CAMP VERDE

THE CENTER OF IT ALL — ARIZONA

WASTEWATER MASTER PLAN

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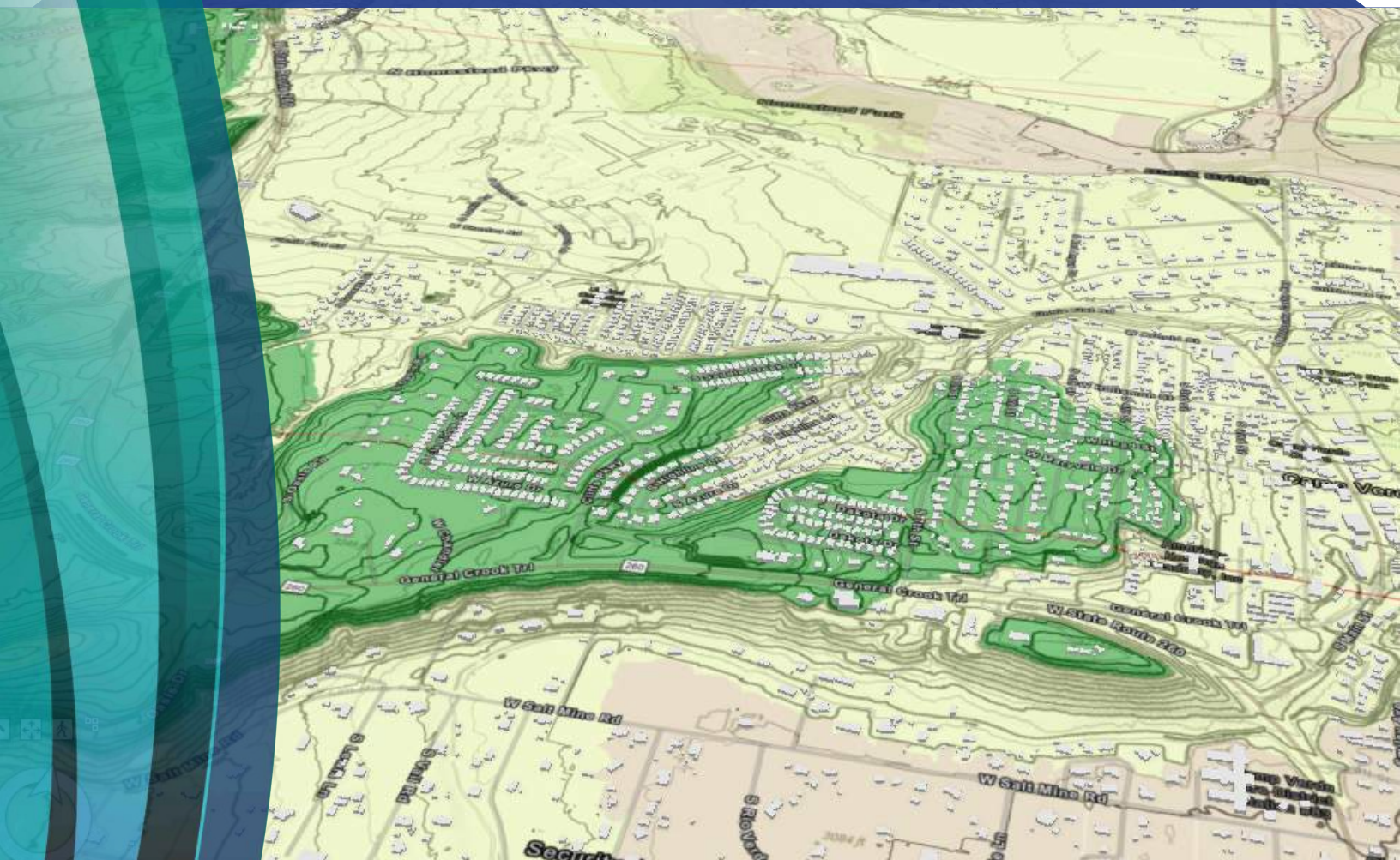
ARIZONA U.S.A

MAY 2025

Drinking Water
Wastewater
Recycled Water

WATERWORKS
ENGINEERS



Wastewater System Master Plan

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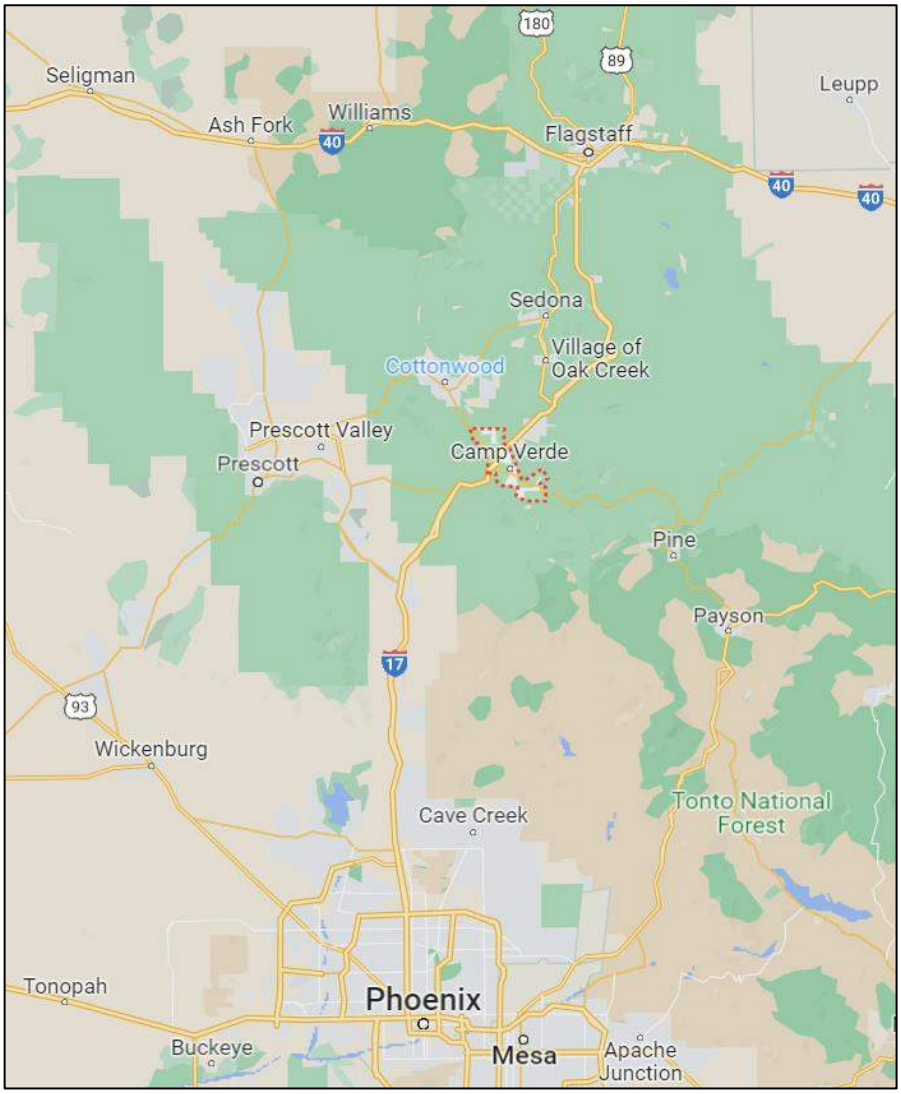
Wastewater System Master Plan

SECTION 1. Introduction

1.1 Background

The Town of Camp Verde (the Town or TOCV) is located in the Verde Valley along eighteen miles of the Verde River, in Yavapai County, Arizona. The Town was settled in 1865 and has a population of approximately 12,000 people[1]. Elevations in the Town range from 3,000 to 3,600 feet above sea level. Nearby cities are Prescott to the West, Cottonwood to the Northwest, and Sedona to the Northeast. The Town of Camp Verde encompasses approximately 42.6 square miles. TOCV and surrounding communities in central Arizona are shown on Figure 1-1.

Figure 1-1 Town of Camp Verde Location[2]



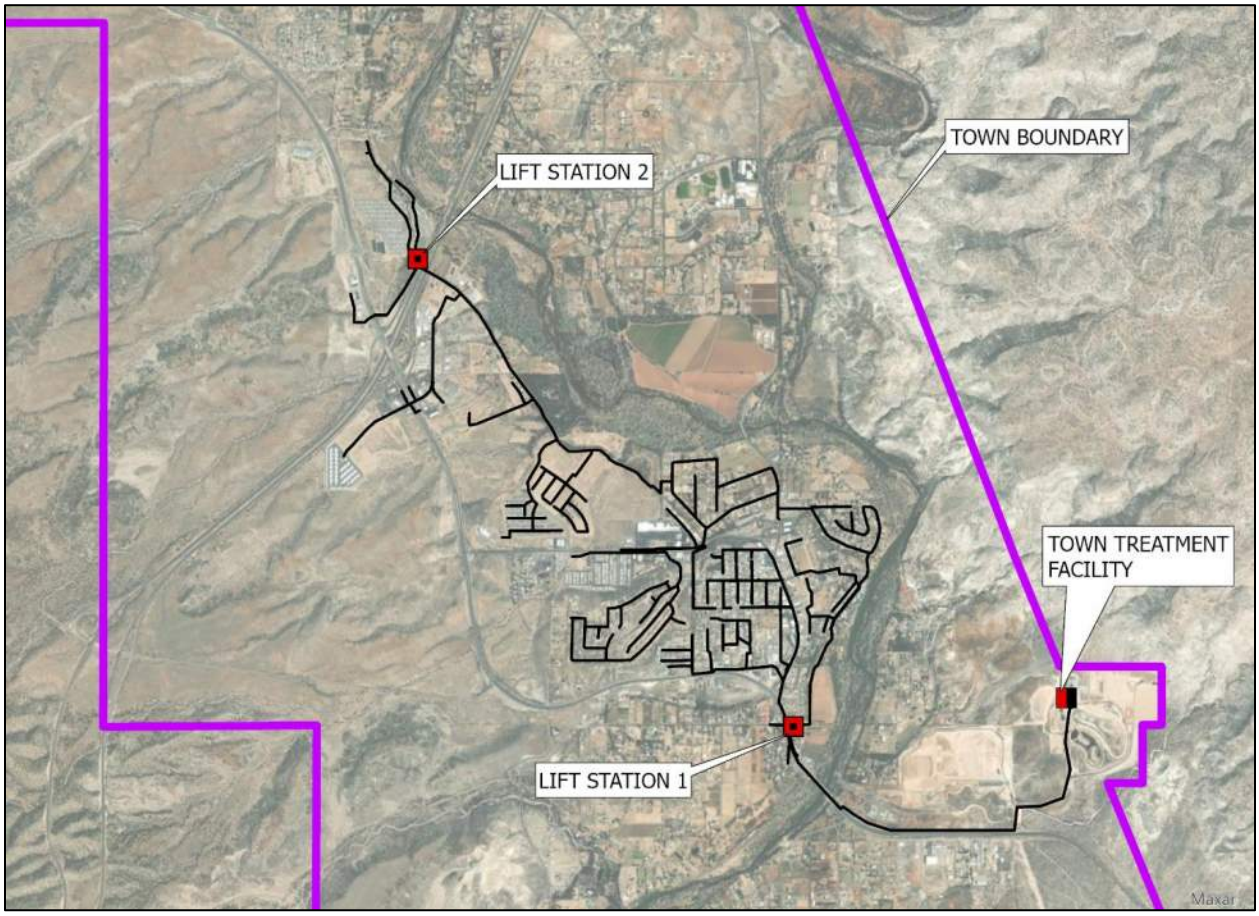
[1] 2020 US Census, [2]Google

SECTION 2. Existing Wastewater Infrastructure

2.1 System Overview

The existing wastewater system comprises gravity sewer mains, two lift stations, and a wastewater treatment facility. The existing system serves approximately 1,300 acres of the Town and collected and treated an average of 265,000 gallons per day in 2024. The overall system layout is shown in Figure 2-1. A more detailed figure of the wastewater system, including pipe sizes, is included in Appendix A.

Figure 2-1 Town of Camp Verde Wastewater System Layout



2.2 Gravity Sewer Mains and Manholes

A gravity sewer main network conveys wastewater from the Town's residents and businesses. Wastewater generally flows towards the Verde River, where it is intercepted by a sewer trunk main that conveys wastewater south along the Verde River to the lift station near the intersection of Highway 260 and Salt Mine Road. It is pumped from the lift station to the treatment facility. The size

and overall lengths of the gravity sewer mains are summarized in Table 2-1. There are also various small-diameter service lines and cleanouts not included in the table.

Table 2-1 Existing Sewer Mains

Pipe Diameter	Overall Quantities, LF
8	91,068
10	931
12	2,754
15	597
18	18,242
Total	113,592

There are 534 existing manholes in the wastewater system. The Town has an ongoing condition assessment program in which the manholes are examined and scanned with a LIDAR and camera system. After scanning, each manhole is graded for structural integrity. The summary of the overall condition of the manhole structures is shown in Table 2-2. For more information about the existing manhole conditions, refer to the ongoing assessment reports by RH Borden and Associates.

Table 2-2 Existing Sewer Mains

Riser/Structure Condition	Overall Number	Percent of Total
Good	497	93%
Poor	1	1%
Fair	14	2%
No Data	22	4%
Total	**534**	**100%**

2.3 Lift Stations and Force Mains

The Town operates two lift stations and associated force mains. Lift Station 1 is located near the intersection of Highway 260 and Salt Mine Road. Lift Station 1 pumps the entire Town's wastewater across the Verde River to the treatment facility, approximately 2 miles away. Lift Station 2 is located just north of Interstate 17 at the Verde Ranch RV Resort. This lift station only serves a large campground and RV park, and pumps wastewater to a nearby gravity sewer manhole. Engineering plans are currently being developed for Lift Station 3 which will be located near Old Highway 279 and Altman Parkway. The two lift stations' characteristics are summarized in Table 2-3.

Table 2-3 Existing Lift Stations

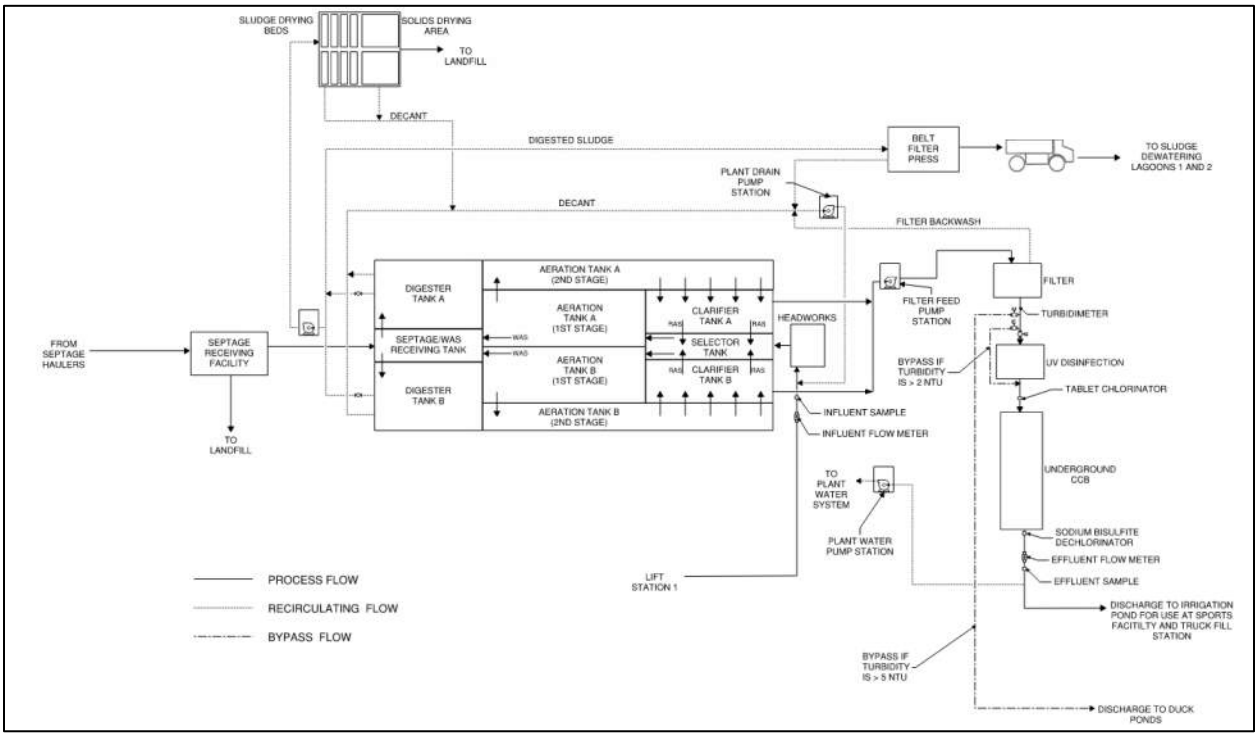
Lift Station	Location	Pumps	Pump Head, ft	Flow, gpm	Force Main Diameter, In	Force Main Length, LF	Force Main Material
1	Near Verde River and HWY 260	3	210	500	8” (Active) 12” (Inactive)	~10,000	8” PVC 12” DIP
2	North of I17	2	190	1200	12”	~200	Ductile Iron

2.4 Wastewater Treatment Facility

The Town operates one wastewater treatment facility east of the Downtown area and the Verde River. The Town of Camp Verde Water Reclamation Facility (WRF) is currently permitted to treat 0.65 million gallons per day (MGD) with a design capacity of 1.3 MGD at build-out. The overall site plan is shown in Figure 2-2. The treatment process at the WRF consists of headworks with bar screens, an extended aeration treatment train with nitrification and denitrification, clarifiers, ultraviolet disinfection, chlorine contact basins, a septage receiving station, and an effluent pump station. The process flow diagram of the WRF is shown in Figure 2-3.

Figure 2-2 Treatment Facility Site Plan

Figure 2-3 Process Flow of WRF



2.4.1 Septage Receiving Station

The existing septage receiving station has reached the end of its service life and needs to be replaced. It is recommended to utilize two new receiving tanks to separate settlers from floaters, and a new receiving screen to improve operations and safety. A new septage station is currently under design.

2.4.2 Effluent Management

The treated effluent is diverted to different areas of the plant based on the turbidity level of the effluent. The distribution of the effluent based on quality is displayed in Table 2-4.

Table 2-4 Distribution of Effluent Based on Quality

Turbidity Level (NTU)	Process Bypassed	Effluent Class	Effluent Destination
NTU < 2	------	A+	Sports Complex via irrigation pond
2 < NTU < 5	UV Disinfection	A+	Sports Complex via irrigation pond
NTU > 5	UV Disinfection and CCB	B+	Evaporation Basin and/or Truck Fill Station

As shown in the table above, no processes are bypassed if the turbidity level is below two NTUs. If the turbidity level is between two and five NTUs, the UV disinfection process is bypassed. In both cases, the effluent is considered A+ and is distributed to the irrigation pond. From there, it will be pumped to the sports complex directly west of the facility. The pond is equipped with a temporary pump with plans to install a permanent pump in the future.

If the turbidity level is above 5 NTU, the UV disinfection and chlorine contact basins are bypassed. The effluent is considered B+ and is distributed to the evaporation basin or the truck fill station on site. The B+ effluent is left to evaporate in the evaporation basin or is used for construction around the Town via the truck fill station.

Future effluent management will consider additional reuse and potential recharge.

There is also discussion about constructing a reclaimed water line down Main Street. This line would be used to irrigate the plants along Main Street, along with the town park. There would also be a truck fill station along this line that would be used for construction purposes.

Recharge wells would require a detailed study of the aquifer and groundwater impacts in the area. Typically, these must be sufficiently far away from the Verde River. Recent regulations regarding direct potable reuse will likely aid in this disposal option. However, after treating to the level to meet these requirements, the water could be used locally as potable water.

2.4.3 Existing Wastewater and Effluent Permits

Table 2-5 Existing Permit

Permit Type	Permit Number	Licensing Time Frame – LTF Number
Aquifer Protection Permit (APP)	101360	82369

Under the current APP permit, there are eight discharge facilities. These facilities include Camp Verde WRF, North Evaporation Basin, South Evaporation Basin, Sludge Dewatering Lagoon #1, Sludge Dewatering Lagoon #2, Sludge Drying Beds, Solids Drying Area, and the Truck Fill Station/Re-use for construction water. The APP permit is found in Appendix B. Use of the sludge dewatering lagoons stopped when the extended aeration treatment train began. All sludge has been removed from the lagoons, and they are being repurposed to store and dewater sludge. The repurposing of the lagoons is currently in progress.

The routine discharge monitoring is outlined in Table 2-7.

Table 2-6 Routine Discharge Sampling Locations

Sampling Point #	Sampling Point Identification	Latitude (North)	Longitude (West)
1	Sampler at the downstream end of the backup chlorination system	34° 33’ 23”	111° 49’ 56”
2	Flow meter located downstream of the disinfection system	34° 33’ 23”	111° 49’ 56”

Table 2-7 Routine Discharge Monitoring

Parameter	Alert Level (AL)	Discharge Limit (DL)	Units	Sampling Frequency	Reporting Frequency
Total Daily Flow	NA	NA	mgd[1]	Daily	Quarterly
Total Flow: Monthly Average	0.618	0.650	mgd	Monthly Calculation	Quarterly
Reuse Flow: Daily	NA	NA	mgd	Daily	Quarterly
Reuse Flow: Monthly Average	0.494	0.650	mgd	Monthly Calculation	Quarterly
Evaporation Pond Flow: Daily	NA	NA	mgd	Daily	Quarterly
Evaporation Pond Flow: Monthly Average	0.494	0.650	mgd	Monthly Calculation	Quarterly
Fecal Coliform: Single Sample Maximum	NA	23.0	CFU[2]	Daily	Quarterly

Parameter	Alert Level (AL)	Discharge Limit (DL)	Units	Sampling Frequency	Reporting Frequency
Fecal Coliform: 4 of 7 samples in a week	NA	Non-detect	CFU	Weekly Evaluation	Quarterly
Total Nitrogen: 5 sample rolling geometric mean	8.0	10.0	mg/L[3]	Monthly Calculation	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/L	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/L	Quarterly	Quarterly

1. Million Gallons per Day
2. Colony Forming Units
3. milligrams per Liter

The reclaimed water monitoring for Class A+ and Class B+ effluent is outlined in Table 2-8. The reclaimed water monitoring is to be performed in addition to the routine monitoring outlined in Table 2-7. As stated above, the Class A+ effluent is used to irrigate the sports complex, and the Class B+ effluent is distributed to the evaporation basins to evaporate or is used at the truck fill station for construction.

Table 2-8 Class A+ and Class B+ Reclaimed Water Monitoring

Parameter	Class A+ DL	Class B+ DL	Sampling Frequency	Reporting Frequency
Fecal Coliform: Single Sample Maximum (CFU)	23	800	Daily	Quarterly
Fecal Coliform: 4 of last 7 samples (CFU)	Non-detect	200	Daily Evaluation	Quarterly
Total Nitrogen: 5 sample rolling geometric mean (mg/L)	10	10	Monthly Calculation	Quarterly
Turbidity: Single Reading (NTU[1])	5	NA	Daily	Quarterly
Turbidity: 24-hour Average (PFU[2])	2	NA	Daily Calculation	Quarterly

Parameter	Class A+ DL	Class B+ DL	Sampling Frequency	Reporting Frequency
Enteric Virus: 4 of last 7 samples (CFU)	Non-detect	NA	Monthly/ Suspended	Quarterly

1. Nephelometric Turbidity Unit
2. Plaque Forming Unit

2.4.4 PFAS Monitoring

It is recommended to begin monitoring for per/polyfluoroalkyl substances (PFAs). The recommended method for monitoring is utilizing EPA's Method 537. This method is acceptable and widely used as it is more cost-effective. Method 537 has a quicker turnaround time for results than Method 1633, which is normally used for non-drinking water. Either method will detect the levels of PFAs in the effluent.

