BIG BEAR AREA REGIONAL WASTEWATER AGENCY

SEWER MASTER PLAN

2010

Prepared by:

ENGINEERING RESOURCES OF SOUTHERN CALIFORNIA, INC.

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ABBREVIATIONS

BBARWA	Big Bear Area Regional Wastewater Agency
BBCCSD	Big Bear City Community Services District
BOD	Biochemical Oxygen Demand
CBBL	City of Big Bear Lake
CSA 53B	San Bernardino County Service Area 53B
DAF	Dissolved Air Flotation
EDU	Equivalent Dwelling Unit
EPA	US Environmental Protection Agency
ERSC	Engineering Resources of Southern California, Inc.
ft	Foot or Feet
gal	Gallon
gpd	Gallons per Day
gpm	Gallons per Minute
hp	Horsepower
I/I	Infiltration/Inflow
LF	Linear Foot or Linear Feet
LPS	Lake Pump Station
mgd	Million Gallons Per Day
mg/L	Milligrams per Liter
NSPS	North Shore Pump Station
O&M	Operation and Maintenance
RAS	Return Active Sludge
sq	Square Foot or Square Feet
TSS	Total Suspended Solid
WWTP	Wastewater Treatment Plant

1. EXECUTIVE SUMMARY

1.1. EXECUTIVE SUMMARY

On May 13th, 2010 the Big Bear Area Regional Wastewater Agency (BBARWA) approved an agreement with Engineering Resources of Southern California, Inc. (ERSC) to update the Agency's existing Long Range Facilities Plan (Sewer Master Plan) originally prepared by ERSC in 2000. The purpose of the update is to conduct a comprehensive review of the BBARWA's interceptor and treatment system, identify current system deficiencies, and determine the long-term system requirements through Year 2030. This Master Plan will serve as a guide for future system development and capital planning.

The scope of ERSC's effort includes: a review of the existing Long Range Facilities Plan and Member Agencies' water/sewer master plans; a review of BBARWA's historical wastewater flow data; an analysis of the existing sewer flow; future sewer flows projections; development of a sewer flow model; and an analysis and determination of the existing interceptor and treatment system deficiencies.

ERSC has the following conclusions and recommendations:

BBARWA's current annual sewer flow is approximately 2.5 million gallons per day (mgd) including 1.4 mgd of base flow, 0.70 mgd of other sanitary flows (generated by visitor, part-time residential and commercial activities), and 0.4 mgd of infiltration/inflow. The sewer load index is approximately 172 gallon per day per full-time residential equivalent dwelling unit (EDU). BBARWA's existing full-time residency rate is estimated to be 38%. Higher full-time residency due to the conversion of part-time residents to full-time residents is possible in the future and should be considered; however, full-time residency rates higher than 50% are unlikely to occur by 2030.

The projected flows by 2030 are as follows:

Full-Time Residency Rate	Projected Annual Flow (mgd)	Non-I/I Max. Day Flow (mgd)	Max Hour Flow (mgd)
38%	2.73	4.83	20.4
50%	3.22	6.04	22.7
75%	4.25	8.07	26.5
100%	5.27	9.43	29.1

Under 38% (existing condition) and 50% full-time residency rate scenarios, the capacities of Agency's facilities are adequate (including appropriate use of the emergency storage), except:

- Lake Pump Station (LPS) has inadequate hydraulic capacity to deliver or store the projected maximum day flows. BBARWA needs to consider expanding the pumping capacity of LPS to 8.0 mgd in the future.

- The WWTP's hydraulic capacity for average day flow is 3.04 mgd and is bottlenecked by the hydraulic capacity of the existing clarifiers. The WWTP's hydraulic capacity is inadequate for the projected flows. BBARWA needs to construct a new clarifier (9,250 sq ft) to expand the WWTP's hydraulic capacity to 4.89 mgd.

- The North Shore Interceptor gravity main upgrade is suggested for carrying projected peak flows. For dry weather flow, assuming a 38% and 50% full-time residency rate, the recommended parallel pipeline installation is 868 feet and 1,628 feet, respectively. For wet weather flow with 100% historical peak I/I, assuming a 38% and 50% full-time residency rate, the recommended parallel pipeline installation is 1,648 feet for both scenarios.

- The Trunk Line upgrade is suggested for carrying projected peak flows. For dry weather flow, assuming a 38% and 50% full-time residency rate, the recommended parallel pipeline installation is 4,125 feet and 6,183 feet, respectively. For wet weather flow with 100% historical peak I/I, assuming a 38% and 50% full-time residency rate, the recommended parallel pipeline installation is 13,606 feet and 14,402 feet, respectively.

Under higher (75% and 100%) full-time residency rate scenarios, which are unlikely, BBARWA may need extra facility upgrades. Under the worst case scenario, BBARWA should consider:

- Expanding pumping capacity of North Shore Pump Station #1 to 0.87 mgd.

- Expanding the WWTP's hydraulic capacity for average day flow to 5.76 mgd.

- Expanding the biological treatment capacity of the oxidation ditches to 6.45 mgd (at 250 mg/L BOD).

- Installing 16,653 linear feet of parallel pipes for the Trunk Line.

ERSC also suggests that BBARWA consider:

- Constructing a covered sludge drying bed to save sludge disposal costs (estimated saving $100,000 per year) by improving the sludge dewatering level during winter season.

- Scheduling and conducting a series of asset useful life replacements for critical treatment plant equipment including construction of a new load equalization basin to increase emergency storage.
- Increasing staffing in the future.

1.2. DOCUMENT ORGANIZATION

1. **Executive Summary** summarizes the purpose, scope and conclusions of this study.

2. **Background** includes the history of BBARWA, its interceptor, treatment and disposal systems, as well as its Member Agencies.

3. **Current and Future Sewer Flow** focuses on the analysis of the current sewer flows and the future sewer flows based on the population and occupancy projection.

4. **Evaluation of Existing Facility Capacities** analyzes and evaluates the treatment plant and interceptor system capacities by processing and operational units.

5. **Staffing Levels** determines the number and type of BBARWA personnel based on performance of specific workloads.

6. **Maintenance Program** introduces the existing maintenance program for each operational unit of the treatment plant and interceptor system.

7. **Future Capital Improvements** provides the recommendation for future capital improvement projects including the preliminary cost estimates and recommended schedules.

8. **Future Service Areas** discusses BBARWA's potential future service areas.

9. **Conclusions** summarizes conclusions.

2. BACKGROUND

Big Bear Area Regional Wastewater Agency (BBARWA) is located in Big Bear City, California, an unincorporated area in the San Bernardino Mountains of Southern California. The Agency provides centralized sewer conveyance, efficient and economical sewer treatment and disposal for the City of Big Bear Lake, Big Bear City Community Services District and San Bernardino County on behalf of County Service Area 53B (the Member Agencies). The Agency was formed in March 1974 to conduct a study to develop and implement a plan for sewer management for the Member Agencies. Currently, there is an estimated population of over 61,575 on a full- and part-time basis and approximately 24,528 equivalent dwelling units (EDUs). It is estimated that 38% of residential EDUs are occupied full-time. BBARWA owns and operates a wastewater treatment plant (WWTP) which currently operates at about 2.5 million gallons per day (mgd).

The purpose of the plant is to treat sewage flows from the Member Agencies and to accept septic waste from residents and businesses, which are not served by a collection system. The effluent is discharged to farm lands in Lucerne Valley and the sludge is collected, dewatered and hauled to disposal facilities off the mountain.

The Agency is required to meet the wastewater treatment requirements of the Colorado River Basin Regional Water Quality Control Board and the Santa Ana Regional Water Quality Control Board. These Water Quality Control Boards require the Agency to remove the nutrients from its wastewater discharge and have emergency storage and standby power for power outages.

2.1. MEMBER AGENCIES AND SERVICE AREA

BBARWA's service area includes the entire Big Bear area comprised of approximately 79,000 acres. It is served by three separate collection systems: City of Big Bear Lake (CBBL), Big Bear City Community Services District (BBCCSD) and the San Bernardino County Service Area 53B (CSA 53B). Each Member Agency maintains and operates its own sewer collection system and delivers wastewater to BBARWA's interceptor system for transport to the WWTP.

CBBL represents approximately 47% of the sewer connections serviced by BBARWA. CBBL is an incorporated city located 25 miles northeast of the City of San Bernardino. CBBL's sanitation department service area covers all land located within the city limits, encompassing approximately seven square miles. In 2009, the service area of CBBL had a permanent population of approximately 6,142, and has approximately 11,489 EDUs. The sewer system of CBBL is comprised of approximately 126 miles of gravity sewer, 3,027 manholes, 13 lift stations and associated force mains.

BBCCSD represents approximately 48% of the total sewer connections serviced by BBARWA. BBCCSD provides fire, water, sewer, solid waste and street lighting services to portions of the unincorporated area of Big Bear City, Lake William, Baldwin Lake and Erwin Lake. The service area of BBCCSD encompasses approximately 21.1 square miles. Its sewer department services 11,855 EDUs, and maintains a system consisting of approximately 115 miles of sewer pipeline, 2,842 manholes, and 7 lift stations and associated force mains.

CSA 53B represents approximately 5% of the total sewer connections serviced by BBARWA. CSA 53B provides sewer service to 1,253 EDUs in the Fawnskin area from the dam to Division Drive.

The service area of BBARWA is shown in Figure 2.1.

2.2. SUMMARY OF INTERCEPTOR SYSTEM

BBARWA operates three sewer main lines

- Lake Pump Station (LPS) Force Main that serves CBBL's sewer system.
- North Shore Interceptor that serves CSA 53B's sewer system.
- BBARWA Trunk Line that serves BBCCSD's sewer system and conveys flow from the North Shore Interceptor to the WWTP.

The LPS Force Main, also named Lake Interceptor Line, is primarily composed of 30,400 linear feet of 16-inch force main and three air injection stations, transferring CBBL collection system flows from BBARWA's LPS to the WWTP.

The North Shore Interceptor transfers CSA 53B collection system flows to Manhole #75 located at the intersection of Division Drive and Aeroplane Boulevard, in which the sewer flows are transferred through the Trunk Line to BBARWA's WWTP. The North Shore Interceptor is composed of approximately 200 feet of 6-inch force main, 6,900 feet of 10-inch force main, 17,700 feet of 12-inch force main, 1,800 feet of 8-inch gravity pipelines and 2,700 feet of 15-inch gravity pipelines.

The Trunk Line transfers CSA 53B and BBCCSD's collection system flows to the treatment plant. It is comprised of approximately 5,700 feet of 18-inch gravity pipelines and approximately 15,800 feet of 21-inch gravity pipelines.

In addition to the three sewer main lines described above, BBARWA's interceptor system also includes four pump stations, three air injection stations and one metering station. The flow chart of the interceptor system is shown in Figure 2.2. The locations of the interceptor lines, trunk lines, manholes, pump stations and air injection stations are shown in Figure 2.3.

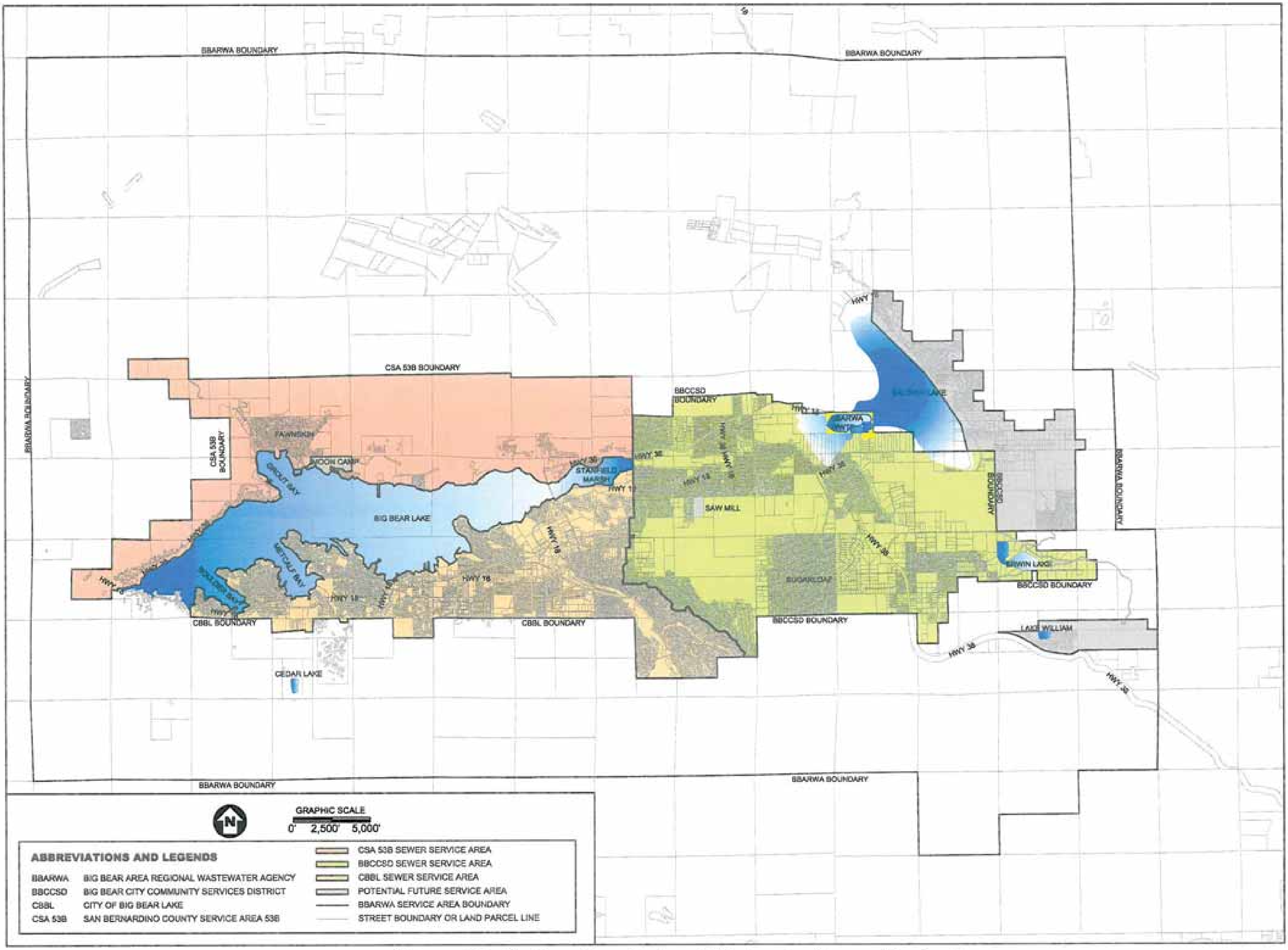

Figure 2.1. Big Bear Area Regional Wastewater Agency Service Area

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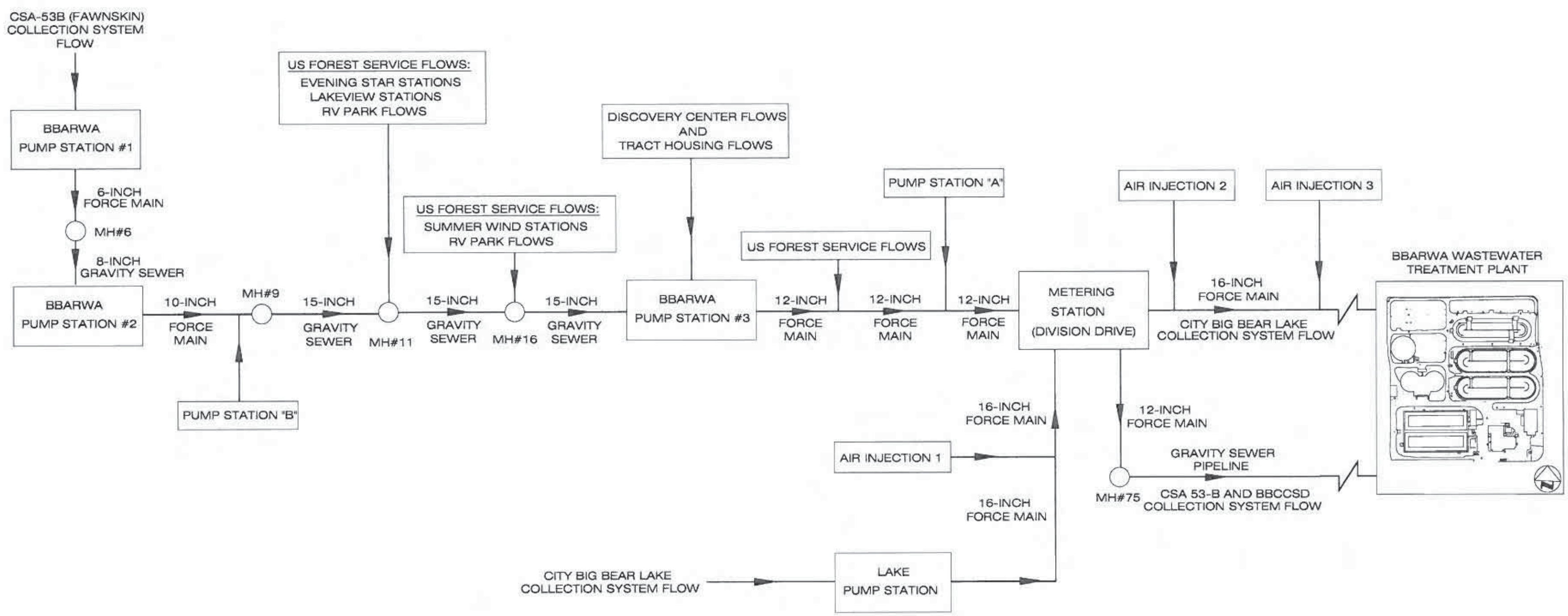

Figure 2.2. Flow Chart of BBARWA's Interceptor System

2.3. SUMMARY OF TREATMENT PLANT

BBARWA's WWTP is located in the Baldwin Lake area, on a 93.5 acre parcel of land in the community of Big Bear City (unincorporated). The plant occupies about 11.2 acres of land, leaving 82.3 acres for storage ponds and an evaporation lake (80 acres). The plant has a peak hydraulic capacity of 9.1 mgd, a secondary wastewater treatment capacity of 4.89 mgd and is currently operating at about 2.5 mgd. The effluent from the WWTP is discharged to farm lands in Lucerne Valley and the sludge is collected, dewatered and hauled to disposal facilities off the mountain.

The WWTP's processing and operational units include pretreatment, aeration/nutrient removal, clarification, sludge dewatering, cannibal solids reduction and effluent storage. The flow schematic of the WWTP is shown in Figure 2.4.

2.4. SUMMARY OF DISPOSAL SITE

BBARWA's wastewater discharge meets the requirements of the Water Quality Control Boards. Currently BBARWA discharges the secondary wastewater treatment plant effluent to a 480-acre site in Lucerne Valley where it is used to irrigate fodder or feed crops. Figure 2.5 shows the current discharge lines and the layout for the existing discharge site in Lucerne Valley. BBARWA is permitted to discharge treated wastewater for irrigation, construction compaction/dust control, and wildland firefighting in Big Bear area.

2.5. FUTURE SERVICE AREAS

BBARWA has identified the following areas as potential future additions:

- Baldwin Lake area
- Lake William area
- Moon Camp
- Saw Mill

FACILITY DESIGNATION

- (2) HEADWORKS BUILDING
- (7) SLUDGE BUILDING
- (9) OXIDATION DITCH/NUTRIENT REMOVAL SYSTEM
- (12) CLARIFIER
- (14) BALANCING CHAMBERS/RECYCLED WATER STORAGE TANKS
- (16) HORSESHOE STORAGE POND
- (17) MAIN EFFLUENT PUMP, WAS AND RAS PUMP STATION
- (18) AUXILIARY EFFLUENT PUMP STATION
- (19) SLUDGE DEWATERING BEDS
- (20) WILDLIFE HABITAT AREA
- (21) EMERGENCY HOLDING POND
- (22) PAVED SLUDGE DRYING AREA
- (23) FILTERS/UV OR CHLORINATION FACILITY
- (26) SAMPLING/MONITORING LOCATION M001 -- BOD/TSS
- (27) SAMPLING/MONITORING LOCATION M002 -- COLIFORM
- (28) SAMPLING/MONITORING LOCATION M003 -- COLIFORM/TURBIDITY
- (30) DISCHARGE POINT 003
- (32) DISCHARGE POINT 001
- (33) SAMPLING/MONITORING LOCATION M-INF

TREATMENT PROCESS FLOW SCHEMATIC

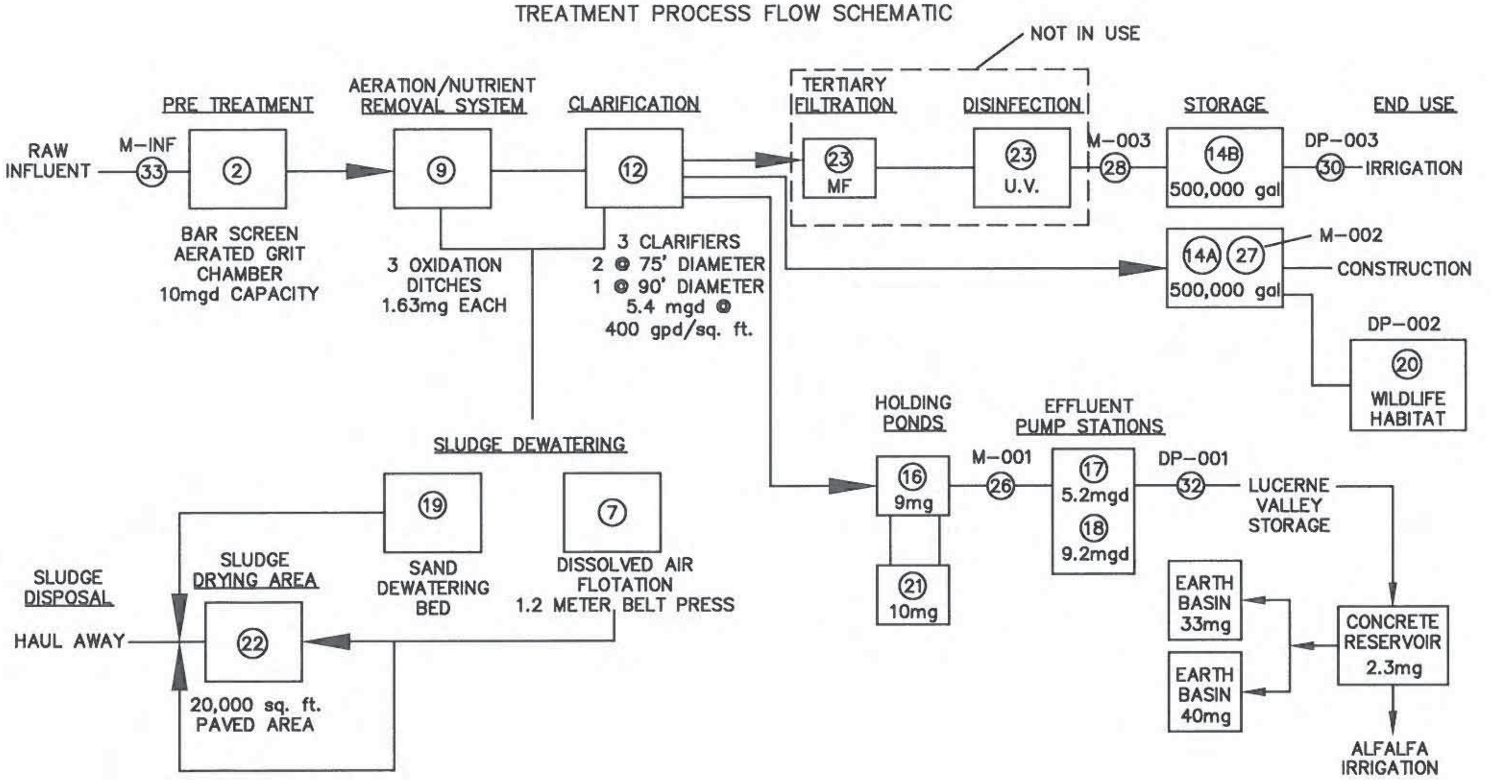

Figure 2.4. BBARWA WWTP Process Flow Diagram

3. CURRENT AND PROJECTED SEWER FLOW

An analysis of the Agency's sewer flow is required to assess the adequacy of the Agency's hydraulic and biological treatment capacity.

3.1. HISTORICAL SEWER FLOW

BBARWA tracks the daily sewer flow and the weekly Biochemical Oxygen Demand (BOD) concentration. The current sewer flow information was obtained through statistical analysis of the historical daily flow data.

3.1.1. HISTORICAL TOTAL FLOW

Figure 3.1 demonstrates BBARWA's monthly sewer flow from January 1990 to March 2010. The total annual flow is presented in Figure 3.2. The average flow rate from 2006 to 2009 is approximately 789 million gallons per year or 2.16 million gallons per day (mgd). On average, CBBL contributes approximately 54% of the total flow, or 1.16 mgd; BBCCSD contributes approximately 42% of the total flow, or 0.92 mgd; and CSA 53B contributes approximately 4% of the total flow, or 0.08 mgd.

3.1.2. CONTRIBUTION OF INFILTRATION AND INFLOW

As indicated in Figure 3.1, BBARWA's sewer flows show high seasonal variances. The seasonal variance is primarily attributed to the high level of the infiltration/inflow (I/I) due to the defects in the Member Agencies' systems. Figure 3.3 shows the comparison of the monthly precipitation and the monthly sewer flow over the past 20 years. Precipitation and flow peaks overlap except during the winter season when there are one to two-month gaps between precipitation and the related flow. This is because in the winter snowfall does not contribute to the I/I until the snow starts to melt. Considering snow melt, monthly precipitation and monthly sewer flow are significantly correlated as shown in Figure 3.3.

Seasonal variance of sewer flow is also due to the seasonal nature of tourism in the area as visitors and part-time residents travel to the area during weekends, holidays and the winter snow season. More detailed analysis of the weekend and holiday effect on the flow is presented in the following sections.

