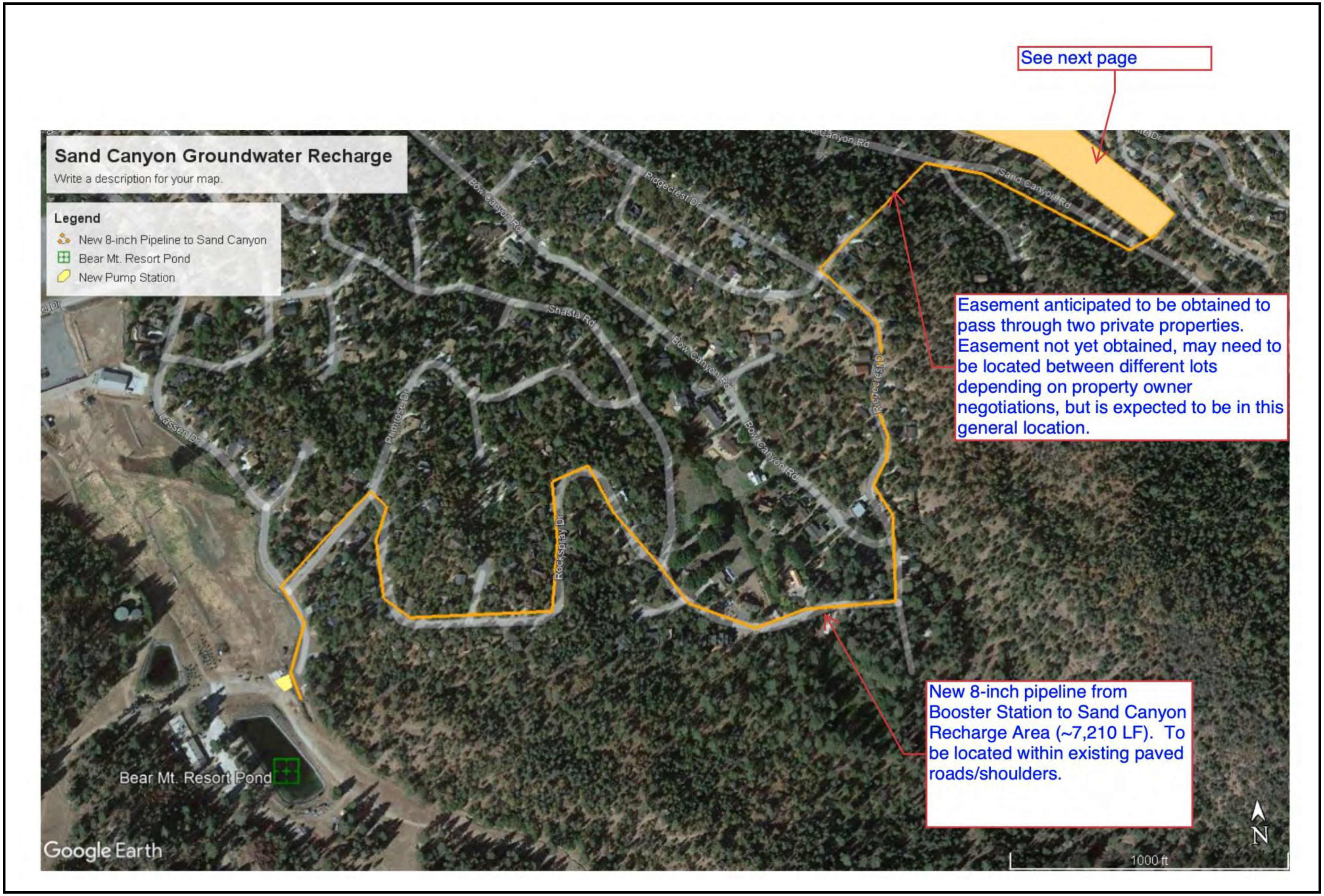

FIGURE 3-31

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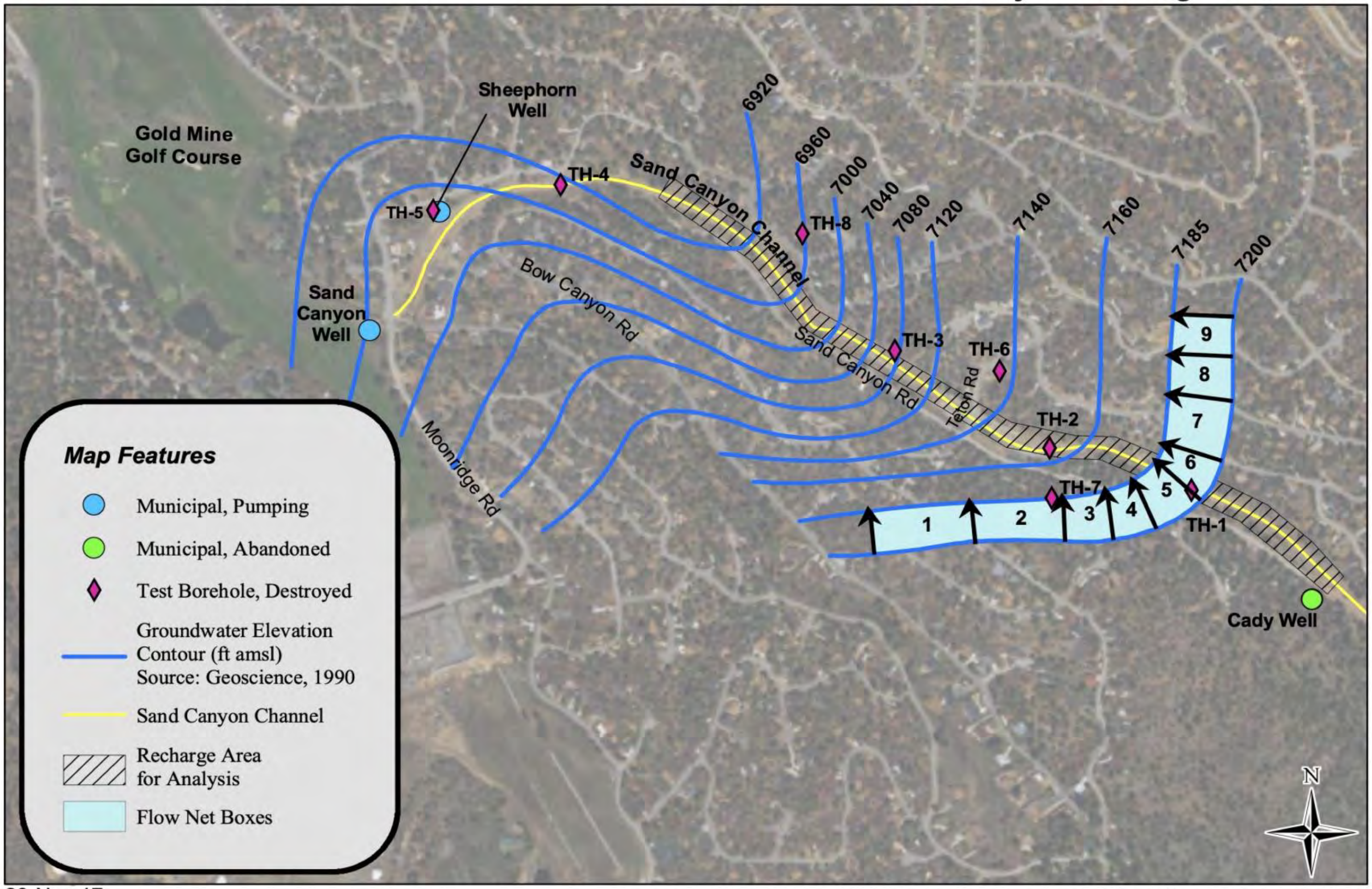
Sand Canyon Groundwater Recharge Proposed Pipeline Alignment and Booster Pump Station

Recharge Area

WSC



29-Nov-17

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Sand Canyon Underflow Analysis

Figure 3

FIGURE 3-32

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Sand Canyon Underflow Analysis

FIGURE 3-33

Replenish Big Bear Program East Overview

FIGURE 3-34

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Shay Pond Pipeline and Discharge Overview