Recent PFAs sampling conducted on 8/22/2024 showed the results displayed in Table 2-9.

Table 2-9 PFAS Sampling Results

Parameter	Result, ug/L (24H3308-01)	Result, ug/L (24H3308-02)	PQL, ug/L
PFBS	11	12	2.6
PFOS	87.8	8.8	6.9
PFBA	7.3	5.1	3.4
PFHpA	3.7	3.8	1.7
PFHxA	22	23	2.6
PFOA	24	24	4.3
PFPeA	46	49	1.7

The PFA concentrations within the effluent should be understood when considering future effluent uses.

2.4.5 Power Consumption

The plant is supplied with power by Arizona Public Service (APS). The service to the WRF is 1200 amps or 956 kW. The generator is rated for 600 amps or 478 kW. With a safety factor of two to

account for the inrush current, in 2024, the WRF used an average of 29% of the APS service and an average of 59% of the generator capacity.

The power consumption for the projected plant capacities is shown in Table 2-10. The data shows that additional generator capacity is needed before the 0.65 MGD expansion and more service capacity is needed before the 1.3 MGD expansion.

Table 2-10 Projected Power Needs

	2023	0.65 MGD	1.3 MGD	1.7 MGD
Flow, mgd	0.262	0.65	1.3	1.7
kW	280	695	1390	1818

SECTION 3. Planning

3.1 Planning Horizons

Both the 2050 and buildout conditions were analyzed for this report. Through discussions with the Town, it was determined that 2050 provides a practical horizon for planning, development, and design purposes. Therefore, most of the analysis and planning discussed in this report are primarily focused on 2050 conditions. Buildout is considered too far into the future to be of great practical value for planning and design; new infrastructure based on the buildout conditions will likely be oversized for many years and may even exceed its service life before the full capacity is utilized.

3.2 Existing Service Areas

3.2.1 Town

The Town's current designated service area per the Northern Arizona Council of Governments Section 208 Water Quality Management Plan is approximately 2,500 acres. However, the Town's effective service area, or the area presently served by the Town's wastewater infrastructure is approximately 1,300 acres. The remainder of the Town's designated service area utilizes private septic tanks. There are currently no known active plans to install wastewater infrastructure to serve these areas.

In recent years, the Town has begun planning to extend the Town's wastewater infrastructure to the north of I-17. These plans and analyses have been incorporated into this report as needed.

3.2.2 Yavapai Apache Nation

The Tunlii plant, owned and operated by the Yavapai Apache Nation (YAN), also provides wastewater service to portions of its own administrative area and several parcels outside its administrative area. In particular, it provides wastewater services to the Yavapai County courthouse, the Sheriff's facilities, FrameTec and several businesses located near the intersection of Highway 260 and the Forest 372 Route. YAN also provides services to the middle Verde YAN area east of the Verde River.

It is also understood that a small lagoon-based treatment facility located east of the Verde River provides services to some of the Middle Verde Area YAN administrative area east of the Verde River as well as some portions of the Town.

The Town's existing effective and designated service areas, along with existing YAN effective service area and YAN boundary are shown in Appendix C.

3.3 2050 and Buildout Service Areas

It is assumed that by 2050 all areas within the Town boundary west of the Verde River will be served by a centrally treated wastewater system and that no significant development will be allowed to be constructed without being connected to the wastewater system (i.e. no heavy use of septic systems). A figure showing the 2050 wastewater system service area, providers, and anticipated treatment facilities is shown in Appendix D.

At Buildout, it is anticipated that all businesses and residents within the Town boundary will have wastewater service. It is assumed that all residents and businesses currently using septic systems will be connected to a centrally treated wastewater collection system. It is anticipated that the Town, YAN, and the Verde Lakes Water Corporation will provide the service. A figure showing the buildout service area, providers, and anticipated treatment facilities is shown in Appendix E.

3.4 Wastewater Flow by Land Use

The various land use and zoning designations from the Town and Yavapai County were analyzed and consolidated into land use types to project wastewater generation on a gallons per acre per day basis, as shown in Table 3-1. For planning purposes, the wastewater generation rate is assumed to be 2/3 of the assumed water demand developed for the TOCV Water Master Plan. For this analysis, it was assumed that the YAN areas are equivalent to a mix of low-density residential development and commercial areas (75% residential, 25% commercial). A figure showing the assumed land uses throughout the Town Boundary is included in Appendix F.

Table 3-1 Wastewater Generation Demand by Land Use Type

Land Use Type	Assumed Lot Size (Acres)	Dwellings per Acre, Units	Generation per Dwelling, gpd	gpd/acre
Rural Residential	3	0.33	183	61
Low Density Residential	1.25	0.80	183	146
Medium Density Residential	0.2	5.00	183	913
YAN (Current, Land Swap)	-	-	-	309
Commercial	-	-	-	800

Land Use Type	Assumed Lot Size (Acres)	Dwellings per Acre, Units	Generation per Dwelling, gpd	gpd/acre
PAD	-	-	-	1,840
Open Space / US Forest Service	-	-	-	0
ROW	-	-	-	0
State Land Department	-	-	-	913
State Use	-	-	-	219

These wastewater generation rates were applied to land use to develop buildout and 2050 flow projections discussed in Section 4.6.

3.5 Population Projections

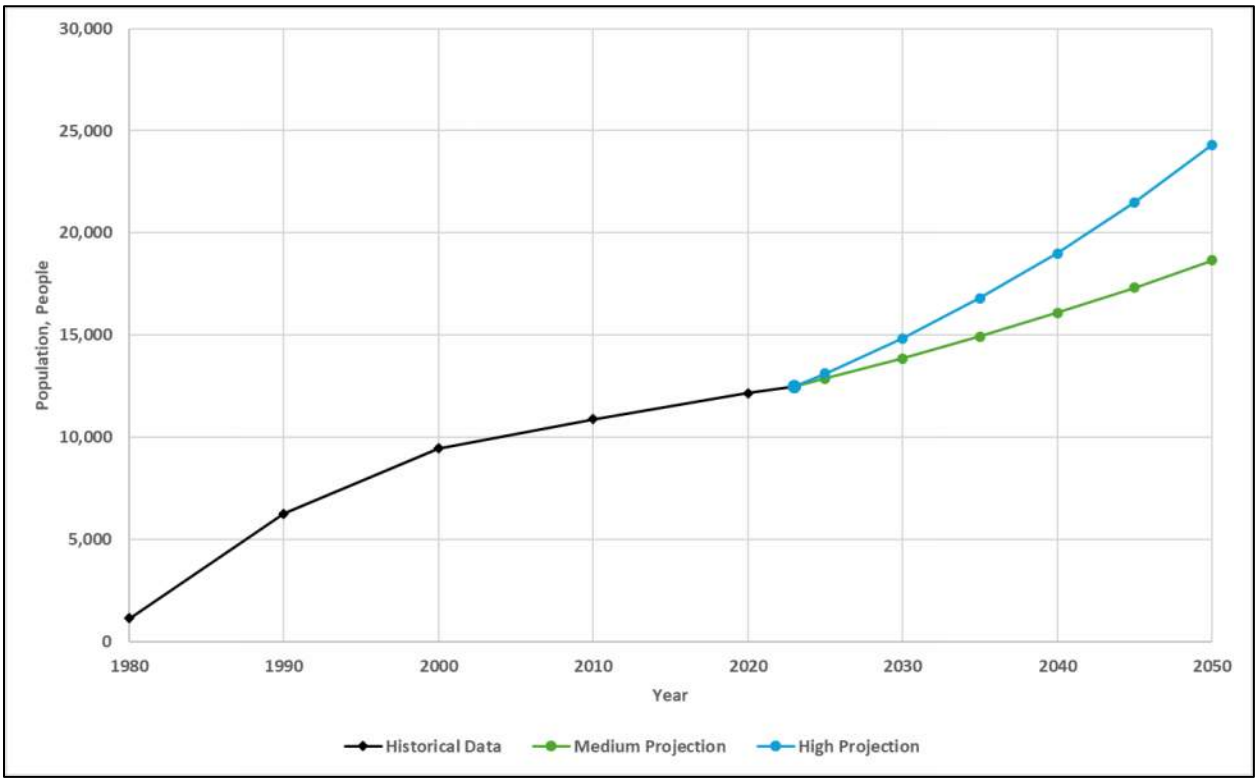
The TOCV requested a medium and high projection for population growth. The medium projection annualized growth rate used is 1.5%. This was derived from the Regional Economic Development Center at Yavapai College using the Lightcast Q1 Data Set, using a range of 2019-2030. The high projection annualized growth rate used is 2.5%. This is a conservative estimate to ensure the Town will have the facilities online ahead of the development demand.

Table 3-2 displays the population projections through 2050. The projections start with the population of the TOCV in 2023 of 12,489, based on the US Census as of July 1, 2023. Figure 3-1 shows the historical data through 2023 and the medium and high rates of growth.

Table 3-2 Population Projections

Year	Medium Projection		High Projection	
	Population, people	Annualized Growth Rate, %	Population, people	Annualized Growth Rate, %
2023	12,489	1.50%	12,489	2.50%
2025	12,866	1.50%	12,994	2.50%
2030	13,861	1.50%	14,346	2.50%
2035	14,932	1.50%	15,839	2.50%
2040	16,086	1.50%	17,488	2.50%
2045	17,329	1.50%	19,308	2.50%
2050	18,669	1.50%	21,317	2.50%

Figure 3-1 TOCV Population Projection

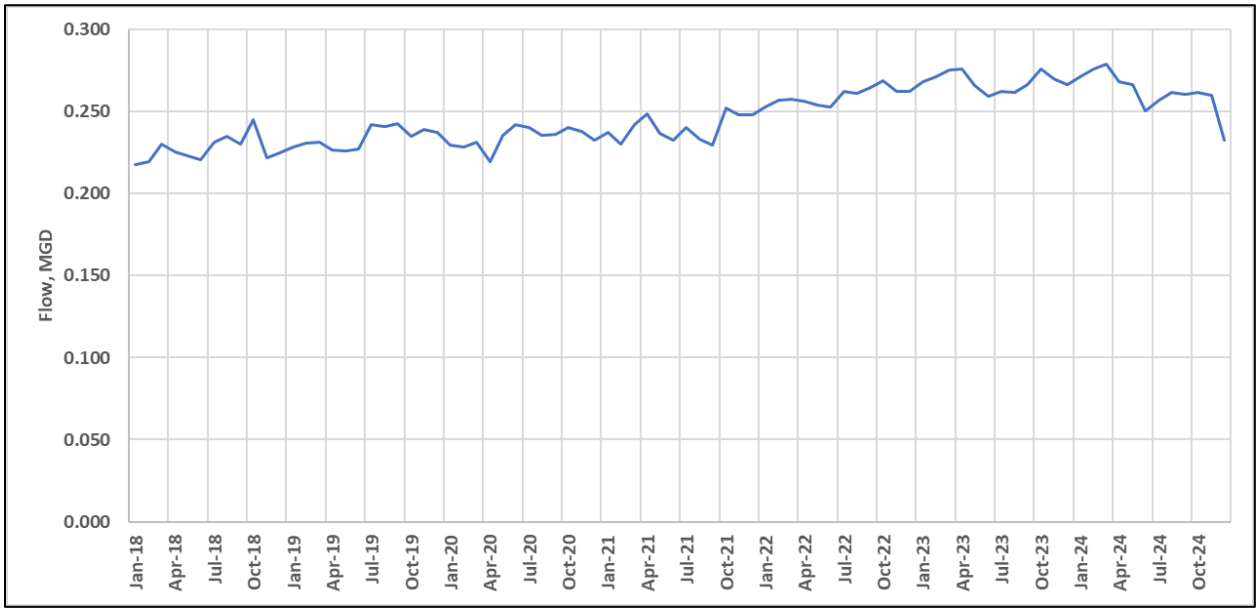


SECTION 4. Wastewater Flow Analysis

4.1 Historic Wastewater Flows

Wastewater flows generated by the existing service area and received at the wastewater treatment plant have been trending upward for several years. The average daily flows per month between January 2018 and December 2024 are shown in Figure 4-1.

Figure 4-1 Average Daily Flow per Month



The daily flows received at the treatment facility between January 1, 2024, and December 31, 2024, are shown in Figure 4-2.

Figure 4-2 2024 Daily Flow

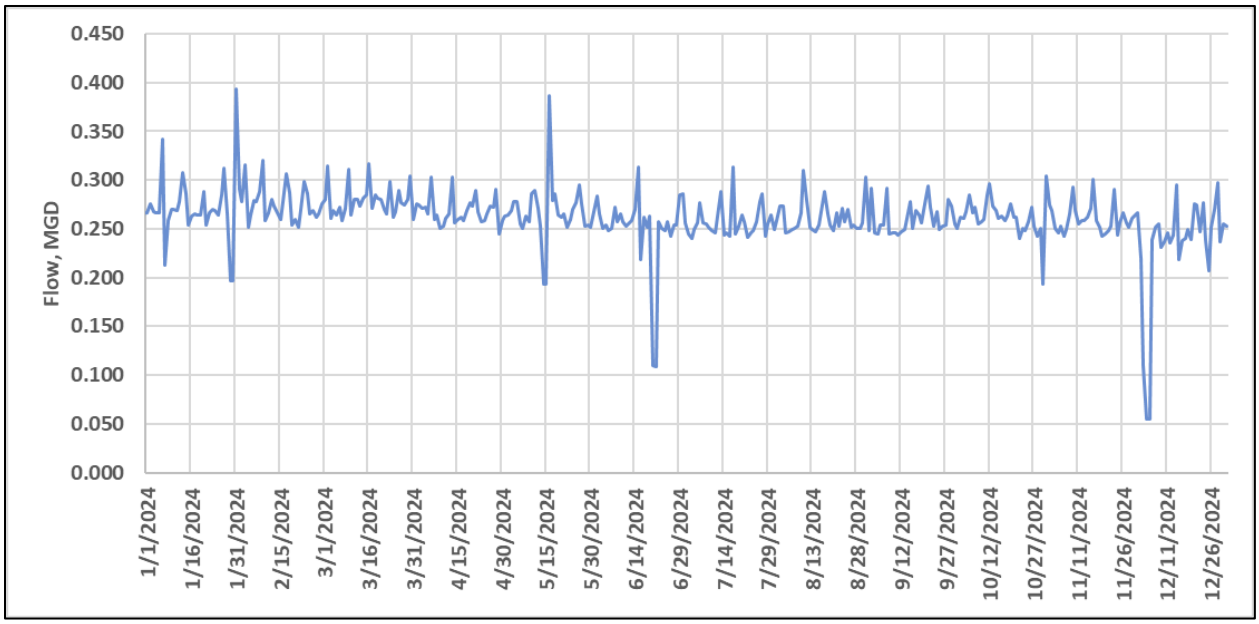


Table 4-1 presents a brief statistical analysis of the wastewater flows received at the wastewater treatment facility. Using data from water customers in the wastewater service area as a stand-in for wastewater flow data, it is estimated that approximately 60% of wastewater currently generated in the service area is from residential customers and 40% is generated by commercial customers.

Table 4-1 Existing Treatment Facility Flow Statistics

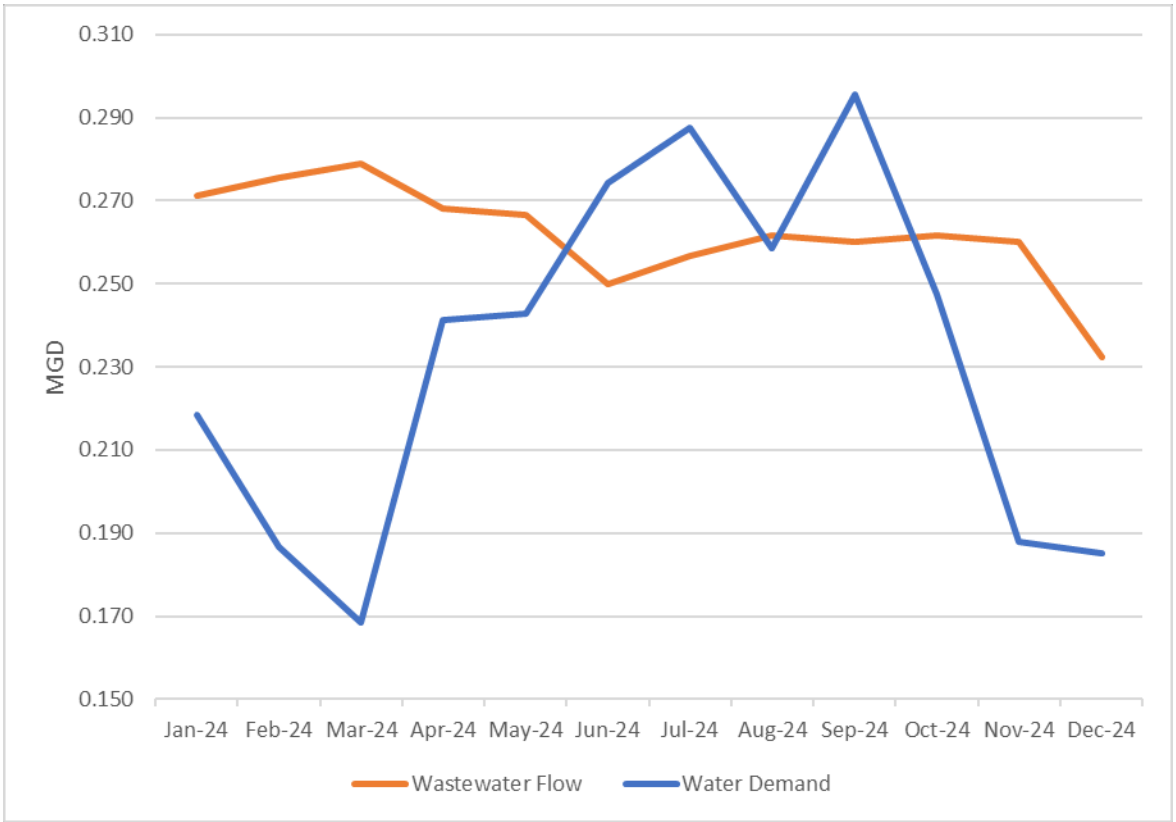
Flow Condition	Flow, MGD	Flow Factor (% of Average)
Min	0.141	0.53
8% (synthetic Avg day, min month)	0.245	0.92
Avg	0.267	1.00
92% (synthetic Avg day, max month)	0.307	1.15
Max	0.364	1.36
Average Day, Max Month	0.276	1.03
Average Day, Min Month	0.259	0.97

4.1.1 Wastewater Flow vs. Water Demand

For planning purposes, the amount of wastewater flow generated is typically assumed to be 60-85% of the water demand for a particular customer or area. The remainder of the water demand is used outdoors or consumed in such a way that it is not returned to the wastewater system.

In Camp Verde, the wastewater flow received at the plant was larger than the water demand from the wastewater service area for a portion of 2024. The water demand and wastewater flow for the wastewater service area is plotted in Figure 4-3.

Figure 4-3 Wastewater Flow vs. Water Demand



After discussions with the Town engineering and operations staff, it was determined that this occurs because there are several wastewater customers that use minimal amounts of metered potable water from the Town water system, while contributing large amounts of wastewater flow to the Town wastewater system. These customers include a car wash, a large RV resort, and a marijuana growing/processing facility. The "extra" wastewater originates from private wells used by these customers that are unmetered by the Town.

The slow decline in wastewater flow shown in Figure 4-3 after April, comes from the decrease in late spring and summer use at the RV resort. The RV resort is understood to have high occupancy rates in winter and spring seasons, and a far lower occupancy rate in the summer and early fall. The spike in water demand occurring in April is due to increased summer use.

4.2 Plant Flow and Loading

Plant flow was analyzed from January 2024 to December 2024 to determine flow data. Lab samples from this same period were used to determine plant loading of total suspended solids (TSS), biological oxygen demand (BOD) and ammonia. The lab data was analyzed to determine max loading. The month that experienced the highest BOD showed ammonia and TSS levels that were

below 92%. This was the same for the month with the highest TSS level, showing BOD and ammonia levels below 92%. The same trend occurred in the month with the highest ammonia levels. Due to this, the synthetic 92nd percentile was used for max loading in all three cases. The results are displayed in Table 4-2.

Table 4-2 Existing Treatment Facility Flows and Loading

WWTP Flows		Units	Value
AAD Flow (Plant Data Jan 2024-Dec 2024)		0.258	MGD
ADMM Flow (Plant Data Jan 2024 - Dec 2024)		0.301	MGD
Influent BOD (Lab Data Jan 2024 - Dec 2024)	Average	323	mg/L
		713	lb/d
	Synthetic 92%	448	mg/L
		1134	lb/d
Influent TSS (Lab Data Jan 2024 - Dec 2024)	Average	226	mg/L
		493	lb/d
	Synthetic 92%	270	mg/L
		579	lb/d
Influent Ammonia as N (Lab Data Jan 2024 - Dec 2024)	Average	41.9	mg/L
		91.7	lb/d
	Synthetic 92%	46.9	mg/L
		108.0	lb/d

The plant also receives septage that is treated in the Septage Receiving Tank to reduce nitrogen concentrations. The average septage flow received from January 2024 to December 2024 is shown in Table 4-3.

Table 4-3 Average Monthly Septage Flow

Month	Average Flow per Month, gpd
Jan-24	8,527
Feb-24	11,115
Mar-24	10,121
Apr-24	10,122
May-24	6,527
Jun-24	5,804
Jul-24	4,351
Aug-24	5,260
Sep-24	3,678
Oct-24	5,520

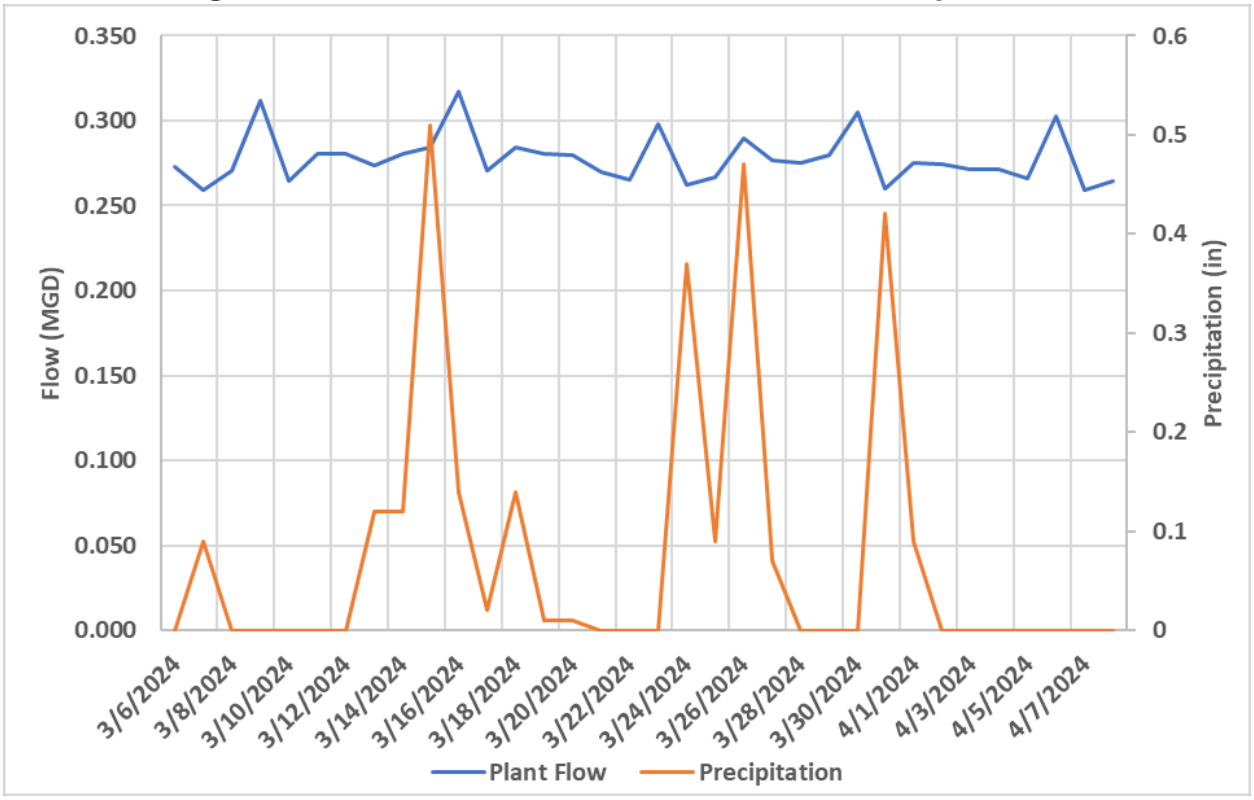
Nov-24	5,129
Dec-24	4,763
12-month average	6,743

The secondary treatment process consists of conventional activated sludge (using the Aero-Mod process) that achieves nitrification and denitrification. The current operation only uses one of the Aero-Mod trains. Modeling of the system was completed using the BioWin modeling program. The model processes were calibrated to match the Aero-Mod process and operations data. A dynamic model with diurnal flow was created based on the influent pump station (IPS) data. According to the modeling results, the existing plant is capable of treating wastewater up to 0.65 MGD with one train of the Aero-Mod.