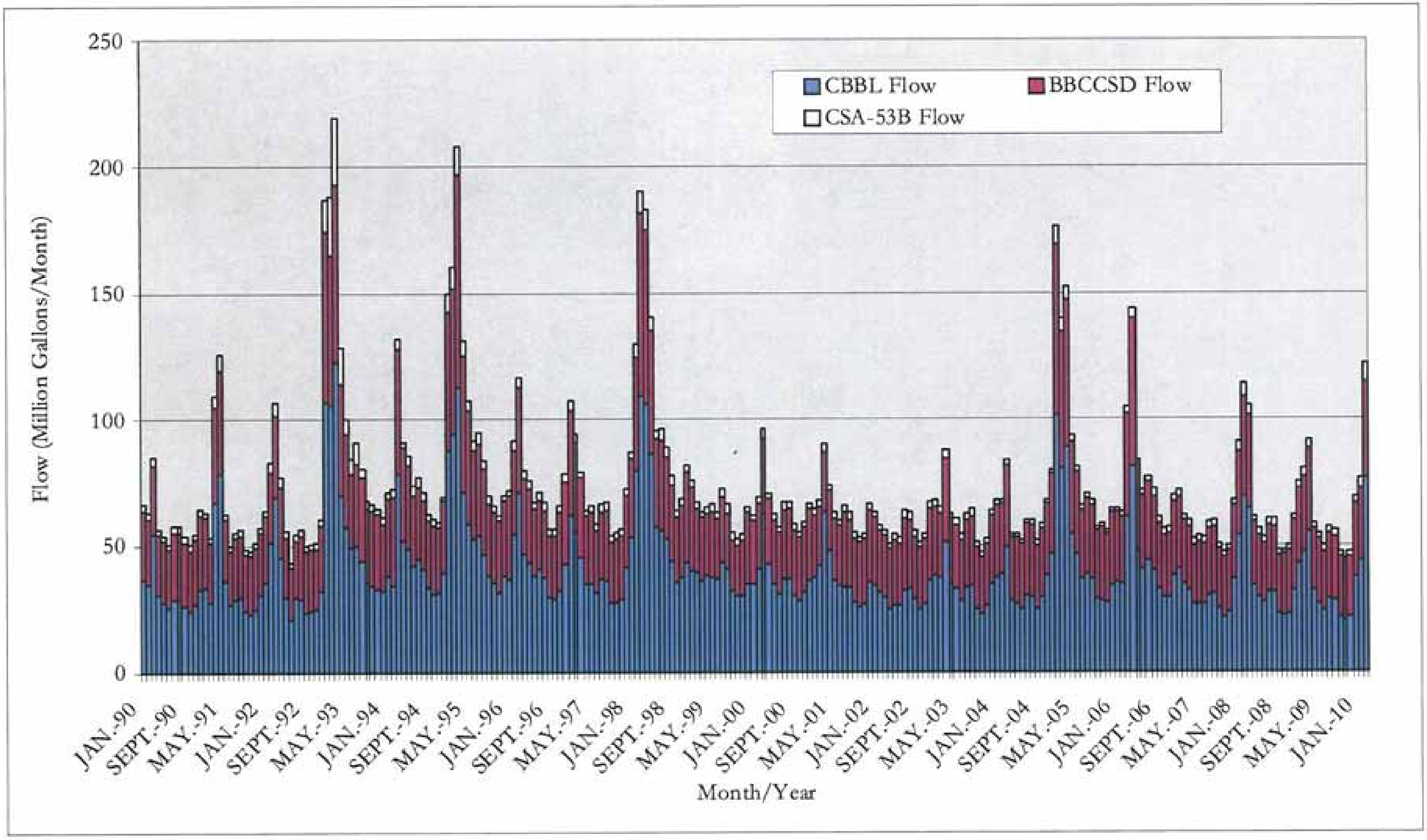

Figure 3.1. Historical Monthly Sewer Flow at BBARWA WWTP

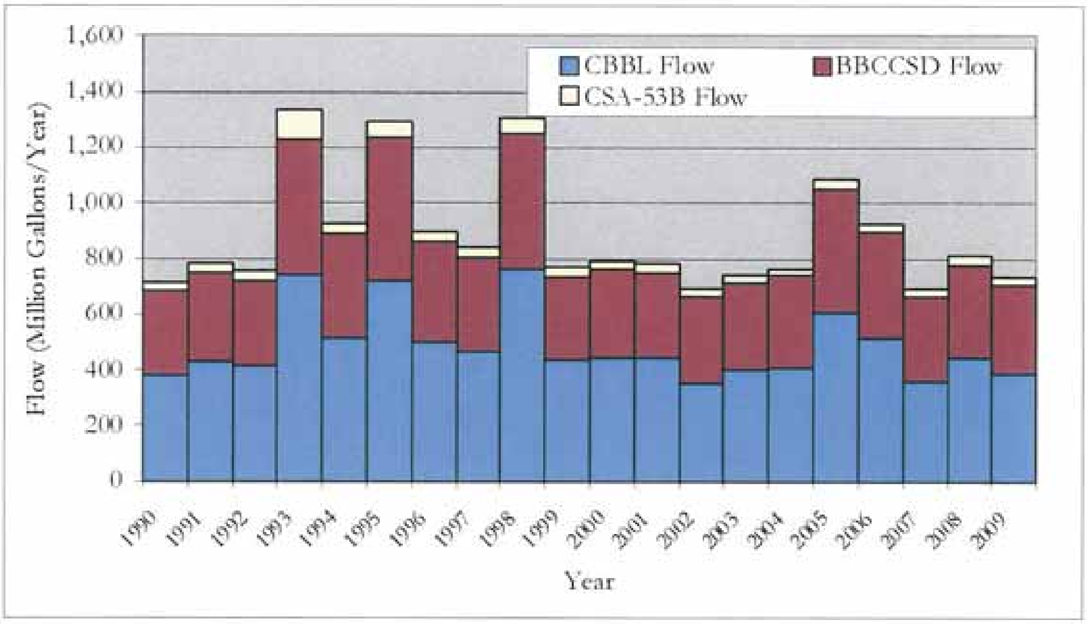

Figure 3.2. Historical Annual Sewer Flow at BBARWA WWTP

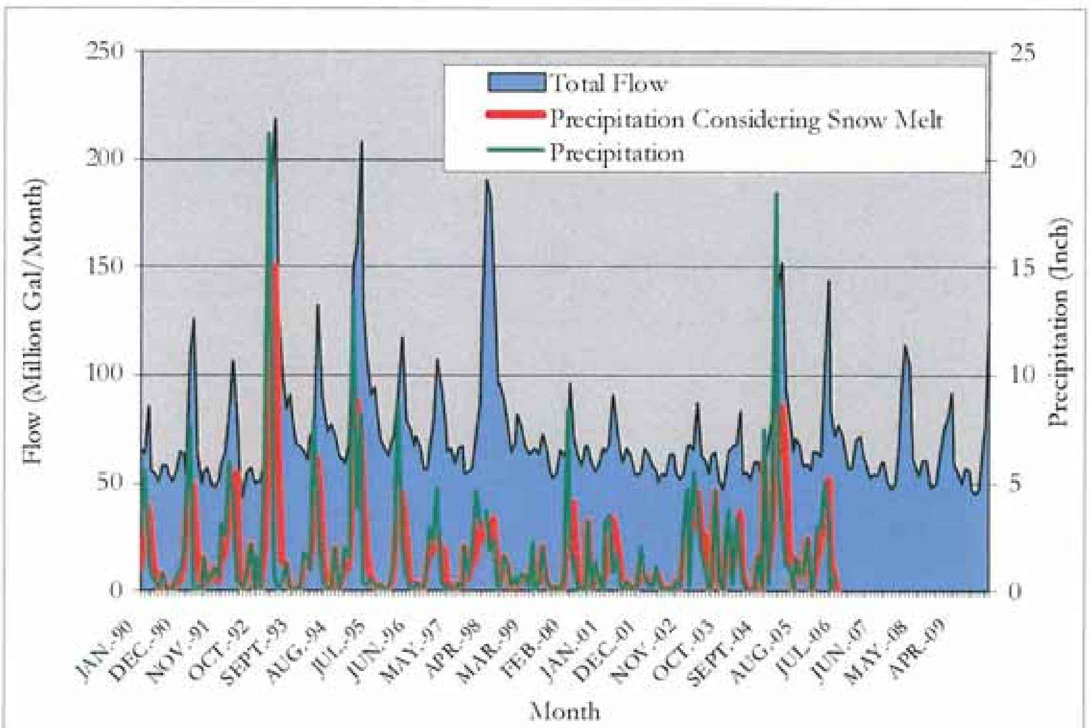

Figure 3.3. Correlation between Monthly Precipitation and Monthly Sewer Flow at BBARWA (Note: Precipitation includes rainfall and snow melt)

3.1.3. HISTORICAL SEWER FLOW COMPONENTS

BBARWA's sewer flow is comprised of three components:

1). Sanitary base flow generated by full-time residential homes,
2). Other sanitary flows due to tourist, commercial activities, and part-time residential; and
3). I/I due to precipitation (snow melt) which may enter the sewer system.

This section contains the analysis of the historical flow and BOD data in order to obtain the historical monthly I/I, the historical average base flow, the historical other sanitary flows, and the historical maximum I/I.

3.1.3.1. Historical Monthly I/I

The analysis of the sewer flow components starts with isolating the I/I from the total flow. The typical BOD concentration in BBARWA's sewer flow without I/I is approximately 280 mg/L. A sewer flow with a BOD concentration less than 280 mg/L can be considered diluted by I/I. The estimate of I/I was achieved by BOD balancing[1] (see example below). The estimated monthly historical I/I is shown in Figure 3.4.

3.1.3.2. Annual Historical Base Flow

The base flow is the flow generated by full-time residential EDUs. The base flow was determined by extracting flow data during a period in which I/I flow and other sanitary flows would be minimal, thus leaving only flow that would be associated with full-time residential EDUs. The average non-I/I daily flow (total daily flow excluding I/I estimated above) during the period from September 1st to November 30th excluding weekends and holidays is used to estimate the annual base flow. The estimated average base flow by year is presented in Table 3.1. In 2009, the base flow was approximately 1.37 mgd. Based on full-time residency rates provided by CSD and the City of Big Bear Lake Department of Water and Power in their respective master plans and the number of full-time dwelling units reported by Bear Valley Electric, BBARWA has estimated the current full-time residency rate at approximately 38% and sewer load of 172 gallons per day per full-time residential EDU.

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[1] BOD balancing example: if the measured total flow rate is 5 mgd and the measured BOD concentration is 200 mg/L, then the estimated I/I = $5mgd - \left(\frac{5mgd \times 200mg/L}{280mg/L} \right) = 1.43mgd$.

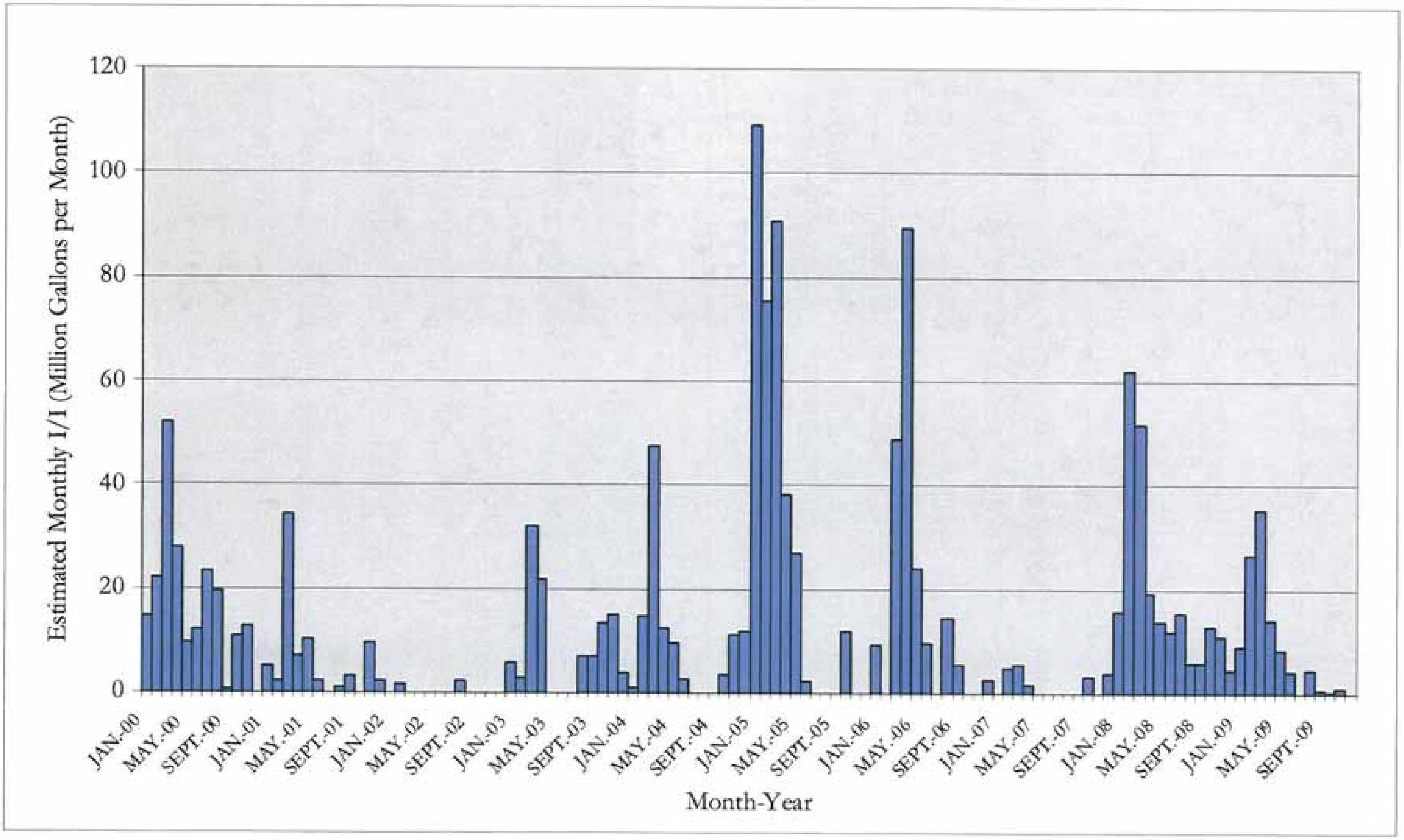


Figure 3.4. Monthly Historical I/I at BBARWA

Table 3.1. Estimated Historical Base Flow at BBARWA

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average Base Flow (mgd)	1.48	1.60	1.15	1.61	1.60	1.70	1.43	1.17	1.37

3.1.3.3. Historical Other Sanitary Flows

The other sanitary flows are those sanitary flows associated with all other EDUs not included in the base flow. Included in these EDUs would be nonresidential EDUs (primarily commercial) and residential EDUs that are occupied less than 100% during an annual period. Other sanitary flows are assumed to be driven largely by tourism, i.e. visitors to Big Bear. Based on the most recent five-year period, other sanitary flows are estimated to be 50.8% of the annual base flow. It is also assumed that this percentage will decrease as full-time residential EDUs increase. Table 3.2 shows the projected percentages of the other sanitary flows in relation to the base flows with an increase in the full-time residency rate.

Table 3.2. Projected Percentage of Other Sanitary Flows to Base Flow at BBARWA

Full-time Residential EDUs as % of Total EDUs	38%	50%	75%	100%
Other Sanitary Flows as % of Base Flow	50.8%	44.3%	30.6%	17.0%

For the purpose of this study, other sanitary flows are assumed to occur on weekends and holidays only.

3.1.3.4. Historical Maximum Day I/I

BBARWA's recorded maximum day flow occurred on January 10th 2005 (Monday), which was 12.79 mgd. The average base flow in 2005 is estimated at approximately 1.60 mgd (see Table 3.1). Other sanitary flows are estimated to be zero for the purpose of determining historical maximum day I/I since January 10th 2005 was not holiday or weekend, thus, the historical maximum day I/I is 11.19 mgd (i.e. 12.79 mgd – 1.60 mgd).

3.2. CURRENT SEWER FLOW

In this study, the current sewer flows refer to the current average flow and potential maximum day and hour flows (i.e., the worst case scenarios) under current population and occupancy statistics.

3.2.1. CURRENT AVERAGE ANNUAL FLOW

Current average annual flow can be calculated as:

Current Average Annual Flow
= (2009 Base Flow) + (Other Sanitary Flows) + (2000-2009 Average I/I)
= (1.37 mgd) + (50.8% x 1.37 mgd) + (0.389 mgd)
= 2.45 mgd

The current total flow by month is shown in Figure 3.5.

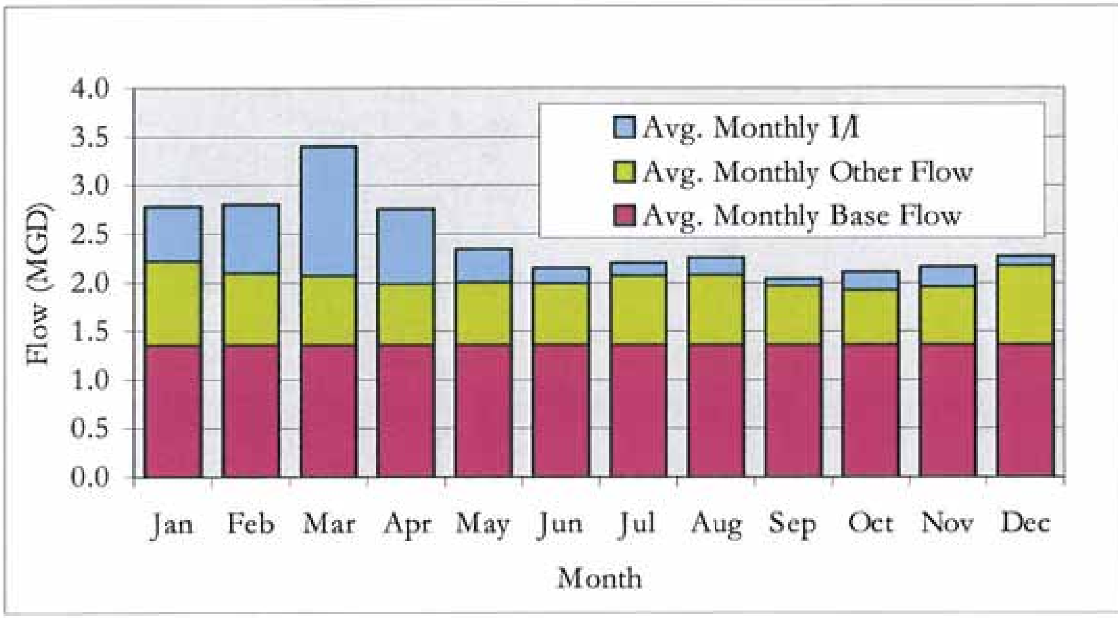


Figure 3.5. Current Total Sewer Flow at BBARWA

3.2.2. CURRENT NON-I/I MAXIMUM DAY FLOW

The non-I/I flow is the sanitary flow generated by both full-time residents and tourist/commercial activities. The non-I/I maximum day flow will be the basis for the WWTP biological treatment capacity evaluation.

The current non-I/I maximum day flow can be calculated as:

Current Non-I/I Maximum Day Flow
= (Non-I/I Average Flow) x (Peaking Factor)
= (Average Base Flow + Other Sanitary Flows) x 1.9
= (1.37 mgd + 0.85 mgd) x 1.9
= 4.21 mgd

where the peaking factor is the ratio of maximum day to average day base flow or other sanitary flows. The maximum day non-I/I flow is expected to occur in January and is estimated to be 4.21 mgd, as shown in Figure 3.6.

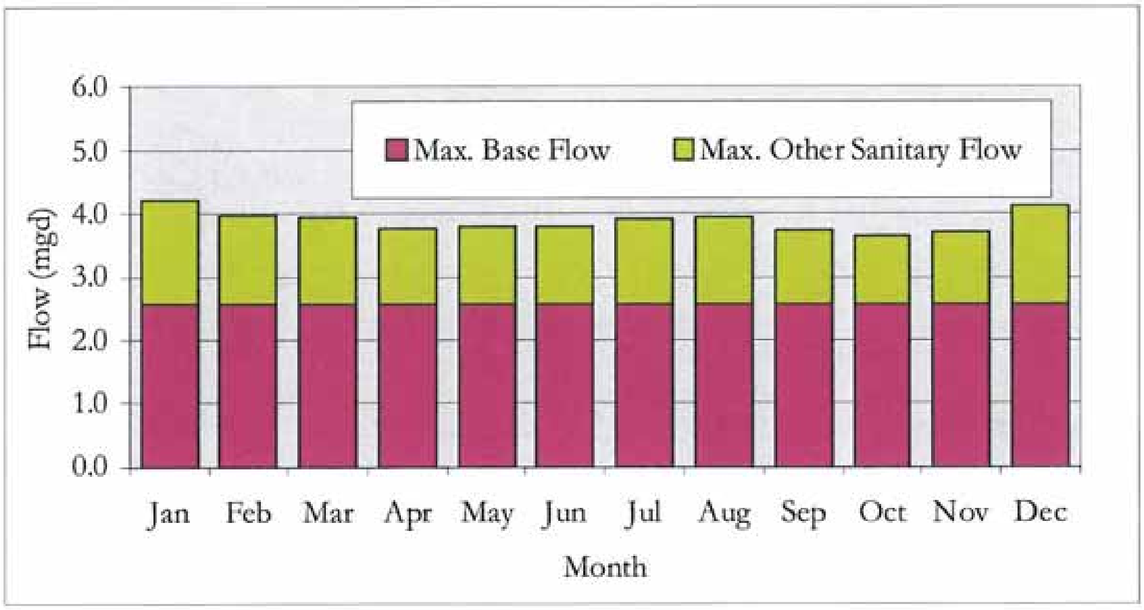


Figure 3.6. Current Maximum Non-I/I Sewer Flow at BBARWA

3.2.3. CURRENT MAXIMUM DAY AND MAXIMUM HOUR FLOW

The current maximum day and maximum hour flows are the potential maximum flows under the worst case scenarios. The maximum hour flow will be the basis for the hydraulic capacity evaluation of the WWTP and the interceptor system.

The current maximum day flow is expected to occur in January when the current non-I/I maximum day flow (4.21 mgd) combines with the historical maximum day I/I (11.19 mgd) producing a potential maximum day flow of 15.4 mgd (4.21 mgd +11.19 mgd). The potential maximum day flow by month is shown in Figure 3.7.

The current maximum hour flow can be calculated as:

Current Maximum Hour Flow
= (Non-I/I Max Day Flow) x (Day Pattern Peaking Factor) +
(Historical Maximum Hour I/I)
= (4.21 mgd x 1.9) + (11.19 mgd)
= 19.2 mgd

where the day pattern peaking factor is the ratio of peak hour flow to average day flow. This peaking factor is 1.9 according to BBARWA's staff. The historical maximum hour I/I is the same as the historical maximum day I/I (11.19 mgd). The maximum hour flow of 19.2 mgd is expected to occur in January, as shown in Figure 3.8.

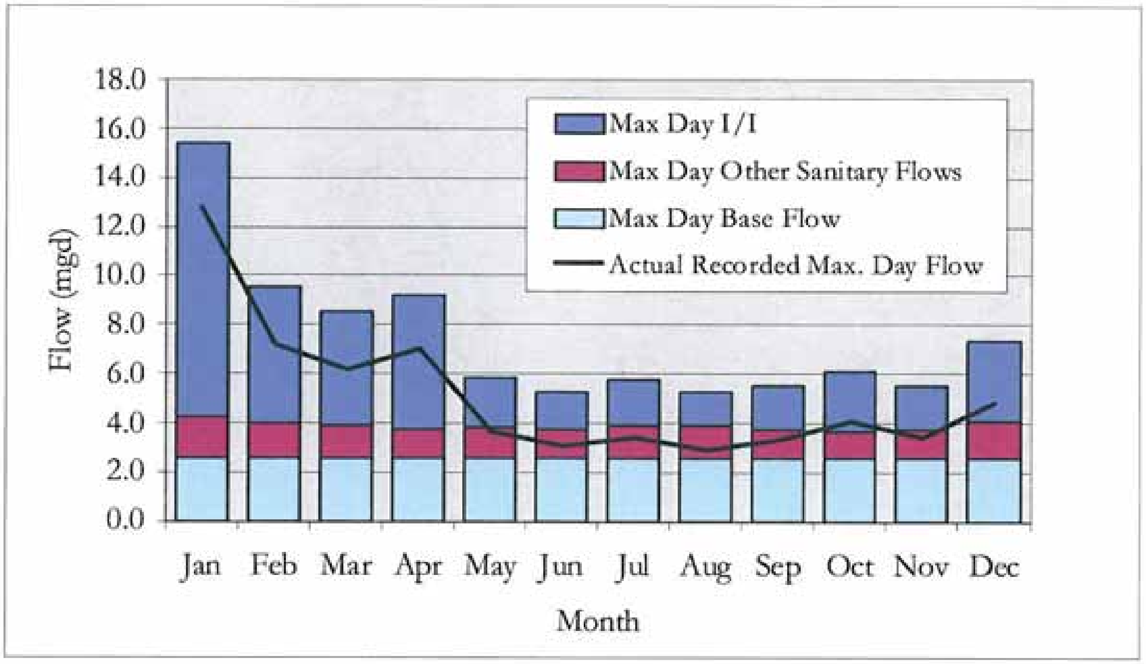


Figure 3.7. Current Maximum Day Flow at BBARWA

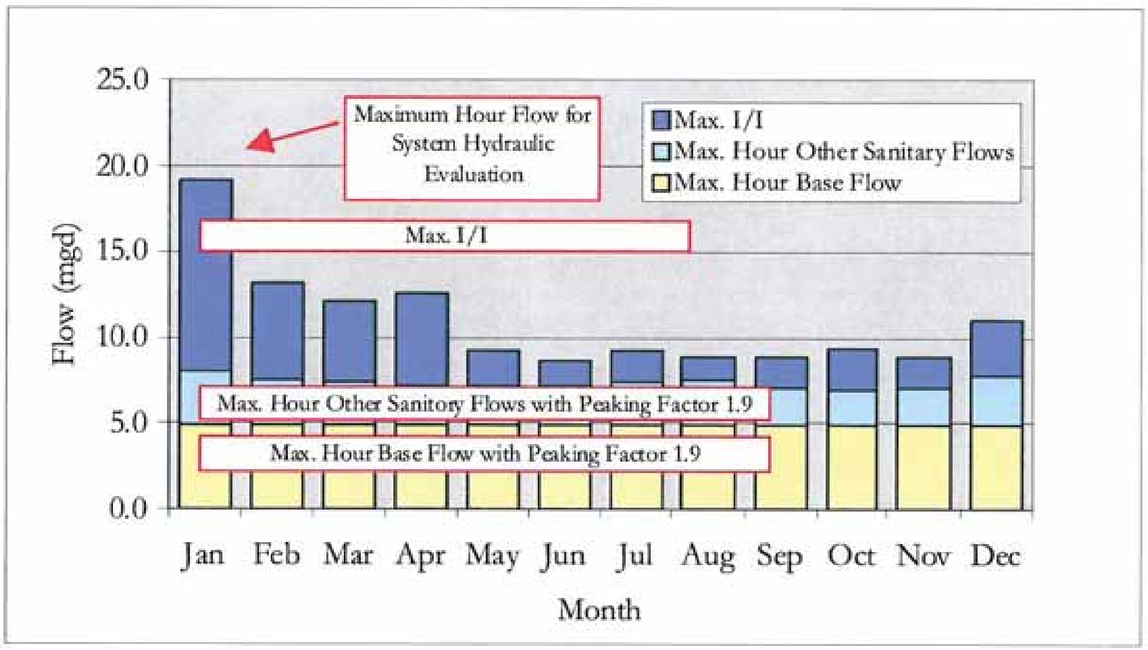


Figure 3.8. Current Maximum Hour Flow at BBARWA

3.3. FUTURE SEWER FLOW PROJECTION

The future sewer flow projection is based on the future population and EDU projections utilizing the constant sewer load index of 172 gallons per day per full-time residential EDU. The future sewer flow is also significantly impacted by conversion from part-time residency to full-time residency.