4.3 Wet Weather Flow

Influent flows at the WRF from January 2024 to December 2024 were analyzed to determine the effect of rainfall within the TOCV service area. For this, precipitation information was collected from the Weather Underground, a community-based weather data recording organization. Rainfall data was collected from the Verde Ridge – KAZCAMP58 weather station from January 2024 to December 2024. A comparison was performed with the rainfall and plant flow data during the same period. This was done to determine if rainfall affects the Town's wastewater system. A rain event was considered a wet weather event if there was a total of 0.5 inches or more of precipitation over three days. Using this method, it was found that there were five such wet weather events during the period of analysis. Graphs were made for each wet weather event to observe the effect. A graph showing the wet weather event that occurred from March to April 2024 is shown in Figure 4-4. The weather events in orange show no visible effect on the plant flow in blue.

Figure 4-4 Wet Weather Event from March – April 2024

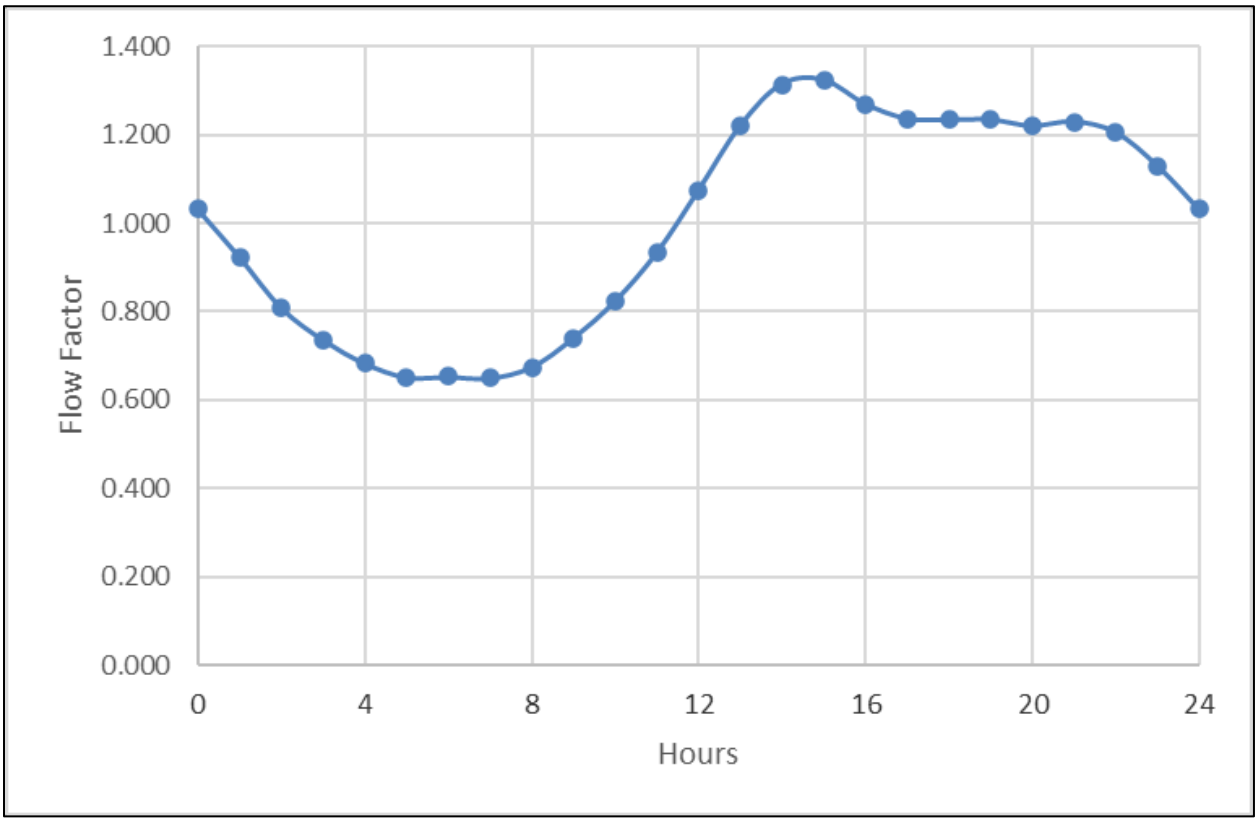


This is typical of all the wet weather events that occurred during the period analyzed. This shows that very little inflow or infiltration into the wastewater system occurs. Town operations and engineering staff also stated they see little effect from rainfall on the wastewater collection system. To limit inflow, Town staff have planned on equipping all manholes in flood-prone areas with hinged, rain-tight, PAMREX sewer lids.

4.4 Diurnal Pattern

Four flow meters were placed in manholes in the wastewater collection system to collect flow data at those locations and develop diurnal curves. The flow meter locations and subsequent curves developed from each are included in Appendix G. These curves were applied to the appropriate upstream areas in the hydraulic model to develop a general diurnal pattern for the entire wastewater collection system. Specifically, this diurnal curve is experienced at Lift Station 1 and the Town's treatment facility. This is shown in Figure 4-5. The hydraulic model is discussed in detail in SECTION 5.

Figure 4-5 Collection System Diurnal Curve



4.5 Peaking Factors

Peaking factors are applied to average flows to calculate a peak flow that is used to analyze and determine the capacity and appropriate size of wastewater infrastructure. Through analysis of historic plant and the flow meter data, it was determined that the Town's historic wastewater collection system peaking factor is approximately 1.80 times the average flow during December 2022 through November 2023. This was determined using the max flow day factor for the study period (1.36 x daily average) multiplied by the peak hour flow factor (1.32 x flow) determined when analyzing the diurnal curve and flow meter data.

Table 4-4 2023 Historic Peaking Factors

Daily Peak Hour Peaking Factor	Max Day Peaking Factor	Resultant Peaking Factor
1.32	1.36	1.80

For planning purposes, the population-based peaking factor provided by the Arizona Administrative Code R18-9-E301 will be used when evaluating future infrastructure. In most cases, this will result in a greater, or more conservative, peaking factor, particularly with smaller flows and infrastructure.

4.6 2050 Wastewater Plant Flow Projections

In 2050, the Town is anticipated to provide wastewater service to all areas south and west of the Verde River, including a portion of county land just north of the Town boundary, but excluding the areas around the Tunlii plant operated by YAN. Wastewater flow growth was determined based on the following concepts:

- Future wastewater flows are based on land use.
- The Town's residential population is growing annually by 1%. By 2050, all residents would live in the Town's water service area, which is larger than the wastewater service area.
- The existing ratio of residential to commercial flows (60% residential, 40% commercial) will be maintained through 2050.

The wastewater flow projections shown in Table 4-5 are based on land use, the anticipated service areas, and population projections.

Table 4-5 2050 Projected Wastewater Plant Flow

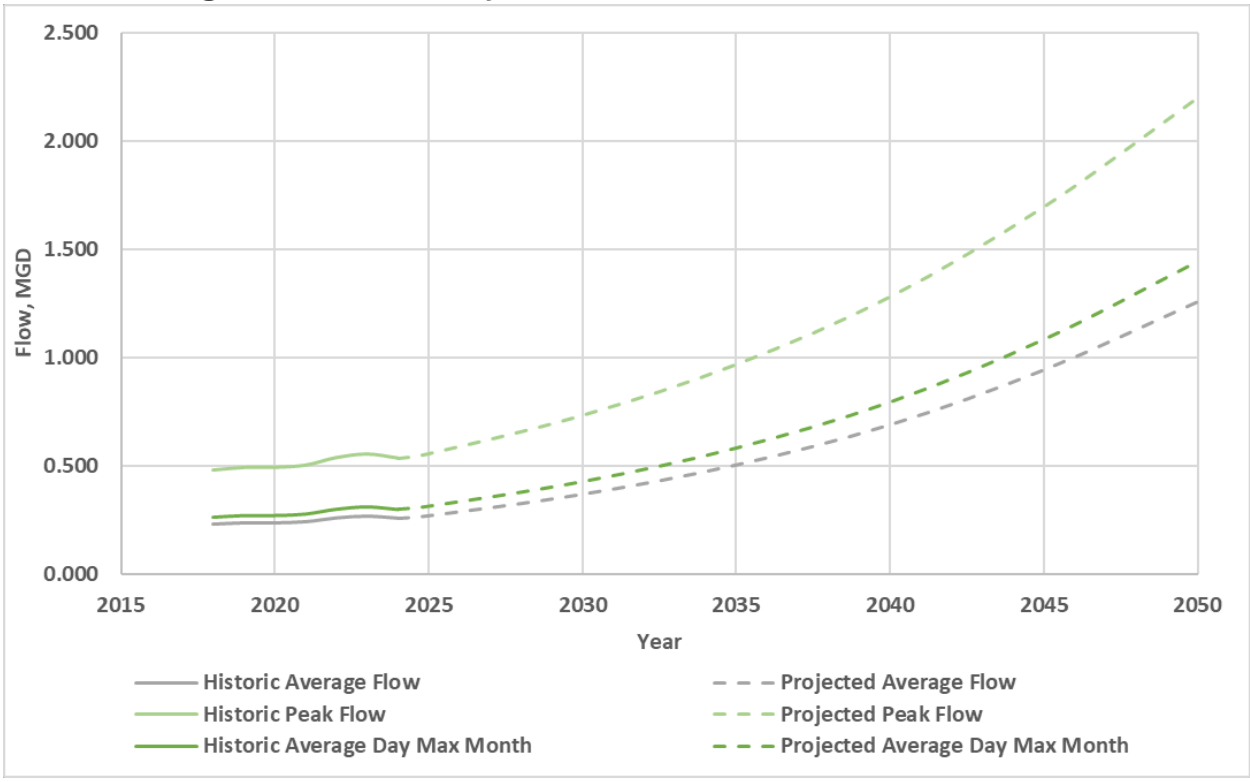
Facility	Average Day Flow, gpd
Alcantara (Town)	281,000
Main Plant (Town)	1,240,000
Total	1,521,000

The projected flow to the main plant is tabulated in Table 4-6. The table includes average day, average day max month based on the historic average day max month peaking factor, and peak flow based on ADEQ peaking factors. For the ADEQ peaking factor, it is assumed that the wastewater generated per person per day will decrease over time. In existing conditions, it is assumed that a person will generate 80 gallons of wastewater per day. It is also assumed that the flow per person will decrease to 70 gallons per day by 2050. The projected flow is shown graphically in Figure 4-6.

Table 4-6 2050 Projected Main Plant Wastewater Flow

Year	Avg Flow, MGD	2023 Max Month Factor	Average Day Max Month, MGD	Assumed gal/person	Equiv. Total Population	ADEQ Peaking Factor	Peak Flow, MGD
2024	0.258	1.15	0.30	80	3,224	2.07	0.53
2025	0.270	1.15	0.31	79.26	3,411	2.06	0.56
2030	0.369	1.15	0.42	77.41	4,770	1.99	0.73
2035	0.504	1.15	0.58	75.56	6,676	1.92	0.97
2040	0.689	1.15	0.79	73.70	9,349	1.86	1.28
2045	0.941	1.15	1.08	71.85	13,100	1.80	1.70
2050	1.25	1.15	1.44	70	17,922	1.75	2.20

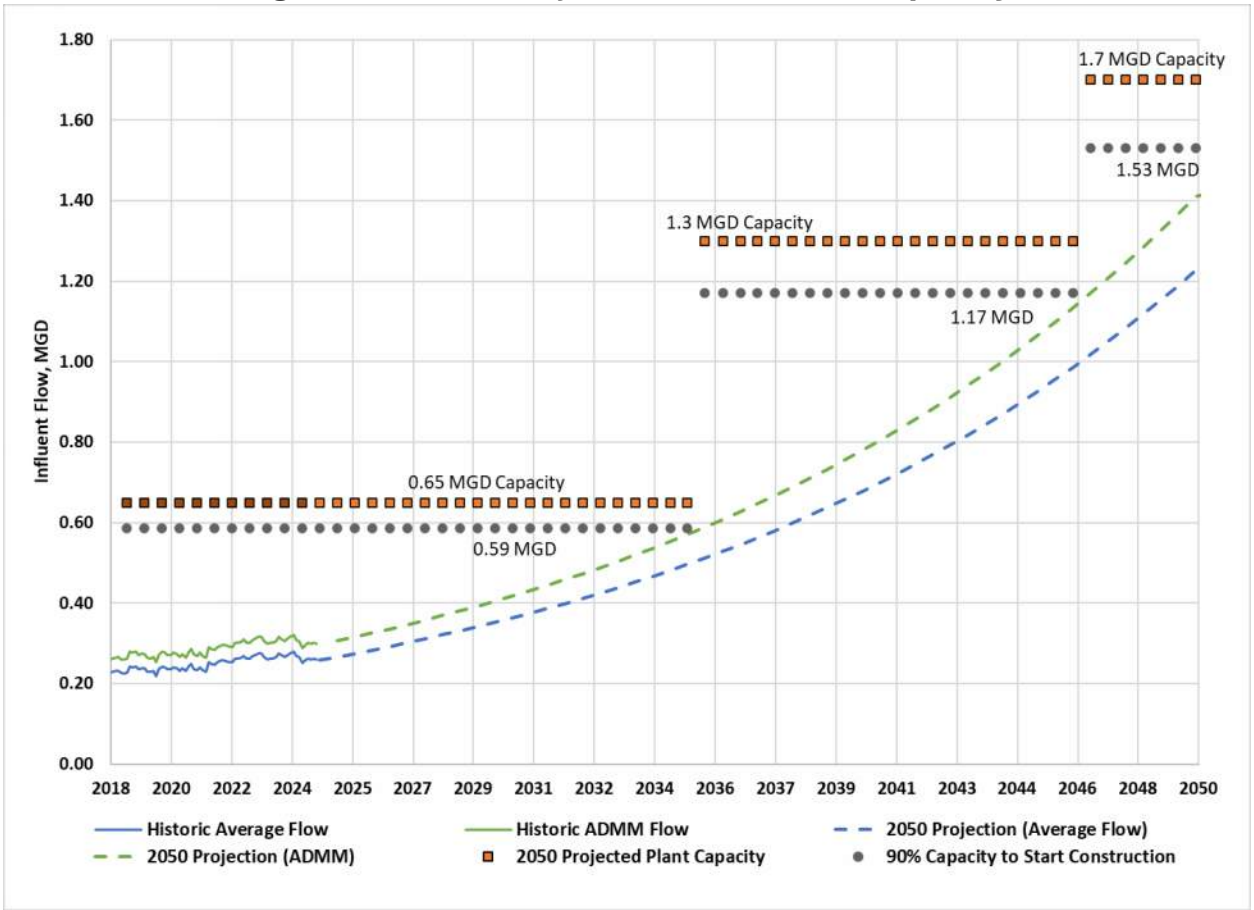
Figure 4-6 2050 Projected Main Plant Wastewater Flow



The main plant is currently permitted up to 0.65 MGD treatment capacity and up to 1.3 MGD for Phase II, as discussed in Section 2.4. Typically, construction for the next phase should start when the plant's ADMM flow reaches 90% design capacity. According to the 2050 wastewater flow projection, the plant's ADMM flow will reach 90% capacity of 0.65 MGD (0.59 MGD) by 2035, and

90% capacity for 1.3 MGD (1.17 MGD) by 2046. A new permit for a designed capacity of 1.7 MGD is required once the plant reaches 1.17 MGD capacity. The main plant's capacity for the projected 2050 wastewater flow is shown in Figure 4-7.

Figure 4-7 2050 Projected Main Plant Capacity



4.7 Buildout Wastewater Plant Flow Projections

In buildout conditions, it is anticipated that the entire Town will be served by a centralized wastewater collection system. Table 4-7 shows the buildout wastewater flow projections for the entire Town. These include areas served by the Town, YAN, and the Verde Lakes Water Company.

Table 4-7 Buildout Flow Projections

Service Provider	Facility	Avg. Day Flow, MGD
Town	Alcantara	0.94
	Main Plant	4.08
	New Plant	0.69
	Town Subtotal	**5.71**
YAN	Tunlii	0.27

	Lagoon Plant	0.93
	YAN Subtotal	**1.20**
Verde Lakes Water Corp.	Verde Lakes	0.44
Total	**-**	**7.35**

SECTION 5. Hydraulic Modeling and Analysis

5.1 Modeling Software Selection

A hydraulic computer model of the wastewater system was developed using Aquatwin Sewer by Aquanuity.

5.2 GIS Database and Model Development

A GIS database of the Town's wastewater system developed alongside this Master Plan was used as the basis for a hydraulic computer model of the wastewater collection system. The GIS database incorporated information from as-built drawings, an aerial survey, parts of a previous GIS database, and other sources as appropriate.

Both existing and future conditions scenarios were modeled for a variety of flows and development conditions. The future conditions scenarios incorporate the capital improvement projects in SECTION 6 of this report.

5.3 Wastewater Loading

For the existing conditions, wastewater flow was assigned, or loaded, to manholes located throughout the collection system according to geolocated water meter demand data provided by the Town. The water demand attributed to a location was then adjusted so the overall wastewater flow for the system matched the Town's average flow of 0.267 MGD. Wastewater flow for future conditions was attributed to the model based on land use as discussed in Section 3.4 and Section 4.6.

5.4 Gravity Sewer Mains and Manholes

The locations and elevations of existing gravity sewer mains and manholes were imported into Aquatwin based on data from the aerial survey and field condition assessments. The data was supplemented by additional field data and as-built drawings as needed.

Future gravity mains and manholes were placed throughout the anticipated 2050 service area to act as trunk mains for additional connections. The elevations are such that a slightly greater than minimum slope is maintained. In most cases, at least 8' of cover is maintained, except for the gravity sewer main leading from Lift Station 3. In most locations, the future sewer depth is less than

15’. However, some short stretches of up to 25’ depth will be required due to local topography. Additional analysis and design of the final sewer locations may reduce the constructed depth.

5.5 Lift Stations and Force Mains

Lift stations were modeled using a method that does not use actual pump curves, pump controls, or wet well characteristics. Instead, the pumps were arranged to automatically transfer all flow to the downstream location.

5.6 Model Calibration

The steady state average day model flows in the existing conditions were adjusted to approximately match the data provided from the flow monitoring analysis used to develop a diurnal curve for the system.

5.7 Model Scenarios

Two development conditions were explicitly modeled in steady-state scenarios. These were the existing conditions and the 2050 conditions. In the 2050 model it was assumed that all the improvements listed in the Capital Improvements Plan in SECTION 7 were fully implemented. Aquatwin Sewer does not require separate scenarios to be run using separate peaking factors. Instead, a single scenario provides results showing both average day and peak hour conditions. The peaking factors used in the steady state conditions were those listed in the Arizona Administrative Code R18-9-E301, which is based on an equivalent population. Wet weather scenarios were not included because of the minimal influence of rainfall events.

5.8 Model Results

The model results indicate the existing wastewater collection system has sufficient capacity to convey the existing flows without exceeding any d/D requirements.

The future conditions were modeled both with and without the equalization basin located at proposed Lift Station 3, as discussed in Section 6.5. As modeled, the results indicate that the projected peak flow will exceed the conveyance capacity directly downstream of the I-17 Crossing unless the flow is attenuated or capacity is increased. The model results also show that a segment of the downstream trunk main installed near the lift station may reach a d/D of approximately 0.9-1.0 if the equalization basin is not installed.

It should be noted that elevations assigned to this portion of the existing 21-inch trunk main indicate they are installed at slopes below the allowable minimum. This is somewhat unlikely and may indicate that flawed data was used when the model was constructed. The existing mains are calculated to have sufficient capacity for the future peak flow if they were installed at the minimum allowable slope. Therefore, it is recommended that the 21-inch main is surveyed when the equalization basin discussed in Section 6.5 is considered.

The model results show that an equalization basin installed near proposed Lift Station 3 can successfully reduce the flow downstream so the existing sewer mains can convey the projected peak flows at acceptable d/D ratios. Figures showing the projected 2050 peak flow d/D ratios with and without the equalization basin are included in Appendix H.

SECTION 6. Future Wastewater Infrastructure

6.1 Design Criteria

The recommended design and analysis criteria for the wastewater system infrastructure are summarized below in Table 6-1. Appendix I contains a comparison of these recommendations along with the City of Cottonwood and the City of Prescott.

Table 6-1 Recommended Infrastructure Design Criteria

Design Parameter	Recommended
Gravity Main Velocity (full flow)	2 ft/s < V < 10 ft/s
Force Main Velocity	3 ft/s < V < 7 ft/s
d/D for new gravity sewer (<12”)	0.50
d/D for new gravity sewer (=>12”)	0.75
max d/D for existing mains	0.75
Gravity Main Roughness	n = 0.013
Force Main Roughness	c = 120
Design Flows	See Table 3-1 for general Land Use
	per AAC for specific uses
Per Capita Wastewater Generation	80 gallons / person
Dry Weather Peaking Factor (New Developments)	per AAC Table
Wet Weather Peaking Factor (New Developments)	N/A

6.2 2050 Wastewater System

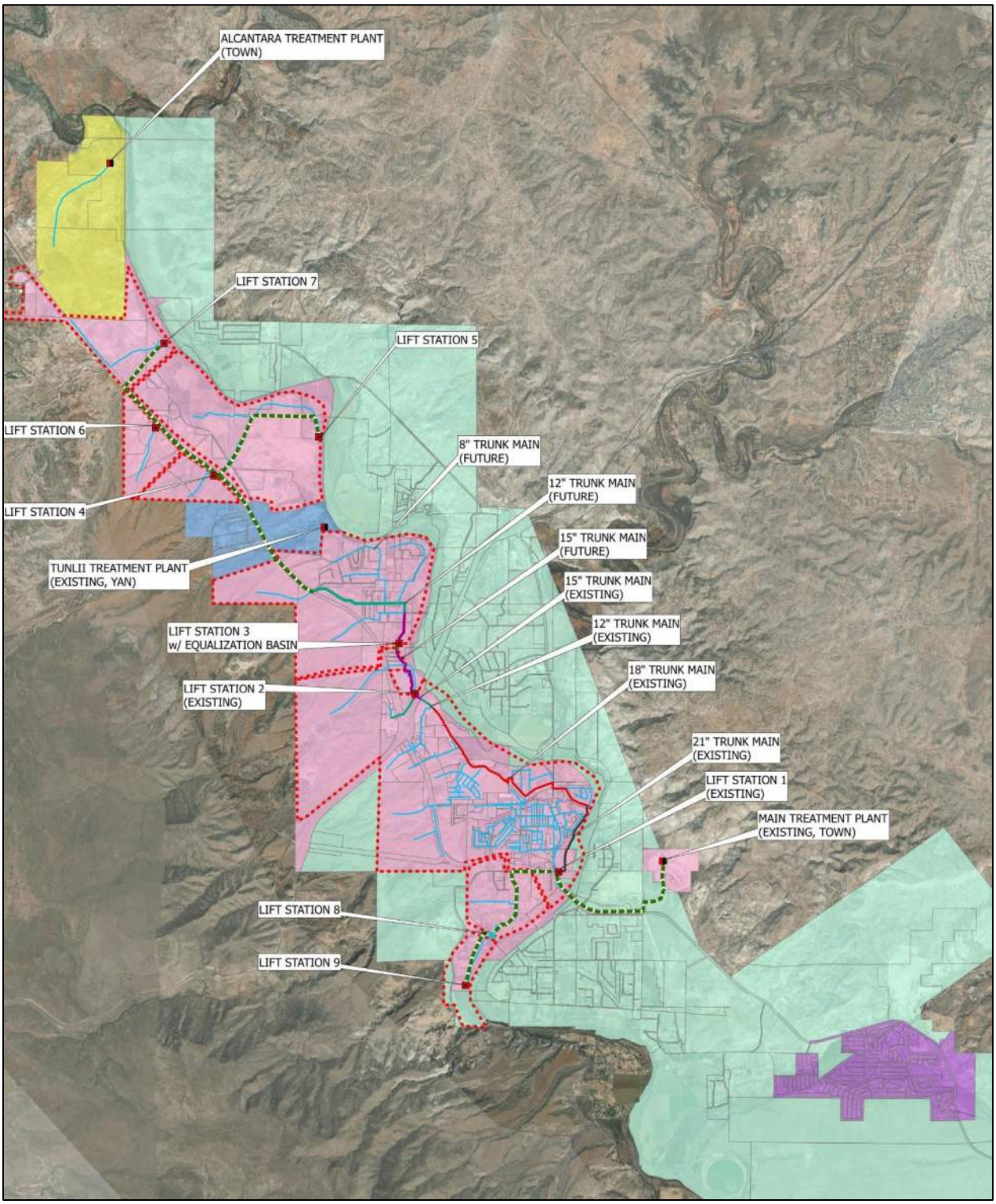
The conceptual layout of the Town's 2050 backbone wastewater system is shown in Figure 6-1. As shown in the figure, the Town will serve all areas west of or south of the Verde River and a small portion of county land north of the Town boundary. A more detailed figure is included in Appendix J.

Ground elevations in the 2050 service generally decrease north to south, and from the Town boundary towards the Verde River. However, the slopes are broken due to many ridges and dry washes perpendicular to the river. This creates many natural, disconnected gravity sewer basins with the lowest point near the Verde River. From the bottom of each basin, lift stations will be needed to pump wastewater to Highway 260, and south along the highway to a point where it can be discharged to the gravity collection system, which will convey it to the Town's main treatment facility.

Wastewater from the County area north of the Town boundary will flow to a new treatment facility near the Alcantara winery and resort. It is understood that Town officials have held discussions with potential developers regarding this facility.

The system as depicted in Figure 6-1 and the figure in Appendix J is meant to be the basis for future detailed engineering design as the system expands over time. The future sewer main alignments show trunk or backbone sewer mains required to serve larger areas, not particular streets or neighborhoods. Final sewer main alignments, basin boundaries, pipe sizes, manhole inverts, and lift station locations will need to be carefully evaluated and finalized as the wastewater system develops.

Figure 6-1 2050 Wastewater System

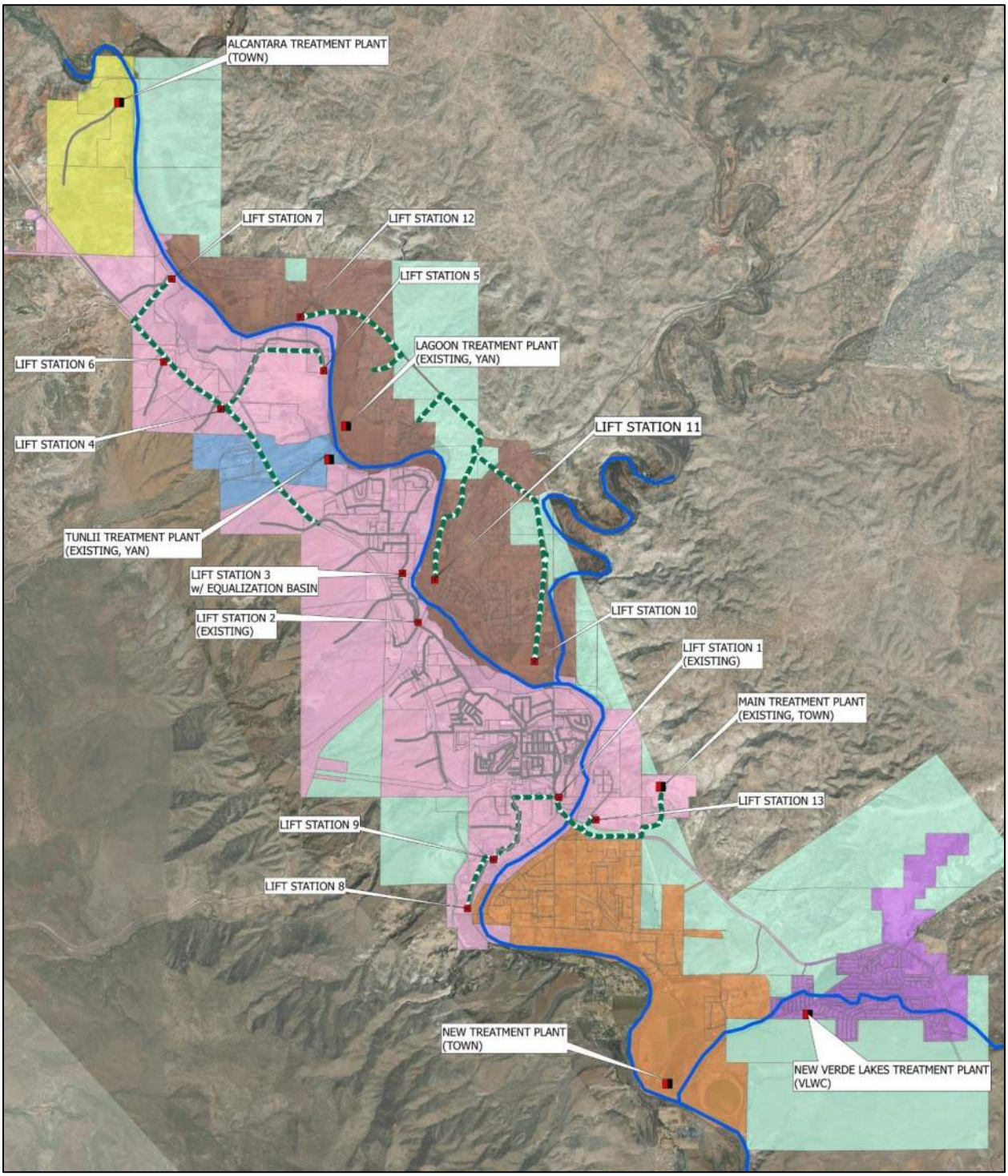


It is understood that the High View development will install two long-term but temporary package treatment plants that will treat wastewater flows from those developments. However, it is also understood that those treatment plants will be converted into lift stations prior to 2050. For this reason, the two package treatment plants are not shown in the figure.

6.3 Buildout Wastewater System

The conceptual layout of the Town's buildout wastewater system is shown in Figure 6-2. As shown in the figure, all areas within the Town boundary, except for forest service lands, are anticipated to be served by a centralized wastewater collection and treatment system in the buildout condition. The figure shows several new lift stations and treatment facilities operated by the Town and others. The figure generally does not show gravity sewer mains since the figure depicts a condition that is outside the 2050 planning horizon.

Figure 6-2 Buildout Wastewater System



6.4 2050 Gravity Mains

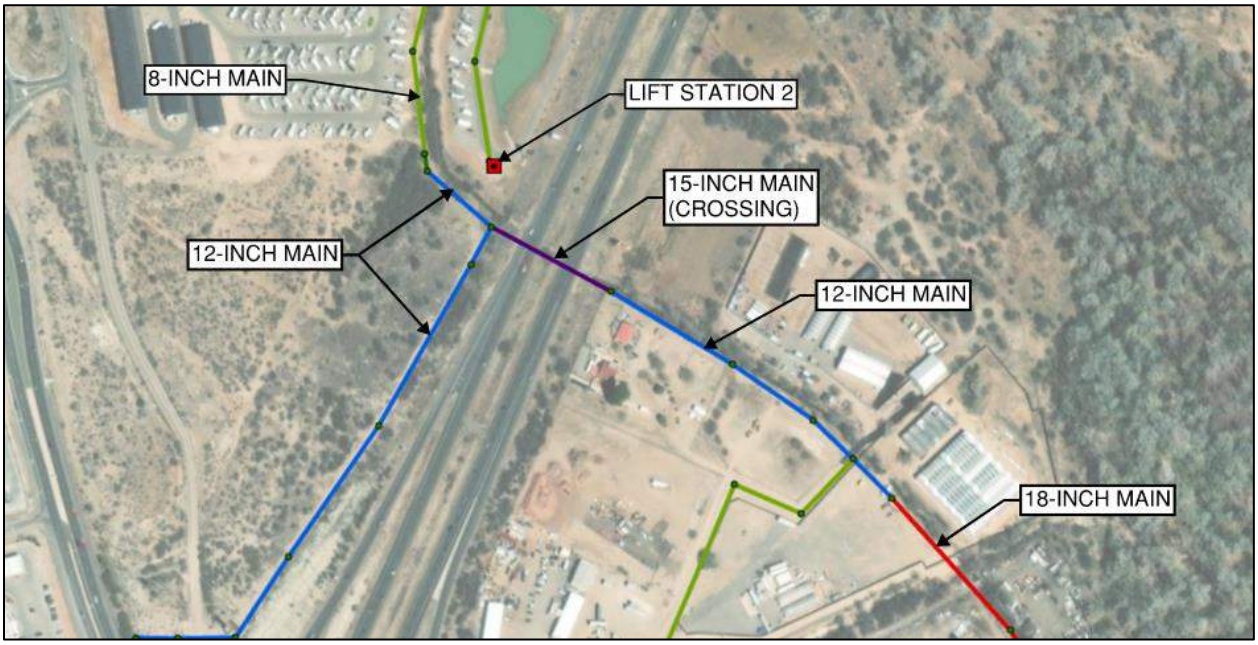
Existing sewer mains and proposed gravity trunk mains required in 2050 are shown in Figure 6-1. The figure in Appendix J shows the 2050 system layout in greater detail. The trunk mains are sized for 2050 peak flows, based on the 2050 flow projections and ADEQ peaking factors. The figures do not depict the numerous local sewer mains and laterals that will be required to convey flow to the trunk mains.

In developed areas, the trunk mains generally follow existing or likely future rights of way, or are shown between buildings or along property lines in developed areas of the Town. The trunk mains shown in currently undeveloped areas follow likely alignments required by topographic conditions. Alignments were chosen to minimize required depth and to enable the maximum service areas. The trunk mains were assumed to have an 8-foot minimum depth in most locations. This will enable additional local mains and service laterals to tie into them and also allow for some flexibility at final design.

6.5 I-17 Crossing Bottleneck

The existing wastewater system backbone was installed in 2006. It consists of 12-inch through 21-inch mains that increase in size as the pipes approach Lift Station 1. There is a bottleneck caused by the existing gravity sewer mains both upstream and downstream of the 15-inch crossing underneath I-17. At this location, 12-inch and 8-inch sewer mains are installed leading to the crossing, and approximately 1,200 LF of 12-inch sewer main is installed downstream of the crossing. These pipe sizes create a bottleneck in the gravity collection system that limits the amount of wastewater that can be generated upstream of the crossing without requiring improvements.

Figure 6-3 I-17 Crossing



6.5.1 Capacity Analysis

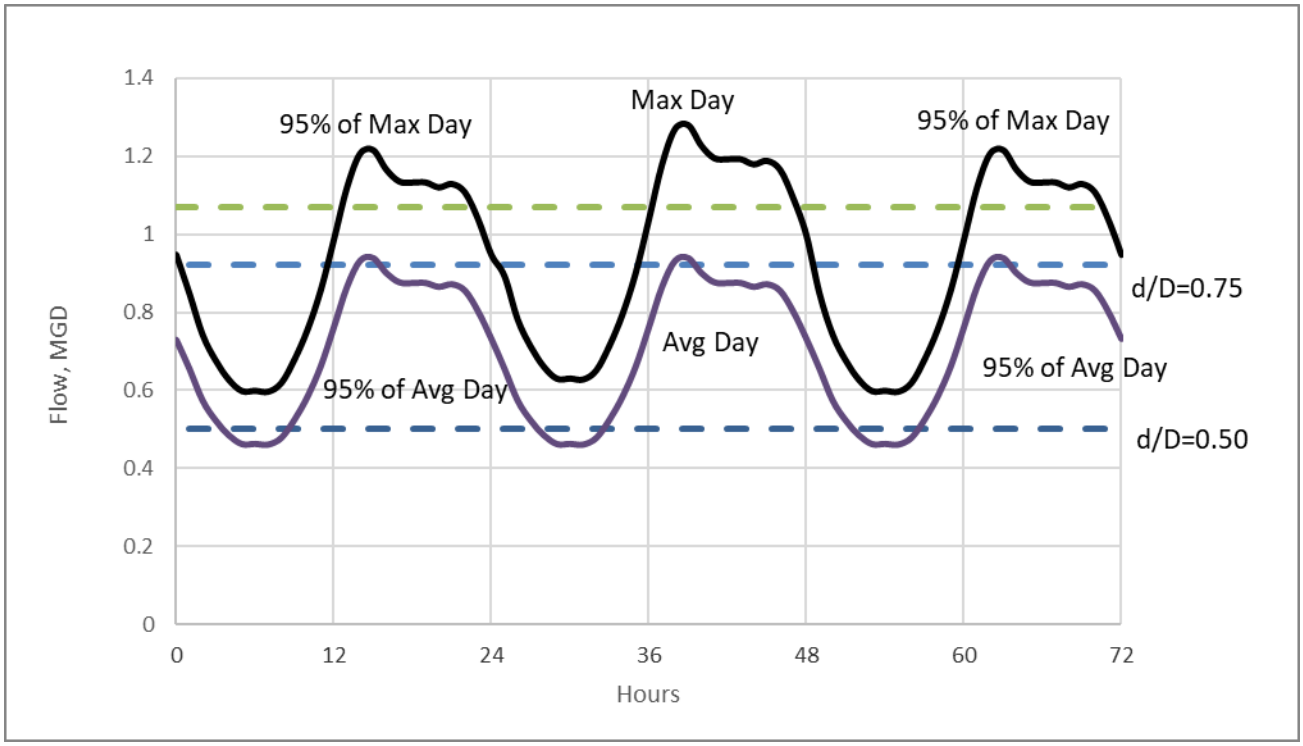
Average day flows at the crossing in 2050 are projected to be 0.71 MGD, which equals a 1.28 MGD peak flow using historic peaking factors and curves. The downstream capacity of the 12-inch main is approximately 0.92 MGD, which is equivalent to an average day flow of 0.51 MGD. These flows are shown in Table 6-2.

Table 6-2 2050 Flows at I-17 Crossing

Projected Avg Day Flow, MGD	Projected Peak Hour Avg Day, MGD	Projected Max Day Flow, MGD	Projected Peak Hour Max Day, MGD	Downstream Capacity (d/D =0.75), MGD	Downstream Capacity Equivalent Avg Day Flow, MGD
0.71	0.94	0.97	1.28	0.92	0.51

Figure 6-4 graphically depicts projected flows at the crossing on average and max day conditions while incorporating the diurnal pattern shown in Section 4.4. The average and max day curves are preceded and followed by a day with 95% of that flow. Capacity at different d/D values for the downstream 12-inch main is also shown. As shown on the table and figure, the 0.75 d/D will be exceeded on an average day basis as well as a maximum day basis. This means that additional capacity will be required, or flow must be attenuated.

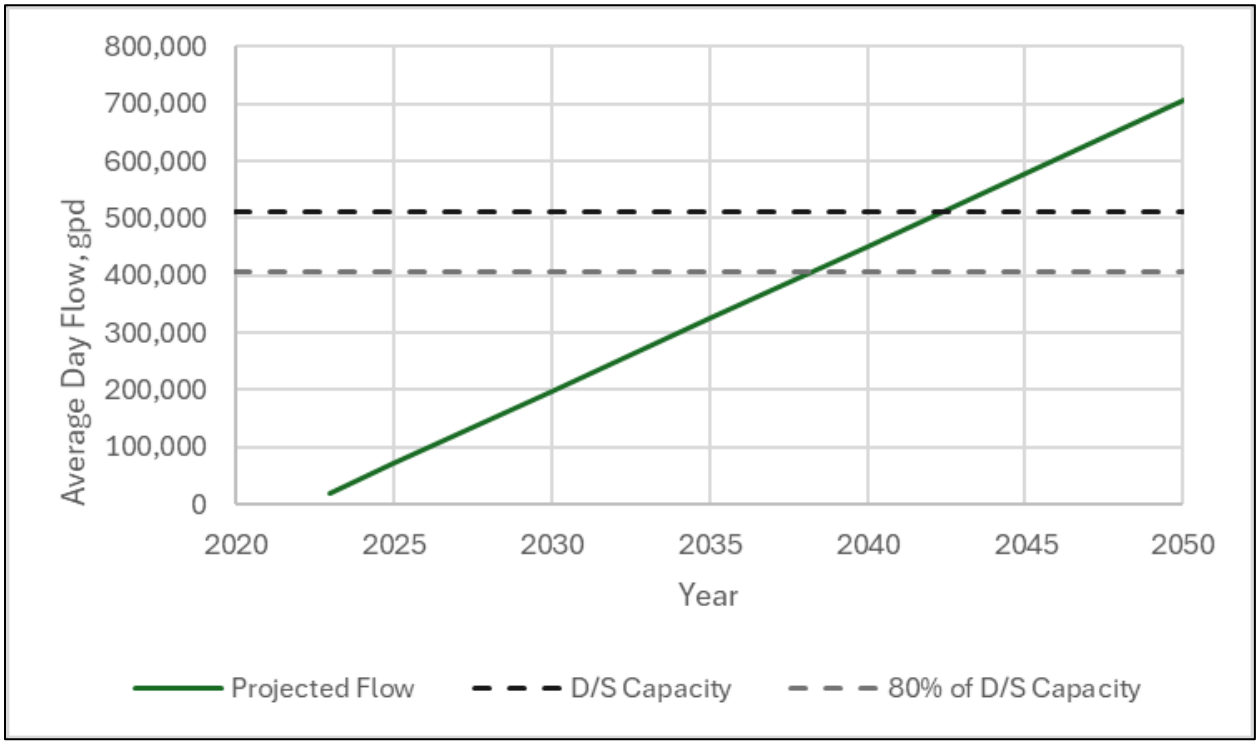
Figure 6-4 2050 Projected Flow at I-17 Crossing



For this report, it is recommended that detailed analysis and design of new infrastructure begin when flows at the crossing reach 408,000 gallons per day or 283 gpm (80% of average day downstream capacity). Average flows at the crossing are currently estimated to be only 20,000 gallons per day based on hydraulic modeling. However, it must be noted that the existing flows are understood to be highly variable and seasonal due the Verde Ranch RV Resort and the Verde Ranch Car Wash. Both of these businesses are known to use water sources not monitored by the Town, which makes the use of metered water as a substitute for actual wastewater flows not applicable.

The projected flow growth at the crossing is shown in Figure 6-5, assuming a straight-line growth between 2023 and 2050. However, actual growth will likely be “lumpy” and varied due to the expansion of the upstream wastewater system and new developments coming online. According to the figure, 80% of downstream capacity (downstream capacity is d/D=0.75) will be reached around 2038 and the existing capacity will be exceeded around 2042. However, flow monitoring of the crossing should begin when the wastewater system north of I-17 starts to significantly expand. The 12-inch section of main should also be carefully surveyed so that the exact capacity can be calculated based on the actual existing conditions. This will help the Town recognize when planning and design of new infrastructure should begin and the options more thoroughly evaluated.

Figure 6-5 Projected Flow Growth at I-17 Crossing



Three options for mitigating the downstream bottleneck were preliminarily analyzed. These included the installation of a treatment facility north of I-17, which would reduce flow downstream, the installation of an equalization basin north of I-17 that will attenuate the flow peaks, and the installation of parallel or upsized pipes downstream of I-17 to add capacity.

6.5.2 New Treatment Facility

The first option considered was the installation of a treatment facility north of I-17. The facility would need to be large enough and positioned in such a location that it can intercept and treat flows from upstream areas. This facility will have large upfront capital costs and ongoing maintenance costs.

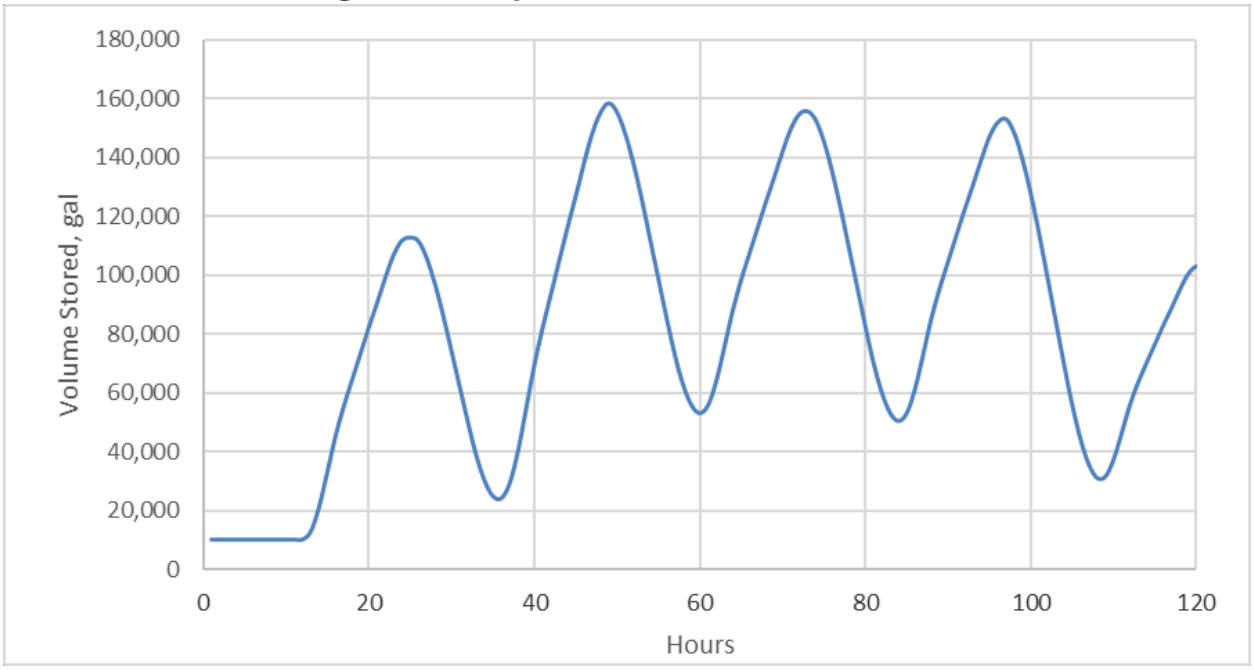
6.5.3 Equalization Basin

The second option considered was the installation of an equalization basin upstream of the I-17 crossing at the anticipated location of Lift Station 3. When using the patterns and flow in Figure 6-4 and Table 6-3 it can be determined that a 160,000-gallon equalization basin will be needed around 2043, depending on how quickly the area develops. Figure 6-6 illustrates the volume stored in an equalization basin over a 4-day period. As shown in the figure, the volume stored decreases over time as it is slowly pumped out at a rate to match the downstream capacity of 0.92 MGD.