3.3.1. FUTURE POPULATION AND EDU PROJECTION

This study assumes that the average annual increase rate of residential EDUs in BBARWA's service area is approximately 0.8% over the next 20 years. This rate of growth is based on long-term historical average and is consistent with growth rates forecast by other agencies in the Big Bear area. The projected residential EDUs from 2010 to 2030 are presented in Table 3.3.

3.3.2. OCCUPANCY ASSUMPTION AND RANGES

Due to the resort nature of the Big Bear area, occupancy is characterized by a high percentage of part-time residents. For long-term planning purposes, the conversion of part-time residents to full-time residents should be considered. Although it is uncertain that

Table 3.3. Projected Residential EDUs at BBARWA for Study Purposes

Year	EDUs	EDUs Increment	Year	EDUs	EDUs Increment
2010	20,310	50	2021	21,985	200
2011	20,360	80	2022	22,185	200
2012	20,440	110	2023	22,385	200
2013	20,550	135	2024	22,585	200
2014	20,685	160	2025	22,785	200
2015	20,845	180	2026	22,985	200
2016	21,025	180	2027	23,185	200
2017	21,205	180	2028	23,385	200
2018	21,385	200	2029	23,585	200
2019	21,585	200	2030	23,785	200
2020	21,785	200			

this conversion would occur and there are no indications that it is occurring or likely to occur, the impact needs to be understood. The conversion to full-time residency results in significant sewer load increases even if service connections remain constant.

According to the 2007 United States Census, the residential vacancy percentage for Big Bear City is approximately 52.3%. Research conducted by the *BBCCSD 2010 Water Master Plan* concluded that residency with water meter readings of 500 cubic feet or less during a 2-month period are consistent with the U.S. Census's vacancy percentage. BBCCSD estimated that the full-time residency rate within the BBCCSD boundary is approximately 47.7%

The *CBBL 2006 Water Master Plan* estimated 25% full-time residency rate within the CBBL boundary. Since CBBL and BBCCSD contribute approximately one-half each to the total sewer flows at BBARWA's WWTP, it is reasonable to estimate that the overall percentage of full-time residents within BBARWA's service area is close to the average of 47.7% and 25%. In this study, the current full-time residency rate is assumed to be 38%, and has been determined based on the average full-time residency rate referenced above and the full-time residenctial accounts reported by Bear Valley Electric.

3.3.3. FUTURE FLOW PROJECTION

The future flow projection includes a projection of the average base flow, non-I/I maximum day flow, maximum day flow and maximum hour flow using various assumptions of the full-time residency rate over the next 20 years.

3.3.3.1. Projected Annual Flow

The projected total flow is comprised of three components: base flow, other sanitary flows and I/I. The base flow is projected based on 172 gallons per day per full-time residential EDU. The base flow increases proportionately to the number of full-time residential EDUs. Other sanitary flows are a specific percentage of the base flow based on the full-time residency percentage. I/I is assumed to remain at the historical average (or maximum level for maximum flow projection).

Figure 3.9 shows the projected annual sewer flow over the next 20 years using the average I/I flow experienced in 2000-2009. Using the existing 38% full-time residency rate, the annual flow increases from 2.43 mgd to 2.73 mgd by 2030, a 12.3% increase. Assuming a 50%, 75% and 100% full-time residency rate, the annual flow increases to 3.22 mgd, 4.25 mgd and 5.27 mgd, respectively, by 2030.

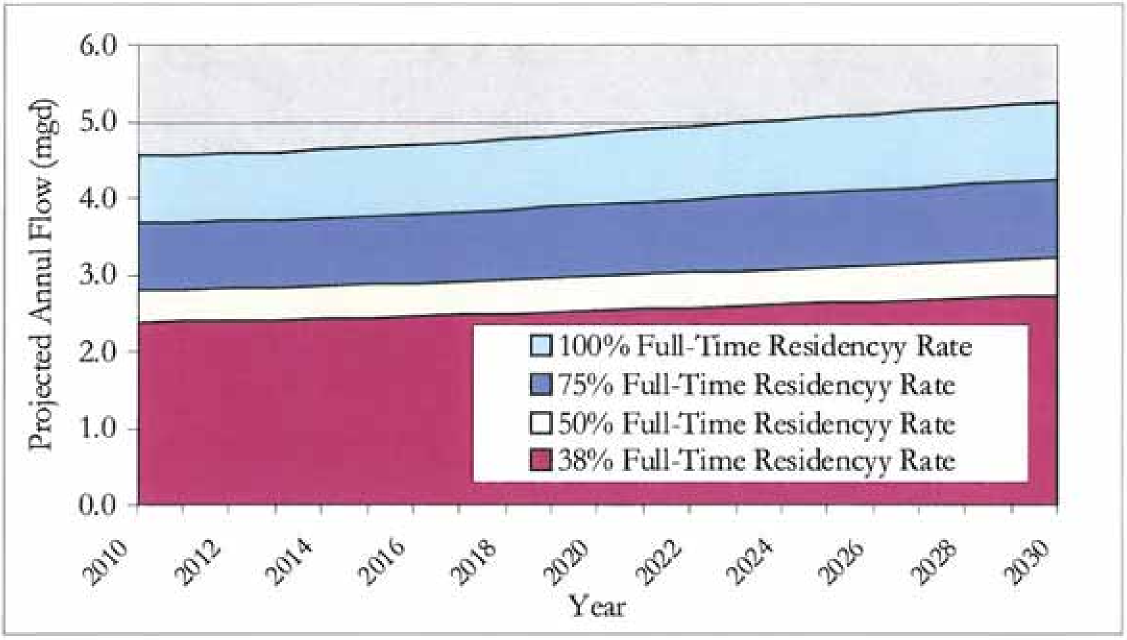


Figure 3.9. Projected Annual Sewer Flows Using Average I/I during 2000-2009 at BBARWA

Figure 3.10 shows the projected annual sewer flow over the next 20 years using 2005 I/I, the highest I/I flow in the last ten years. Using the existing 38% full-time residency rate, the annual flow increases from 2.97 mgd to 3.31 mgd in 2030, an 11.4% increase. Assuming 50%, 75% and 100% full-time residency rates, the total annual flow increases to 3.92 mgd, 4.98 mgd and 5.76 mgd, respectively, by 2030.

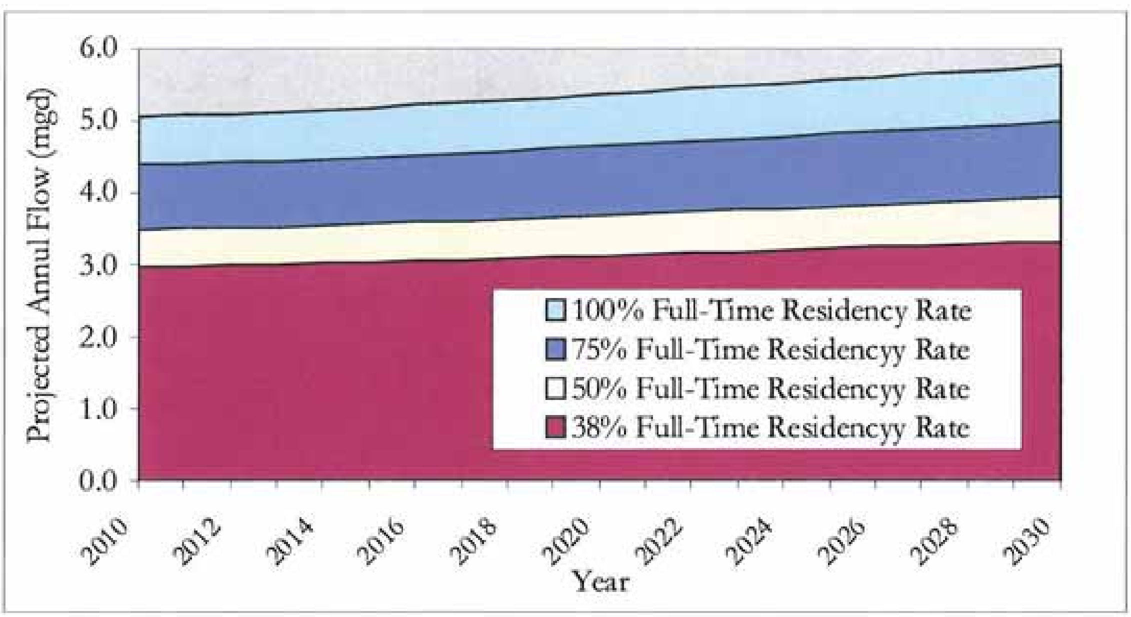


Figure 3.10. Projected Annual Sewer Flows with 2005 I/I at BBARWA

3.3.3.2. Projected Non-I/I Maximum Day Flow

The projected non-I/I maximum day flow will be used to evaluate the future biological treatment capacity of the WWTP.

The projected non-I/I maximum day flow can be calculated as:

Projected Non-I/I Maximum Day Flow
= (Projected Non-I/I Average Flow) x (Peaking Factor)
= (Projected Average Base Flow + Projected Other Sanitary Flows) x 1.9

where the peaking factor is the ratio of maximum day to average day base flow or other sanitary flows. Since the projected maximum day other sanitary flows always occur in January, the projected non-I/I maximum day flow will also occur in January. The projected non-I/I maximum day flows over the next 20 years are shown in Figure 3.11.

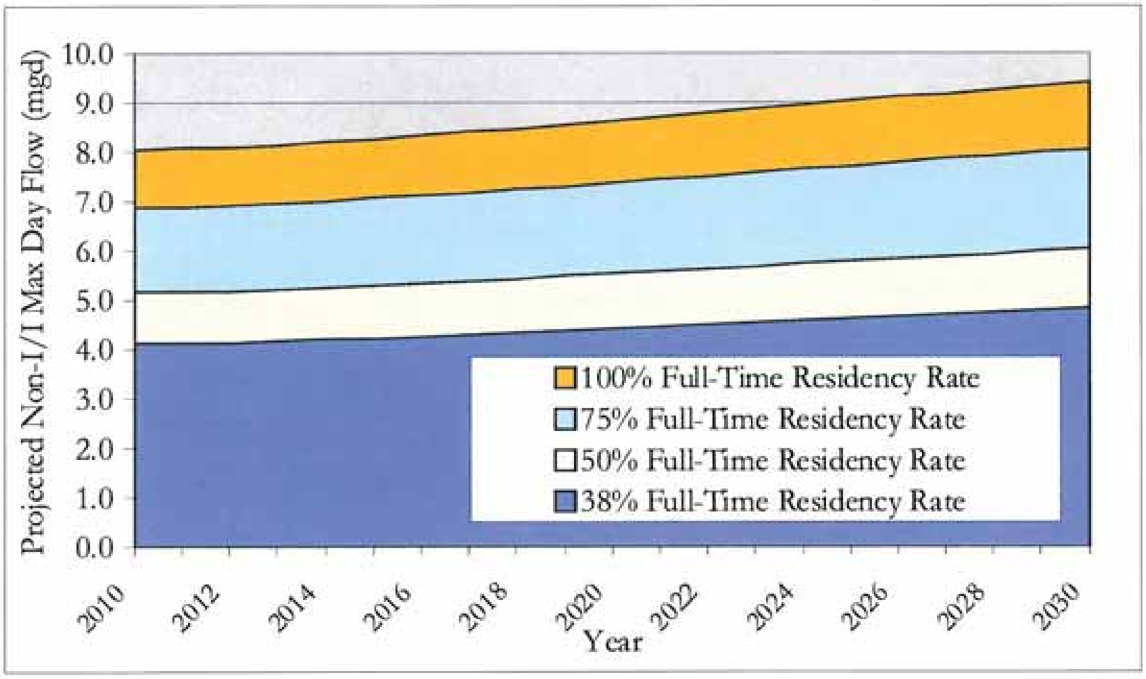


Figure 3.11. Projected Non-I/I Maximum Day Sewer Flows at BBARWA

Using the existing 38% full-time residency rate, the non-I/I maximum day flow increases from 4.21 mgd to 4.83 mgd in 2030, a 14.7% increase. Assuming 50%, 75% and 100% full-time residency rates, the non-I/I maximum day flow increases to 6.04 mgd, 8.07 mgd and 9.43 mgd, respectively, by 2030.

3.3.3.3. Projected Maximum Hour Flow

The projected maximum hour flow will be used to evaluate the hydraulic capacities of the sewer treatment facilities and the sewer interceptor systems. The projected maximum hour flow can be calculated as:

Projected Maximum Hour Flow
= (Projected Non-I/I Max Day Flow) x (Day Pattern Peaking Factor) + (Historical Maximum Hour I/I)

where the day pattern peaking factor is the ratio of peak hour flow to average day flow, which is 1.9. The projected maximum hour flow reflects the worst case scenario whereby the projected non-I/I maximum hour flow combines with the historical maximum hour I/I producing a flow of 11.19 mgd in January (please refer to Section 3.2.3 for detailed discussion).

The projected maximum hour flows over the next 20 years are shown in Figure 3.12.

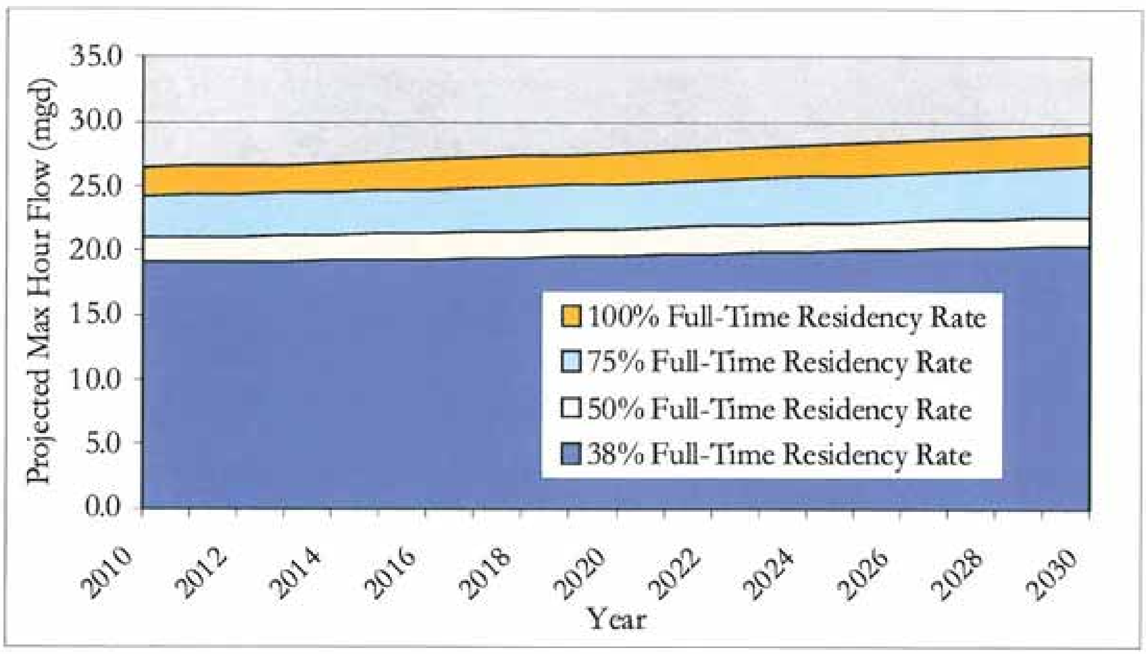


Figure 3.12. Projected Maximum Hour Sewer Flows at BBARWA

Using the existing 38% full-time residency rate, the maximum hour flow increases from 19.2 mgd to 20.4 mgd in 2030, an increase of 6.3%. Assuming 50%, 75% and 100% full-time residency rate, the total flow increases to 22.7 mgd, 26.5 mgd and 29.1 mgd, respectively, by 2030.

3.3.3.4. Summary of Projected Annual Flow

The projected annual flows are summarized in Table 3.4. For planning purposes, the Agency will utilize average annual flows at 38% and 50% full-time residency rates only.

Table 3.4. Summary of Projected Annual Flow at BBARWA

Full-Time Residency Rate	2010 (Current) Average Annual Flow (mgd)		2030 Projected Average Annual Flow (mgd)	
	with Avg. I/I*	with 2005 I/I**	with Avg. I/I*	with 2005 I/I**
38%	2.43	2.97	2.73	3.31
50%	2.81	3.49	3.22	3.92
75%	3.68	4.40	4.25	4.98
100%	4.56	5.06	5.27	5.76

* Avg. I/I is the average I/I flow experienced in 2000-2009.

** 2005 I/I is the highest I/I flow in the last ten years.

4. EVALUATION OF EXISTING FACILITY CAPACITIES

Every sewer system has a certain capacity and when the sewer flow exceeds the capacity, a sewer overflow may occur. This section reviews and evaluates the capacities of BBARWA's existing sewer interceptor system, wastewater treatment facilities and the effluent disposal system. These capacities are compared to the current and projected sewer flows under various scenarios. If the analysis determines that a capacity problem exists or will develop in the future, a capacity capital improvement plan is developed to construct the needed facilities.

4.1. INTERCEPTOR SYSTEM CAPACITY EVALUATION

BBARWA's interceptor system includes three sewer main lines. The 16-inch Lake Pump Station (LPS) Force Main transfers CBBL collection system flows from BBARWA's LPS to BBARWA's WWTP. The North Shore Interceptor transfers CSA 53B collection system's sewer flows to Manhole #75, where the sewer flow is then transferred through the Trunk Line to BBARWA's WWTP. The North Shore Interceptor has approximately 24,800 feet of force main, powered by Pump Stations #1, #2 and #3. The North Shore Interceptor also has approximately 4,500 feet of gravity mains. The Trunk Line transfers CSA 53B and BBCCSD's collection systems' sewer flows to the WWTP. The Trunk Line is comprised of approximately 5,700 feet of 18-inch gravity pipelines and approximately 15,800 feet of 21-inch gravity pipelines.

The hydraulic capacities of the interceptor system under various scenarios over the next 20 years were studied. The identified deficiencies are presented in the following section.

4.1.1. LAKE PUMP STATION FORCE MAIN

The hydraulic capacity of the LPS Force Main is dependent on the pumping capacity of LPS as well as the carrying capacity of the 16-inch pipe. Force mains from pump stations are typically designed for velocities between 2 to 8 feet per second. The maximum force main velocity at peak conditions is recommended not to exceed 10 feet per second. For a 16-inch force main, the carrying capacity with a velocity of 6 feet per second is 3,560 gpm (5.1 mgd), the peak carrying capacity with a velocity of 10 feet per second is 5,900 gpm (8.5 mgd). LPS is equipped with two small pumps and two large pumps. The pumping capacity of LPS is 2,200 gpm (2.4 mgd) with two small pumps running or 3,200 gpm (4.6 mgd) with two large pumps running; both are less than the carrying capacity of the 16-inch force main.

Therefore the overall hydraulic capacity of the LPS Force Main is determined by the pumping capacity of the LPS.

The pumping capacity of LPS was compared with the projected maximum day and maximum hour flows under various scenarios from CBBL to determine the capacity adequacy, as shown in Tables 4.1 and 4.2. The projected maximum day and maximum hour flows are presented in Section 3.3.3.3 where CBBL is assumed to have 47% of total EDUs and total projected flow.

Under all scenarios, LPS pumps are not able to deliver the maximum day or maximum hour flow instantaneously to the WWTP. When flow exceeds the pumping capacity of LPS, BBARWA can divert the raw wastewater to the emergency storage ponds at LPS for temporary storage. The ponds at LPS can store up to 32.8 million gallons, of which 5.5 million gallons is available to BBARWA and the remaining 27.3 million gallons is owned by CBBL

When the maximum day flow occurs, assuming the current 38% full-time residency rate, in Year 2015 approximately 2.65 mgd of excess flow (when two large pumps run) need to be diverted to the storage pond; the 5.5-million-gallon available storage will hold 2.1 days of excess flow. In 2030, approximately 2.93 mgd of excess flow (when two large pumps run) will need to be diverted to the storage pond; the 5.5-million-gallon available storage will hold excess flow for 1.9 days. Under the maximum sewer flow load when full-time residency rate is 100% in 2030, approximately 5.09 mgd of excess flow (when two large pumps run) will need to be diverted to the storage pond; the 5.5-million-gallon available storage will hold excess flows for 1.1 day. Since the maximum day flow is expected to last for more than one day, the LPS hydraulic capacity is inadequate to deliver or store the projected maximum day flows.

When the maximum hour flow occurs, using the existing 38% full-time residency rate, in 2015 approximately 4.45 mgd of excess flow (when two large pumps run) will be diverted to the storage pond; the 5.5-million-gallon available storage will hold 30 hours of excess flow. In 2030, approximately 4.98 mgd of excess flow (when two large pumps run) will be diverted to the storage pond; the storage pond will hold excess flows for 27 hours. Under the maximum sewer flow load when full-time residency is 100% in 2030, approximately 9.08 mgd of excess flow (when two large pumps run) will be diverted to the storage pond; the storage pond will hold flows for 15 hours. Since the maximum hour flow is expected to last for less than 15 hours, the LPS hydraulic capacity is adequate to deliver or store the projected maximum hour flows.

Table 4.1. BBARWA's Lake Pump Station Capacity Evaluation with Projected Maximum Day Flows

Year	Full-Time Residency Rate	Max Day Flow (mgd)	Pumping Capacity * (mgd)	On Site Excess Flow (mgd)	Max Storage Capacity (mg)	Max Storage Time (days)	Hydraulic Capacity Adequacy **
2015	38%	7.3	2.4	4.85	5.5	1.1	NO
			4.6	2.65	5.5	2.1	OK
	50%	7.8	2.4	5.35	5.5	1.0	NO
			4.6	3.15	5.5	1.7	NO
	75%	8.6	2.4	6.19	5.5	0.9	NO
			4.6	3.99	5.5	1.4	NO
	100%	9.1	2.4	6.75	5.5	0.8	NO
			4.6	4.55	5.5	1.2	NO
2020	38%	7.3	2.4	4.94	5.5	1.1	NO
			4.6	2.74	5.5	2.0	NO
	50%	7.9	2.4	5.46	5.5	1.0	NO
			4.6	3.26	5.5	1.7	NO
	75%	8.7	2.4	6.33	5.5	0.9	NO
			4.6	4.13	5.5	1.3	NO
	100%	9.3	2.4	6.92	5.5	0.8	NO
			4.6	4.72	5.5	1.2	NO
2025	38%	7.4	2.4	5.04	5.5	1.1	NO
			4.6	2.84	5.5	1.9	NO
	50%	8.0	2.4	5.58	5.5	1.0	NO
			4.6	3.38	5.5	1.6	NO
	75%	8.9	2.4	6.49	5.5	0.8	NO
			4.6	4.29	5.5	1.3	NO
	100%	9.5	2.4	7.11	5.5	0.8	NO
			4.6	4.91	5.5	1.1	NO
2030	38%	7.5	2.4	5.13	5.5	1.1	NO
			4.6	2.93	5.5	1.9	NO
	50%	8.1	2.4	5.70	5.5	1.0	NO
			4.6	3.50	5.5	1.6	NO
	75%	9.1	2.4	6.65	5.5	0.8	NO
			4.6	4.45	5.5	1.2	NO
	100%	9.7	2.4	7.29	5.5	0.8	NO
			4.6	5.09	5.5	1.1	NO

* Maximum Pumping Capacity is 2.4 mgd with two small pumps running and 4.6 mgd with two large pumps running.

** If a storage time is less than 2 days, the hydraulic capacity is considered inadequate.

Table 4.2. BBARWA's Lake Pump Station Capacity Evaluation with Projected Maximum Hour Flows

Year	Full-Time Residency Rate	Max Hour Flow (mgd)	Pumping Capacity * (mgd)	On Site Excess Flow (mgd)	Max Storage Capacity (mg)	Max Storage Time (hours)	Hydraulic Capacity Adequacy
2015	38%	9.0	2.4	6.65	5.5	20	OK
			4.6	4.45	5.5	30	OK
	50%	10.0	2.4	7.59	5.5	17	OK
			4.6	5.39	5.5	24	OK
	75%	11.6	2.4	9.17	5.5	14	OK
			4.6	6.97	5.5	19	OK
	100%	12.6	2.4	10.24	5.5	13	OK
			4.6	8.04	5.5	16	OK
2020	38%	9.2	2.4	6.82	5.5	19	OK
			4.6	4.62	5.5	29	OK
	50%	10.2	2.4	7.81	5.5	17	OK
			4.6	5.61	5.5	24	OK
	75%	11.9	2.4	9.46	5.5	14	OK
			4.6	7.26	5.5	18	OK
	100%	13.0	2.4	10.57	5.5	12	OK
			4.6	8.37	5.5	16	OK
2025	38%	9.4	2.4	7.00	5.5	19	OK
			4.6	4.80	5.5	28	OK
	50%	10.4	2.4	8.03	5.5	16	OK
			4.6	5.83	5.5	23	OK
	75%	12.2	2.4	9.76	5.5	14	OK
			4.6	7.56	5.5	17	OK
	100%	13.3	2.4	10.93	5.5	12	OK
			4.6	8.73	5.5	15	OK
2030	38%	9.6	2.4	7.18	5.5	18	OK
			4.6	4.98	5.5	27	OK
	50%	10.7	2.4	8.26	5.5	16	OK
			4.6	6.06	5.5	22	OK
	75%	12.5	2.4	10.07	5.5	13	OK
			4.6	7.87	5.5	17	OK
	100%	13.7	2.4	11.28	5.5	12	OK
			4.6	9.08	5.5	15	OK

* Maximum Pumping Capacity is 2.4 mgd with two small pumps running and 4.6 mgd with two large pumps running.

BBARWA is considering expanding LPS pumping capacity to 8.0 mgd in the future. The LPS capacity evaluation with 8.0 mgd pumping capacity is shown in Tables 4.3 and 4.4.

Table 4.3. BBARWA's Lake Pump Station Capacity Evaluation with Expanded Pumping Capacity and Projected Maximum Day Flows

Year	Full-Time Residency Rate	Max Day Flow (mgd)	Pumping Capacity (mgd)	On Site Excess Flow (mgd)	Max Storage Capacity (mg)	Max Storage Time (days)	Hydraulic Capacity Adequacy
2015	38%	7.3	8.0	0	5.5	-	OK
	50%	7.8	8.0	0	5.5	-	OK
	75%	8.6	8.0	0.59	5.5	9.4	OK
	100%	9.1	8.0	1.15	5.5	4.8	OK
2020	38%	7.3	8.0	0	5.5	-	OK
	50%	7.9	8.0	0	5.5	-	OK
	75%	8.7	8.0	0.73	5.5	7.5	OK
	100%	9.3	8.0	1.32	5.5	4.2	OK
2025	38%	7.4	8.0	0	5.5	-	OK
	50%	8.0	8.0	0	5.5	-	OK
	75%	8.9	8.0	0.89	5.5	6.2	OK
	100%	9.5	8.0	1.51	5.5	3.6	OK
2030	38%	7.5	8.0	0	5.5	-	OK
	50%	8.1	8.0	0.10	5.5	53.1	OK
	75%	9.1	8.0	1.05	5.5	5.2	OK
	100%	9.7	8.0	1.69	5.5	3.2	OK

Table 4.4. BBARWA's Lake Pump Station Capacity Evaluation with Expanded Pumping Capacity and Projected Maximum Hour Flows

Year	Full-Time Residency Rate	Max Hour Flow (mgd)	Pumping Capacity (mgd)	On Site Excess Flow (mgd)	Max Storage Capacity (mg)	Max Storage Time (hours)	Hydraulic Capacity Adequacy
2015	38%	9.0	8.0	1.05	5.5	126	OK
	50%	10.0	8.0	1.99	5.5	66	OK
	75%	11.6	8.0	3.57	5.5	37	OK
	100%	12.6	8.0	4.64	5.5	28	OK
2020	38%	9.2	8.0	1.22	5.5	108	OK
	50%	10.2	8.0	2.21	5.5	60	OK
	75%	11.9	8.0	3.86	5.5	34	OK
	100%	13.0	8.0	4.97	5.5	27	OK
2025	38%	9.4	8.0	1.40	5.5	94	OK
	50%	10.4	8.0	2.43	5.5	54	OK
	75%	12.2	8.0	4.16	5.5	32	OK
	100%	13.3	8.0	5.33	5.5	25	OK
2030	38%	9.6	8.0	1.58	5.5	84	OK
	50%	10.7	8.0	2.66	5.5	50	OK
	75%	12.5	8.0	4.47	5.5	30	OK
	100%	13.7	8.0	5.68	5.5	23	OK

When the LPS pumping capacity is expanded to 8.0 mgd and assuming the maximum sewer flow load, a 100% full-time residency rate, and a maximum day flow event, approximately 1.69 mgd of excess flow will need to be diverted to the storage pond in 2030; the 5.5-million-gallon available storage will be able to hold flows for 3.2 days. During a maximum hour flow event, approximately 5.68 mgd of excess flow will be diverted to the storage pond; the 5.5-million-gallon storage pond will be able to hold flows for 23 hours. The adequacy of LPS hydraulic capacity is significantly improved.

4.1.2. NORTH SHORE INTERCEPTOR

4.1.2.1. North Shore Pump Stations

The North Shore Interceptor has both gravity pipelines and force mains. The force mains are powered by three pump stations: North Shore Pump Station #1 (NSPS 1), North Shore Pump Station #2 (NSPS 2) and North Shore Pump Station #3 (NSPS 3). The flow direction is from NSPS 1 to NSPS 2 then to NSPS 3. Because sewer flow or infiltration converges along the North Shore Interceptor, NSPS 3 is estimated to have 25% and 67% greater sewer flow load than that of NSPS 2 and NSPS 1, respectively.

NSPS 1 has two pumps with a capacity of 400 gpm or 0.58 mgd each. The pump station can be operated with both pumps running providing a maximum capacity of 600 gpm or 0.86 mgd at NSPS 1. Table 4.5 compares the pumping capacities of NSPS 1 with the projected maximum hour flow of CSA 53B under various scenarios. CSA 53B is assumed to contribute 5% of total EDUs and total projected flow, and is assumed to pump 60% of the total projected flow from CSA 53B.

Table 4.5 indicates that in 2030 with 100% full-time residency rate (however this rate is unlikely to occur), NSPS 1 has an inadequate capacity for the projected maximum hour flow. Under all other scenarios, NSPS 1 has adequate capacity for projected flow with both pumps running.

NSPS 2 has two pumps each with a capacity of 700 gpm or 1.01 mgd. NSPS 2 can be operated with both pumps running providing a maximum capacity of 1,050 gpm or 1.51 mgd. Table 4.6 compares the capacities of NSPS 2 with the projected maximum hour flow under various scenarios. NSPS 2 is assumed to pump 80% of the total projected flow from CSA 53B (i.e. 100% of NSPS 1 flow plus 33% additional flow).

Table 4.6 indicates that NSPS 2 has adequate capacity for maximum hour flow under all scenarios.

NSPS 3 has two pumps each with a capacity of 900 gpm or 1.30 mgd. The pump station can be operated with both pumps running providing a maximum capacity of 1,350 gpm or 1.94 mgd. Table 4.7 compares the capacities of NSPS 3 with the projected maximum hour flow under various scenarios. NSPS 3 is assumed to pump 100% of the total flow from CSA 53B (i.e. 100% of NSPS 2 flow plus 25% additional flow).

Table 4.7 indicates that NSPS 3 has adequate capacity for projected maximum hour flow under all scenarios.

Table 4.5. BBARWA's North Shore Pump Station #1 Capacity Evaluation

Year	Full-Time Residency Rate	Pumping Capacity (mgd)	Max Hour Flow (mgd)	Excess Capacity or Deficiency (mgd)	Hydraulic Capacity Adequacy
2015	38%	0.58	0.58	0.00	OK
		0.86		0.29	
	50%	0.58	0.64	-0.06	OK
		0.86		0.23	
	75%	0.58	0.74	-0.16	OK
		0.86		0.13	
	100%	0.58	0.81	-0.23	OK
		0.86		0.06	
2020	38%	0.58	0.59	-0.01	OK
		0.86		0.28	
	50%	0.58	0.65	-0.08	OK
		0.86		0.21	
	75%	0.58	0.76	-0.18	OK
		0.86		0.11	
	100%	0.58	0.83	-0.25	OK
		0.86		0.04	
2025	38%	0.58	0.60	-0.02	OK
		0.86		0.26	
	50%	0.58	0.67	-0.09	OK
		0.86		0.20	
	75%	0.58	0.78	-0.20	OK
		0.86		0.09	
	100%	0.58	0.85	-0.27	OK
		0.86		0.01	
2030	38%	0.58	0.61	-0.04	OK
		0.86		0.25	
	50%	0.58	0.68	-0.10	OK
		0.86		0.18	
	75%	0.58	0.80	-0.22	OK
		0.86		0.07	
	100%	0.58	0.87	-0.30	NO
		0.86		-0.01	

* Pumping Capacity is 0.58 mgd with one pump running and 0.86 mgd with two pumps running.

** NSPS1 is assumed to pump 60% of the total projected flow of CSA 53B.

*** A positive number indicates excess capacity, and a negative number indicates deficient capacity.

Table 4.6. BBARWA's North Shore Pump Station #2 Capacity Evaluation

Year	Full-Time Residency Rate	Pumping Capacity (mgd)	Max Hour Flow (mgd)	Excess Capacity or Deficiency (mgd)	Hydraulic Capacity Adequacy
2015	38%	1.01	0.77	0.24	OK
		1.51		0.74	
	50%	1.01	0.85	0.16	OK
		1.51		0.66	
	75%	1.01	0.99	0.02	OK
		1.51		0.53	
	100%	1.01	1.08	-0.07	OK
		1.51		0.44	
2020	38%	1.01	0.78	0.22	OK
		1.51		0.73	
	50%	1.01	0.87	0.14	OK
		1.51		0.64	
	75%	1.01	1.01	0.00	OK
		1.51		0.50	
	100%	1.01	1.10	-0.10	OK
		1.51		0.41	
2025	38%	1.01	0.80	0.21	OK
		1.51		0.71	
	50%	1.01	0.89	0.12	OK
		1.51		0.62	
	75%	1.01	1.04	-0.03	OK
		1.51		0.48	
	100%	1.01	1.13	-0.13	OK
		1.51		0.38	
2030	38%	1.01	0.82	0.19	OK
		1.51		0.70	
	50%	1.01	0.91	0.10	OK
		1.51		0.60	
	75%	1.01	1.06	-0.05	OK
		1.51		0.45	
	100%	1.01	1.16	-0.16	OK
		1.51		0.35	

* Pumping Capacity is 1.01 mgd with one pump running and 1.51 mgd with two pumps running.

** NSPS 2 is assumed to pump 80% of the total projected flow of CSA 53B.

Table 4.7. BBARWA's North Shore Pump Station #3 Capacity Evaluation

Year	Full-Time Residency Rate	Pumping Capacity (mgd)	Max Hour Flow (mgd)	Excess Capacity or Deficiency (mgd)	Hydraulic Capacity Adequacy
2015	38%	1.30	0.96	0.33	OK
		1.94		0.98	
	50%	1.30	1.06	0.23	OK
		1.94		0.88	
	75%	1.30	1.23	0.06	OK
		1.94		0.71	
	100%	1.30	1.34	-0.05	OK
		1.94		0.60	
2020	38%	1.30	0.98	0.32	OK
		1.94		0.96	
	50%	1.30	1.09	0.21	OK
		1.94		0.86	
	75%	1.30	1.26	0.03	OK
		1.94		0.68	
	100%	1.30	1.38	-0.08	OK
		1.94		0.56	
2025	38%	1.30	1.00	0.30	OK
		1.94		0.94	
	50%	1.30	1.11	0.19	OK
		1.94		0.83	
	75%	1.30	1.29	0.00	OK
		1.94		0.65	
	100%	1.30	1.42	-0.12	OK
		1.94		0.53	
2030	38%	1.30	1.02	0.28	OK
		1.94		0.92	
	50%	1.30	1.13	0.16	OK
		1.94		0.81	
	75%	1.30	1.33	-0.03	OK
		1.94		0.62	
	100%	1.30	1.46	-0.16	OK
		1.94		0.49	

* Pumping Capacity is 1.30 mgd with one pump running and 1.94 mgd with two pumps running.

** NSPS 3 is assumed to pump 100% of the total projected flow of CSA 53B.

4.1.2.2. North Shore Gravity Main and Force Main

The North Shore Interceptor has approximately 24,800 feet of force mains and approximately 4,500 feet of gravity pipelines. There are 23 manholes or cleanouts, of which 7 accept sewer flow from Fawnskin, the US Forest Service, RV Park, etc. The capacity of the pipelines was evaluated section by section under various scenarios.

The evaluation criteria include:

- All gravity sewer pipes, up to and including 12-inch diameter pipe, shall be sufficient to carry the peak flow when 50% full.
- All larger sewer pipe, except those designed as laterals, shall be sufficient to carry the peak flow when 75% full.

If a specific section of sewer main fails to meet the above requirements, then this section of sewer main will be considered inadequate and parallel pipe installation will be suggested.

The evaluation considered the various scenarios in Years 2010, 2015, 2020, 2025 and 2030 as shown in Table 4.8:

The identified pipe deficiencies and recommended new parallel pipe installation for each scenario are presented in Appendix A (*BBARWA Sewer System Improvement Required*).

By 2030, assuming a 38% full-time residency rate, a dry weather condition flow (without I/I) approximately 868 linear feet of parallel pipelines need to be installed. The estimated cost is $60,773. By 2030, assuming a 38% full-time residency rate, a wet weather condition flow with 100% historical peak I/I approximately 1,648 linear feet of parallel pipelines need to be installed. The estimated cost is $142,469.

By 2030, under the worst case scenario assuming a 100% full-time residency rate (which may be unlikely to occur), a wet weather condition flow and 100% historical peak I/I, approximately 1,648 linear feet of parallel pipelines need to be installed. The estimated cost is $162,825.

Table 4.8. Evaluation Scenarios of BBARWA's Interceptor System

No.	Full-Time Residency Rate	Weather Condition	I/I as % of Historical Peak I/I	No.	Full-Time Residency Rate	Weather Condition	I/I as % of Historical Peak I/I
Year 2010				Year 2025			
1	38%	Dry (July)	0%	37	38%	Dry (July)	0%
2	50%	Dry (July)	0%	38	50%	Dry (July)	0%
3	75%	Dry (July)	0%	39	75%	Dry (July)	0%
4	100%	Dry (July)	0%	40	100%	Dry (July)	0%
5	38%	Wet (Jan.)	50%	41	38%	Wet (Jan.)	50%
6	50%	Wet (Jan.)	50%	42	50%	Wet (Jan.)	50%
7	75%	Wet (Jan.)	50%	43	75%	Wet (Jan.)	50%
8	100%	Wet (Jan.)	50%	44	100%	Wet (Jan.)	50%
9	38%	Wet (Jan.)	100%	45	38%	Wet (Jan.)	100%
10	50%	Wet (Jan.)	100%	46	50%	Wet (Jan.)	100%
11	75%	Wet (Jan.)	100%	47	75%	Wet (Jan.)	100%
12	100%	Wet (Jan.)	100%	48	100%	Wet (Jan.)	100%
Year 2015				Year 2030			
13	38%	Dry (July)	0%	49	38%	Dry (July)	0%
14	50%	Dry (July)	0%	50	50%	Dry (July)	0%
15	75%	Dry (July)	0%	51	75%	Dry (July)	0%
16	100%	Dry (July)	0%	52	100%	Dry (July)	0%
17	38%	Wet (Jan.)	50%	53	38%	Wet (Jan.)	50%
18	50%	Wet (Jan.)	50%	54	50%	Wet (Jan.)	50%
19	75%	Wet (Jan.)	50%	55	75%	Wet (Jan.)	50%
20	100%	Wet (Jan.)	50%	56	100%	Wet (Jan.)	50%
21	38%	Wet (Jan.)	100%	57	38%	Wet (Jan.)	100%
22	50%	Wet (Jan.)	100%	58	50%	Wet (Jan.)	100%
23	75%	Wet (Jan.)	100%	59	75%	Wet (Jan.)	100%
24	100%	Wet (Jan.)	100%	60	100%	Wet (Jan.)	100%
Year 2020							
25	38%	Dry (July)	0%				
26	50%	Dry (July)	0%				
27	75%	Dry (July)	0%				
28	100%	Dry (July)	0%				
29	38%	Wet (Jan.)	50%				
30	50%	Wet (Jan.)	50%				
31	75%	Wet (Jan.)	50%				
32	100%	Wet (Jan.)	50%				
33	38%	Wet (Jan.)	100%				
34	50%	Wet (Jan.)	100%				
35	75%	Wet (Jan.)	100%				
36	100%	Wet (Jan.)	100%				

4.1.3. TRUNK LINE

The Trunk Line is composed of approximately 5,700 feet of 18-inch gravity pipelines and 15,800 feet of 21-inch gravity pipelines. The Trunk Line has 81 manholes or cleanouts, of which 22 are connected to the BBCCSD collection system. The capacity of the Trunk Line was evaluated section by section under various scenarios. The evaluation scenarios and criteria are same as in Table 4.8.

The identified pipe deficiencies and recommended new parallel pipe installation for each scenario are presented in Appendix A (*BBARWA Sewer System Improvement Required*).

By 2030, assuming a 38% full-time residency rate, a dry weather condition flow (without I/I), approximately 4,125 linear feet of parallel pipelines need to be installed. The estimated cost is $429,238. By 2030, assuming a 38% full-time residency rate, a wet weather condition flow with 100% historical peak I/I, approximately 13,606 linear feet of parallel pipelines need to be installed. The estimated cost is $2,603,121.

By 2030, under the worst case scenario assuming a 100% full-time residency rate (which may be unlikely to occur), a wet weather condition flow and a 100% historical peak I/I, approximately 16,653 linear feet of parallel pipelines need to be installed. The estimated cost is $3,880,950.

4.2. TREATMENT PLANT CAPACITY EVALUATION

BBARWA's WWTP consists of a headwork, three oxidation ditches, three clarifiers, two load equalization basins, one horseshoe secondary effluent balancing pond, one sludge treatment system, and one 10-million-gallon emergency storage pond. The layout of the treatment plant is presented in Figure 4.1.

The WWTP is required to have adequate hydraulic capacity and biological treatment capacity to treat the projected sewer flow. Generally speaking, the hydraulic capacity should be adequate to handle the average flow and maximum hour flow, and the biological treatment capacity should be adequate to handle the maximum BOD or Total Suspended Solids (TSS). Currently the maximum flow transferred from LPS to the WWTP will be limited to 4.6 mgd regardless of CBBL's peak flow at LPS. When the flow from CBBL exceeds 4.6 mgd, the excess flow will be stored at the LPS site storage pond. Therefore, the total peak flow to the WWTP is the total flow of the BBCCSD and CSA 53B plus 4.6 mgd from CBBL. BBARWA is currently upgrading LPS and is considering expanding the pumping capacity of LPS to 8.0 mgd. At that time, the total peak flow to the WWTP is the total flow of the BBCCSD and CSA 53B plus 8.0 mgd from CBBL.

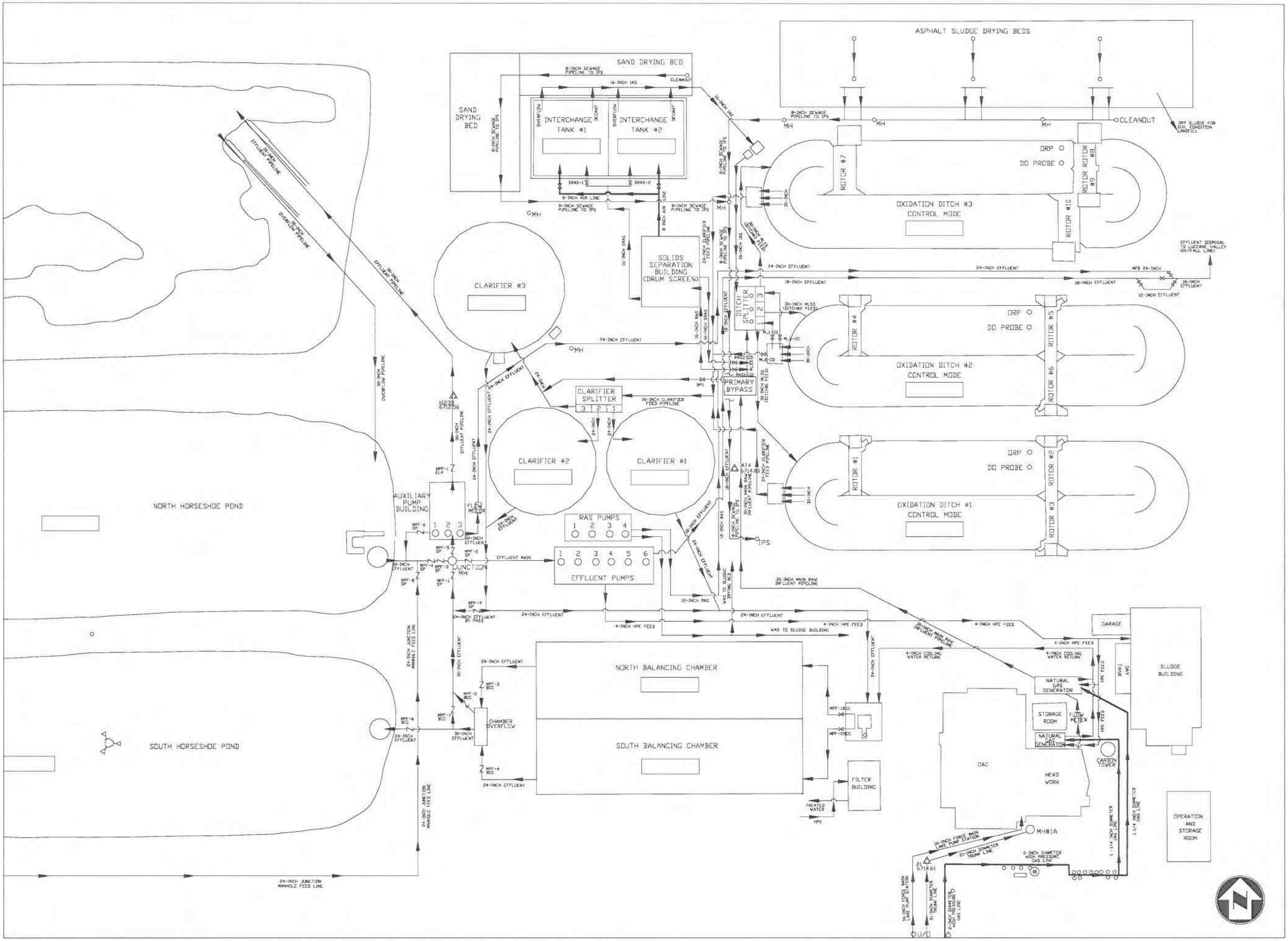


Figure 4.1. BBARWA WWTP Layout

4.2.2. TREATMENT PLANT HYDRAULIC CAPACITY

The overall hydraulic capacity of the WWTP is determined by the minimum hydraulic capacity of the operational units including the pumping equipment, the clarifiers and the pretreatment system. The pumping capacities of the WWTP are listed in Table 4.9. The WWTP has four 100-hp effluent pumps with soft starters able to transport 5.4 mgd of effluent to the disposal site in Lucerne Valley. The plant also has three 300-hp auxiliary pumps with soft start motors in an auxiliary pump station that can pump 9.6 mgd of effluent flow to Lucerne Valley. When the 300 hp auxiliary pumps are utilized, the 100 hp effluent pumps are shut down, thus the maximum delivery capacity of the effluent and auxiliary pumps is 9.6 mgd.

Table 4.9. Existing Pump Capacities of BBARWA's WWTP

	Pumps	hp	Cumulative hp	mgd	Cumulative mgd
1.	Aerators (6 @ 60 hp Each) *	360	360	-	-
2.	RAS Pumps (4 @ 7.5 hp Each)	30	390	-	-
3.	Miscellaneous	80	470	-	-
4.	Effluent Pump #1	100	570	2.1	2.1
5.	Effluent Pump #2	100	670	1.4	3.5
6.	Effluent Pump #3	100	870	1.0	4.5
7.	Effluent Pump #4	100	970	0.7	5.2
8.	Auxiliary Pump #1	300	770**	4.0	4.0**
9.	Auxiliary Pump #2	300	1070**	3.3	7.3**
10	Auxiliary Pump #3	300	1370**	2.3	9.6**

* Only two aerators per ditch are needed for treatment during high flow.
** When the auxiliary pumps are in operation, the effluent pumps are off.

The system's hydraulic capacity may be limited by the hydraulic capacities of the existing clarifiers and the existing pretreatment system (bar screens and grit removal chambers). The treatment plant currently has three clarifiers: two at 75-foot diameter and one at 90-foot diameter. The total area of the clarifiers is 15,200 square feet. The clarifiers were designed with an overflow rate of 200 gpd per square foot for average day sewer flow and 600 gpd per square foot for peak hour flow. The total hydraulic capacity is 3.04 mgd (i.e. 15,200 sq ft x 200 gpd/sq ft) for the average day flow, and 9.12 mgd (i.e. 15,200 sq ft x 600 gpd/sq ft) for the peak flow. The hydraulic capacity of the pretreatment system is approximately 10.5 mgd. Hence, the overall hydraulic capacity of the treatment plant is determined by the clarifier capacity (the minimum capacity provided by the operational units) and it is 3.04 mgd for the average day flow and 9.1 mgd for the peak flow.

Table 4.10 compares the WWTP's existing hydraulic capacity with the projected average day flows over the next 20 years.

Table 4.10. Evaluation of BBARWA' WWTP Hydraulic Capacity for Projected Average Day Flows

Year	Full Time Residency Rate	Projected Avg. Flow (mgd)		Existing Hydraulic Capacity (mgd)	Excess Capacity or Deficiency*** (mgd)		Hydraulic Capacity Adequacy	
		with Avg. I/I*	with 2005 I/I**		with Avg. I/I*	with 2005 I/I**	with Avg. I/I*	with 2005 I/I**
2015	38%	2.44	3.03	3.04	0.60	0.01	OK	OK
	50%	2.87	3.56	3.04	0.17	-0.52	OK	NO
	75%	3.77	4.48	3.04	-0.73	-1.44	NO	NO
	100%	4.67	5.17	3.04	-1.63	-2.13	NO	NO
2020	38%	2.54	3.12	3.04	0.50	-0.08	OK	NO
	50%	2.99	3.67	3.04	0.05	-0.63	OK	NO
	75%	3.92	4.64	3.04	-0.88	-1.60	NO	NO
	100%	4.86	5.35	3.04	-1.82	-2.31	NO	NO
2025	38%	2.63	3.22	3.04	0.41	-0.18	OK	NO
	50%	3.10	3.80	3.04	-0.06	-0.76	NO	NO
	75%	4.08	4.81	3.04	-1.04	-1.77	NO	NO
	100%	5.06	5.56	3.04	-2.02	-2.52	NO	NO
2030	38%	2.73	3.31	3.04	0.31	-0.27	OK	NO
	50%	3.22	3.92	3.04	-0.18	-0.88	NO	NO
	75%	4.25	4.98	3.04	-1.21	-1.94	NO	NO
	100%	5.27	5.76	3.04	-2.23	-2.72	NO	NO

* Avg. I/I is the average I/I flow experienced in 2000-2009.
** 2005 I/I is the highest I/I flow in the last ten years.
*** A positive number indicates excess capacity, and a negative number indicates deficient capacity.