Table 6-3 Assumed Equalization Basin Flow Pattern

Day	Day 1	Day 2	Day 3	Day 4	Day 5
% of Max Day	95%	100%	95%	95%	90%

Figure 6-6 Equalization Volume Stored



A 160,000-gallon equalization basin would have a 20’ x 60’ footprint and would be 20’ deep. The basin would need to be covered, and additional needed equipment would include odor control, level control, and electrical gear. It is anticipated that the Lift Station 3 pumps can be used to pump wastewater from the basins.

6.5.4 Upsize Downstream Sewer Mains

The bottleneck downstream of the crossing may also be eliminated by upsizing or installing new parallel downstream sewer mains. Replacing the existing 12-inch sewer main with a 15-inch sewer main installed at minimum slope would increase the capacity to approximately 1.43 MGD, which would be sufficient for the 2050 peak flow. Or, a parallel main could be installed alongside the existing sewer main to add the required capacity. However, installing a parallel main will do nothing to attenuate any peak flow that exceeds the main capacity near Lift Station 1.

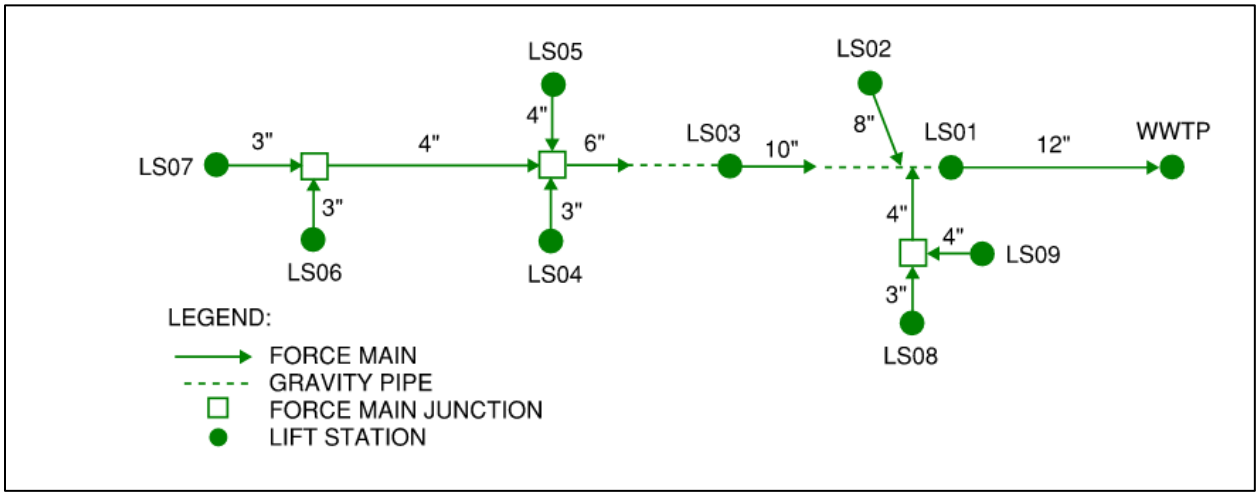
6.5.5 Recommendation

The new treatment facility, equalization basin, and upsizing of downstream sewer mains were all considered and evaluated. It is recommended that an equalization basin be installed near Lift Station 3. This is recommended because it will provide the most operational flexibility for the Town, and may be expanded with additional needs. The lift station will also reduce peak flow for all locations downstream, rather than adding capacity to a particular location. As discussed previously, it appears portions of the trunk main may be installed with shallow slopes near Lift Station 1. If this is true, the equalization basin will also help to attenuate the peak flows through this segment of the trunk main.

6.6 2050 Lift Stations and Force Mains

It is anticipated that seven new lift stations will be needed for the wastewater system to convey flow south to the Town's main treatment facility in addition to the existing two lift stations in 2050. The approximate locations are shown in Figure 6-1. Lift Station 4 and Lift Station 6, shown on the figure, are expected to replace the packaged treatment plants installed for the High View development. It is anticipated that multiple lift stations will pump into a single force main since much of the force main will be installed along Highway 260. A schematic of the anticipated lift station and force main system is shown in Figure 6-7. The anticipated force main diameters are also shown.

Figure 6-7 2050 Force Main Schematic



Since flows will increase over time as the area develops and new lift stations are added, the installation of one large and one small force main is recommended. This will enable the force main to be switched from the small force main to the large force main as additional capacity is needed. Table 6-4 presents a summary of the flows and force mains required for each lift station and force main as depicted above.

Table 6-4 2050 Lift Station Summary

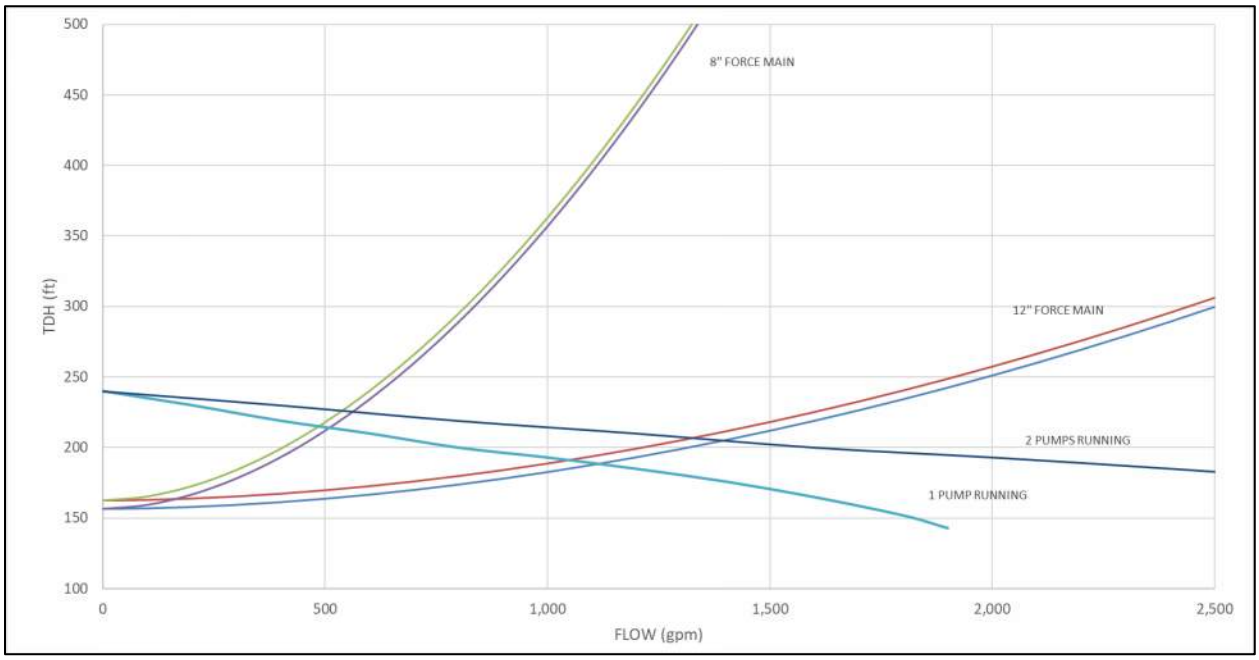
Lift Station	Local Avg Flow, gpd	ADEQ Peaking Factor	Local Peak Flow, gpd	Local Force Main, in	Local Force Main Velocity, ft/s	Combined Downstream Force Main, in	Combined Downstream Force Main Velocity, ft/s
LS01	1,224,113	1.76	2,157,126	12”	4.25	NA	NA
LS02	486,027	1.91	930,430	8”	4.12	NA	NA
LS03	559,896	2.56	1,433,335	10”	4.07	NA	NA
LS04	50,405	2.48	124,938	3”	3.94	6”	6.05
LS05	165,683	2.15	355,537	4”	6.30		
LS06	74,941	2.36	176,671	3”	5.57	4”	6.68
LS07	101,851	2.27	231,305	3”	4.10		
LS08	40,676	2.55	103,684	3”	3.27	4”	5.47
LS09	100,407	2.27	228,416	4”	4.05		

Additional local, privately owned and operated lift stations not shown here may also be required for individual developments and homeowners. These lift stations may be required if a new development is located and planned in such a way that the Town's wastewater collection system cannot serve them. The developers, owners, and homeowners associations of these areas will be responsible for the design, construction, operation, and maintenance of these lift stations.

6.6.6 2050 Lift Station 1 Capacity

Lift Station 1 currently pumps through an existing 8-inch force main to the Town’s wastewater treatment plant. There is also an existing 12-inch force main that is not currently used. Figure 6-8 shows the pump and system curves for Lift Station 1 assuming either one or two pumps are running of the three total installed. The figure illustrates that the existing pumps can convey approximately 550 gpm (792,000 gpd) through the 8-inch force main. According to the main plant flow projections shown in Table 4-6, this will be sufficient for peak flow until the 2025-2030 timeframe. At this point, the pumps will either have to be upsized or the 12-inch force main will need to be used. As also shown in the figure and Table 4-6, the existing pumps and 12-inch force main will be sufficient for approximately 1,400 gpm peak flow (2.02 MGD), which is projected to be sufficient until the 2045-2050 timeframe. Please note that the wet well size was not included in this analysis.

Figure 6-8 Lift Station 1 Pump and System Curves



6.7 Buildout Lift Stations and Force Mains

Additional lift stations and capacity for existing lift stations will be needed at buildout. Below, Table 6-5 shows the requirements of each lift station, based on the locations shown in Figure 6-1 and the buildout flows based on land use.

Table 6-5 Buildout Lift Station Summary

Lift Station	Total Avg Flow, gpd	ADEQ Peaking Factor	Total Peak Flow, gpd	Force Main Diameter, in	Peak Flow Force Main Velocity, ft/s
LS01	3,572,621	1.62	5,795,248	16	6.42
LS02	1,294,835	1.75	2,263,610	12	4.46
LS03	1,489,841	2.56	3,813,993	16	4.23
LS04	112,031	2.25	251,554	4	4.46
LS05	442,442	1.93	854,955	6	6.74
LS06	165,641	2.15	355,457	4	6.30
LS07	260,039	2.04	530,965	4	9.41

Lift Station	Total Avg Flow, gpd	ADEQ Peaking Factor	Total Peak Flow, gpd	Force Main Diameter, in	Peak Flow Force Main Velocity, ft/s
LS08	228,289	2.07	472,744	6	3.73
LS09	350,583	1.98	693,684	6	5.47
LS10	468,519	1.92	900,184	6	7.09
LS11	149,990	2.17	325,530	4	5.77
LS12	98,939	2.28	225,476	4	4.00
LS13	459,169	1.93	883,993	6	6.97

6.8 2050 Treatment Plant Capacity

As discussed in Section 2.4 the existing treatment plant is permitted up to 1.3 MGD design capacity. This section describes all the process units and any modifications required for the Phase 2, 1.3 MGD design capacity. The design criteria follow ADEQ Bulletin Number 11 as amended by BADCT and the latest WEF Manual of Practice (MOP) 8 handbook. Table 6-6 summarizes the main process units expansions from existing to 2050.

Table 6-6 Buildout Process Expansion Summary

	Existing	Phase 1 – 0.65 MGD	Phase 2 – 1.3 MGD	2050
Flows				
AAD flow, mgd	0.27	0.57	1.13	1.24
ADMM flow, mgd	0.31	0.65	1.30	1.42
PH flow, mgd	0.45	0.96	1.92	2.17
Aeration Basins				
No. of Duty Aero-Mod Unit	1	1	2	2

	Existing	Phase 1 – 0.65 MGD	Phase 2 – 1.3 MGD	2050
Anoxic Zone Volume, cft	4,480	4,480	4,480	4,480
Aeration Zone Volume, cft	43,710	43,710	87,420	87,420
Total Volume, cft	48,190	48,190	91,900	91,900
Secondary Clarifier				
Existing No. of Clarifiers	2	2	2	2
Surface Area (Each), sf	960			
Number of Duty Units	1	1	2	2
Surface Overflow Rate at AAD flow, gpd/sf	278	589	589	643
Surface Overflow Rate at PH flow, gpd/sf	473	1,001	1,001	1,093
Note: Surface Overflow Rate should not exceed 800 gpm/sf at AAD flow and 1,200 gpm/sf at PH flow per ADEQ Bulletin No. 11 and WEF MOP 8.				
Filters				
Existing No. of Filters	1	1	1	1
Disk per Filter Unit	6			
Filter Area per Disk, sf	50			
Hydraulic Loading Rate at AAD flow, gpm/sf	0.62	1.31	2.62	2.86
Hydraulic Loading Rate at PH flow, gpm/sf	1.05	2.22	4.45	4.86
Note: Hydraulic loading rate should not exceed 10 gpm/sf per Title 22 Report.				
UV				

	Existing	Phase 1 – 0.65 MGD	Phase 2 – 1.3 MGD	2050
Minimum hourly flow, mgd	0.35			
PH flow, mgd	1.08			
No.of Duty Units	1	2	4	4
No.of Standby Units	1	1	1	1
Total No. of Units	2	3	5	5
Chlorine Contact Basin				
Channel Width, ft	7.8			
Channel Length, ft	16.5			
Water Depth, ft	9.3			
Volume per Train, cft	1,190			
Contact Time at AAD flow, min	30			
No. of Duty Units for AAD flow	1	2	3	3
Contact Time at PH flow, min	15			
No. of Duty Units for PH flow	2	3	5	5
Total No. of Units (Existing/New)	4/0	4/0	4/1	5/0
Septage Receiving Tank				
Septage flow, gpd	11,961	25,321	50,643	55,327
Tank Volume (each), gal	40,691			
No. of Duty Units	1	2	3	3
HRT, d	1.6	1.5	1.1	1.0

	Existing	Phase 1 – 0.65 MGD	Phase 2 – 1.3 MGD	2050
Digester				
Septage + WAS flow, gpd	25,311	53,582	107,165	117,077
Tank Volume (each), gal	157,678			
No. of Duty Units	2	2	4	4
HRT, d	12	5.9	5.9	5.4
Belt Filter Press				
Flow, gpm	19	39	79	86
Solids, ppd	4,479	9,482	18,964	20,718
BFP Size, m	1.5			
No. of Duty Units	1	2	3	3
No. of Standby Units	1	1	1	1
Total No. of Units (Existing/New)	1/1	2/0	2/1	3/0

6.9 Equalization Basin

The main plant could benefit from providing an equalization basin upstream of the main process units. This would reduce the peak hour flows significantly and allow the facility to operate more uniformly and offset daily peak flows and low flow overnight. This will flatten the flow pattern, ease the operation of wasting, filtration, and chemical/UV dosing.

Phase	AAD Flow, MGD	EQ Basin Size, gal
Current	0.3	25,000
Phase 1	0.7	60,000
Phase 2	1.3	110,000

2050	1.42	120,000

6.10 Existing Blowers Evaluation

The main plant currently has five (5) existing blowers for the aeration process, and recently purchased three (3) more. The blower capacity is 536 scfm each. With one blower offline, the current firm blower capacity is 3,752 scfm. These blowers provide air for the Aero-Mod system, including the selector tank and the aeration tanks. The airflow rate requirement for each phase is summarized in Table 6-7.

Table 6-7 Airflow Requirement Summary

	Existing	Phase 1 – 0.65 MGD	Phase 2 – 1.3 MGD
Airflow Requirement, scfm[1]	610	900	6,500
Blowers (duty/standby)	2/6	2/6	8/0
[1]Airflow requirement is based on BioWin Models.			

Based on the calibrated BioWin Models, the existing eight (8) blowers are sufficient to provide air to the aeration zones for Phase 1 (0.65 MGD). Based on the BioWin Model, it is estimated that the existing blowers can provide air to a maximum capacity of 0.75 MGD (projected to occur in late 2038). There is a significant jump in airflow requirement from Phase 1 to Phase 2 based on model results. High nitrate concentration was observed in the model for Phase 2 (1.3 MGD) in the effluent due to insufficient anoxic zones for denitrification. To combat the high nitrate concentrations, 20% of the septage is diverted to a second-stage aeration tank as a carbon supplement to aid in denitrification. The septage flow contributes to high airflow requirements because septage is high in organic matter and hence requires high airflow to provide sufficient oxygen.

Currently, the first-stage aeration tanks have fine-bubble diffusers, and the second-stage aeration tanks have coarse-bubble diffusers. Airflow requirements can be reduced if second-stage aeration tanks convert to fine-bubble diffusers. Oxygen transfer efficiency is higher in fine-bubble diffusers, therefore, the airflow requirements are lower, and the existing blowers will be sufficient. See Appendix K for BioWin modeling results.

6.11 Effluent Management

A water balance of the ponds was conducted. Data from April 2022 through March 2024 was used. The estimated volume of the ponds is shown in Table 6-8. The parameters used for the water balance were the average effluent for each month of the study, ratioed up for future flows, average precipitation, irrigation, evaporation, and infiltration. A summary for one year of the water balance study is shown in Table 6-9. The study showed that ponds can properly store effluent up to 0.4 mgd. The storage in the ponds is not sufficient to handle flows above this. It is recommended to explore a AZPDES outfall to accommodate additional effluent. The full water balance results can be found in Appendix L.

Table 6-8 Estimated Volume of Ponds

Parameter	Dimensions
Area, ft^2	476,949
Depth, ft	7
Volume, ft^3	3,338,643
Volume, mg	25

Table 6-9 Effluent Water Balance Study

Parameter	Result
Future Effluent (+), mg	141.04
Precipitation (+), mg	3.43
Irrigation (-), mg	17.31
Evaporation (-), mg	37.42
Infiltration (-),mg	78.13
Net Volume, mg[1]	20.81
Current Effluent Flow, mg/mo* (mgd)	8.62 (0.29)
Future Effluent Flow, mg/mo[2*]	11.8
Future Effluent Flow, mgd	0.39

Parameter	Result
1. Single Month Maximum is 25 mg 2. Limited by available existing storage and infiltration rates * 1 Year Average	

SECTION 7. Capital Improvement Plans

The Capital Improvement Plan (CIP) outlines projects required to meet future water flows within the Town of Camp Verde wastewater system. The CIP is packaged into recommended projects for 2025 through 2050 based on current needs and future development.

The following cost estimates shown in Table 7-2 are for construction-related costs and do not include land/ROW acquisitions (if needed), permitting, or internal Town costs for the subject projects. Some of the following projects and costs are driven by and funded by developers, while others will utilize grants and loans as funding sources. Costs associated with developer-driven projects may be listed here and are the developer's responsibility. As discussed, approximately 95,000 ft of gravity sewer has been identified for replacement over the next 25 years. The annual pipe replacement cost is averaged over the years. The costs are presented in both 2024 dollars and in future dollars, assuming a 3% inflation rate.

7.1 Funding

Funding needs to take place for operation, maintenance, and upgrades to the water system. Funding will be a combination of utilities' rates, impact fees, and capacity fees. The impact fee is calculated based on costs for plant expansion and upgrades to the sewer system. Table 7-1 shows the approved 2025 impact fee per meter size; the impact fees for Cottonwood, AZ, and Clarkdale, AZ, two similarly sized communities, are shown for comparison.

Table 7-1 Capacity Fees

Meter Size, in	Proposed 2024	2022	2024
	Camp Verde	Cottonwood	Clarkdale
0.625 / 0.75	$ 4,500	$ 4,502	$ 5,527
1	$ 7,515	$ 7,518	$ 9,895
1.5	$ 14,985	$ 14,992	$ 19,740
2	$ 23,984	$ 23,995	$ 31,794
3	$ 45,000	$ 45,020	$ 63,638

Wastewater System Master Plan

Table 7-2 Camp Verde CIP Improvements

Year	ID	Project	Description	Estimated Construction Cost / Cost Sharing				Total Project Cost
				Town	YAN	Developer	Grants/Partnerships	
2025	1	Blower Addition Building and Installation	To prepare for the future growth of the Town sewer treatment, staff needs to prepare the north side blower building to add additional aeration to the aeration basin. The new building will provide connections as well as shelter for the new blowers already purchased.	$191,000	$0	$0	$0	$191,000
2025	2	Black Bridge Loop Sewer Main Extension - Project Design (1/3)	The new sewer mains will provide sewer service to residents who have been levied for the district improvements for more than 10 years. Allows future expansion to the north adjacent to Montezuma Castle HWY and connection of the restrooms at Rezzonico Park. To be completed in 2027.	$200,000	$0	$0	$0	$200,000
2025	3	Wastewater Treatment Plant Administration Building	The current office is a single – wide mobile style office. The office is small and in disrepair. Will replace with a tough-shed style building atop a poured-in-place slab.	$85,000	$0	$0	$0	$85,000
2025	4	Wastewater Treatment Plant Control Panels Upgrade	WWTP Control Panels have outdated technology. These need to be updated. 90% of plant controls are out of date. If failure occurs, parts are not available to repair system. The operation of the plant is maintained based on Updated Controls.	$206,250	$0	$0	$0	$206,250
2025	5	Sludge Drying Bed Liner Installation & Septic Hauling Station	The Town was issued a Notice of Violation regarding final inspection of the Sludge Drying Beds. ADEQ has requested that the Town install liners in each basin to prevent any infiltration below the liner.	$550,000	$0	$0	$0	$550,000
2025	6	Northbound Sewer Collection System Expansion - Obtain sewer easement for Phase 1/2 and finalize design (1/5)	Expand the sewer system northwest along the Highway 260 corridor to convert septic areas into the Town sewer system and provide sewer for future development in the area. Removal of septic systems from older residential areas provides more sewer connections options for development within Town limits. To be completed in 2029.	$200,000	$0	$0	$0	$200,000
2025	7	Wastewater Master Plan	The Master Plan will help to determine collection system and treatment system capacities for future development. The Town currently does not have a Wastewater–CAD Model to use for system design and diagnostics, which is a much-needed addition to the toolbox in sizing pipes, flows, lift station pumps, and treatment.	$191,000	$0	$0	$0	$191,000

2025	8	Septage Receiving Station	Install new septage receiving station to replace existing station.	$500,000	$0	$0	$0	$500,000
2025	9	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$150,000				$150,000
			2025 Subtotals:	**$2,273,250**	**$0**	**$0**	**$0**	**$2,273,250**
2026	1	Black Bridge Loop Sewer Main Extension - Construction Sewer Main(2/3)	The new sewer mains will provide sewer service to residents who have been levied for the district improvements for more than 10 years. Allows future expansion to the north adjacent to Montezuma Castle HWY and connection of the restrooms at Rezzonico Park. To be completed in 2027.	$800,000	$0	$0	$0	$800,000
2026	3	Wastewater John Deer Compact Track Loader	Purchase new Track loader, equipment is specially made for maintaining sludge drying area. The new equipment provides for safety and more productive movement of sludge and solid movement at the plant.	$122,000	$0	$0	$0	$122,000
2026	4	Northbound Sewer Collection System Expansion - Phase 1 Project Construction (2/5)	Expand the sewer system northwest along the Highway 260 corridor to convert septic areas into the Town sewer system and provide sewer for future development in the area. Removal of septic systems from older residential areas provides more sewer connections options for development within Town limits. Lift Station 3 is part of this improvement. To be completed in 2029.	$4,400,000	$0	$0	$1,100,000	$5,500,000
2026	5	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$150,000	$0	$0	$0	$150,000
			2026 Subtotals:	**$5,472,000**	**$0**	**$0**	**$1,100,000**	**$6,572,000**
2027	1	Black Bridge Loop Sewer Main Extension - Construction Sewer Main (2/3)	The new sewer mains will provide sewer service to residents who have been levied for the district improvements for more than 10 years. Allows future expansion to the north adjacent to Montezuma Castle HWY and connection of the restrooms at Rezzonico Park. To be completed in 2027.	$764,909	$0	$0	$0	$764,909
2027	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains.	$327,818	$0	$0	$0	$327,818
2027	4	Northbound Sewer Collection System Expansion - Phase 2 and Phase 3 Final Design (3/5)	Expand the sewer system northwest along the Highway 260 corridor to convert septic areas into the Town sewer system and provide sewer for future development in the area. Removal of septic systems from older residential areas provides more sewer connections options for development within Town limits. To be completed in 2029.	$327,818	$0	$0	$0	$327,818