Table 4.10 indicates that the WWTP has inadequate hydraulic capacity for the average day flow after 2015 (assuming a 38% or 50% full-time residency rate). BBARWA needs to construct a new clarifier to expand the WWTP's hydraulic capacity. The suggested new clarifier should have hydraulic capacity of 1.85 mgd to match the existing oxidation ditch's capacity (4.89 mgd, see discussion in the later section). With the new clarifier, the WWTP's hydraulic capacity for the average flow is 4.89 mgd, adequate for the average flow under 50% full-time residency rate scenario by 2030 (higher full-time residency rate is unlikely to occur). Assuming design overflow rate of 200 gpd per square foot, the new clarifier area is 9,250 square feet.

An assessment of the adequacy of the WWTP's peak hydraulic capacity was completed using projected maximum hour sewer flows which exceed 9.1 mgd (the WWTP's overall hydraulic capacity). When the flow to the WWTP exceeds 9.1 mgd, the emergency storage pond may be used to store the untreated or partially treated wastewater. The WWTP has as an on-site 10-million-gallon emergency storage pond for untreated or partially treated wastewater. This emergency pond remains empty under normal operations. The results of the peak hydraulic capacity evaluation are presented in Table 4.11.

In Table 4.11, BBCCSD's share of the total flow is 48% (based on the prorata share of EDUs), CSA 53B's share is 5% (based on the prorata share of EDUs) and CBBL's share is 4.6 mgd (based on the maximum hydraulic capacity for instantaneous delivery of wastewater flow from LPS to the WWTP). Table 4.11 includes multiple scenarios for the Years 2015, 2020, 2025 and 2030 using various full-time residency rates. Assuming a 38% full-time residency rate, by 2015 the WWTP's on-site emergency storage pond can store untreated or partially treated sewer flow for up to 42 hours, and by 2030, the storage pond is able to store excess flow for 38 hours. By 2030, assuming a 100% full-time residency rate the storage pond is able to store excess flow for 22 hours. Since the maximum hour flow is expected to last for less than 22 hours, the WWTP is expected to have an adequate hydraulic capacity to treat or store the maximum hour flow.

Table 4.12 is an assessment of the WWTP's peak hydraulic capacity assuming LPS's pumping capacity is expanded to 8.0 mgd. Under this scenario, by 2015 assuming a 38% full-time residency rate, the emergency storage pond can store untreated or partially treated sewer flow for up to 26 hours, and by 2030 the storage pond is able to store excess flow for 25 hours. By 2030, assuming a 100% full-time residency rate, the storage pond is able to store excess flow for 17 hours. Since the maximum hour flow is expected to last for less than 17 hours, the WWTP is expected to have adequate hydraulic capacity to treat or store the maximum hour flow when LPS's pumping capacity is expanded to 8.0 mgd.

Table 4.11. Evaluation of BBARWA' WWTP Hydraulic Capacity for Projected Maximum Hour Flows

Yr	Full - Time Resid. Rate	Flow to WWTP (mgd)				Treatment Capacity (mgd)	On Site Excess Flow (mgd)	On Site Storage Capacity (mg)	Max Storage Time (hr)	Hydraulic Capacity Adequacy
		CBBL*	BBCCSD	CSA 53B	Total					
2015	38%	4.6	9.2	1.0	14.8	9.1	5.7	10	42	OK
	50%	4.6	10.2	1.1	15.9	9.1	6.8	10	35	OK
	75%	4.6	11.8	1.2	17.7	9.1	8.6	10	28	OK
	100%	4.6	12.9	1.3	18.9	9.1	9.8	10	25	OK
2020	38%	4.6	9.4	1.0	15.0	9.1	5.9	10	41	OK
	50%	4.6	10.4	1.1	16.1	9.1	7.0	10	34	OK
	75%	4.6	12.1	1.3	18.0	9.1	8.9	10	27	OK
	100%	4.6	13.3	1.4	19.2	9.1	10.1	10	24	OK
2025	38%	4.6	9.6	1.0	15.2	9.1	6.1	10	39	OK
	50%	4.6	10.7	1.1	16.4	9.1	7.3	10	33	OK
	75%	4.6	12.4	1.3	18.3	9.1	9.2	10	26	OK
	100%	4.6	13.6	1.4	19.6	9.1	10.5	10	23	OK
2030	38%	4.6	9.8	1.0	15.4	9.1	6.3	10	38	OK
	50%	4.6	10.9	1.1	16.6	9.1	7.5	10	32	OK
	75%	4.6	12.7	1.3	18.7	9.1	9.6	10	25	OK
	100%	4.6	14.0	1.5	20.0	9.1	10.9	10	22	OK

* Assuming Lake Pump Station has existing pumping capacity of 4.6 mgd.

Since the WWTP's current peak hydraulic capacity is also limited by the hydraulic capacity of the clarifiers, the new clarifier will expand the WWTP's peak hydraulic capacity from 9.1 mgd to 9.6 mgd (limited by the WWTP's existing pumping capacity).

Table 4.12. BBARWA' WWTP Peak Hydraulic Capacity Evaluation with Expanded Lake Pump Station Pumping Capacity

Yr	Full-Time Resid. Rate	Flow to WWTP (mgd)				Treatment Capacity (mgd)	On Site Excess Flow (mgd)	On Site Storage Capacity (mg)	Max Storage Time (hr)	Hydraulic Capacity Adequacy
		CBBL*	BBCCSD	CSA 53B	Total					
2015	38%	8.0	9.2	1.0	18.2	9.1	9.1	10	26	OK
	50%	8.0	10.2	1.1	19.3	9.1	10.2	10	24	OK
	75%	8.0	11.8	1.2	21.1	9.1	12.0	10	20	OK
	100%	8.0	12.9	1.3	22.3	9.1	13.2	10	18	OK
2020	38%	8.0	9.4	1.0	18.4	9.1	9.3	10	26	OK
	50%	8.0	10.4	1.1	19.5	9.1	10.4	10	23	OK
	75%	8.0	12.1	1.3	21.4	9.1	12.3	10	20	OK
	100%	8.0	13.3	1.4	22.6	9.1	13.5	10	18	OK
2025	38%	8.0	9.6	1.0	18.6	9.1	9.5	10	25	OK
	50%	8.0	10.7	1.1	19.8	9.1	10.7	10	23	OK
	75%	8.0	12.4	1.3	21.7	9.1	12.6	10	19	OK
	100%	8.0	13.6	1.4	23.0	9.1	13.9	10	17	OK
2030	38%	8.0	9.8	1.0	18.8	9.1	9.7	10	25	OK
	50%	8.0	10.9	1.1	20.0	9.1	10.9	10	22	OK
	75%	8.0	12.7	1.3	22.1	9.1	13.0	10	19	OK
	100%	8.0	14.0	1.5	23.4	9.1	14.3	10	17	OK

* Assuming Lake Pump Station has expanded pumping capacity of 8.0 mgd.

4.2.3. TREATMENT PLANT BIOLOGICAL TREATMENT CAPACITY

The biological treatment capacity of the WWTP is determined by the treatment capacities of the oxidation ditches. BBARWA's WWTP has three oxidation ditches with nutrient (nitrogen and phosphorous) removal. There are three 60-hp aerators in the first and second oxidation ditches, two 30-hp aerators and two 60-hp aerators in the third ditch, and four 7.5-hp return activated sludge (RAS) pumps that must be operated to ensure treatment of wastewater flows up to 4.9 mgd. The WWTP has an additional equivalent of approximately 80 hp of miscellaneous motors and electrical units that may be on line at any time, as shown in Table 4.9.

The biological treatment capacity of the oxidation ditches is 1.63 mgd each at 250 mg/L of BOD, which equals:

1.63 mgd/Ditch x 3 Ditches x 250 mg/L BOD
= 10,188 lb/day BOD

or approximately:

1.63 mgd/Ditch x 3 Ditches @ 250 mg/L BOD
= 1.46 mgd/Ditch x 3 Ditches @ 280 mg/L BOD
= 4.37 mgd of typical sewer @ 280 mg/L BOD

Figure 4.2 compares the existing biological treatment capacity with the average BOD loading over the next 20 years under various full-time residency rate scenarios. The excess or deficient capacities are shown in Table 4.13.

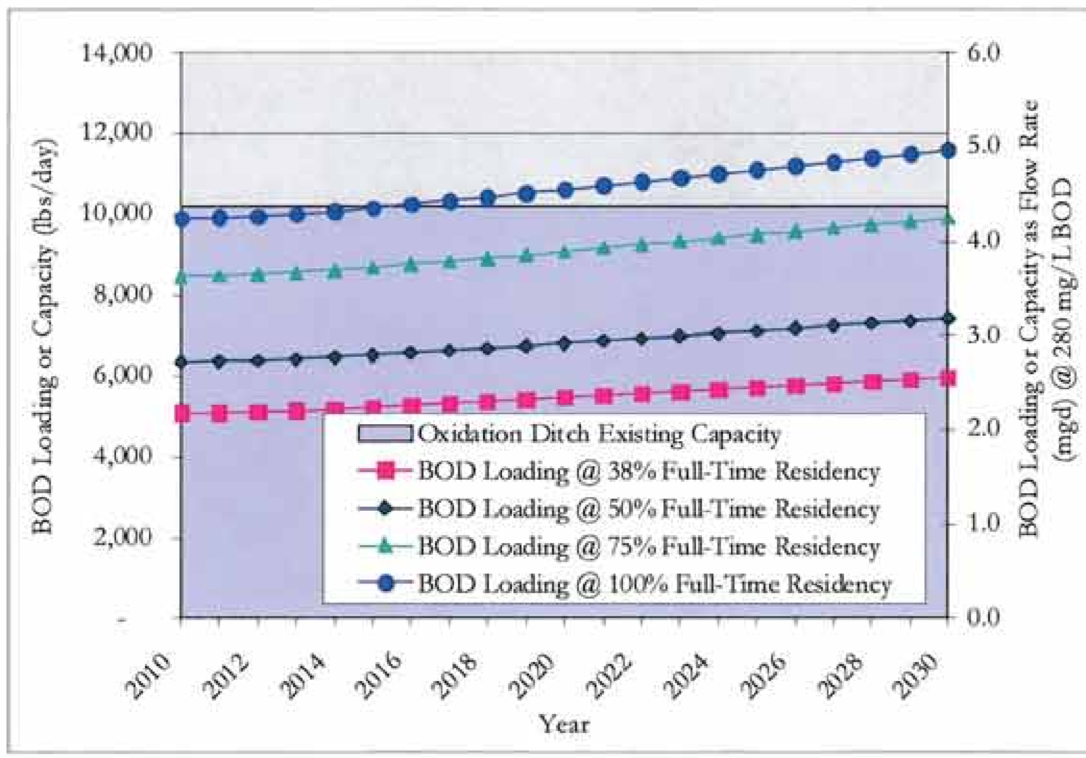


Figure 4.2. Projected Average BOD Loadings vs. Existing Biological Treatment Capacity at BBARWA's WWTP

Table 4.13. Excess or Deficient Biological Treatment Capacites with Projected Average Day BOD Loadings at BBARWA's WWTP

Year	Excess or Deficient Biological Capacity*							
	38% Full-Time Residency Rate		50% Full-Time Residency Rate		75% Full-Time Residency Rate		100% Full-Time Residency Rate	
	Lb/day	mgd	Lb/day	mgd	Lb/day	mgd	Lb/day	mgd
2010	5,460	2.34	4,242	1.82	2,136	0.92	601	0.26
2011	5,449	2.34	4,227	1.81	2,117	0.91	578	0.25
2012	5,430	2.33	4,204	1.80	2,085	0.89	540	0.23
2013	5,404	2.32	4,172	1.79	2,041	0.88	488	0.21
2014	5,373	2.30	4,132	1.77	1,988	0.85	424	0.18
2015	5,336	2.29	4,085	1.75	1,924	0.83	349	0.15
2016	5,294	2.27	4,032	1.73	1,853	0.79	264	0.11
2017	5,252	2.25	3,980	1.71	1,782	0.76	179	0.08
2018	5,210	2.23	3,927	1.68	1,710	0.73	94	0.04
2019	5,164	2.21	3,869	1.66	1,631	0.70	-1	0.00
2020	5,117	2.19	3,810	1.63	1,552	0.67	-95	-0.04
2021	5,070	2.17	3,751	1.61	1,472	0.63	-190	-0.08
2022	5,024	2.15	3,693	1.58	1,393	0.60	-284	-0.12
2023	4,977	2.13	3,634	1.56	1,314	0.56	-378	-0.16
2024	4,931	2.11	3,576	1.53	1,235	0.53	-473	-0.20
2025	4,884	2.09	3,517	1.51	1,155	0.50	-567	-0.24
2026	4,838	2.08	3,459	1.48	1,076	0.46	-662	-0.28
2027	4,791	2.06	3,400	1.46	997	0.43	-756	-0.32
2028	4,745	2.04	3,342	1.43	917	0.39	-850	-0.36
2029	4,698	2.02	3,283	1.41	838	0.36	-945	-0.41
2030	4,651	2.00	3,224	1.38	759	0.33	-1,039	-0.45

* A positive number indicates excess capacity, and a negative number indicates deficient capacity.

Figure 4.2 and Table 4.13 indicate that the biological treatment capacity of the oxidation ditches is adequate for the average flow over the next 20 years assuming 38%, 50% and 75% full-time residency rates. Under the 100% full-time residency rate scenario (which is unlikely to occur), the biological treatment capacity of the oxidation ditches is inadequate beginning in 2017. By 2030, the capacity deficiency is approximately 1,039 lbs BOD/day or 0.45 mgd of typical sewer.

The biological treatment capacity of the WWTP needs to be adequate to handle the maximum day BOD loading. The maximum day BOD loading occurs when the WWTP receives non-I/I maximum day flow. This usually occurs in January as described in Section 3.3.3.2. Figure 4.3 compares the biological treatment capacity of the oxidation ditches to the BOD loading associated with the non-I/I maximum day flow over the next 20 years under various full-time residency rate scenarios. The excess or deficient capacities are shown in Table 4.14.

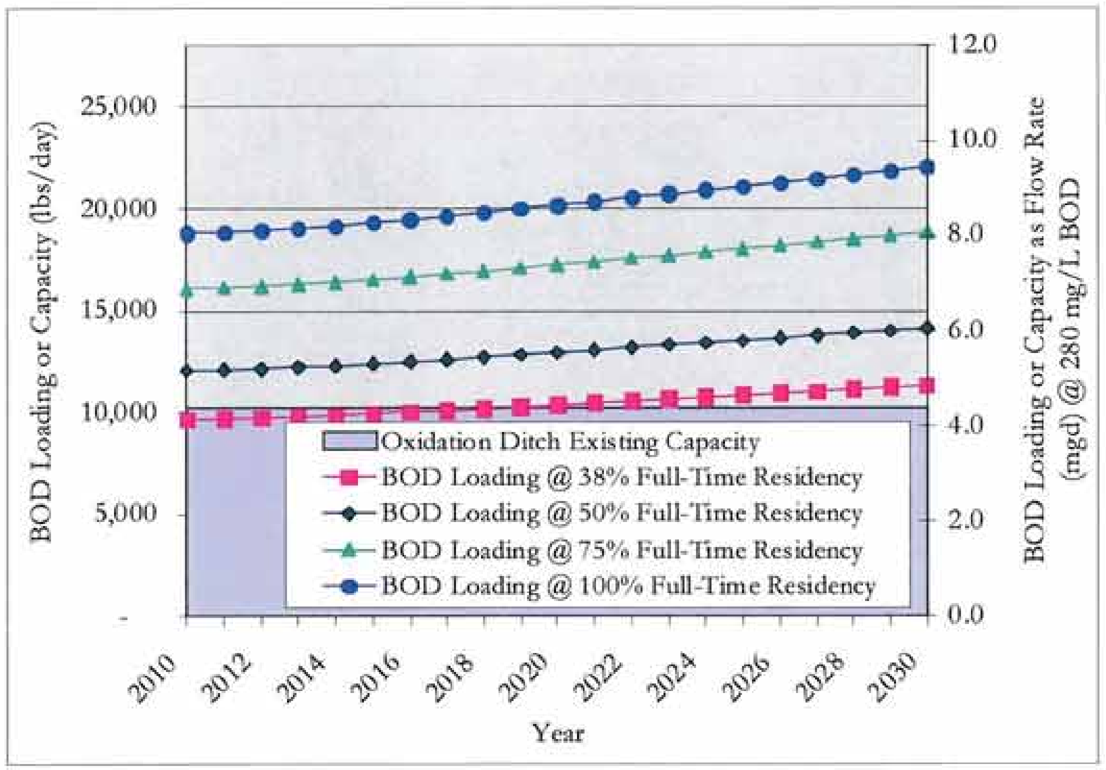


Figure 4.3. Projected Maximum BOD Loadings vs. Existing Biological Treatment Capacity at BBARWA's WWTP

Figure 4.3 and Table 4.14 indicate that with a 38% full-time residency rate, the current biological treatment capacity is adequate to treat the maximum day BOD loading flow through 2026. Under the other scenarios, the WWTP shows biological treatment capacity deficiency.

By 2030, assuming an existing 38% full-time residency rate, the WWTP needs an additional 332 lbs/day of biological treatment capacity to handle the maximum BOD loading. By 2030, assuming a 50%, 75% and 100% full-time residency rate, the WWTP needs to add biological treatment capacity of 3,043, 7,727 and 11,144 lbs/day (or 1.3 mgd, 3.31 mgd and 4.78 mgd), respectively.

Table 4.14. Excess or Deficient Biological Treatment Capacities with Projected Maximum Day BOD Loadings at BBARWA's WWTP

Year	Excess or Deficient Biological Treatment Capacity*							
	38% Full-Time Residency Rate		50% Full-Time Residency Rate		75% Full-Time Residency Rate		100% Full-Time Residency Rate	
	Lb/day	mgd	Lb/day	mgd	Lb/day	mgd	Lb/day	mgd
2010	1,205	0.52	-1,110	-0.48	-5,110	-2.19	-8,027	-3.44
2011	1,183	0.51	-1,138	-0.49	-5,148	-2.21	-8,072	-3.46
2012	1,148	0.49	-1,182	-0.51	-5,208	-2.23	-8,144	-3.49
2013	1,099	0.47	-1,243	-0.53	-5,291	-2.27	-8,242	-3.53
2014	1,040	0.45	-1,318	-0.56	-5,392	-2.31	-8,363	-3.58
2015	969	0.42	-1,407	-0.60	-5,513	-2.36	-8,507	-3.65
2016	889	0.38	-1,507	-0.65	-5,649	-2.42	-8,668	-3.71
2017	810	0.35	-1,608	-0.69	-5,784	-2.48	-8,830	-3.78
2018	730	0.31	-1,708	-0.73	-5,920	-2.54	-8,991	-3.85
2019	641	0.27	-1,819	-0.78	-6,070	-2.60	-9,171	-3.93
2020	553	0.24	-1,930	-0.83	-6,221	-2.67	-9,350	-4.01
2021	465	0.20	-2,042	-0.87	-6,372	-2.73	-9,529	-4.08
2022	376	0.16	-2,153	-0.92	-6,522	-2.80	-9,709	-4.16
2023	288	0.12	-2,264	-0.97	-6,673	-2.86	-9,888	-4.24
2024	199	0.09	-2,375	-1.02	-6,824	-2.92	-10,067	-4.31
2025	111	0.05	-2,487	-1.07	-6,974	-2.99	-10,247	-4.39
2026	22	0.01	-2,598	-1.11	-7,125	-3.05	-10,426	-4.47
2027	-66	-0.03	-2,709	-1.16	-7,275	-3.12	-10,606	-4.54
2028	-155	-0.07	-2,820	-1.21	-7,426	-3.18	-10,785	-4.62
2029	-243	-0.10	-2,932	-1.26	-7,577	-3.25	-10,964	-4.70
2030	-332	-0.14	-3,043	-1.30	-7,727	-3.31	-11,144	-4.78

* A positive number indicates excess capacity, and a negative number indicates deficient capacity.

BBARWA may choose to store the excess flow in the storage pond during the maximum day BOD loading. Under the worst case scenario, the excess loading is 4.78 mgd (excluding I/I) and BBARWA can use its existing 10-million-gallon on-site storage to store the maximum day BOD loading flow for 2.09 days.

4.2.4. SLUDGE TREATMENT CAPACITY

BBARWA currently uses dissolved air flotation (DAF) to increase the solids concentration in the mixed liquor that is extracted from the secondary clarifiers. The sludge is then dewatered with a belt press and dried in asphalt-lined drying beds. The dried solids are hauled away to disposal sites off the mountain. BBARWA also utilizes a Cannibal Solids Reduction Process to significantly reduce sludge production.

4.2.4.1. Projected Sludge Quantity

Sludge production is driven primarily by the influent BOD. The sludge production per week fluctuates from highs during the summer and winter ski season, to lows during the spring and fall. Figure 4.4 presents the average influent BOD loading (green solid line) and average wasted biomass quantity (red solid line) from January 2007 to June 2010. If the BOD removal rate is assumed to be 80%, then the average sludge yield coefficient (a ratio of sludge production per pound of influent BOD) can be calculated. Figure 4.4 indicates the sludge yield coefficient fluctuates month by month with an average value of 0.85.

In 2008, BBARWA began utilizing a Cannibal Solids Reduction Process, where the solids typically produced were reduced significantly. The cannibal process uses a separate side-stream system to recycle and restructure the bacterial population until all excess biological material is completely broken down and degraded. The wasted biomass is further converted to off-belt-filter-press sludge assuming a dry solid content of 14% and an average 74% conversion factor (due to the efficiency of the belt filter press).

Currently, the cannibal process reduces approximately 60% of solids produced. This study assumes a 50% reduction in the long term. With calculated sludge coefficients, an assumed sludge reduction rate and the projected non-I/I flow, the wasted biomass quantity by month during the next 20-year period can be calculated. The month in which the maximum wasted biomass occurs is July of each year. The dashed line in Figure 4.4. indicates the current solids production in each month assuming a 50% sludge reduction rate.

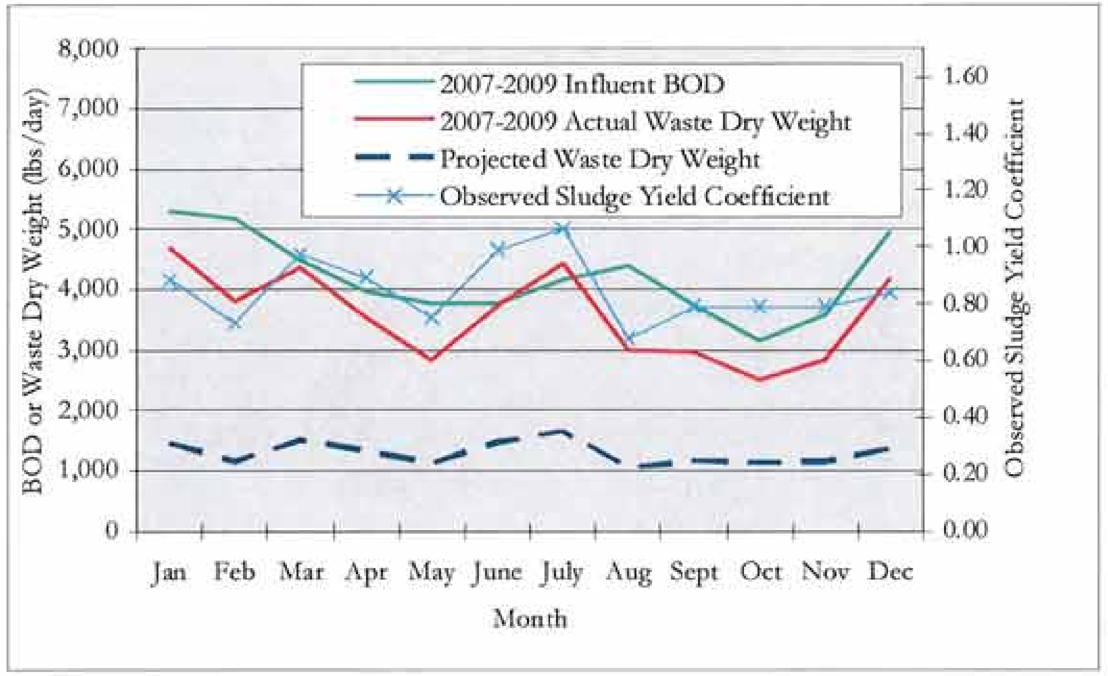


Figure 4.4. Existing Wasted Biomass Quantity and Sludge Yield Coefficient at BBARWA's WWTP

The maximum quantities of the wasted biomass and the sludge, assuming a 50% sludge reduction rate by the cannibal process, are presented in Table 4.15.

As shown in Table 4.15, assuming a 38% full-time residency rate, the projected peak sludge quantity (in July) will increase from 7.52 tons per day to approximately 8.81 tons per day in 2030, a 17% increase. If the full-time residency rate increases to 100% by 2030, the sludge quantity is estimated to be 17.87 tons per day, an approximately 138% increase over the existing load level.