Wastewater System Master Plan

			2027 Subtotals:	**$1,420,545**	**$0**	**$0**	**$0**	**$1,420,545**
2028	1	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains	$337,653	$0	$0	$0	$337,653
2028	3	Hydro Vac Truck	Purchase a new Hydro Vac Truck.	$562,754	$0	$0	$0	$562,754
2028	5	Wastewater JLG 1055	Purchase new JLG 1055 Lift for use in lifting aeration filters at the plant. At this time, staff must rent this item and put employees at risk to remove the filters to replace them. The expectations for running and operating the Wastewater Plant by the community is a safe environment for plant employees.	$252,114	$0	$0	$0	$252,114
2028	6	Northbound Sewer Collection System Expansion - Phase 2 Construction (4/5)	Expand the sewer system northwest along the Highway 260 corridor to convert septic areas into the Town sewer system and provide sewer for future development in the area. Removal of septic systems from older residential areas provides more sewer connections options for development within Town limits. To be completed in 2029.	$6,753,053	$0	$0	$0	$6,753,053
			2028 Subtotals:	**$7,905,574**	**$0**	**$0**	**$0**	**$7,905,574**
2029	1	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains	$347,782	$0	$0	$0	$347,782
2029	3	Northbound Sewer Collection System Expansion - Phase 3 Construction Continued (5/5)	Expand the sewer system northwest along the Highway 260 corridor to convert septic areas into the Town sewer system and provide sewer for future development in the area. Removal of septic systems from older residential areas provides more sewer connections options for development within Town limits. To be completed in 2029.	$3,477,822	$0	$3,477,822	$0	$6,955,644
			2029 Subtotals:	**$3,825,604**	**$0**	**$3,477,822**	**$0**	**$7,303,427**
2030	1	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$179,108	$0	$0	$0	$179,108
2030	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet each year of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains	$1,791,078	$0	$0	$0	$1,791,078

2030	3	Refurbish Pumps at Lift Station 1	Refurbish one pump each year at Lift Station 1, starting in 2030.	$214,929	$0	$0	$0	$214,929
2030	4	0.65 MGD WWTF Expansion	Begin the process of the needed 0.65 MGD expansion to the WWTF in 2030 to be completed by 2034.	$19,403,350	$0	$0	$19,403,350	$38,806,700
2030	5	3/4 or 1-Ton Pickup Truck	Purchase a new Pickup Truck.	$179,108	$0	$0	$0	$179,108
2030	6	Gravity Sewer Main	Install 10,000 feet of 8-inch gravity sewer main to serve the already developed Salt Mine area south of Hwy 260. This is dependent on the installation of LS09.	$3,462,752	$0	$0	$0	$3,462,752
2030	7	Lift Station 9	New lift station to serve the already developed Salt Mine area south of Hwy 260. Depends on LS08.	$382,097	$0	$382,097	$0	$764,193
2030	8	Force Main	This force main is needed for Lift Station 9. Install 7000 feet of 4-inch pipe.	$725,387	$0	$725,387	$0	$1,450,774
			2030 Subtotals:	**$26,337,809**	**$0**	**$1,107,484**	**$19,403,350**	**$46,848,642**
2035	1	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$207,635	$0	$0	$0	$207,635
2035	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet each year of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains.	$2,076,351	$0	$0	$0	$2,076,351
2035	3	Gravity Sewer Main	Install 22,000 feet of 8-inch gravity sewer main to serve the undeveloped Salt Mine area west of Hwy 260. This will tie into the existing gravity sewer system serving the Verde Ranch Estate Development. Install an additional gravity sewer main in the already developed Salt Mine area south of Hwy 260. This will depend on the installation of LS08 and LS09.	$1,578,027	$0	$7,336,440	$0	$8,914,466
2035	4	Lift Station 8	New lift station to serve the already developed Salt Mine area south of Hwy 260.	$401,428	$0	$0	$0	$401,428
2035	5	Force Main	This force main is needed for Lift Station 8. Install 4000 feet of 3-inch pipe.	$1,591,869	$0	$0	$0	$1,591,869
2035	6	3/4 or 1-Ton Pickup Truck	Purchase a new Pickup Truck.	$207,635	$0	$0	$0	$207,635
			2035 Subtotals:	**$6,062,944**	**$0**	**$7,336,440**	**$0**	**$13,399,384**

2040	1	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$240,706	$0	$0	$0	$240,706
2040	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet each year of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains.	$2,407,060	$0	$0	$0	$2,407,060
2040	3	Replace Pumps at Lift Station 1	Replace one pump each year at Lift Station 1, starting in 2030.	$577,694	$0	$0	$0	$577,694
2040	4	Gravity Sewer Main	Install 21,000 feet of 8- and 15-inch gravity sewer main west of Hwy 260 to serve the YAN properties anticipated to be acquired through a land swap with the US Forest Service. Install the gravity sewer main to serve the County area north of the Town boundary and the Alcantara area. This is dependent upon the Alcantara WWTP being installed.	$263,172	$5,937,414	$3,851,295	$0	$10,051,881
2040	5	Lift Station 4	High View packaged treatment plant converted into lift station.	$561,647	$0	$0	$0	$561,647
2040	6	Lift Station 5	Serves YAN area outside of current Tunlii WRF Service area.	$1,604,706	$0	$0	$0	$1,604,706
2040	7	Force Main	This force main is needed for Lift Station 4 and 5. Install 9000 feet of 6-inch pipe.	$3,048,942	$0	$0	$0	$3,048,942
2040	8	3/4 or 1-Ton Pickup Truck	Purchase a new Pickup Truck.	$240,706	$0	$0	$0	$240,706
2040 Subtotals:				**$8,944,634**	**$5,937,414**	**$3,851,295**	**$0**	**$18,733,343**
2045	1	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$279,044	$0	$0	$0	$279,044
2045	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet each year of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains.	$2,790,442	$0	$0	$0	$2,790,442
2045	3	Lift Station 6	High View packaged treatment plant converted into lift station.	$0	$0	$0	$0	$0
2045	4	Force Main	This force main is needed for Lift Station 6. Install 14,000 feet of 4-inch pipe.	$1,562,647	$2,976,471	$0	$0	$4,539,119
2045	5	Equalization Basin	Install 160,000-gallon equalization basin to attenuate high flows south of I-17 crossing	$2,083,530	$0	$0	$0	$2,083,530

2045	6	0.4 MGD Expansion	Begin the process of the needed 0.4 MGD expansion to the WWTF in 2043 to be completed by 2046.	$2,083,530	$0	$0	$0	$2,083,530
2045	7	3/4- or 1-Ton Pickup Truck	Purchase a new Pickup Truck.	$279,044	$0	$0	$0	$279,044
			2045 Subtotals:	**$9,078,238**	**$2,976,471**	**$0**	**$0**	**$12,054,709**
2050	1	SCADA Upgrades	Upgrade existing SCADA systems to improve continuous monitoring of system.	$323,489	$0	$0	$0	$323,489
2050	2	Gravity Sewer Main Pipe Replacement	This project will replace approximately 5,000 linear feet each year of aged, small undersized gravity mains and add new 8, 12, or 15-inch diameter gravity mains	$3,234,887	$0	$0	$0	$3,234,887
2050	3	Gravity Sewer Main	Install 9,000 feet of 8-inch gravity sewer main to serve the area around Mongini and the future YAN property just south and west of Mongini. This is dependent on the installation of LS07.	$5,822,796	$0	$0	$0	$5,822,796
2050	4	Lift Station 7	New lift station to serve the area around Mongini and the future YAN property just south and west of Mongini	$1,386,746	$0	$0	$0	$1,386,746
2050	5	Force Main	This force main is needed for Lift Station 7. Install 7,000 feet of 4-inch pipe.	$1,272,389	$1,272,389	$0	$0	$2,544,778
2050	6	3/4- or 1-Ton Pickup Truck	Purchase a new Pickup Truck.	$323,489	$0	$0	$0	$323,489
			2050 Subtotals:	**$12,363,796**	**$1,272,389**	**$0**	**$0**	**$13,636,185**
			Grand Totals:	**$83,984,393**	**$10,186,274**	**$15,773,041**	**$20,503,350**	**$130,447,058**

Wastewater System Master Plan

SECTION 8. Appendix

Wastewater System Master Plan

Appendix A Existing Conditions Overall Layout

LIFT STATION 2

MAG 208 SERVICE AREA BOUNDARY

TOWN BOUNDARY

GRAVITY SEWER TRUNK MAIN

TREATMENT FACILITY

GRAVITY SEWER TRUNK MAIN

LIFT STATION 1

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CAMP VERDE
THE CENTER OF IT ALL — ARIZONA

WATERWORKS ENGINEERS

Appendix B APP Permit

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director

Via Electronic Mail

November 22, 2021

Town of Camp Verde
Attn: Troy Odell, P.E., Deputy Public Works Director
395 South Main Street,
Camp Verde, Arizona, 86322
Troy.odell@campverde.az.gov

Re: **Aquifer Protection Permit (APP) Significant Amendment Issuance**
Town of Camp Verde Water Reclamation Facility
Inventory Number: 101360 LTF ID: 82369

Dear Mr. Odell,

Enclosed is a signed copy of the Aquifer Protection Permit (APP) and Executive Summary for the above referenced facility. This permit was developed pursuant to A.A.C. Title 18, Chapter 11, Article 4, Aquifer Water Quality Standards, and A.A.C. Title 18, Chapter 9, Article 1, APP rules. If you have any questions regarding this permit or the facility, please feel free to contact me at Gutierrez.Diana@azdeq.gov or 602-771-4141.

Sincerely,

Diana Gutierrez

Diana Gutierrez, Project Manager
APP Unit, Groundwater Protection Value Stream,
Water Quality Division, ADEQ

Enclosures: Final Signed Permit
Executive Summary

cc (via electronic mail):
Naveen Savarirayan, Value Stream Manager, GPVS, WQD, ADEQ
Mohamed Hegazy, Associate Environmental Engineer, APP Unit, GPVS, WQD, ADEQ
Shivani Shah, Environmental Engineer, APP Unit, GPVS, WQD, ADEQ
Monica Hubbard, APP Unit, GPVS, WQD, ADEQ
Tracy Bunch, APP Unit, GPVS, WQD, ADEQ
Steve Baker, AZDHS
Chet Teague, Wastewater Division Manager, Town of Camp Verde

ADEQ Arizona Department of Environmental Quality

EXECUTIVE SUMMARY

www.azdeq.gov

Town of Camp Verde Water Reclamation Facility
Aquifer Protection Permit No. P-101360
Place ID 1403, LTF No. 82369
Significant Amendment

I. Introduction:

The Arizona Department of Environmental Quality (ADEQ) proposes to issue an Aquifer Protection Permit (APP) for the subject facility that covers the life of the facility, including operational, closure, and post-closure periods unless suspended or revoked pursuant to Arizona Administrative Code (A.A.C.) R18-9-A213. The requirements contained in this permit will allow the permittee to comply with the two key requirements of the Aquifer Protection Program: 1) meet Aquifer Water Quality Standards (AWQS) at the Point of Compliance (POC); and 2) demonstrate Best Available Demonstrated Control Technology (BADCT). BADCT's purpose is to employ engineering controls, processes, operating methods or other alternatives, including site-specific characteristics (i.e., the local subsurface geology), to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer or to prevent pollutants from reaching the aquifer.

II. Permittee

Town of Camp Verde
395 South Main Street
Camp Verde, Arizona 86322

III. Facility Name & Location:

Town of Camp Verde Water Reclamation Facility
880 S. Cowboy Trail
Camp Verde, Arizona, 86322

IV. Facility Description:

The Town of Camp Verde is authorized to operate the Camp Verde Water Reclamation Facility, with a design capacity of 1.3 million gallons per day (mgd) at full build-out; however, permitted flow shall be limited to 0.65 mgd until adequate disposal capacity is demonstrated under an APP amendment, as per Section 3.0, Compliance Schedule, Item No. 6.

Phase I WRF: The design capacity of the Phase I WRF is 0.65 mgd. The treatment process for the Phase I WRF consists of the headworks with bar screens, an extended aeration treatment train with nitrification and denitrification, clarifiers, ultraviolet (UV) disinfection, a backup chlorination system, a septage receiving station, and an effluent pump station. Filtration shall be provided as necessary to meet the discharge standards. Effluent may be disposed by infiltration and evaporation in the Duck Ponds, or delivered for beneficial reuse under a valid Recycled Water Permit.

The facility consists of two (2) aerobic sludge digesters and a belt press for sludge dewatering. The sludge is treated through the south aerobic digester and dewatered through a belt press. The two (2) treatment lagoons from the existing Lagoon Plant will be repurposed as sludge dewatering lagoons to store and dewater the waste activated sludge from the aerobic digester. The septage will

be digested in the north aerobic digester and then dried through the eight (8) new sludge drying beds. The facility will be adding two (2) new concrete-paved drying area (solids drying areas) for composting and miscellaneous solid handling activities. Solids from the screenings, grit and scum, shall be haul off-site for management and disposal.

Phase II WRF: The design capacity of the Phase II WRF is 1.30 mgd. The treatment process shall consist of the headworks with bar screens, two (2) 0.65 mgd extended aeration treatment trains with nitrification and denitrification, clarifiers, ultraviolet (UV) disinfection, a backup chlorination system, a septage receiving station, an effluent pump station, two (2) aerobic digesters, a belt press for sludge dewatering, two (2) sludge drying lagoons, eight (8) sludge drying beds and two (2) solids handling areas. Filtration shall be provided as necessary to meet the discharge standards. Effluent shall be disposed by infiltration and evaporation in the Duck Ponds, or delivered for beneficial reuse under a valid Recycled Water Permit. All industrial hookups and other non-residential hookups to the treatment system shall be authorized according to the applicable federal, state or local regulations.

V. **Amendment Description:**

The purpose of this amendment is to:

1. Update the Facility Address in Section 1.1 of the Permit.
2. Update the Annual Registration Fee Flow Rate in Section 1.1 and 2.1 to the current rate of 0.65 mgd instead of the full build-out amount of 1.35 mgd.
3. Remove CSI No.5 from the previous Permit because this Amendment increases the flow rate to 0.65 mgd.
4. Remove all Interim WRF language from the permit and the previous permit Table 1A for the Interim WRF.
5. Sections 2.2.5 and 2.5.3 of the Permit, update reclaimed water classification and monitoring to Class A+ to the Irrigation Storage Pond and irrigation reuse at the Sports Complex, while maintaining the Class B+ to the existing evaporation/infiltration ponds and truck fill station for construction water reuse.
6. Section 3.0, add Compliance Schedule Item No. 8, for the permittee to submit well abandonment documents for conceptual POC No.2 which was abandoned due to the location in the middle of the concrete lined sludge drying/processing area.
7. Section 3.0, add Compliance Schedule Item No. 9, for the permittee to submit an updated contingency plan within 90 days of permit issuance.
8. Section 4.2, update monitoring for total metals to dissolved metals in the Groundwater Monitoring Tables 12 and 13 for POCs 1 and 3. This change is to establish consistent groundwater quality monitoring standards between Aquifer Protection Permits that are aligned with widely accepted practices within the scientific community and ADEQ substantive policy. Analyzing for dissolved metals provides a more accurate measurement of the water quality by filtering out particulate matter that may have come from external sources (well casings, sampling equipment, etc.).
9. Section 4.2, Table 14, replace performance levels of three linear feet for both freeboard for sludge lagoons and duck pond freeboard to performance levels of three vertical feet.

The permit category for this amendment was determined to be an "Significant Amendment" in accordance with A.A.C. R18-9-A211(B)(2)(b), "A physical change in a permitted facility or a change in its method of operation results in: an increase in design flow of a sewage treatment facility."

VI. **Regulatory Status**

The Facility was last inspected on 8/26/21 and was determined to be in compliance at the time of inspection.

VII. Best Available Demonstrated Control Technology (BADCT):

The treatment train, sludge drying beds and solids handling area at WRF is designed to meet the treatment performance criteria for new facilities as specified in Arizona Administrative Code R18-9-B204. The sludge drying lagoons meets the performance criteria for existing facilities as specified in Arizona Administrative Code R18-9-B205.

VIII. Compliance with Aquifer Water Quality Standards (AWQS):

To ensure that site operations do not result in violation of Aquifer Water Quality Standards at the point of compliance, representative samples of the effluent shall be collected at the Sampler at the downstream end of the back-up chlorination system (see Section 4.2, Tables 8 and 9, in the permit).

Reclaimed monitoring for Class A+ reuse is required under permit Section 4.2, Table 10 for Fecal Coliform, Total Nitrogen, Turbidity, and Enteric Virus. Reclaimed monitoring for Class B+ reuse is required under permit Section 4.2, Table 11 for Fecal Coliform and Total Nitrogen.

Groundwater monitoring is required under this permit per Section 4.2, Tables 12 and 13 for Fecal Coliform, nitrogen species, metals and organic compounds.

Facility inspection and operational monitoring will be performed on a routine basis (see Section 4.2, Table 14, in the permit).

STATE OF ARIZONA
AQUIFER PROTECTION PERMIT NO. P-101360
PLACE ID 1403, LTF 82369
SIGNIFICANT AMENDMENT

1.0 AUTHORIZATION

In compliance with the provisions of Arizona Revised Statutes (A.R.S.) Title 49, Chapter 2, Articles 1, 2, and 3, Arizona Administrative Code (A.A.C.) Title 18, Chapter 9, Articles 1 and 2, A.A.C. Title 18, Chapter 11, Article 4 and amendments thereto, and the conditions set forth in this permit, the Arizona Department of Environmental Quality (ADEQ) hereby authorizes the Town of Camp Verde to operate the Town of Camp Verde Water Reclamation Facility located at 1300 Payson Highway, in Camp Verde, Arizona, in Yavapai County, over groundwater of the Verde River Basin in Township 13 N, Range 5 E, Section 4 of the Gila and Salt River Baseline and Meridian.

This permit becomes effective on the date of the Water Quality Division Director's signature and shall be valid for the life of the facility (operational, closure, and post-closure periods) unless suspended or revoked pursuant to A.A.C. R18-9-A213. The permittee shall construct, operate and maintain the permitted facilities:

1. Following all the conditions of this permit including the design and operational information documented or referenced below, and
2. Such that Aquifer Water Quality Standards (AWQS) are not violated at the applicable point(s) of compliance (POC) set forth below or if an AWQS for a pollutant has been exceeded in an aquifer at the time of permit issuance, that no additional degradation of the aquifer relative to that pollutant and as determined at the applicable POC occurs as a result of the discharge from the facility.

1.1. PERMITTEE INFORMATION

Facility Name:	Town of Camp Verde Water Reclamation Facility
Facility Address:	880 S. Cowboy Trail Camp Verde, Arizona, 86322
County:	Yavapai
Permitted Flow Rate:	0.65 million gallons per day (mgd)
Permittee:	Town of Camp Verde
Permittee Address:	395 South Main Street Camp Verde, Arizona 86322
Facility Contact:	Troy Odell, P.E., Deputy Public Works Director
Emergency Phone No.:	928-554-0820
Latitude/Longitude:	34° 33' 24.54" N/ 111° 49' 57.42" W
Legal Description:	Township 13 N, Range 5 E, Section 4, Gila and Salt River Baseline and Meridian

1.2. AUTHORIZING SIGNATURE

Randall Matas, Deputy Director

Water Quality Division

Arizona Department of Environmental Quality

Signed this 22 day of November, 2021

THIS AMENDED PERMIT SUPERSEDES ALL PREVIOUS PERMITS

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2.0 SPECIFIC CONDITIONS

[A.R.S. §§ 49-203(4), 49-241(A)]

2.1. FACILITY / SITE DESCRIPTION

[A.R.S. § 49-243(K)(8) and A.A.C. R18-5-114]

The Town of Camp Verde is authorized to operate the Camp Verde Water Reclamation Facility, with a design capacity of 1.3 million gallons per day (mgd) at full build-out; however, permitted flow shall be limited to 0.65 mgd until adequate disposal capacity is demonstrated under an APP amendment, as per Section 3.0, Compliance Schedule, Item No. 6.

Phase I WRF: The design capacity of the Phase I WRF is 0.65 mgd. The treatment process for the Phase I WRF consists of the headworks with bar screens, an extended aeration treatment train with nitrification and denitrification, clarifiers, ultraviolet (UV) disinfection, a backup chlorination system, a septage receiving station, and an effluent pump station. Filtration shall be provided as necessary to meet the discharge standards. Effluent may be disposed by infiltration and evaporation in the Duck Ponds, or delivered for beneficial reuse under a valid Recycled Water Permit.

The facility consists of two (2) aerobic sludge digesters and a belt press for sludge dewatering. The sludge is treated through the south aerobic digester and dewatered through a belt press. The two (2) treatment lagoons from the existing Lagoon Plant will be repurposed as sludge dewatering lagoons to store and dewater the waste activated sludge from the aerobic digester. The septage will be digested in the north aerobic digester and then dried through the eight (8) new sludge drying beds. The facility will be adding two (2) new concrete-paved drying area (solids drying areas) for composting and miscellaneous solid handling activities. Solids from the screenings, grit and scum, shall be haul off-site for management and disposal.

Phase II WRF: The design capacity of the Phase II WRF is 1.30 mgd. The treatment process shall consist of the headworks with bar screens, two (2) 0.65 mgd extended aeration treatment trains with nitrification and denitrification, clarifiers, ultraviolet (UV) disinfection, a backup chlorination system, a septage receiving station, an effluent pump station, two (2) aerobic digesters, a belt press for sludge dewatering, two (2) sludge drying lagoons, eight (8) sludge drying beds and two (2) solids handling areas. Filtration shall be provided as necessary to meet the discharge standards. Effluent shall be disposed by infiltration and evaporation in the Duck Ponds, or delivered for beneficial reuse under a valid Recycled Water Permit. All industrial hookups and other non-residential hookups to the treatment system shall be authorized according to the applicable federal, state or local regulations.

The site includes the following permitted discharging facilities:

Table 1: DISCHARGING FACILITIES

Facility	Latitude	Longitude
Camp Verde WRF	34° 33' 24.54" N	111° 49' 57.42" W
North Duck Pond	34° 33' 17.64" N	111° 49' 48.12" W
South Duck Pond	34° 33' 11.82" N	111° 49' 52.14" W
Sludge Dewatering Lagoon #1	34° 33' 18.5" N	111° 50' 01.8" W
Sludge Dewatering Lagoon #2	34° 33' 20.5" N	111° 49' 59.7" W
Sludge Drying Beds	34° 33' 27.2" N	111° 49' 59.4" W
Solids Drying Areas	34° 33' 26.8" N	111° 49' 57.75" W
Truck Fill Station/Re-Use for Construction Water	34° 33' 15" N	111° 49' 50" W

2.1.1. Annual Registration Fee

[A.R.S. § 49-242 and A.A.C. R18-14-104]

The annual registration fee for this permit is payable to ADEQ each year. The annual registration fee flow rate is established by the permitted flow rate identified in Section 1.1. If the facility is not constructed or is incapable of discharge, the permittee may be eligible for reduced fees pursuant to A.A.C. R18-14-104(A), Table 2. Send all correspondence requesting reduced fees to the Groundwater Protection Value Stream. Please reference the permit number, LTF number, and the reason for requesting reduced fees under this rule.