Table 4.15. Projected Maximum Biomass Production and Sludge Quantity at BBARWA's WWTP

Year	Maximum Month Sludge Quantity							
	38% Full-Time Residency Rate		50% Full-Time Residency Rate		75% Full-Time Residency Rate		100% Full-Time Residency Rate	
	Biomass* (lbs/day)	Sludge** (tons/day)	Biomass* (lbs/day)	Sludge** (tons/day)	Biomass* (lbs/day)	Sludge** (tons/day)	Biomass* (lbs/day)	Sludge** (tons/day)
2010	2,015	7.52	2,534	9.46	3,432	12.81	4,086	15.26
2011	2,020	7.54	2,541	9.49	3,440	12.84	4,096	15.29
2012	2,028	7.57	2,551	9.52	3,454	12.90	4,112	15.35
2013	2,039	7.61	2,564	9.57	3,472	12.96	4,134	15.44
2014	2,052	7.66	2,581	9.64	3,495	13.05	4,162	15.54
2015	2,068	7.72	2,601	9.71	3,522	13.15	4,194	15.66
2016	2,086	7.79	2,624	9.80	3,553	13.26	4,230	15.79
2017	2,104	7.86	2,646	9.88	3,583	13.38	4,266	15.93
2018	2,122	7.92	2,669	9.96	3,613	13.49	4,302	16.06
2019	2,142	8.00	2,694	10.06	3,647	13.62	4,343	16.21
2020	2,161	8.07	2,718	10.15	3,681	13.74	4,383	16.36
2021	2,181	8.14	2,743	10.24	3,715	13.87	4,423	16.51
2022	2,201	8.22	2,768	10.34	3,749	14.00	4,463	16.67
2023	2,221	8.29	2,793	10.43	3,782	14.12	4,504	16.82
2024	2,241	8.37	2,818	10.52	3,816	14.25	4,544	16.97
2025	2,261	8.44	2,843	10.62	3,850	14.37	4,584	17.12
2026	2,280	8.51	2,868	10.71	3,884	14.50	4,624	17.27
2027	2,300	8.59	2,893	10.80	3,918	14.63	4,665	17.42
2028	2,320	8.66	2,918	10.90	3,951	14.75	4,705	17.57
2029	2,340	8.74	2,943	10.99	3,985	14.88	4,745	17.72
2030	2,360	8.81	2,968	11.08	4,019	15.01	4,785	17.87

* Assuming a 50% reduction rate by cannibal process and calculated as 100% dry weight, 7 days a week.
** Assuming a 50% reduction rate by cannibal process and calculated as 14% of dry weight, 5 days per week.

4.2.4.2. Sludge Thickening

The WWTP uses DAF to increase the solids concentration from 0.75% to 3%. The DAF has a limit of 160 gpm for the 0.75% sludge, or 600 pounds of dry weight per hour. The DAF is normally operated during working hours, but there is a one-hour start up and a half-an-hour shut down included during the shift period.

Assuming 5 days per week at 6.5 hours per day, this is 19,500 pounds per week. In order to handle the sludge produced in the maximum month at the treatment plant, the DAF may have to operate for additional hours per day. Table 4.16 lists the required working hours including start up and shut down per day assuming 5 days a week and 7 days a week, respectively. By the Year 2030, with a 38% full-time residency rate, the DAF unit must operate 7.0 hours per day for a 5-day week in order to meet the projected sludge produced. Assuming a 100% full time-residency rate, the DAF unit must be operated 12.7 hours per day 5 days a week, or 9.5 hours per day for 7 days a week to meet the projected sludge production.

4.2.4.3. Sludge Dewatering

The WWTP has a single belt press (no redundancy) capable of handling approximately 160 gpm at 3%, or 675 pounds of dry weight solids per hour. The belt press dewaters the sludge to 14% solids. There is a half-an-hour start up for the belt press and a one and one-half hour shut down period. The belt press is capable of dewatering approximately 4,050 pounds per day of dry weight solids during a normal 8-hour work day (assuming 6 hours of actual operation time).

Table 4.17 lists the required working hours including the start up and shut down time per day assuming 5 days week and 7 days a week. The calculation includes a 74% conversion factor as described in previous paragraphs. By the Year 2030, assuming 38% and 50% full-time residency rates, the belt press unit has adequate capacity to handle the solids produced during the normal 8-hour work day, 5 days a week. Assuming 75% and 100% full-time residency rates, the belt press unit has to be operated longer than the standard work day. By the Year 2030, assuming a 100% full-time residency rate, the unit has to be operated 9.3 hours per day, 5 days a week or 7.2 hours per day for 7 days a week.

Table 4.16. Projected DAF Working Hours per Day at BBARWA's WWTP

Year	Working Hours per Day*							
	38% Full-Time Residency Rate		50% Full-Time Residency Rate		75% Full-Time Residency Rate		100% Full-Time Residency Rate	
	Days per Week		Days per Week		Days per Week		Days per Week	
	5	7	5	7	5	7	5	7
2010	6.2	4.9	7.4	5.7	9.5	7.2	11.0	8.3
2011	6.2	4.9	7.4	5.7	9.5	7.2	11.1	8.3
2012	6.2	4.9	7.5	5.8	9.6	7.3	11.1	8.4
2013	6.3	4.9	7.5	5.8	9.6	7.3	11.1	8.4
2014	6.3	4.9	7.5	5.8	9.7	7.3	11.2	8.4
2015	6.3	4.9	7.6	5.8	9.7	7.4	11.3	8.5
2016	6.4	5.0	7.6	5.9	9.8	7.4	11.4	8.5
2017	6.4	5.0	7.7	5.9	9.9	7.5	11.5	8.6
2018	6.5	5.0	7.7	5.9	9.9	7.5	11.5	8.7
2019	6.5	5.1	7.8	6.0	10.0	7.6	11.6	8.7
2020	6.5	5.1	7.8	6.0	10.1	7.6	11.7	8.8
2021	6.6	5.1	7.9	6.1	10.2	7.7	11.8	8.9
2022	6.6	5.2	8.0	6.1	10.2	7.7	11.9	8.9
2023	6.7	5.2	8.0	6.2	10.3	7.8	12.0	9.0
2024	6.7	5.2	8.1	6.2	10.4	7.9	12.1	9.1
2025	6.8	5.3	8.1	6.2	10.5	7.9	12.2	9.1
2026	6.8	5.3	8.2	6.3	10.6	8.0	12.3	9.2
2027	6.9	5.3	8.3	6.3	10.6	8.0	12.4	9.3
2028	6.9	5.4	8.3	6.4	10.7	8.1	12.5	9.3
2029	7.0	5.4	8.4	6.4	10.8	8.1	12.6	9.4
2030	7.0	5.4	8.4	6.4	10.9	8.2	12.7	9.5

* Includes a 1-hour start up and a 0.5-hour shut-down period.

Table 4.17. Projected Belt Filter Press Working Hours per Day at BBARWA's WWTP

Year	Working Hours per Day*							
	38% Full-Time Residency Rate		50% Full-Time Residency Rate		75% Full-Time Residency Rate		100% Full-Time Residency Rate	
	Days per Week		Days per Week		Days per Week		Days per Week	
	5	7	5	7	5	7	5	7
2010	5.1	4.2	5.9	4.8	7.2	5.7	8.2	6.5
2011	5.1	4.2	5.9	4.8	7.3	5.8	8.3	6.5
2012	5.1	4.2	5.9	4.8	7.3	5.8	8.3	6.5
2013	5.1	4.2	5.9	4.8	7.3	5.8	8.3	6.5
2014	5.1	4.2	5.9	4.8	7.3	5.8	8.4	6.5
2015	5.2	4.3	6.0	4.8	7.4	5.8	8.4	6.6
2016	5.2	4.3	6.0	4.9	7.4	5.9	8.5	6.6
2017	5.2	4.3	6.0	4.9	7.5	5.9	8.5	6.7
2018	5.2	4.3	6.1	4.9	7.5	5.9	8.6	6.7
2019	5.3	4.3	6.1	4.9	7.6	6.0	8.6	6.7
2020	5.3	4.4	6.2	5.0	7.6	6.0	8.7	6.8
2021	5.3	4.4	6.2	5.0	7.7	6.1	8.8	6.8
2022	5.4	4.4	6.2	5.0	7.7	6.1	8.8	6.9
2023	5.4	4.4	6.3	5.0	7.8	6.1	8.9	6.9
2024	5.4	4.4	6.3	5.1	7.8	6.2	8.9	7.0
2025	5.5	4.5	6.3	5.1	7.9	6.2	9.0	7.0
2026	5.5	4.5	6.4	5.1	7.9	6.2	9.1	7.0
2027	5.5	4.5	6.4	5.2	8.0	6.3	9.1	7.1
2028	5.5	4.5	6.5	5.2	8.0	6.3	9.2	7.1
2029	5.6	4.6	6.5	5.2	8.1	6.4	9.3	7.2
2030	5.6	4.6	6.5	5.2	8.1	6.4	9.3	7.2

* Includes a 0.5-hour start up and a 1.5-hour shut-down period.

4.2.4.4. Sludge Drying and Disposal

The WWTP currently has its dewatered solids (14% solids) dried in asphalt-lined drying beds and then hauled away to disposal sites. The asphalt-lined drying beds have a capacity of 5.7 tons per day during April through October. The beds dry the sludge to a solid concentration of approximately 45%. From January through March, and during November and December the use of the asphalt-lined bed is greatly reduced due to the weather conditions. The solids concentration of hauled away sludge drops to an average of 18.4%. The disposal cost is approximately $100 per wet ton (or $715 per dry ton).

By increasing the solids concentration, BBARWA can save disposal costs by constructing a covered sludge drying bed to improve the sludge dewatering level. Figure 4.5 demonstrates the potential cost savings associated with the sludge dewatering levels.

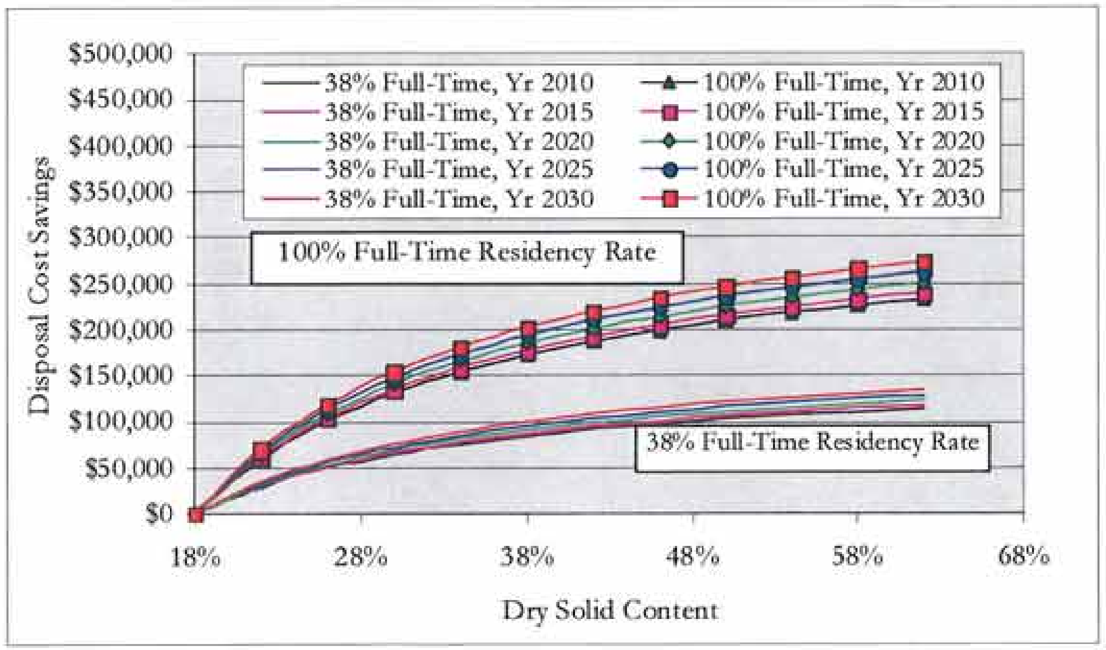


Figure 4.5. Potential Sludge Disposal Cost Savings at BBARWA's WWTP

4.2.5. EMERGENCY POWER CAPACITY

The WWTP has two existing standby power plants to provide emergency power supply. Power Plant #1 has one 600-kilowatt natural gas generator capable of supplying approximately 840 hp. Power Plant #2 has two 250-kilowatt natural gas generators capable of supplying approximately 670 hp. The total power supplied by the standby power plants is approximately 1,500 hp. These natural gas generators are supplied with a continuous flow of natural gas from an 8-inch steel high-pressure gas line. The gas enters the facility at high pressure of 300 psi and is reduced to 35 psi through a series of regulators and is fed to each power plant with separate 1¼-inch gas lines, thus Power Plant #1 and #2 can be operated independently. Power Plant #1 and Power Plant #2 consume approximately 58 British Thermal Units (BTUs) per hour and 52 BTUs per hour of gas, respectively, at 100% power. The continuous supply of natural gas provides for unlimited operation of the standby power plants during electrical outages. The power plants have been permitted by the Air Quality Management District (AQMD) for continuous operation.

The power demands of the existing facilities have been shown in Table 4.9. When the 300-hp auxiliary pumps are on, the 100-hp effluent pumps are shut down. As such, the potential maximum total power demand is approximately 1,370 hp according to Table 4.9. The emergency power (1,500 hp) is adequate for the maximum total power demand.

During a power failure, BBARWA has additional alternatives to the emergency power to ensure no sewer overflow occurs. These alternatives include:

1. Using the 10-million-gallons emergency storage pond for influent storage.
2. Using the 7.5-million-gallon horseshoe secondary effluent balancing pond for effluent storage.
3. Diverting (without pumping) the raw wastewater to the emergency storage ponds at the LPS site for temporary storage. The ponds at the LPS site can store up to 5.5 mg.

4.3. OUTFALL LINES AND DISPOSAL SITE EVALUATION

Currently BBARWA discharges the secondary effluent to a 480-acre site in Lucerne Valley. The outfall lines are composed of approximately 58,500 linear feet of 12- to 18-inch pipelines. The system also includes an effluent disposal reservoir and a disposal pond.

4.3.1. OUTFALL LINES AND FACILITIES

As described in previous sections, the maximum delivery capacity of the pumping equipment is 9.6 mgd. If this delivery capacity does not change over the next 20 years, the maximum flow load of the outfall lines will remain at 9.6 mgd and the existing outfall lines will be adequate. The existing effluent disposal reservoir and disposal pond are also adequate for the next 20 years

4.3.2. SPRAY IRRIGATION SYSTEM

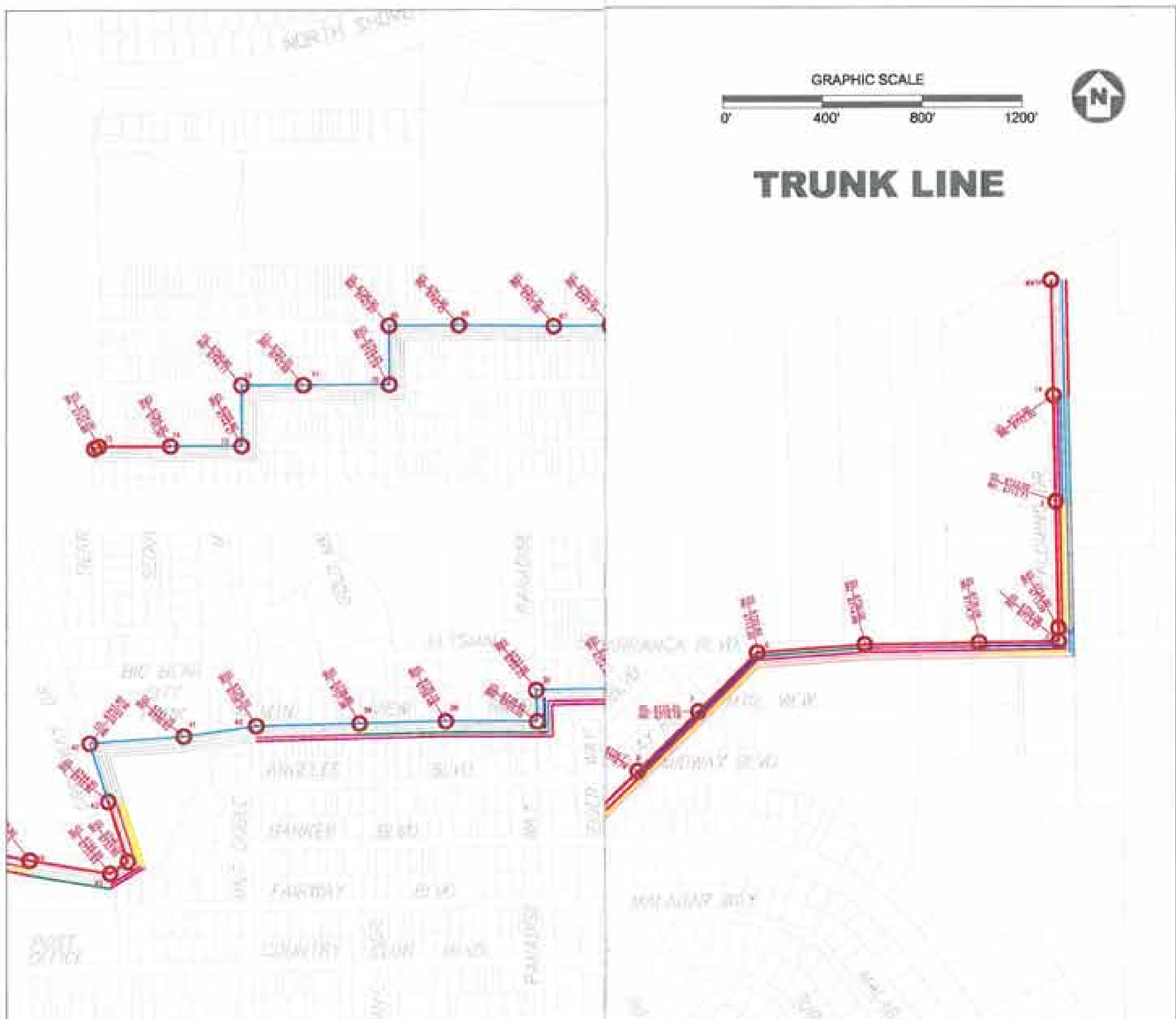
The spray irrigation system has a capacity of 6.05 mgd. Assuming a 38% full-time residency rate, the average flow is projected to increase to 3.31 mgd (with Year 2005 I/I) by 2030; under the worse case scenario assuming a 100% full-time residency rate, the average flow is projected to be 5.76 mgd by 2030. Under all scenarios, the capacity of the spray irrigation system is adequate.

4.4. SUMMARY OF SYSTEM CAPACITY EVAULATION

Table 4.18 is the summary of BBARWA's sewer system capacity evaluation under the scenarios of 38% and 50% full-time residency rates with projected sewer flow through 2030. Higher full-time residency is unlikely to occur and the corresponding results are not included in Table 4.18.

Table 4.18. Summary of BBARWA's Sewer System Capacity Evaluation

Facility	Capacity Adequacy		Suggested Improvement	
	Full-Time Residency Rate		Full-Time Residency Rate	
	38%	50%	38%	50%
Lake Pump Station Force Main				
LPS for max day flow	Upgrade	Upgrade	Expand pumping capacity to 8.0 mgd	
LPS for max hour flow	OK	OK	-	-
North Shore Interceptor				
NSPS 1	OK	OK	-	-
NSPS 2	OK	OK	-	-
NSPS 3	OK	OK	-	-
Pipeline for dry weather	Upgrade	Upgrade	Install 868 ft parallel pipes	Install 1,628 ft parallel pipes
Pipeline for wet weather 100% peak I/I	Upgrade	Upgrade	Install 1,648 ft parallel pipes	Install 1,648 ft parallel pipes
Trunk Line				
Pipeline for dry weather	Upgrade	Upgrade	Install 4,125 ft parallel pipes	Install 6,183 ft parallel pipes
Pipeline for wet weather 100% peak I/I	Upgrade	Upgrade	Install 13,606 ft parallel pipes	Install 14,402 ft parallel pipes
WWTP Hydraulic Capacity				
For average flow	Upgrade	Upgrade	Construct new clarifier (9,250 sq ft)	
For maximum hour flow	OK	OK	Use on-site emergency storage	
WWTP Biological Treatment (Oxidation Ditch)				
For average flow	OK	OK	-	-
For peak BOD flow	OK	OK	Use on-site emergency storage	
WWTP Sludge Treatment				
Sludge Thickening	OK	OK	-	-
Sludge Dewatering	OK	OK	-	-
Sludge Drying	OK	OK	Construct new covered drying bed	
Others				
Emergency Power	OK	OK	-	-
Outfall Lines and Facility	OK	OK	-	-
Spray Irrigation System	OK	OK	-	-



LEGENDS

PROPERTY LINE
8-INCH GRAVITY PIPE
10-INCH GRAVITY PIPE
12-INCH GRAVITY PIPE
15-INCH GRAVITY PIPE
18-INCH GRAVITY PIPE
21-IN 0% FULL-TIME RESIDENTIAL RATE
24-IN STORICAL PEAK I / I, 38% FULL-TIME RESIDENTIAL RATE
27-IN STORICAL PEAK I / I, 50% FULL-TIME RESIDENTIAL RATE

5. STAFFING LEVELS

Presently, the facilities are being staffed with a General Manager, a Plant Superintendent, a Finance Manager, an Accounting/HR Technician, seven Operators (including one Senior Operator), two Lab Personnel (including one Senior Lab Analyst) and a Part-Time Administrative Clerk.

Based on EPA publication, *Estimating Staffing for Municipal Wastewater Treatment Facilities*, the estimated staffing requirements of BBARWA's WWTP with the existing design flow and the potential treatment plant expansion are listed in Table 5.1. Table 5.1 also includes ERSC estimated staffing requirement of administrative and interceptor system maintenance which are not included in EPA's guideline. The potential expansions are based on the projected hydraulic capacity requirements as described in Section 4.2.3 (*Treatment Plant Biological Treatment Capacity*). The recommended positions for BBARWA are presented in Table 5.2.

Table 5.1. Estimated Staffing at BBARWA's WWTP Based on EPA Publications

	For Existing WWTP	With Suggested New Clarifier
Supervisory	1.0	1.0
Clerical	0.2	0.2
Laboratory	1.0	1.0
Yardwork	0.9	0.9
Operation	7.2	7.6
Maintenance	1.7	2.0
Subtotal	12.1	12.7
Admin Staff*	3.0	3.0
Interceptor Sys. Maintenance*	1.5	1.5
Total	16.6	17.2

* Staffing requirements estimated by ERSC but not included in the EPA publications.

Table 5.2. Existing and Recommended Positions for BBARWA

	Existing Position at WWTP	**Recommended Position for Existing WWTP**	**Recommended Positions with Suggested New Clarifier**
Superintendent	1.0	1.0	1.0
Senior Operator	1.0	1.0	1.0
Lead Operator	2.0	2.0	2.0
Operator/Laboratory	6.0	7.6	8.2
Temp/Seasonal	-	-	-
Interceptor	-	1.5	1.5
Admin Staff	3.5	3.5	3.5
Total	13.5	16.6	17.2

6. MAINTENANCE PROGRAM

A sewer system maintenance program has been developed and updated from time to time as needed. The maintenance program is comprised of a series of activities that cover and reflect the following elements:

1. Maintaining relevant information to establish and prioritize appropriate maintenance activities;
2. Conducting routine preventive operation and maintenance activities including a system for scheduling regular maintenance;
3. Identifying and prioritizing the system deficiencies and implementing short-term and long term-rehabilitation actions to address each deficiency; and
4. Maintaining equipment and replacement parts inventories.

6.1. OPERATION AND MAINTENANCE MANUAL

BBARWA keeps its updated Operation and Maintenance Manuals in the Administration Building. The Operation and Maintenance Manual includes:

- BBARWA's permit and regulations
- Treatment plant operational units, operation, and control
- Personnel
- Records
- Maintenance
- Emergency operating and response program
- Safety
- Utilities
- Electrical System

6.2. SYSTEM INFORMATION

BBARWA has a computer maintenance database which has been used for spare parts inventory and maintenance schedule activity. BBARWA also keeps its digitized sewer system maps in AutoCAD format. The maps show all gravity line segments and manholes, lift station location, force mains and metering stations. The sewer map book is manually updated by the staff and routinely updated by BBARWA's engineers. With the digital system map, BBARWA has developed a sewer system hydraulic model to help analyze system capacity. The model includes the entire gravity collection system using all pipeline from 8-inches in diameter and larger. The hydraulic model is updated as new or relief pipeline are installed. BBARWA's future plan is to develop a GIS system that combines all the system information and maintenance database information to help prioritize appropriate maintenance activities.

6.3. ROUTINE MAINTENANCE ACTIVITIES

The Agency staff, led by the Plant Superintendent and Senior Plant Operator, maintains the sewer system. BBARWA also engages the services of contractors for use of specialized equipment, including a Vactor/Rodder, Dump Truck, Hydro Truck, Compressor, Generator, Mobile Rodder and TV Truck. The routine maintenance activities include:

1. Flow Monitoring – BBARWA owns and maintains two metering stations, seven portable flow monitors, and corresponding software, which is used by BBARWA personnel to measure both dry and wet weather flow from each member agency and at key locations throughout the main trunk line. BBARWA has continued to keep the metering station up-to-date so the current system does not become obsolete.

2. Sewer Line Maintenance – BBARWA's operations crew supervises the contractor during rodding, hydro cleaning, and video inspections during maintenance activities. For difficult areas, cleaning is immediately followed by video inspection to ensure adequate cleaning.

3. Structures Inspection – There are 98 manholes and other structures in the BBARWA collection system. BBARWA staff inspects these structures as a condition of preventive maintenance.

4. Smoke Testing – BBARWA hires a contractor for smoke testing as needed. It will detect defects, cross connections, and unauthorized connections to the system. The smoke tests are also used to monitor/reduce inflow and infiltration (I/I).

5. Video Inspection – BBARWA contracts with a local company's modern TV truck which uses state-of-the-art digital video equipment and conducts underground pipe inspection. BBARWA's entire collection system is video inspected every four years.

6. Lift Station Maintenance– BBARWA owns and operates four lift stations (North Shore Pump Stations #1, #2, #3, and Lake Pump Station). All stations have redundant pumps and have on-site backup generators. Each lift station has a data sheet indicating the operational data sheet, and in the event of total pump failure, how much time there is before the station will overflow. All four stations are

equipped with a telephone line to a SCADA System at the treatment plant, which is operated 24 hours a day, seven days a week. BBARWA's operations staff have been trained on proper service; staff inspects each lift station weekly. Maintenance includes changing fluids, checking batteries and battery chargers, exercising standby generators, cleaning wet wells, applying degreaser and changing odor control agents, back-flushing pumps, and assuring proper operation of the level transducer.

6.4. INTERCEPTOR SYSTEM CAPACITY EVLAUTION

BBARWA uses a hydraulic computer model to analyze the system capacity based on the estimated flow generated for dry and wet weather scenarios. For new or proposed projects (commercial, housing, etc.), BBARWA will analyze the existing capacity of the sewer system before approving any proposed project from each member agency. The analysis will be done in-house by BBARWA's staff or engineers. It will examine existing downstream line capacity and projected sewage flow from the proposed projects. These studies (reports) will be kept on file at BBARWA's office for inspection and future reference.

All defects or surcharge pipeline will be documented (photographed and recorded) in the maintenance list (repair and replacement) for future analysis and comparison. Defects which could result in flow stoppage or overflow will be immediately reported and repaired. BBARWA inspects the entire system every year. The Agency also maintains a "Watch List" for any structural defects, which are monitored for visible changes in conditions. The sewer system is reevaluated for possible repair or replacement. BBARWA will continue to update their "Watch List" as part of the collection system rehabilitation plan.

6.5. REPLACEMENT INVENTORIES

The Agency has summarized their critical spare parts inventory and list of major equipment used for sewer system operation and maintenance. The contingency equipment (i.e. pumps, generators, etc.) can be used effectively as emergency response equipment and accessories to allow field crews to effectively respond to any incidents and efficiently perform routine maintenance.

The Agency maintains a replacement inventory for four lift stations and the collection system, including spare pumps for all of the stations. The inventory lists are updated annually. Inventories are limited to critical parts and equipment because BBARWA also relies on parts vendors and outside contractors to supply parts and services during an emergency.

7. FUTURE CAPITAL IMPROVEMENTS

BBARWA's capital improvement projects over the next 20 years include three categories: capacity upgrades, asset useful life replacement, and beneficial upgrades, as presented in Appendix B (*BBARWA's Twenty-Year Capital Improvement Projects*). The total estimated cost of the planned projects is $19,307,773. Where appropriate, the estimated costs of these projects include an additional 30% for administration, legal, engineering costs and construction contingency.

7.1. CAPACITY UPGRADES

Capacity upgrades include the upgrades identified in Table 4.18.

1. Upgrading LPS and expanding LPS's pumping capacity to 8.0 mgd helps to improve LPS's delivery and storage capacity for the maximum day flow. The estimated cost is $1,856,275.

2. Constructing a new secondary clarifier (9,250 square feet) improves the WWTP's hydraulic capacity to 4.89 mgd for average flow and 9.6 mgd for peak flow. The estimated cost is $ 1,680,896.

3. Upgrading the gravity pipelines of the North Shore Interceptor system and Trunk Line system ensures ample capacity of the interceptor systems. BBARWA has options to set priorities for various scenarios as shown in Table 7.1. Table 7.2 shows the unit costs used in the cost estimation. The size and location of parallel pipelines under 38% and 50% full-time residency rate scenarios are presented in Figure 7.1. For information under other scenarios, please refer to Appendix A (*BBARWA Sewer System Improvement Required*).

7.2. ASSET USEFUL LIFE REPLACEMENTS

Asset useful life replacements are the scheduled replacement of critical treatment plant equipment based on useful life, including construction of a new load equalization basin to increase emergency storage (estimated cost $1,789,493) and other replacments listed in Appendix B.

7.3. BENEFICIAL UPGRADES

Beneficial upgrades include covered sludge drying bed (estimated cost $1,715,239) which can save BBARWA sludge disposal costs of approximately $100,000 per year.

Table 7.1. Costs of BBARWA's Interceptor System Upgrades

	38% Full-Time Residency Rate		**50% Full-Time Residency Rate**	
	Parallel Pipe Length (LF)	Cost	Parallel Pipe Length (LF)	Cost
North Shore Interceptor				
For dry weather	868	$ 60,773	1,628	$116,662
For wet weather 100% peak I/I	1,648	$142,469	1,648	$ 145,197
Trunk Line				
For dry weather	4,125	$429,238	6,183	$798,946
For wet weather 100% peak I/I	13,606	$2,603,121	14,402	$2,962,360

Table 7.2. Unit Costs of Sewer Main Pipe Replacement or Parallel Pipe Installation*

Pipe Size (in)	Unit	Unit Cost	Pavement Cost**	Total Unit Cost
8	LF	$55	$15	$70
10	LF	$65	$15	$80
12	LF	$80	$15	$95
15	LF	$105	$15	$120
18	LF	$140	$15	$155
21	LF	$175	$15	$190
24	LF	$230	$15	$245
27	LF	$260	$15	$275
30	LF	$290	$15	$305
36	LF	$350	$15	$365

* The cost estimate is based on the Year 2009 construction cost.

** Assuming asphalt cement repair for 100% of the pipeline alignment with 12 feet width.

8. FUTURE SERVICE AREAS

BBARWA's future service area may include the Baldwin Lake area, Lake William area, Moon Camp and Saw Mill.

8.1. BALDWIN LAKE AREA

The Baldwin Lake area is located on the northernmost end of the Big Bear area (please refer to Figure 2.1 for location). Baldwin Lake is part of the Baldwin Lake Ecological Reserve which includes a small lake that often dries up in the summer, scattered homes around the lake and for tourists, a horse riding stable with a petting zoo and an ecological reserve for bird watching.

According to *County of San Bernardino 2007 General Plan*, the land use types in Baldwin Lake include:

- RS, Single Residential;
- RL, Rural Living;
- RL-40, Rural Living with a minimum lot size of 40 acres;
- RL-20, Rural Living with a minimum lot size of 20 acres;
- RL-10, Rural Living with a minimum lot size of 10 acres;
- IN, Institutional.

The acreage permitted dwelling unit density and build-out EDUs of each land use type in the Baldwin Lake area are listed in Table 8.1.

Table 8.1. Baldwin Lake Area Land Use Types and Build-out EDUs

Land Use Type	Acreage	Permitted Density (EDUs/Acre) or FAR*	Build-Out EDUs
RS	539	4	2,158
RL	377	0.4	151
RL-40	438	0.025	11
RL-20	166	0.05	8
RL-10	10	0.1	1
Residential Subtotal	1,531	-	2,329
IN	23	FAR 0.5	-
Total	1,554	-	-

* FAR = Floor Area Factor, the permitted ratio of floor area to total net parcel area.

The Baldwin Lake area will contribute a maximum of 2,329 residential EDUs to BBARWA's service area under build-out conditions. With a sewer load of 172 gallons per day per full-time residential EDU, Baldwin Lake will contribute approximately 148 million gallons per year of wastewater to BBARWA's WWTP under build-out conditions. Baldwin Lake's planned institutional land will contribute an estimated 6 million gallons per year of wastewater (12 gallons per year per square foot) to the WWTP.

8.2. LAKE WILLIAM AREA

The Lake William area is located on the southernmost end of the Big Bear area (please refer to Figure 2.1 for location). The area consists of a small lake and approximately 240 legal lots, of which approximately 120 lots have been built on.

According to *County of San Bernardino 2007 General Plan*, the land use types in the Lake William area include:

- RS, Single Residential;
- RS-20M, Single Residential with a minimum lot size of 20,000 square feet;
- RL-40, Rural Living with a minimum lot size of 40 acres;
- RL-20, Rural Living with a minimum lot size of 20 acres;
- RL-10, Rural Living with a minimum lot size of 10 acres;
- CN, Neighborhood Commercial.

The acreage, permitted dwelling unit density and build-out EDUs of each land use type in the Lake William area are listed in Table 8.2.

The Lake William area will contribute a maximum of 221 residential EDUs to BBARWA's service area under build-out conditions. With a sewer load of 172 gallons per day per full-time residential EDU, the Lake William area will contribute approximately 14 million gallons per year of wastewater to BBARWA's WWTP under build-out condition. The Lake William's planned neighborhood commercial land will contribute an estimated 1 million gallons per year of wastewater (12 gallons per year per square foot) to the WWTP.

Table 8.2. Lake William Area Land Use Types and Build-out EDUs

Land Use Type	Acreage(Lots)	Permitted Density (EDUs/Acre) or FAR*	Build-Out EDUs**
RS	54(182)	4	182
RS-20M	27(28)	2	28
RL-40	228	0.025	6
RL-20	13	0.05	1
RL-10	40	0.1	4
Residential Subtotal	362	-	221
CN	4	FAR 0.5	-
Total	366	-	-

* FAR = Floor Area Factor, the permitted ratio of floor area to total net parcel area.
** Build-out EDUs = (Acreage x Permitted Density) or Lots, which one is less.

8.3. MOON CAMP

Moon Camp is a 62-acre residential project located on State Highway 38 between Canyon Road and Polique Canyon Road in the Fawnskin area of San Bernardino County (please refer to Figure 2.1 for location). San Bernardino County has converted the land use type of Moon Camp from RL-40 to RS-20M. According to an environmental impact report released by San Bernardino County, the proposed project includes 57 lots and a private marina with 55 boat slips. Moon Camp will contribute a maximum of 57 residential EDUs and approximately 3.6 million gallons of wastewater to BBARWA's WWTP under build-out condition,

8.4. SAW MILL

Saw Mill is an approximately 40-acre land area located on the east side of Big Bear Lake and to the south side of Highway 18 (please refer to Figure 2.1 for location). According to *County of San Bernardino 2007 General Plan*, the land use types of Saw Mill area is RL-20 (Rural Living with a minimum lot size of 20 acres). The permitted dwelling unit density of RL-20 is 0.05 units per acre and the build-out EDUs of Saw Mill area is 2. With a sewer load of 172 gallons per day per full-time residential EDU, the Saw Mill area will contribute an estimated 0.13 million gallons per year of wastewater to BBARWA's WWTP under build-out conditions.

In total, the future service areas will add maximum 2,609 residential EDUs to BBARWA's service and contribute approximately 173 million gallons per year of sewer flow to the WWTP under build-out conditions (assuming 100% full-time residencial rate). It should be noted that the projected future service area sewer flow is not included in the total sewer flow projection presented in Section 3. Re-evaluation and detailed calculation may be required when the future service area is incorporated. .

9. CONCLUSIONS

The primary conclusions of this report include:

Existing and Projected Sewer Flows

- BBARWA's current annual sewer flow is approximately 2.5 million gallons per day (mgd) including approximately 1.4 mgd of base flow generated by full-time residential homes (38% of the total EDUs), 0.70 mgd of other sanitary flows generated by visitor, part-time residential and commercial activities, and 0.4 mgd of infiltration/inflow (I/I) due to precipitation.

- The sewer load index is approximately 172 gallons per day per full-time residential EDU.

- On average, CBBL contributes approximately 54% of the total flow, BBCCSD contributes approximately 42% of the total flow and CSA 53B contributes approximately 4% of the total flow.

- BBARWA's sewer flows show high seasonal variances. The seasonal variance is primarily attributed to precipitation and the seasonal nature of tourism in this area.

- BBARWA's historical maximum day I/I is 11.19 mgd.

- The current worst case scenario is expected to occur in January with maximum day flow of 15.4 mgd and maximum hour flow of 19.2 mgd.

- The projected annual flows, non-I/I maximum day flows and maximum hour flows by 2030 under various full-time residency rate scenarios is as following:

Full-Time Residency Rate	Projected Annual Flow (mgd)	Non-I/I Max. Day Flow (mgd)	Max Hour Flow (mgd)
38%	2.73	4.83	20.4
50%	3.22	6.04	22.7
75%	4.25	8.07	26.5
100%	5.27	9.43	29.1

Lake Pump Station's Capacity

- Lake Pump Station (LPS)'s existing pumping capacity is not able to deliver the projected maximum day flow and maximum hour flow instantaneously to the WWTP. Storage ponds have to be used to store excess flow feeding LPS. Excess maximum day flow from LPS can be stored for 0.8 to 2.1 days and excess maximum hour flow can be strored for 12 to 30 hours. Therefore, over the next 20 years, the hydraulic capacity of LPS is adequate to deliver or store the projected maximum hour flows but may be inadequate to deliver or store the projected maximum day flows.

- BBARWA is considering expanding the pumping capacity of LPS to 8.0 mgd in the future. With the expanded pumping capacity, LPS will have an adequate hydraulic capacity to deliver or store the projected maximum day and hour flows over the next 20 years.

North Shore Interceptor System Capacity

- Pump stations #1, #2 and #3 in the North Shore Interceptor system have adequate capacities for projected maximum hour flows with 38% to 100% full-time residency rates over the next 20 years.

- The North Shore Interceptor gravity main has sections which need to be upgraded to handle the projected peak flow over the next 20 years. By 2030, assuming a 38% full-time residency rate and dry weather flow, approximately 868 linear feet of parallel pipeline need to be installed. The estimated cost is $60,773. By 2030, assuming a 38% full-time residency rate, wet weather flow and a 100% historical peak I/I, approximately 1,648 linear feet of parallel pipelines need to be installed. The estimated cost is $142,469.

Trunk Line Capacity

- The Trunk Line has sections which need to be upgraded to handle the projected peak flow over the next 20 years. By 2030, assuming a 38% full-time residency rate and dry weather flow, approximately 4,125 linear feet of parallel pipelines need to be installed. The estimated cost is $429,238. By 2030, assuming a 38% full-time residency rate, wet weather flow and a 100% historical peak I/I, approximately 13,606 linear feet of parallel pipelines need to be installed. The estimated cost is $2,603,121.

WWTP's Hydraulic Capacities

- The hydraulic capacity of BBARWA's wastewater treatment plant (WWTP) for average day flow is approximately 3.04 mgd, which is determined by the hydraulic capacity of the existing clarifiers. The WWTP has inadequate hydraulic capacity for the average day flow over the next 20 years. BBARWA needs to construct a new clarifier (9,250 sq ft) to expand the WWTP's hydraulic capacity.

- The WWTP's hydraulic capacity for peak flow is approximately 9.1 mgd, which is also determined by the hydraulic capacity of the existing clarifiers. However, when the flow to the WWTP exceeds 9.1 mgd, the WWTP can use the emergency storage pond to store the untreated or partially treated wastewater. In general, the WWTP has adequate hydraulic capacity to treat or store the maximum hour flow over the next 20 years.

<u>WWTP's Biological Treatment Capacity</u>

- The WWTP's existing biological treatment capacity of the oxidation ditches is 10,188 lb/day BOD or 4.37 mgd at 280 mg/L BOD. The biological treatment capacity of the existing oxidation ditches is adequate for the projected average flow over the next 20 years with 38%, 50% and 75% full-time residency rates.

- Assuming a 38% full-time residency rate, the WWTP's biological treatment capacity is adequate to treat the maximum BOD loading day flow until 2026. Under the other scenarios, the WWTP has inadequate biological treatment capacity for the maximum day BOD loading. BBARWA can select to store the excess flow in the storage pond during the maximum BOD loading day. Under the worst case scenario, BBARWA can store excess flow for 2.09 days.

<u>WWTP's Sludge Treatment Capacity</u>

- Assuming a 38% full-time residency rate, the projected peak sludge quantity (occurs in July) increases from current 7.52 tons per day to approximately 8.81 tons per day by 2030. Assuming a 100% full-time residency rate, the projected sludge quantity increases to 17.87 tons per day by 2030.

- The WWTP's sludge treatment facilities have adequate capacities to handle the projected sludge quantities over the next 20 years but have to operate longer than the standard work day with 50%, 75% or 100% full-time residency rates.

- By increasing the solids concentration BBARWA can save disposal costs by constructing a covered sludge drying bed to improve the sludge dewatering level.

<u>Other Facilities</u>

- The WWTP's emergency power capacity is adequate.

- The capacity of existing outfall lines is adequate for the next 20 years.

- BBARWA's sewer system maintenance program has been developed and is maintained in operating condition.

Staffing Levels

- With the existing design flow, BBARWA's WWTP needs staff for 16.6 positions except contracted interceptor maintenance service based on the EPA publications. With the proposed new clarifier, BBARWA needs to staff for 17.2 positions. BBARWA has existing staff of 13.5 positions. BBARWA may need to add staffing in the future.

Asset Useful Life Replacements

- BBARWA's capital improvement plan has identified numerous replacements over the next 20 years based on the useful life of equipment.

Future Service Areas

- BBARWA's future service areas include the Baldwin Lake area, Lake William area, Moon Camp and Saw Mill and will add a maximum of 2,609 residential EDUs to BBARWA's service and contribute approximately 173 million gallons per year of sewer flow to the WWTP under build-out conditions and 100% full-time residency rate. This projection is not included in the total projected flow of the existing service area. The capacity should be re-evaluated when a new service area is incorporated into the system.

ERSC's recommendations include:

- Currently the WWTP's overall hydraulic capacity is bottlenecked by the clarifiers' capacity (3.04 mgd). BBARWA should construct a new secondary clarifier to add new capacity to the existing treatment system. The new clarifier will have an overflow rate of 200 gpd per square foot and an area of 9,250 square feet. The new clarifier will expand the WWTP's hydraulic capacity to 4.89 mgd for average day flow and 9.6 mgd for the peak flow. The estimated cost of the suggested clarifier is approximately $1,680,000 including an additional 30% for administration, legal, engineering costs and construction contingency.

- BBARWA should construct a covered sludge drying bed to improve the sludge dewatering level during the winter season. With the current flow and BOD level, the new covered sludge drying bed can save BBARWA approximately $100,000 per year assuming haul-away sludge has a solid content of 45%. The estimated cost of the covered sludge drying bed is $1,700,000.

- Generally, BBARWA's existing biological treatment capacity of the oxidation ditches is adequate for the average flow over the next 20 years. BBARWA can use on-site storage to balance maximum BOD loading day flow and hence does not need additional biological treatment capacity. However, BBARWA can always construct a new oxidation ditch to expand its biological treatment capacity when the funding is available.

- BBARWA's interceptor system has gravity mains that need to be upgraded to handle the projected flows over the next 20 years. These upgrades include approximately 868 linear feet of gravity pipes in the North Shore Interceptor System and 4,125 linear feet of gravity pipes in the Trunk Line that are a priority due to deficiencies under dry weather conditions.

REFERENCES

1. ADS Environmental Services, "Big Bear City Community Services District Inflow/Infiltration Study", January, 1999.

2. CDM, "City of Big Bear Lake Water Master Plan", October 2006.

3. Daniel B. Stephens & Associates, Inc., "Big Bear City Community Services District", January 2010.

4. Engineering Resources of Southern California, Inc, "Big Bear Area Regional Wastewater Agency Long Range Facilities Plan", May 2000.

5. Engineering Resources of Southern California, Inc, "Big Bear Area Regional Wastewater Agency Sewer System Management Plan", May 2009.

6. Neste, Brudin & Stone Inc. and CM Engineering Associates, "Collection, Treatment, Disposal and Reclamation for Big Bear Area Regional Wastewater Agency", March 1975.

7. So & Associates Engineers, Inc., "City of Big Bear Lake Sewer Master Plan", February 2003.

8. Tchobanoglous, George and Burton, Frank, "Wastewater Engineering: Treatment, Disposal, and Reuse – 3rd Ed", 1991.

9. URS Corporation, "County of San Bernardino 2007 General Plan", March 2007.

10. US Environmental Protection Agency, "Estimating Staffing for Municipal Wastewater Treatment Facilities", March 1973.

APPENDIX A
BBARWA SEWER SYSTEM IMPROVEMENT REQUIRED

(Document Bound Separately,
on File at BBARWA's Administration Office)

APPENDIX B
BBARWA'S TWENTY-YEAR CAPITAL IMPROVEMENT PROJECTS

BBARWA
Long-Term CIP

	Base Value @ 2010	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 FORECAST 2020	11 2021	12 2022	13 2023	14 2024	15 2025	16 2026	17 2027	18 2028	19 2029	Total
TREATMENT PLANT																					
Structures																					
Load Equalization Basin - Legal and Engineering Costs		94,493	20,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114,493
Load Equalization Basin - Construction Costs		0	837,500	837,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,675,000
Clarifier 4 - Construction and Engineering	*1,680,896*	0	0	0	0	0	0	0	0	1,085,947	1,118,526	0	0	0	0	0	0	0	0	0	2,204,473
Sludge Building - Roofing Sheet Metal		50,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50,000
Admin Building - HVAC Boiler and Controls	*205,120*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356,187	356,187
Storage Bins	*13,763*	0	0	0	0	0	0	0	0	0	18,317	0	0	0	0	0	0	0	0	0	18,317
Plumbing - Cannibal Building	*28,743*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48,458	0	48,458
Treatment Equipment																					
Clarifier 1	*264,526*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	458,997	458,997
Clarifier 2	*264,526*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	458,997	458,997
Gear Reducer, Drive Motor, Scum Sweep	*104,553*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	181,554	181,554
Carbon Tower	*147,682*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	248,978	0	248,978
Bar Screen	*89,811*	0	0	0	0	0	0	0	0	0	131,504	0	0	0	0	0	0	0	0	0	131,504
Grit Aeration, Air Lift Diffuser	*30,339*	0	0	0	0	0	0	0	0	0	48,388	0	0	0	0	0	0	0	0	0	48,388
Grit Washer	*41,907*	0	0	0	0	0	0	0	0	54,148	0	0	0	0	0	0	0	0	0	0	54,148
Wash Press B.S.	*96,244*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	157,532	0	0	157,532
Wash Press / Grit NEW	*96,244*	0	0	0	0	0	113,805	0	0	0	0	0	0	0	0	0	0	0	0	0	113,805
Miscellaneous Equipment:																					
AQMD Emissions Tester	*11,053*	0	0	0	0	0	0	0	0	0	14,710	0	0	0	0	0	0	0	0	0	14,710
Natural Gas Catalyst	*11,659*	0	0	0	0	0	13,786	0	0	0	0	0	0	0	0	0	18,528	0	0	0	32,314
Pumping Equipment:																					
Clarifier 3:																					
Scum and Tank Drain Pump - 10 HP	*15,325*	0	0	0	0	0	0	0	0	0	0	0	18,814	0	0	0	0	0	0	0	18,814
Cannibal Building:																					
Submersible Pump - 15 HP	*3,037*	0	0	0	0	0	0	0	0	0	0	0	0	4,417	0	0	0	0	0	0	4,417
Auxiliary Pump Building:																					
Auxiliary Pump 2	*14,634*	0	0	0	0	0	0	0	0	0	0	0	0	0	21,920	0	0	0	0	0	21,920
Auxiliary Pump 3	*33,826*	0	0	0	0	0	0	0	0	0	0	0	47,760	0	0	0	0	0	0	0	47,760
Main Pump Building:																					
RAS Pump 1 7.5 HP Rebuild	*3,900*	0	0	0	0	0	0	4,750	0	0	0	0	0	0	5,842	0	0	0	0	0	10,592
RAS Pump 2 Rebuild	*7,875*	7,875	0	0	0	0	0	0	9,879	0	0	0	0	0	0	12,150	0	0	0	0	29,904
RAS Pump 3 Rebuild	*7,875*	7,875	0	0	0	0	0	0	9,879	0	0	0	0	0	0	12,150	0	0	0	0	29,904
RAS Pump 4 7.5 HP Rebuild	*3,900*	0	0	0	0	0	0	4,750	0	0	0	0	0	0	5,842	0	0	0	0	0	10,592
Effluent Pump 1 40 HP	*9,000*	0	0	0	0	0	10,642	0	0	0	0	0	0	13,088	0	0	0	0	0	0	23,731
Effluent Pump 2 40 HP	*9,000*	0	0	0	0	0	10,642	0	0	0	0	0	0	13,088	0	0	0	0	0	0	23,731
Effluent Pump 3 100 HP	*20,000*	0	0	0	0	24,000	0	0	0	0	0	0	28,238	0	0	0	0	0	0	0	52,238
Effluent Pump 4 100 HP	*20,000*	0	0	0	0	0	0	0	0	0	0	0	0	29,086	0	0	0	0	0	0	29,086
Effluent Pump 5 100 HP	*20,000*	0	0	0	0	0	0	24,359	0	0	0	0	0	0	29,958	0	0	0	0	0	54,317
Effluent Pump 6 100 HP	*20,000*	0	0	0	0	0	0	0	0	0	0	0	0	0	29,958	0	0	0	0	0	29,958
Oxidation Ditches:																					
In Plant Sewer Pumps (2) - Oxidation Ditch 1	*16,491*	0	0	0	0	0	0	0	0	0	0	0	23,157	0	0	0	0	0	0	0	23,157
Sludge Building:																					
Belt Feed Pump	*14,418*	0	0	0	0	0	0	0	0	0	0	19,764	0	0	0	0	0	0	0	0	19,764
Storage:																					
Docks Horshoe Pond	*20,179*	0	0	0	0	0	0	0	0	0	0	0	0	29,346	0	0	0	0	0	0	29,346
Processing Equipment:																					
Brush Aerator Paddles, Housing Fan, Bridge	*431,748*	0		0	0	0	255,262	262,920	0	0	0	0	0	0	0	0	0	0	0	0	518,182
Arison 560 Polymer Unit	*13,423*	0	0	0	14,961	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23,309	38,270
Polyblend Unit Belt Press	*8,485*	0	0	0	0	9,741	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9,741
Polyblend Unit DAF	*8,491*	0	0	0	0	0	10,040	0	0	0	0	0	0	0	0	0	0	0	0	0	10,040
Polyblend Unit Backup 1	*7,260*	0	0	0	0	0	0	0	0	0	0	0	10,251	0	0	0	0	0	0	0	10,251
Polyblend Unit Backup 2	*9,129*	0	0	0	10,175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,852	26,027
Cannibal Equipment	*258,645*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	436,051	0	436,051