2.1.2. Financial Capability

[A.R.S. § 49-243(N) and A.A.C. R18-9-A203]

The permittee has demonstrated financial capability under A.R.S. § 49-243(N) and A.A.C. R18-9-A203. The estimated dollar amount for facility closure is $1,283,897.00. The financial capability was demonstrated through A.A.C. R18-9-A203(B)(1) and (2).

2.2. BEST AVAILABLE DEMONSTRATED CONTROL TECHNOLOGY (BADCT)

[A.R.S. § 49-243(B) and A.A.C. R18-9-A202(A)(5)]

The treatment train, sludge drying beds and solids handling area at WRF is designed to meet the treatment performance criteria for new facilities as specified in Arizona Administrative Code R18-9-B204. The sludge drying lagoons meets the performance criteria for existing facilities as specified in Arizona Administrative Code R18-9-B205.

- **Sludge Dewatering Lagoons:** The existing Lagoon Plant was in operation for 30 years prior to commencement of extended aeration treatment train and then lagoons were put in cessation. The lagoons were believed to be underlain with clay soil. The facility has removed all sludge from the lagoon. The lagoons will be repurposed to store and dewater the sludge. The lagoon depth will be adjusted to 6 feet (ft) by placing the suitable material excavated during construction of the sludge drying beds and solids handing areas. The Sludge dewatering lagoons will be sized 420 ft long by 145 ft wide with a total depth of 6 ft. A trench drain will be provided along the midline at the bottom of each dewatering lagoon to collect underdrainage from dewatering sludge. The underdrainage will be returned to the headworks.

  The soil underlying of the sludge drying lagoons are clay soil with low permeability and the facility has demonstrated the BADCT as follows:

  - The well drillers log for well downgradient of the lagoons shows the 0-160 ft of clay and 160-190 ft of limestone. The other well downgradient of duck ponds shows the 0-7 ft of yellow clay, 7-8 ft of clay mixed with some rocks, 8-24 ft. of yellow clay and then 0-139 ft of hard white lime.
  - The depth of the lagoon will be reduced to 6 ft. There will be less volume of sludge i.e. less head in the lagoon compared to when operated as treatment lagoons.
  - The facility has been conducting groundwater monitoring at the Point of Compliance well which is downgradient to these lagoons for the past 12 years. The monitoring results shows that the nitrates and other constituents were never exceeded the AWQS despite of operation of these treatment lagoons over 30 years. The facility will continue to monitor groundwater at this Point of Compliance well.
  - The facility will be testing the soil below existing lagoons and the fill material to determine the soil classification and permeability per the Compliance Schedule Item #1.

- **Sludge Drying Beds:** The facility will consist of eight 145 ft long by 33 ft wide sludge drying beds. The sludge drying beds will be constructed of concrete. Each sludge drying bed will be provided with one feed line and two underdrain lines. The underdrainage will be returned to the headworks. The freeboard of 6 inches will be maintained at the sludge drying beds.

- **Solids Drying Area:** This area will be 150 ft wide and 300 ft long and will be divided in two areas. This area is constructed of concrete.

2.2.1. Engineering Design

The sludge handling units were designed as per the design report prepared and stamped, dated, and signed (sealed) by Troy Odell, P.E. (Professional Engineer) Camp Verde Sanitary District dated August 28, 2019 and subsequent sealed submittals that served as additions to the design report.

The WRF was designed as per the design report prepared by Eric T. Laurin, P.E., of Coe and Van Loo Engineering, Inc., dated April 6, 2006 and subsequent sealed submittals that served as additions to the design report.

2.2.2. Site-Specific Characteristics

Not applicable.

2.2.3. Pre-Operational Requirements

Prior to utilizing the Sludge Dewatering Lagoons soil samples shall be tested and analyzed per Section 3.0 , Compliance Schedule, item 1. Prior to utilizing the Sludge Dewatering Lagoons, the Engineer's Certificate of Completion which confirms that the modifications were constructed according to the Department-approved design report or plans and specifications, per Section 3.0, Compliance Schedule, item 2. Prior to utilizing the Sludge Drying Beds, the Engineer's Certificate of Completion which confirms that they were constructed according to the Department-approved design report or plans and specifications, per Section 3.0, Compliance Schedule, item 3. Prior to utilizing the Sludge Handling Areas, the Engineer's Certificate of Completion which confirms that they were constructed according to the Department-approved design report or plans and specifications, per Section 3.0, Compliance Schedule, item 4. The permittee shall submit the Engineer's Certificate of Completion that confirms the Phase II facility was constructed according to the Department-approved design report or plans and specifications, per Section 3.0, Compliance Schedule, item 5. The permittee shall submit an APP amendment application to increase the flow limit in Table 8 to 1.3 mgd per Section 3.0, Compliance Schedule, item 6. The permittee shall notify ADEQ of the commencement of discharge under Table 9 per Section 3.0, Compliance Schedule, item 7.

2.2.4. Operational Requirements

1. The permittee shall maintain a copy of the up-to-date operations and maintenance manual at the treatment facility site at all times; the manual shall be available upon request during inspections by ADEQ personnel.
2. The pollution control structures shall be inspected for the items listed in Section 4.2, Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING
3. If any damage of the pollution control structures is identified during inspection, proper repair procedures shall be performed. All repair procedures and materials used shall be documented in the facility log book as per Section 2.7.2 and reported to ADEQ in the event of a violation or exceedance as per Section 2.7.3.

2.2.5. Reclaimed Water Classification

[A.A.C. R18-9-B701(C)(2)(a), A.A.C. R18-11-303 through 307]

The treatment facility is rated as producing reclaimed water meeting the Class A+ Reclaimed Water Quality Standards (A.A.C. R18-11, Article 3) for discharge to the Irrigation Storage Pond and for irrigating reuse at the Sports Complex which may be used for any allowable Class A, B, or C use under a valid reclaimed water permit (A.A.C. R18-9, Article 7). The treatment facility is rated as producing reclaimed water meeting the Class B+ Reclaimed Water Quality Standards (A.A.C. R18-11, Article 3) for discharge to the Duck Ponds and for the Truck Fill Station which may be used for any allowable Class B, or C use under a valid reclaimed water permit (A.A.C. R18-9, Article 7). The WRF will not be producing two classes of effluent at the same time, but will be producing A+ or B+ depending on the effluent water quality. The effluent will be diverted to Class A+ uses only if it meets Class A+ requirements. However, if the effluent only meets Class B+ requirements, it will be diverted to Class B+ uses.

2.2.6. Certified Areawide Water Quality Management Plan Conformance

[A.A.C. R18-9-A201(B)(6)(a)]

Facility operations must conform to the approved Certified Areawide Water Quality Management Plan according to the 208 consistency determination in place at the time of permit issuance.

2.3. DISCHARGE LIMITATIONS

[A.R.S. §§ 49-201(14), 49-243 and A.A.C. R18-9-A205(B)]

1. The permittee is authorized to operate the WRF with a maximum average annual flow of 0.65 mgd for the Phase I WRF and 1.3 mgd for the Phase II WRF. The facility may increase flows once adequate disposal capacity has been demonstrated under an APP amendment as per Section 3.0, Compliance Schedule, Item No. 6. Two tables are listed in Section 4.2 for discharge monitoring: Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd). The permittee shall use the monitoring table which is commensurate with the phase in use at the time. Upon construction of each phase, the permittee shall discontinue monitoring required in the previous phase. Monitoring is not required for phases not yet constructed.
2. The permittee shall notify all users that the materials authorized to be disposed of through the treatment facility are typical household sewage and pre-treated commercial wastewater and shall not include motor oil, gasoline, paints, varnishes, hazardous wastes, solvents, pesticides, fertilizers or other materials not generally associated with toilet flushing, food preparation, laundry facilities and personal hygiene.
3. The permittee shall operate and maintain all permitted facilities to prevent unauthorized discharges pursuant to A.R.S. § 49-201(12) resulting from failure or bypassing of applicable BADCT.
4. Specific discharge limitations are listed in Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd), Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd), Table 10: RECLAMIED WATER MONITORING – CLASS A+, and Table 11: RECLAMIED WATER MONITORING – CLASS B+.

2.4. POINT OF COMPLIANCE (POC)

[A R S § 49-244]

The non-hazardous Points of Compliance (POCs) have been established at the following locations:

Table 2: POINT(S) OF COMPLIANCE

POC #	POC Location	Latitude (North)	Longitude (West)
1	Sludge Dewatering Lagoons	34° 33' 16" N	111° 51' 00" W
2	Immediately south of the extended aeration plant (Conceptual)	34° 33' 26" N	111° 49' 57" W
3	South of the South Duck Pond	34° 33' 08" N	111° 49' 54" W

Groundwater monitoring is required at the point of compliance wells. #1 and # 3. POC #2 well is a conceptual well, monitoring is not required except as a contingency action. The director may require an amendment of this permit to install a monitoring well if there is cause or concern that groundwater quality may be impacted at the POC. The Director may amend this permit to designate additional points of compliance if information on groundwater gradients or groundwater usage indicates the need.

2.5. MONITORING REQUIREMENTS

[A R S § 49-243(K)(1), A A C R18-9-A206(A)]

Unless otherwise specified in this permit, all monitoring required in this permit shall continue for the duration of the permit, regardless of the status of the facility. Unless otherwise provided, monitoring shall commence the first full monitoring period following permit issuance. All sampling, preservation and holding times shall be in accordance with currently accepted standards of professional practice. Trip blanks, equipment blanks and duplicate samples shall also be obtained, and Chain-of-Custody procedures shall be followed, in accordance with currently accepted standards of professional practice. Copies of laboratory analyses and Chain-of-Custody forms shall be maintained at the permitted facility. Upon request, these documents shall be made immediately available for review by ADEQ personnel.

2.5.1. Pre-Operational Monitoring

Not applicable.

2.5.2. Routine Discharge Monitoring

The permittee shall monitor the effluent according to Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd). Representative samples of the effluent shall be collected at the point of discharge from the disinfection system.

2.5.3. Reclaimed Water Monitoring

The permittee shall monitor the reclaimed water according to the Reclaimed Water Monitoring Tables in Section 4.2, Table 10: RECLAMIED WATER MONITORING – CLASS A+ and Table 11: RECLAMIED WATER MONITORING – CLASS B+ in addition to the routine discharge monitoring parameters listed in Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd). Representative samples of the reclaimed water shall be collected at the point of discharge from the disinfection system.

2.5.4. Facility / Operational Monitoring

Operational monitoring inspections shall be conducted according to Section 4.2, Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING.

If any damage of the pollution control structures is identified during inspection, proper repair procedures shall be performed. All repair procedures and materials used shall be documented in the facility log book as per Section 2.7.2 and reported to ADEQ in case of a violation or exceedance as per Section 2.7.3.

2.5.5. Groundwater Monitoring and Sampling Protocols

Static water levels shall be measured and recorded prior to sampling. Wells shall be purged of at least three borehole volumes (as calculated using the static water level) or until field parameters (pH, temperature, conductivity) are stable, whichever represents the greater volume. If evacuation results in the well going dry, the well shall be allowed to recover to 80 percent of the original borehole volume, or for 24 hours, whichever is shorter, prior to sampling. If after 24 hours there is not sufficient water for sampling, the well shall be recorded as "dry" for the monitoring event. An explanation for reduced pumping volumes, a record of the volume pumped, and modified sampling procedures shall be reported and submitted with the SMRF.

The permittee may conduct the sampling using low-flow purging methods in accordance with EPA, USGS, or DOD protocols. The well must be purged until indicator parameters stabilize. Indicator parameters shall include dissolved oxygen, turbidity, pH, temperature, and conductivity.

As a third alternative method for sampling within POC wells with very low recharge rates, the permittee may conduct the sampling using no-purge sampling techniques using HydraSleeve™ or similar type methodology. The use of HydraSleeve™ or similar type samplers shall follow accepted EPA, USGS, or DOD protocols. In addition, the HydroSleeve™ or similar type sampler shall be placed just below the water table.

2.5.5.1. POC Well Replacement

In the event that one or more of the designated POC wells should become unusable or inaccessible due to damage, exceedance of an alert level (AL) for water level as required by Section 2.6.2.3.4, or any other event, a replacement POC well shall be constructed and installed upon approval by ADEQ. If the replacement well is fifty feet or less from the original well, the ALs and/or aquifer quality limits (AQLs) calculated for the designated POC well shall apply to the replacement well.

2.5.6. Surface Water Monitoring and Sampling Protocols

Routine surface water monitoring is not required under the terms of this permit.

2.5.7. Analytical Methodology

All samples collected for compliance monitoring shall be analyzed using Arizona state-approved methods. If no state-approved method exists, then any appropriate EPA-approved method shall be used. Regardless of the method used, the detection limits must be sufficient to determine compliance with the regulatory limits of the parameters specified in this permit. If all methods have detection limits higher than the applicable limit, the permittee shall follow the applicable contingency requirements of Section 2.6 and may propose "other actions" including amending the permit to set higher limits. Analyses shall be performed by a laboratory licensed by the Arizona Department of Health Services, Office of Laboratory Licensure and Certification unless exempted under A.R.S. 36-495.02. For results to be considered valid, all analytical work shall meet quality control standards specified in the approved methods. A list of state-certified laboratories in Arizona can be obtained at the address below:

Arizona Department of Health Services
Office of Laboratory Licensure and Certification
250 North 17th Avenue
Phoenix, Arizona 85007
Phone: (602) 364-0720

2.5.8. Installation and Maintenance of Monitoring Equipment

Monitoring equipment required by this permit shall be installed and maintained so that representative samples required by the permit can be collected. If new groundwater wells are determined to be necessary, the construction details shall be submitted to the Groundwater Protection Value Stream for approval prior to installation and the permit shall be amended to include any new monitoring points.

2.6. CONTINGENCY PLAN REQUIREMENTS

[A.R.S. § 49-243(K)(3), (K)(7) and A.A.C. R18-9-A204 and R18-9-A205]

2.6.1. General Contingency Plan Requirements

At least one copy of this permit and the approved contingency and emergency response plan submitted in the application shall be maintained at the location where day-to-day decisions regarding the operation of the facility are made. The permittee shall be aware of and follow the contingency and emergency plans.

Any AL exceedance, or violation of an AQL, DL, or other permit condition shall be reported to ADEQ following the reporting requirements in Section 2.7.3, unless more specific reporting requirements are set forth in Section 2.6.2 through 2.6.5.

Some contingency actions involve verification sampling. Verification sampling shall consist of the first follow-up sample collected from a location that previously indicated a violation or the exceedance of an AL. Collection and analysis of the verification sample shall use the same protocols and test methods to analyze for the pollutant or pollutants that exceeded an AL or violated an AQL or DL. Where verification sampling is specified in this permit, it is the option of the permittee to perform such sampling. If verification sampling is not conducted within the timeframe allotted, ADEQ and the permittee shall presume the initial sampling result to be confirmed as if verification sampling had been conducted. The permittee is responsible for compliance with contingency plans relating to the exceedance of an AL or violation of a DL, AQL or any other permit condition. The permittee is subject to enforcement action for the failure to comply with any contingency actions in this permit.

2.6.2. Exceeding of Alert Levels and Performance Levels

2.6.2.1. Exceeding of Performance Levels Set for Operational Conditions

For freeboard performance levels, the permittee shall comply with the requirements as specified in Section 4.2, Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING to prevent the overtopping of an impoundment or sludge drying bed. If an impoundment or sludge drying bed is overtopped, the permittee shall follow the requirements in Section 2.6.5.3 and the reporting requirements of Section 2.7.3.

If a performance level set in Section 4.2, Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING has been exceeded the permittee shall:

1. Notify the Groundwater Protection Value Stream within five (5) days of becoming aware of the exceedance.
2. Submit a written report to the Groundwater Protection Value Stream within 30 days after becoming aware of the exceedance. The report shall document all of the following:
    a. A description of the exceedance and the cause of the exceedance;
    b. The period of the exceedance, including exact date(s) and time(s), if known, and the anticipated time period during which the exceedance is expected to continue;
    c. Any action taken or planned to mitigate the effects of the exceedance or spill, or to eliminate or prevent recurrence of the exceedance or spill;
    d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS; and
    e. Any malfunction or failure of pollution control devices or other equipment or process.
3. The facility is no longer on alert status once the operational indicator no longer indicates that a performance level is being exceeded. The permittee shall, however, complete all tasks necessary to return the facility to its pre-alert operating condition.

2.6.2.2. Exceeding of Alert Levels (ALs) Set for Discharge Monitoring

1. If an AL set in Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd) has been exceeded, the permittee shall immediately investigate to determine the cause. The investigation shall include the following:
    a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the exceedance;
    b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences; and
    c. If the investigation procedures indicated in (a) and (b) above fail to reveal the cause of the exceedance, the permittee shall sample individual waste streams composing the wastewater for the parameter(s) in question, if necessary to identify the cause of the exceedance.
2. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to the AL exceedance. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6.
3. Within thirty days of an AL exceedance, the permittee shall submit the laboratory results to the Groundwater Protection Value Stream along with a summary of the findings of the investigation, the cause of the exceedance, and actions taken to resolve the problem.
4. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

2.6.2.2.1. Exceeding Permit Flow Limit

If the AL for average monthly flow in Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd) has been exceeded, the permittee shall:

1. If the AL for average monthly flow in Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd), has been exceeded, the permittee shall begin Phase II construction, or submit a report detailing the reasons construction of the next phase is not necessary. Acceptance of the report instead of beginning Phase I construction required ADEQ approval.
2. If the AL for average monthly flow in Section 4.2, Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd), has been exceeded, the permittee shall submit an APP amendment application to expand the WRF to ADEQ, or submit a report detailing the reasons an expansion is not necessary. Acceptance of the report instead of an application for expansion required ADEQ approval.

2.6.2.3. Exceeding of Alert Levels in Groundwater Monitoring

2.6.2.3.1. Alert Levels for Indicator Parameters

No ALs have been established for indicator parameters.

2.6.2.3.2. **Alert Levels for Pollutants with Numeric Aquifer Water Quality Standards**

1. In the case of an exceedance of an AL for a pollutant set in Section 4.2, Table 12: GROUNDWATER MONITORING – POC No. 1 and Table 13: GROUNDWATER MONITORING – POC No. 3, the permittee may conduct verification sampling for those pollutant(s) that exceeded their respective AL(s) within five (5) days of becoming aware of the exceedance. The permittee may use results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.

2. If verification sampling confirms the AL exceedance or if the permittee opts not to perform verification sampling, then the permittee shall increase the frequency of monitoring for each pollutant exceeding its' respective AL(s) as follows:

Table 3: ACCELERATED MONITORING - ALERT LEVEL EXCEEDANCE	
Specified Monitoring Frequency	**Monitoring Frequency for AL Exceedance**
Daily	Daily
Weekly	Daily
Monthly	Weekly
Quarterly	Monthly
Semi-annually	Quarterly
Annually	Quarterly

In addition, the permittee shall immediately initiate an investigation of the cause of the AL exceedance, including inspection of all discharging units and all related pollution control devices, review of any operational and maintenance practices that might have resulted in an unexpected discharge, and hydrologic review of groundwater conditions including upgradient water quality.

3. The permittee shall initiate actions identified in the approved contingency plan referenced in Section 5.0 and specific contingency measures identified in Section 2.6 to resolve any problems identified by the investigation which may have led to an AL exceedance. To implement any other corrective action the permittee shall obtain prior approval from ADEQ according to Section 2.6.6. Alternatively, the permittee may submit a technical demonstration, subject to written approval by the Groundwater Protection Value Stream, that although an AL has been exceeded, the pollutant(s) that exceeded their respective AL(s) are not reasonably expected to cause a violation of an AQL. The demonstration may propose a revised AL or monitoring frequency, for those pollutant(s) that exceeded their respective AL(s), for approval in writing by the Groundwater Protection Value Stream.

4. Within 30 days after confirmation of an AL exceedance, for each pollutant that exceeded an AL, the permittee shall submit the laboratory results to the Groundwater Protection Value Stream along with a summary of the findings of the investigation, the cause of the exceedance, and actions taken to resolve the problem.

5. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

6. For each pollutant that exceeded an AL, the increased monitoring required as a result of an AL exceedance may be reduced to the monitoring frequency in Section 4.2, Table 12: GROUNDWATER MONITORING – POC No. 1 and Table 13: GROUNDWATER MONITORING – POC No. 3 if the results of four sequential sampling events of those pollutants demonstrate that they did not exceed the AL.

7. If the increased monitoring required as a result of an AL exceedance continues for more than six (6) sequential sampling events, the permittee shall submit to ADEQ a second report documenting an investigation of each pollutant which continued to exceed an AL. This report is due within 30 days of the receipt of laboratory results of the sixth sampling event.

2.6.2.3.3. Alert Levels to Protect Downgradient Users from Pollutants without Numeric Aquifer Water Quality Standards

Not required at time of issuance.

2.6.2.3.4. Alert Level for Groundwater Level

Not required at time of issuance.

2.6.3. Discharge Limit Violation

1. If a DL set in Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) or Table 10: RECLAMIED WATER MONITORING and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd) has been violated, the permittee shall immediately investigate to determine the cause. The investigation shall include the following:

   a. Inspection, testing, and assessment of the current condition of all treatment or pollutant discharge control systems that may have contributed to the violation;

   b. Review of recent process logs, reports, and other operational control information to identify any unusual occurrences;

   c. If the investigation procedures indicated in (a) and (b) above fail to reveal the cause of the violation, the permittee shall sample individual waste streams composing the wastewater for the parameters in violation, as necessary to identify the cause of the violation.

   The permittee shall submit a report to the Groundwater Protection Value Stream according to Section 2.7.3, which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. The permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water or groundwater, notification of downstream or downgradient users who may be directly affected by the discharge, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ-approved contingency plan, or separately approved according to Section 2.6.6.

2. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions, or other actions.

2.6.4. Aquifer Quality Limit Violation

1. If an AQL set in Section 4.2, Table 12: GROUNDWATER MONITORING – POC No. 1 and Table 13: GROUNDWATER MONITORING – POC No. 3 has been exceeded, the permittee may conduct verification sampling for those pollutant(s) that were above their respective AQL(s) within five (5) days of becoming aware of the exceedance. The permittee may use results of another sample taken between the date of the last sampling event and the date of receiving the result as verification.

2. If verification sampling does not confirm an AQL exceedance, no further action is needed under this Section.

3. If verification sampling confirms that an AQL was exceeded for any parameter or if the permittee opts not to perform verification sampling, then, the permittee shall increase the frequency of monitoring for those parameters as follows:

Table 4: ACCELERATED MONITORING - AQUIFER QUALITY LIMIT VIOLATION	
Specified Monitoring Frequency	**Monitoring Frequency for AQL Violation**
Daily	Daily
Weekly	Daily
Monthly	Weekly
Quarterly	Monthly
Semi-annually	Quarterly
Annually	Quarterly

In addition, the permittee shall immediately initiate an evaluation for the cause of the violation, including inspection of all discharging units and all related pollution control devices, and review of any operational and maintenance practices that might have resulted in unexpected discharge.