BBARWA
Long-Term CIP

	Base Value @ 2010	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 FORECAST 2020	11 2021	12 2022	13 2023	14 2024	15 2025	16 2026	17 2027	18 2028	19 2029	Total
Painting - Ditch #1 and #2		31,319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31,319
Shaft Mount Reducer - Ditch #3	*11,748*	0	0	0	0	0	13,892	0	0	0	0	16,104	0	0	0	0	18,669	0	0	0	48,665
Expansion of Sludge Drying Beds		0	0	76,806	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	76,806
Solar Bee	*23,874*	0	0	0	0	0	0	0	0	0	31,773	0	0	0	0	0	0	0	0	0	31,773
Solar Drying Engineering, Constr & Equip*	*1,715,239*	0	0	0	0	0	0	1,044,523	1,075,859	0	0	0	0	0	0	0	0	0	0	0	2,120,382
Sludge Belt Conveyor and Bearings	*30,987*	0	0	0	0	0	0	0	0	0	0	42,477	0	0	0	0	0	0	0	0	42,477
Belt Filter Press Drive Motors	*31,776*	0	0	0	0	0	0	38,701	0	0	0	0	0	0	0	0	0	0	0	0	38,701
Total treatment plant equipment		191,562	857,500	914,306	25,136	33,741	428,069	1,380,003	1,095,617	1,140,096	1,363,218	78,345	128,219	89,025	93,520	24,300	37,197	157,532	733,487	1,494,897	10,265,770
INTERCEPTOR SYSTEM																					
Structures																					
LPS Legal and Engineering Costs		94,493	20,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	114,493
LPS Construction Costs		0	870,891	870,891	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,741,782
Pumping Equipment																					0
Back-up Fairbanks 15HP Pump - Station #1	*11,253*	0	0	10,366	0	0	0	0	14,154	0	0	0	0	16,409	0	0	0	0	19,022	0	59,951
Submersible Pump 1 30 HP - LPS	*20,630*	0	0	0	0	0	0	0	0	26,656	0	0	0	0	0	0	32,784	0	0	0	59,440
Submersible Pump 2 125 HP - LPS	*45,829*	0	0	0	0	0	0	0	0	0	0	0	0	66,635	0	0	0	0	0	0	66,635
Submersible Pump 3 30 HP - LPS	*19,915*	0	0	0	0	0	0	0	0	25,732	0	0	0	0	0	0	31,647	0	0	0	57,380
Submersible Pump 4 125 HP - LPS	*16,980*	0	0	0	0	0	0	0	0	0	0	0	0	24,694	0	0	0	0	0	0	24,694
Pipeline																					
Manholes	*0*	48,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48,000
Main Trunk	*319,505*	0	0	0	356,114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	356,114
North Shore Interceptor Sliplining	*0*	0	0	0	0	250,000	250,000	0	0	0	0	0	0	0	0	0	0	0	0	0	500,000
15 Inch Gravity Sewer Pipeline NEW	*529,268*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	866,306	0	0	866,306
8 Inch Gravity Sewer Pipeline NEW	*337,457*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	552,350	0	0	552,350
18 Inch Gravity Sewer Pipeline	*0*	0	0	24,726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24,726
Total interceptor system		142,493	890,891	905,983	356,114	250,000	250,000	0	14,154	52,388	0	0	0	107,737	0	0	64,431	1,418,656	19,022	0	4,471,871
EFFLUENT DISPOSAL ASSETS																					
Storage																					
Monitoring Wells Rehabilitation	*12,815*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22,253	22,253
Standby Pipe Mod. 2" Air Vacs	*28,110*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48,813	48,813
Reservoir	*238,670*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	414,446	414,446
Structures																					
Overflow Structure	*23,457*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40,733	40,733
Control Structure	*29,321*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50,915	50,915
Irrigation																					
Well Drag Sprinkler	*126,979*	0	0	0	0	0	0	0	0	0	167,795	0	0	0	0	0	0	0	0	0	167,795
Irrigation Wheel Line	*35,609*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,939	0	0	0	0	54,939
Total effluent disposal assets		0	0	0	0	0	0	0	0	0	167,795	0	0	0	0	54,939	0	0	0	577,160	799,893
POWER GENERATING EQUIPMENT																					
Cummins Rebuild	*105,750*	0	0	0	0	125,000	0	0	0	0	70,370	0	0	0	158,403	0	0	0	0	0	353,773
Waukesha Rebuild	*114,502*	0	0	0	0	0	67,607	0	0	0	0	0	161,667	0	0	0	0	0	96,520	0	325,884
New Generator	*345,000*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	581,637	0	581,637
Total power generating equipment		0	0	0	0	125,000	67,607	0	0	0	70,370	0	161,667	0	158,403	0	0	0	678,157	0	1,261,294
FLOW MEASURING DEVICES																					
RAS Flow Meter	*11,122*	0	0	0	0	0	0	13,546	0	0	0	0	0	0	0	0	0	0	0	0	13,546
WAS Meter	*7,208*	0	0	0	0	0	0	8,779	0	0	0	0	0	0	0	0	0	0	0	0	8,779
BB Flow Meter and Software	*36,141*	0	0	0	0	0	0	0	0	0	48,099	0	0	0	0	0	0	0	0	0	48,099
CSA Flow Meter	*11,227*	0	0	0	0	0	0	0	0	0	0	0	0	16,327	0	0	0	0	0	0	16,327
Total Influent Flow Meter	*15,843*	0	0	0	0	18,190	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18,190
Auxiliary Flow Meter	*19,021*	0	0	0	0	0	0	0	0	0	0	0	0	27,662	0	0	0	0	0	0	27,662
Lucerne Valley - two - 14" Magmeters	*29160*	0	0	28,316	0	0	0	0	0	0	0	0	0	42,407	0	0	0	0	0	0	70,723

	Base Value @ 2010	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 FORECAST 2020	11 2021	12 2022	13 2023	14 2024	15 2025	16 2026	17 2027	18 2028	19 2029	Total
Effluent Flow Meter	7,940	0	0	0	0	9,569	0	0	0	0	0	0	0	0	0	12,263	0	0	0	0	21,832
Flow Meter CSD/CSA - OAC	13,204	0	0	0	0	15,896	0	0	0	0	0	0	0	0	0	20,372	0	0	0	0	36,268
Total flow measuring devices		0	0	28,316	0	43,655	0	22,325	0	0	48,099	0	0	86,396	0	32,634	0	0	0	0	261,425
OTHER EQUIPMENT																					
Communications																					
Radio Repeater		0	0	0	0	19,169	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19,169
SCADA Display Equipment	5,000	0	0	0	0	0	0	0	0	0	0	0	0	7,359	0	0	0	0	0	0	7,359
SCADA PH and ORC Sensors	3,267	0	0	0	0	0	0	0	4,098	0	0	0	0	0	0	0	0	0	0	0	4,098
SCADA System Replacement	280,662	0	0	0	0	0	0	0	0	0	373,524	0	0	0	0	0	0	0	0	0	373,524
Electrical																					
VFD T/P - Rotor 1 60 HP	10,800	0	0	0	12,037	0	0	0	0	0	0	14,805	0	0	0	0	0	0	18,208	0	45,050
VFD T/P - Rotor 2 60 HP	10,914	0	0	0	0	0	12,905	0	0	0	0	0	0	15,871	0	0	0	0	0	0	28,776
VFD T/P - Rotor 4 60 HP	10,914	0	0	0	0	0	0	13,292	0	0	0	0	0	0	10,347	0	0	0	0	0	29,639
VFD T/P - Rotor 5 60 HP	10,914	0	0	0	0	0	0	0	13,691	0	0	0	0	0	0	16,838	0	0	0	0	30,528
VFD T/P - Rotor 7 60 HP	11,027	0	0	0	0	12,659	0	0	0	0	0	0	15,569	0	0	0	0	0	0	19,148	47,377
VFD T/P - Rotor 8 60 HP	10,914	0	0	0	0	0	0	0	0	14,101	0	0	0	0	0	0	17,343	0	0	0	31,444
VFD Interceptor - Station 3	12,804	0	0	0	0	0	0	0	0	0	0	0	0	18,621	0	0	0	0	0	0	18,621
VFD Interceptor - LPS	20,943	0	0	0	0	0	0	0	0	0	26,675	0	0	0	0	0	0	32,806	0	0	59,481
Security																					
Security System Update - Ops Bldg		0	0	6,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,000
Security System Ops Building	10,490	0	0	0	0	0	0	0	0	0	13,961	0	0	0	0	0	0	0	0	0	13,961
Surveillance System	22,828	0	0	0	0	26,207	0	0	0	0	0	0	0	0	0	35,221	0	0	0	0	61,428
Front security gate	9,534	0	0	0	0	10,945	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10,945
Mobile Pumping Equipment																					
Emergency By-Pass Pump 4"	42,685	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	67,832	0	0	0	67,832
Emergency Back-up Pump 6 "	55,732	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96,778	96,778
Laboratory																					
Ion Analyzer	35,792	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55,221	0	0	0	0	55,221
Fume Hoods	70,170	0	0	0	0	45,000	0	0	0	0	0	0	0	0	0	0	0	0	118,637	0	163,637
Total other equipment		0	0	6,000	12,037	113,981	12,905	13,292	17,789	14,101	414,160	14,805	15,569	41,850	16,347	107,280	85,175	32,806	136,845	115,926	1,170,869
TRANSPORTATION EQUIPMENT																					
Vehicles																					
1989 Dump Truck Replacement	40,000	0	0	0	0	36,747	0	0	0	0	0	0	0	0	0	0	0	0	0	0	36,747
1981 Boom Truck Replacement	8,129	0	0	65,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65,000
2002 Vehicle - Utility Cart Electric	11,700	0	0	0	10,749	0	0	0	0	0	0	0	0	0	0	0	18,593	0	0	0	29,342
2010 GMC 1/2 Ton	34,851	45,000	0	0	0	0	0	0	0	0	0	61,686	0	0	0	0	0	0	0	0	106,686
2003 Chevrolet Silverado	46,543	0	0	0	0	0	0	0	58,136	0	0	0	0	0	0	0	0	0	0	0	58,136
2004 Toyota 4-Runner	36,666	0	0	0	0	0	0	0	0	0	48,798	0	0	0	0	0	0	0	0	0	48,708
2004 Toyota Tundra	40,048	0	0	0	0	0	0	0	0	0	53,299	0	0	0	0	0	0	0	0	0	53,299
2008 Ford F350	45,864	0	0	0	0	0	0	0	0	0	0	0	0	66,699	0	0	0	0	0	0	66,699
Utility Cart Gas	19,530	0	0	0	0	0	0	0	0	0	0	0	0	28,402	0	0	0	0	0	0	28,402
Electric Truck	28,000	0	0	0	0	32,145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32,145
Heavy Equipment and Accessories																					
1996 TCM / Loader and Accessories	80,645	0	0	0	0	78,310	0	0	0	0	0	0	0	0	0	124,422	0	0	0	0	202,732
Bobcat Backhoe	63,423	0	0	0	0	0	0	0	0	0	0	0	0	92,237	0	0	0	0	0	0	92,237
Bobcat Hammer Attachment	9,709	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15,429	0	0	0	15,429
Total transportation equipment		45,000	0	65,000	10,749	147,202	0	0	58,136	0	102,096	61,686	0	187,338	0	124,422	34,022	0	0	0	835,651
OTHER TANGIBLE PLANT																					
Asphalt and Paving		40,000	0	0	0	81,000	0	0	0	0	0	60,000	0	0	0	0	60,000	0	0	0	241,000
TOTAL		419,056	1,748,391	1,919,605	404,037	794,578	758,671	1,415,620	1,185,696	1,206,586	2,165,738	214,835	305,456	512,347	268,271	343,575	280,824	1,608,995	1,567,510	2,187,983	10,307,772

*Project timing (acceleration or deferral) is based on available funding and competing projects

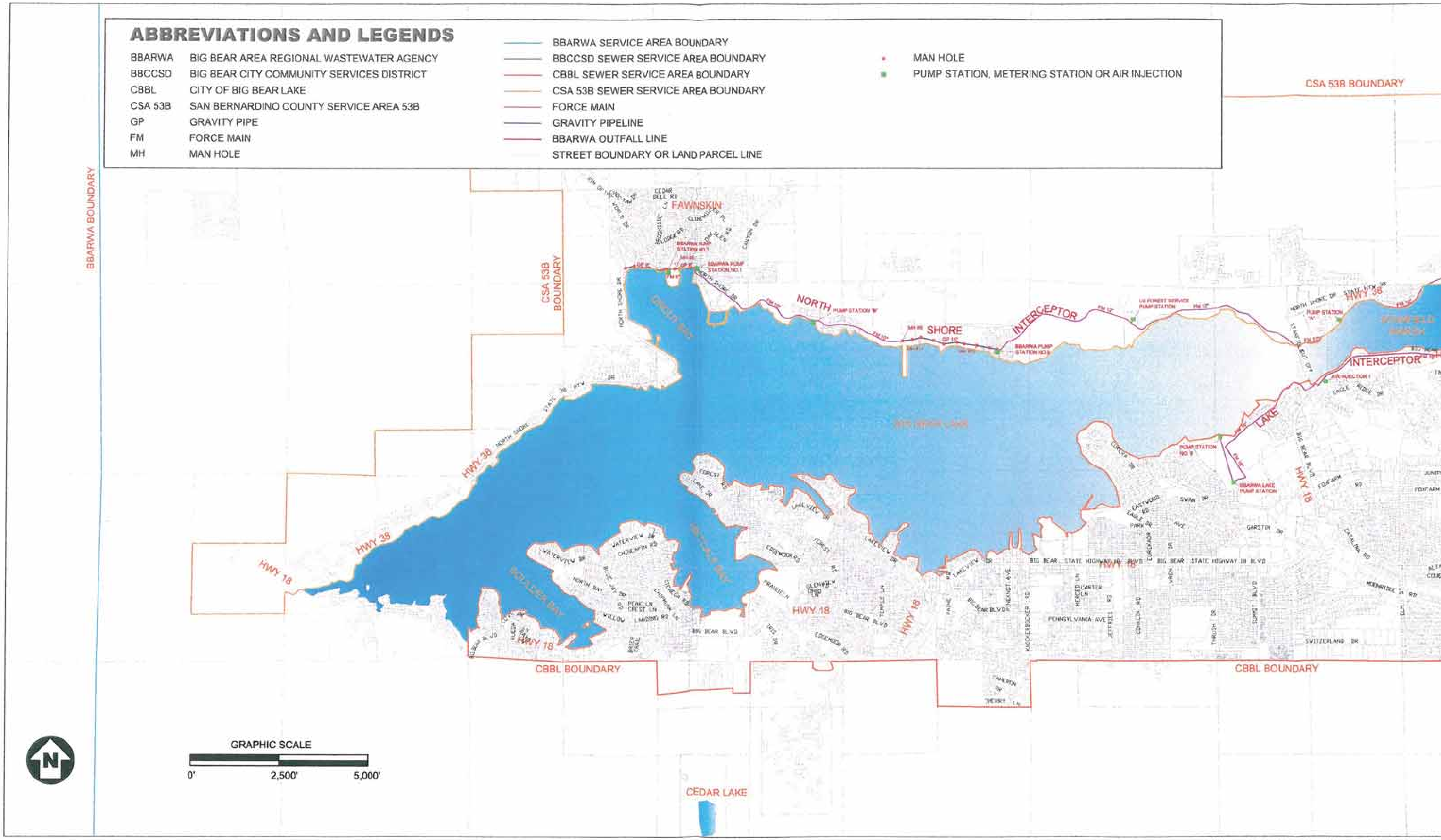
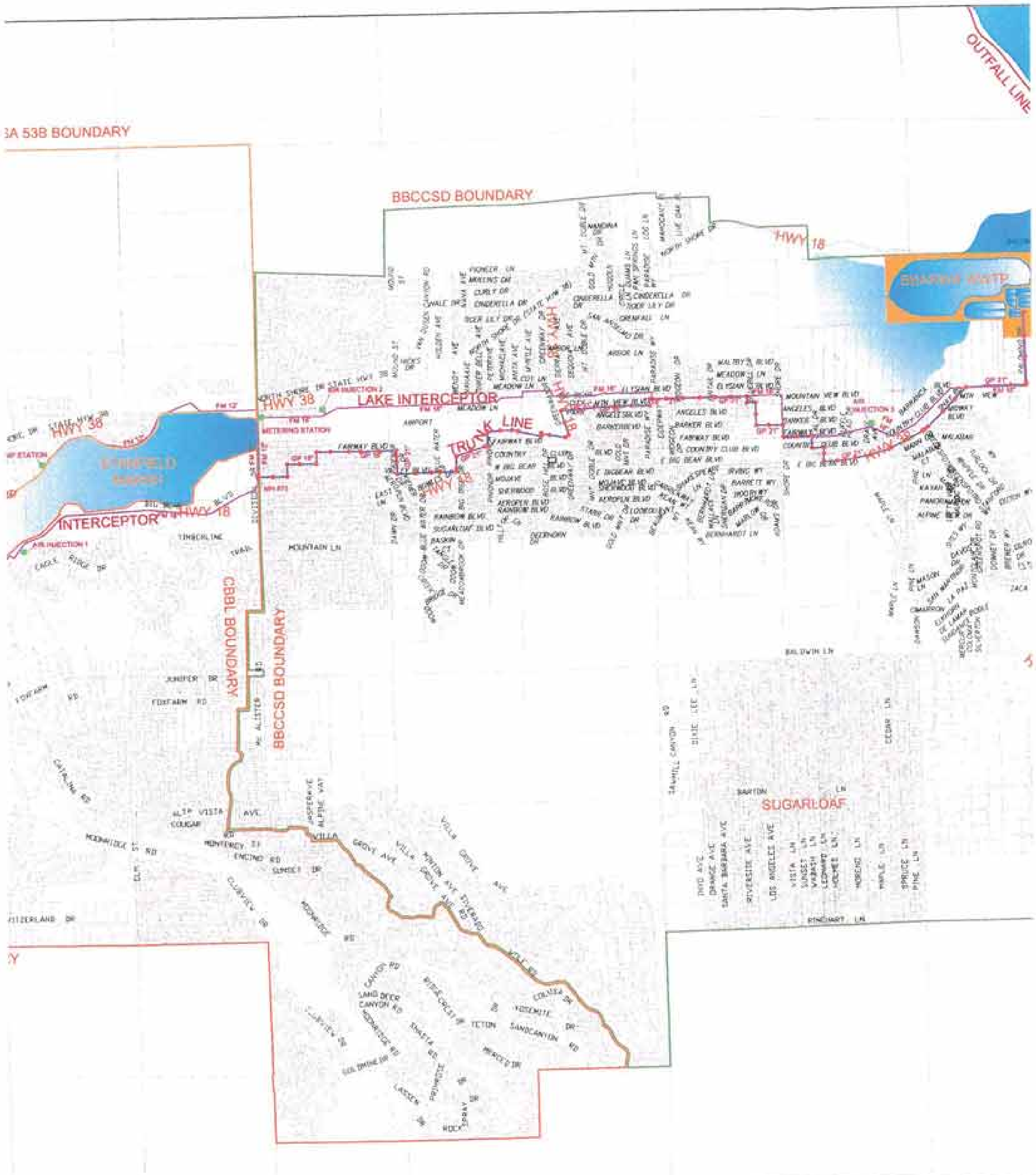
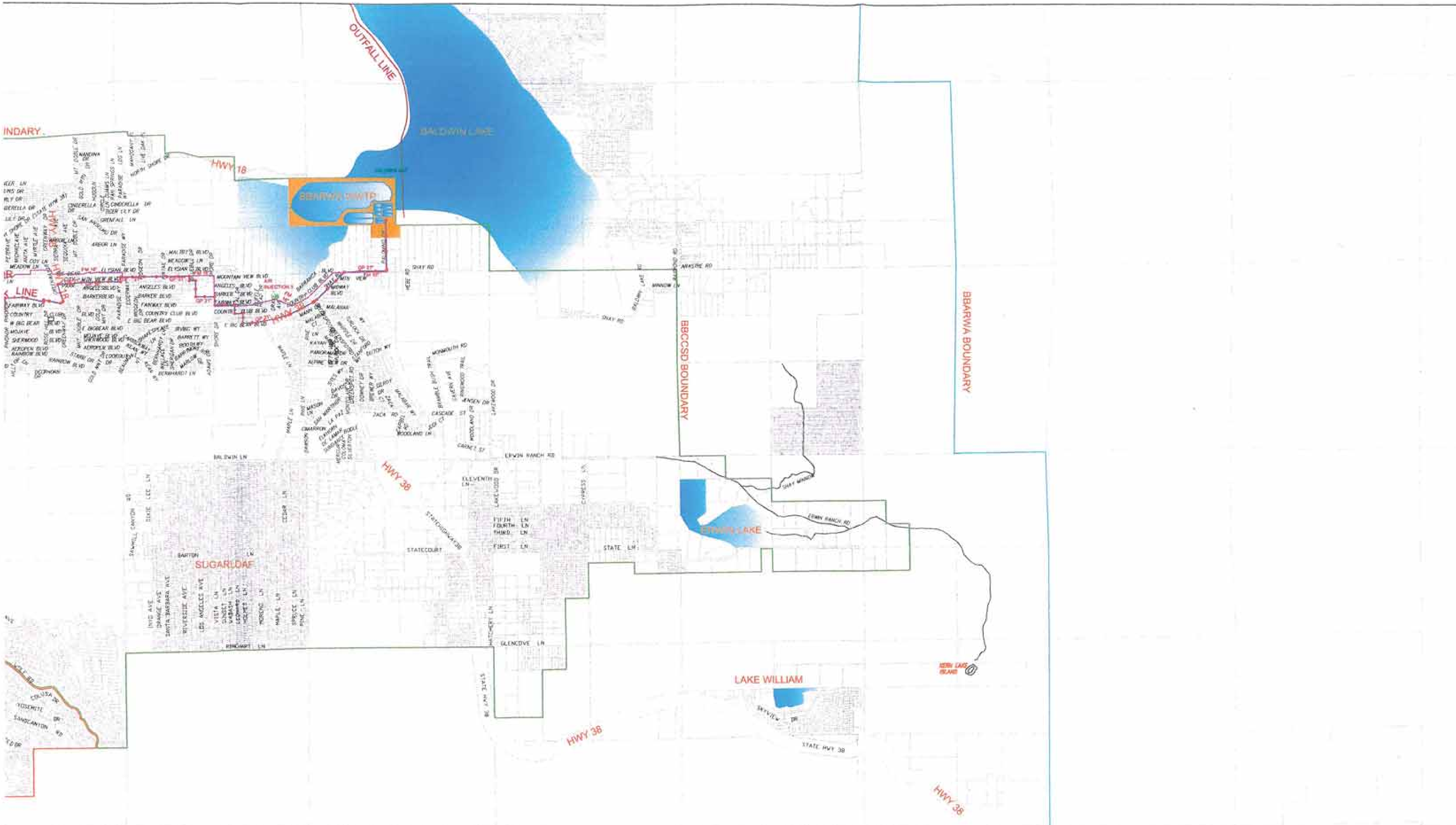


Figure 2.3. Overview Map of Sewer Intercept



ew Map of Sewer Interceptor System of Big Bear Area Regional Wastewater Agency



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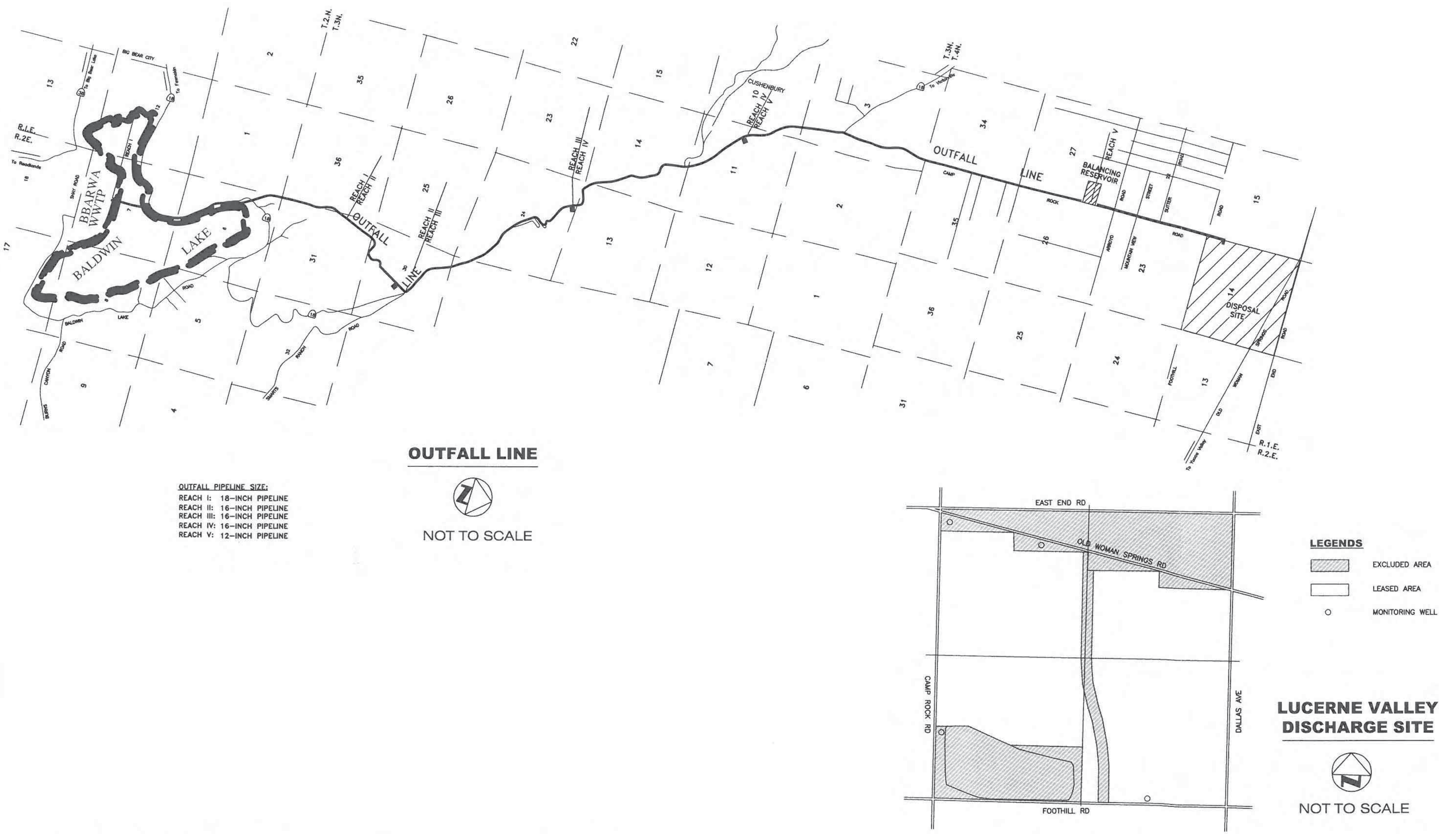

Figue 2.5. BBARWA Outfall Line and Lucerne Valley Discharge Site.