The permittee also shall submit a report according to Section 2.7.3, which includes a summary of the findings of the investigation, the cause of the violation, and actions taken to resolve the problem. A verified exceedance of an AQL will be considered a violation unless the permittee demonstrates within 30 days that the exceedance was not caused or contributed to by pollutants discharged from the facility. Unless the permittee has demonstrated that the exceedance was not caused or contributed to by pollutants discharged from the facility, the permittee shall consider and ADEQ may require corrective action that may include control of the source of discharge, cleanup of affected soil, surface water, or groundwater, and mitigation of the impact of pollutants on existing uses of the aquifer. Corrective actions shall either be specifically identified in this permit, included in an ADEQ approved contingency plan, or separately approved according to Section 2.6.6.

4. Upon review of the submitted report, the Department may amend the permit to require additional monitoring, increased frequency of monitoring, amendments to permit conditions or other actions.

5. The increased monitoring for those pollutant(s) required as a result of an AQL exceedance may be reduced to the original sampling frequency for each respective pollutant, if the results of three (3) sequential sampling events demonstrate that the parameter(s) does not exceed their respective AQL(s), and upon ADEQ approval.

2.6.5. Emergency Response and Contingency Requirements for Unauthorized Discharges

[A.R.S. § 49-201(12) AND PURSUANT TO A.R.S. § 49-241]

2.6.5.1. Duty to Respond

The permittee shall act immediately to correct any condition resulting from a discharge pursuant to A.R.S. § 49-201(12) if that condition could pose an imminent and substantial endangerment to public health or the environment.

2.6.5.2. Discharge of Hazardous Substances or Toxic Pollutants

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of suspected hazardous substances (A.R.S. § 49-201(19)) or toxic pollutants (A.R.S. § 49-243(I)) on the facility site, the permittee shall promptly isolate the area and attempt to identify the discharged material. The permittee shall record information, including name, nature of exposure and follow-up medical treatment, if necessary, on persons who may have been exposed during the incident. The permittee shall notify the Groundwater Protection Value Stream within 24 hours of discovering the discharge of hazardous material which (a) has the potential to cause an AWQS or AQL exceedance, or (b) could pose an endangerment to public health or the environment.

2.6.5.3. Discharge of Non-Hazardous Materials

In the event of any unauthorized discharge pursuant to A.R.S. § 49-201(12) of non-hazardous materials from the facility, the permittee shall promptly attempt to cease the discharge and isolate the discharged material. Discharged material shall be removed and the site cleaned up as soon as possible. The permittee shall notify the Groundwater Protection Value Stream within 24 hours of discovering the discharge of non-hazardous material which has the potential to cause an AQL exceedance, or could pose an endangerment to public health or the environment.

2.6.5.4. Reporting Requirements

The permittee shall submit a written report for any unauthorized discharges reported under Sections 2.6.5.2 and 2.6.5.3 to the Groundwater Protection Value Stream within 30 days of the discharge or as required by subsequent ADEQ action. The report shall summarize the event, including any human exposure, and facility response activities and include all information specified in Section 2.7.3. If a notice is issued by ADEQ subsequent to the discharge notification, any additional information requested in the notice shall also be submitted within the time frame specified in the notice. Upon review of the submitted report, ADEQ may require additional monitoring or corrective actions.

2.6.6. Corrective Actions

Specific contingency measures identified in Section 2.6 have already been approved by ADEQ and do not require written approval to implement.

With the exception of emergency response actions taken under Section 2.6.5, the permittee shall obtain written approval from the Groundwater Protection Value Stream prior to implementing a corrective action to accomplish any of the following goals in response to exceedance of an AL, AQL, DL, or other permit condition:

1. Control of the source of an unauthorized discharge;
2. Soil cleanup;
3. Cleanup of affected surface waters;
4. Cleanup of affected parts of the aquifer;
5. Mitigation to limit the impact of pollutants on existing uses of the aquifer.

Within 30 days of completion of any corrective action, the operator shall submit to the Groundwater Protection Value Stream, a written report describing the causes, impacts, and actions taken to resolve the problem.

2.7. REPORTING AND RECORDKEEPING REQUIREMENTS

[A R S § 49-243(K)(2), A A C R18-9-A206(B), R18-9-A207, and R18-5-104]

2.7.1. Self-Monitoring Report Form

1. The permittee shall complete the Self-Monitoring Reporting Forms (SMRFs) provided by ADEQ, and submit the completed report through the myDEQ online reporting system. The permittee shall use the format devised by ADEQ.
2. The permittee shall complete the SMRF to the extent that the information reported may be entered on the form. If no information is required during a reporting period, the permittee shall enter "not required" on the form, include an explanation, and submit the form to the Groundwater Protection Value Stream.
3. The tables contained in Section 4.0 list the monitoring parameters and the frequencies for reporting results on the SMRF:
    a. Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd)
    b. Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd)
    c. Table 10: RECLAMIED WATER MONITORING – CLASS A+
    d. Table 11: RECLAMIED WATER MONITORING – CLASS B+
    e. Table 12: GROUNDWATER MONITORING – POC No. 1
    f. Table 13: GROUNDWATER MONITORING – POC No. 3

The parameters listed in the above-identified tables from Section 4.0 are the only parameters for which SMRF reporting is required.

2.7.2. Operation Inspection / Log Book Recordkeeping

A signed copy of this permit shall be maintained at all times at the location where day-to-day decisions regarding the operation of the facility are made. A log book (paper copies, forms, or electronic data) of the inspections and measurements required by this permit shall be maintained at the location where day-to-day decisions are made regarding the operation of the facility. The log book shall be retained for ten years from the date of each inspection, and upon request, the permit and the log book shall be made immediately available for review by ADEQ personnel. The information in the log book shall include, but not be limited to, the following information as applicable:

1. Name of inspector;
2. Date and shift inspection were conducted;
3. Condition of applicable facility components;
4. Any damage or malfunction, and the date and time any repairs were performed;
5. Documentation of sampling date and time; and
6. Any other information required by this permit to be entered in the log book.
7. Monitoring records for each measurement shall comply with A.A.C. R18-9-A206(B)(2).

2.7.3. Permit Violation and Alert Level Status Reporting

1. The permittee shall notify the Groundwater Protection Value Stream within five (5) days (except as provided in Section 2.6.5) of becoming aware of an AL exceedance, or violation of any permit condition, AQL, or DL for which notification requirements are not specified in Sections 2.6.2 through 2.6.5.
2. The permittee shall submit a written report to the Groundwater Protection Value Stream within 30 days of becoming aware of the violation of any permit condition, AQL, or DL. The report shall document all of the following:
    a. Identification and description of the permit condition for which there has been a violation and a description of the cause;
    b. The period of violation including exact date(s) and time(s), if known, and the anticipated time period during which the violation is expected to continue;
    c. Any corrective action taken or planned to mitigate the effects of the violation, or to eliminate or prevent a recurrence of the violation;
    d. Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS;
    e. Proposed changes to the monitoring which include changes in constituents or increased frequency of monitoring; and
    f. Description of any malfunction or failure of pollution control devices or other equipment or processes.

2.7.4. Operational, Other or Miscellaneous Reporting

The permittee shall record the information as required in Section 4.2, Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING in the facility log book as per Section 2.7.2, and report to the Groundwater Protection Value Stream any violations or exceedances as per Section 2.7.3.

If the treatment facility is classified for reclaimed water under this permit, the permittee shall submit the reclaimed water monitoring results and flow volumes to any of the following in accordance with A.A.C. R18-9-B701(C)(2)(c):

1. Any reclaimed water agent who has contracted for delivery of reclaimed water from the permittee; and
2. Any end user who has not waived interest in receiving this information.

2.7.5. Reporting Location

All Self-Monitoring Report Forms (SMRFs) shall be submitted through the myDEQ portal accessible on the ADEQ website at: http://www.azdeq.gov/welcome-mydeq

All other documents required by this permit shall be mailed to:

The Arizona Department of Environmental Quality
Groundwater Protection Value Stream
Mail Code 5415B-3
1110 West Washington Street
Phoenix, Arizona 85007
Phone (602) 771-4571

2.7.6. Reporting Deadline

The following table lists the quarterly report due dates:

Table 5: QUARTERLY REPORTING DEADLINES	
Monitoring Conducted During Quarter:	**Quarterly Report Due By:**
January-March	April 30
April-June	July 30
July-September	October 30
October-December	January 30

The following table lists the semi-annual and annual report due dates if applicable:

Table 6: (SEMI-)ANNUAL REPORTING DEADLINES	
Monitoring Conducted:	**Report Due By:**
Semi-annual: January-June	July 30
Semi-annual: July-December	January 30
Annual: January-December	January 30

2.7.7. Changes to Facility Information in Section 1.0

The Groundwater Protection Value Stream shall be notified within ten days of any change of facility information including Facility Name, Permittee Name, Mailing or Street Address, Facility Contact Person, certified operator in direct responsible charge or Emergency Telephone Number.

2.8. Temporary Cessation

[A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A209(A)]

The permittee shall give written notice to the Groundwater Protection Value Stream before ceasing operation of the facility for a period of 60 days or greater. The permittee shall take the following measures upon temporary cessation:

1. If applicable, direct the wastewater flows from the facility to another state-approved wastewater treatment facility;
2. Correct the problem that caused the temporary cessation of the facility; and
3. Notify the Groundwater Protection Value Stream with a monthly facility status report describing the activities conducted on the treatment facility to correct the problem.
4. Submittal of Self-Monitoring Report Forms (SMRFs) is still required; report "temporary cessation" in the comment section.

At the time of notification the permittee shall submit for ADEQ approval a plan for maintenance of discharge control systems and for monitoring during the period of temporary cessation. Immediately following ADEQ approval, the permittee shall implement the approved plan. If necessary, ADEQ shall amend permit conditions to incorporate conditions to address temporary cessation. During the period of temporary cessation, the permittee shall provide written notice to the Groundwater Protection Value Stream of the operational status of the facility every three years. If the permittee intends to permanently cease operation of any facility, the permittee shall submit closure notification, as set forth in Section 2.9 below.

2.9. Closure

[A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(B)]

For a facility addressed under this permit, the permittee shall give written notice of closure to the Groundwater Protection Value Stream of the intent to cease operation without resuming activity for which the facility was designed or operated. Submittal of SMRFs is still required; report "closure in process" in the comment section.

2.9.1. Closure Plan

Within 90 days following notification of closure, the permittee shall submit for approval to the Groundwater Protection Value Stream, a closure plan which meets the requirements of A.R.S. § 49-252 and A.A.C. R18-9-A209(B)(3).

If the closure plan achieves clean-closure immediately, ADEQ shall issue a letter of approval to the permittee. If the closure plan contains a schedule for bringing the facility to a clean-closure configuration at a future date, ADEQ may incorporate any part of the schedule as an amendment to this permit.

2.9.2. Closure Completion

Upon completion of closure activities, the permittee shall give written notice to the Groundwater Protection Value Stream indicating that the approved closure plan has been implemented fully and providing supporting documentation to demonstrate that clean-closure has been achieved (soil sample results, verification sampling results, groundwater data, as applicable). If clean-closure has been achieved, ADEQ shall issue a letter of approval to the permittee at that time. If any of the following conditions apply, the permittee shall follow the terms of post-closure stated in this permit:

1. Clean-closure cannot be achieved at the time of closure notification or within one year thereafter under a diligent schedule of closure actions;
2. Further action is necessary to keep the facility in compliance with the AWQS at the applicable POC or, for any pollutant for which the AWQS was exceeded at the time this permit was issued, further action is necessary to prevent the facility from further degrading the aquifer at the applicable POC with respect to that pollutant;
3. Remedial, mitigative or corrective actions or controls are necessary to comply with A.R.S. § 49-201(30) and Title 49, Chapter 2, Article 3;
4. Further action is necessary to meet property use restrictions.
5. SMRF submittals are still required until Clean Closure is issued.

2.10. Post-closure

[A.R.S. §§ 49-243(K)(6), 49-252 and A.A.C. R18-9-A209(C)]

Post-closure requirements shall be established based on a review of facility closure actions and will be subject to review and approval by the Groundwater Protection Value Stream.

In the event clean-closure cannot be achieved pursuant to A.R.S. § 49-252, the permittee shall submit for approval to the Groundwater Protection Value Stream a post-closure plan that addresses post-closure maintenance and monitoring actions at the facility. The post-closure plan shall meet all requirements of A.R.S. §§ 49-201(30) and 49-252 and A.A.C. R18-9-A209(C). Upon approval of the post-closure plan, this permit shall be amended or a new permit shall be issued to incorporate all post-closure controls and monitoring activities of the post-closure plan.

2.10.1. Post-Closure Plan

A specific post-closure plan may be required upon the review of the closure plan.

2.10.2. Post-Closure Completion

Not required at the time of permit issuance.

3.0 COMPLIANCE SCHEDULE

[A R S § 49-243(K)(5) and A A C R18-9-A208]

Unless otherwise indicated, for each compliance schedule item listed below, the permittee shall submit the required information to the Groundwater Protection Value Stream.

Table 7: COMPLIANCE SCHEDULE ITEMS

No.	Description	Due By:	Permit Amendment Required?
Soil Testing			
1	The permittee shall collect the soil samples from each treatment lagoon and soil samples from the fill material which will be used to adjust lagoon depth. The soil samples shall be tested to determine the soil classification and the hydraulic conductivity. The permittee shall submit the soil testing results to the Department.	Prior to utilizing the Sludge Dewatering Lagoons and within 90 days after completion of back filling	No
Engineer's Certificate of Completion			
2	The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion, in a format approved by the Department, which confirms that the modifications for Sludge Dewatering Lagoons are performed according to the Department-approved design report or plans and specifications, as applicable.	Prior to utilizing the Sludge Dewatering Lagoons and within 90 days after completion of construction.	No
3	The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion, in a format approved by the Department, which confirms that the Sludge Drying Beds are constructed according to the Department-approved design report or plans and specifications, as applicable.	Prior to utilizing the Sludge Drying Beds and within 90 days after completion of construction.	No
4	The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion, in a format approved by the Department, which confirms that the Solids Drying Areas are constructed according to the Department-approved design report or plans and specifications, as applicable.	Prior to utilizing the Sludge Handling Areas and within 90 days after completion of construction	No
Phase II WRF			
5	The permittee shall submit a signed, dated, and sealed Engineer's Certificate of Completion, in a format approved by the Department, which confirms that the Phase II facility is constructed according to the Department-approved design report or plans and specifications, as applicable.	Prior to discharge under Table 9, and within 90 days after completion of Phase II construction.	No

Table 7: COMPLIANCE SCHEDULE ITEMS			
6	The permittee shall submit an APP amendment application to increase the flow limit in Table 9 to 1.3 mgd. The Demonstration shall include a documentation the facility has adequate setbacks for a design flow of 1.3 mgd and at least 1.3 mgd of disposal capacity.	At least 90 days prior to the anticipated date of permit issuance.	Yes
7	The permittee shall notify ADEQ of the commencement of discharge under Table 8.	Within 15 days after the commencement of discharge under Table 8.	No
POC Well No.2			
8	The permittee shall submit well abandonment documents for conceptual POC Well No. 2.	Within 60 days of permit issuance.	No
Contingency Plan			
9	The permittee shall submit an updated Contingency Plan.	Within 90 days of permit issuance.	No

4.0 TABLES OF MONITORING REQUIREMENTS

4.1. PRE-OPERATIONAL MONITORING (OR CONSTRUCTION REQUIREMENTS)

Not applicable.

4.2. COMPLIANCE OR OPERATIONAL MONITORING

Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd)[1]					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system			34° 33' 23"	111° 49' 56"
2	Flow meter located downstream of the disinfection system			34° 33' 23"	111° 49' 56"
Parameter	**Alert Level (AL)**	**Discharge Limit (DL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Flow[2]: Daily[3]	Not Applicable[4]	Not Applicable	mgd[5]	Daily	Quarterly
Total Flow: Monthly Average[6]	0.618	0.650	mgd	Monthly Calculation	Quarterly
Reuse Flow: Daily	Not Applicable	Not Applicable	mgd	Daily	Quarterly
Reuse Flow: Monthly Average	0.494	0.650	mgd	Monthly Calculation	Quarterly
Duck Pond Flow: Daily	Not Applicable	Not applicable	mgd	Daily	Quarterly
Duck Pond Flow: Monthly Average	0.494	0.650	mgd	Monthly Calculation	Quarterly
Fecal Coliform: Single sample maximum	Not Applicable	23.0	CFU[7]	Daily[8]	Quarterly
Fecal Coliform: four (4) of seven (7) samples in a week[9]	Not Applicable	Non-detect[10]	CFU	Weekly Evaluation	Quarterly
Total Nitrogen[11] :Five-sample rolling geometric mean[12]	8.0	10.0	mg/l[13]	Monthly Calculation	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/l	Quarterly	Quarterly

[1] The facility shall monitor under this Table until the permittee demonstrates that the facility has at least 1.30 mgd of disposal capacity per Section 3.0, item 6 of the Compliance Schedule.
[2] Total flow for all methods of disposal (Reuse and the Duck Ponds)
[3] Total Daily Flow shall be measured using a continuous recording flow meter that totals the flows daily.
[4] Not Applicable means that monitoring is required, but no limits have been specified at the time of permit issuance
[5] mgd = million gallons per day
[6] Monthly Average means the calculated average of daily flow values in a month
[7] CFU = Colony Forming Units / 100 ml sample. For CFU, a value of <1.0 shall be considered to be non-detect.
[8] For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four samples in each week are obtained and analyzed
[9] Week means a seven-day period starting on Sunday and ending on the following Saturday. The reporting form for this parameter consists of 13 weeks per quarter
[10] Fecal coliform 4 of 7 samples requires entering "Compliance" or "Non-compliance" on the SMRF for each week of the reporting period. Evaluate the daily fecal coliform results for that week (Sunday through Saturday). If, of these seven days, four or more of the daily fecal coliform results are non-detect, report "Compliance" for that week's entry on the SMRF. If three or fewer of the daily fecal coliform results are non-detect, report "Non-compliance" for that week's entry on the SMRF
[11] Total Nitrogen = Nitrate as N + Nitrite as N + Total Kjeldahl Nitrogen
[12] The five-sample rolling geometric mean is determined by multiplying the five (5) most recent monthly sample values together then taking the fifth root of the product. *Example:* $GM_5 = \sqrt[5]{(m_1)(m_2)(m_3)(m_4)(m_5)}$
[13] mg/l = milligrams per liter

Table 8: ROUTINE DISCHARGE MONITORING– Phase I (0.65 mgd) (Continued)					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system			34° 33' 23"	111° 49' 56"
2	Flow meter located downstream of the disinfection system			34° 33' 23"	111° 49' 56"
Parameter	**Alert Level**	**Discharge Limit**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Metals (Total)					
Antimony	0.0048	0.006	mg/l	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/l	Quarterly	Quarterly
Barium	1.60	2.00	mg/l	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/l	Quarterly	Quarterly
Cadmium	0.004	0.005	mg/l	Quarterly	Quarterly
Chromium	0.08	0.1	mg/l	Quarterly	Quarterly
Lead	0.04	0.05	mg/l	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/l	Quarterly	Quarterly
Nickel	0.08	0.1	mg/l	Quarterly	Quarterly
Selenium	0.04	0.05	mg/l	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/l	Quarterly	Quarterly
Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs)					
Benzene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Carbon tetrachloride	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Semi-Annually	Semi-Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Semi-Annually	Semi-Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Dichloromethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Ethylbenzene	0.56	0.7	mg/l	Semi-Annually	Semi-Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Semi-Annually	Semi-Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Semi-Annually	Semi-Annually
Monochlorobenzene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Styrene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Tetrachloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Toluene	0.8	1.0	mg/l	Semi-Annually	Semi-Annually
Trihalomethanes (total)[14]	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Semi-Annually	Semi-Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Trichloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Vinyl Chloride	0.0016	0.002	mg/l	Semi-Annually	Semi-Annually
Xylenes (Total)	8.0	10.0	mg/l	Semi-Annually	Semi-Annually

[14] Total Trihalomethanes (TTHMs) are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane

Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd)[15]					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system			34° 33' 23"	111° 49' 56"
2	Flow meter located downstream of the disinfection system			34° 33' 23"	111° 49' 56"
Parameter	**Alert Level (AL)**	**Discharge Limit (DL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Flow[16]: Daily[17]	Not Applicable[18]	Not Applicable	mgd[19]	Daily	Quarterly
Total Flow: Monthly Average[20]	1.235	1.30	mgd	Monthly Calculation	Quarterly
Reuse Flow: Daily	Not Applicable	Not Applicable	mgd	Daily	Quarterly
Reuse Flow: Monthly Average	1.235	1.30	mgd	Monthly Calculation	Quarterly
Duck Pond Flow: Daily	Not Applicable	Not applicable	mgd	Daily	Quarterly
Duck Pond Flow: Monthly Average	1.235	1.30	mgd	Monthly Calculation	Quarterly
Fecal Coliform: Single sample maximum	Not Applicable	23.0	CFU[21]	Daily[22]	Quarterly
Fecal Coliform: four (4) of seven (7) samples in a week[23]	Not Applicable	Non-detect[24]	CFU	Weekly Evaluation	Quarterly
Total Nitrogen[25] :Five-sample rolling geometric mean[26]	8.0	10.0	mg/l[27]	Monthly Calculation	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Quarterly	Quarterly
Fluoride	3.2	4.0	mg/l	Quarterly	Quarterly

[15] Permittee may begin monitoring under this Table per Section 3.0, item 7 of the Compliance Schedule.
[16] Total flow for all methods of disposal (Reuse and the Duck Ponds)
[17] Total Daily Flow shall be measured using a continuous recording flow meter that totals the flows daily.
[18] Not Applicable means that monitoring is required, but no limits have been specified at the time of permit issuance
[19] mgd = million gallons per day
[20] Monthly Average means the calculated average of daily flow values in a month
[21] CFU = Colony Forming Units / 100 ml sample. For CFU, a value of <1.0 shall be considered to be non-detect.
[22] For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four samples in each week are obtained and analyzed
[23] Week means a seven-day period starting on Sunday and ending on the following Saturday. The reporting form for this parameter consists of 13 weeks per quarter
[24] Fecal coliform 4 of 7 samples requires entering "Compliance" or "Non-compliance" on the SMRF for each week of the reporting period. Evaluate the daily fecal coliform results for that week (Sunday through Saturday). If, of these seven days, four or more of the daily fecal coliform results are non-detect, report "Compliance" for that week's entry on the SMRF. If three or fewer of the daily fecal coliform results are non-detect, report "Non-compliance" for that week's entry on the SMRF
[25] Total Nitrogen = Nitrate as N + Nitrite as N + Total Kjeldahl Nitrogen
[26] The five-sample rolling geometric mean is determined by multiplying the five (5) most recent monthly sample values together then taking the fifth root of the product. *Example:* $GM_5 = \sqrt[5]{(m_1)(m_2)(m_3)(m_4)(m_5)}$
[27] mg/l = milligrams per liter

Table 9: ROUTINE DISCHARGE MONITORING– Phase II (1.3 mgd) (Continued)					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system			34° 33' 23"	111° 49' 56"
2	Flow meter located downstream of the disinfection system			34° 33' 23"	111° 49' 56"
Parameter	**Alert Level**	**Discharge Limit**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Metals (Total)					
Antimony	0.0048	0.006	mg/l	Quarterly	Quarterly
Arsenic	0.04	0.05	mg/l	Quarterly	Quarterly
Barium	1.60	2.00	mg/l	Quarterly	Quarterly
Beryllium	0.0032	0.004	mg/l	Quarterly	Quarterly
Cadmium	0.004	0.005	mg/l	Quarterly	Quarterly
Chromium	0.08	0.1	mg/l	Quarterly	Quarterly
Lead	0.04	0.05	mg/l	Quarterly	Quarterly
Mercury	0.0016	0.002	mg/l	Quarterly	Quarterly
Nickel	0.08	0.1	mg/l	Quarterly	Quarterly
Selenium	0.04	0.05	mg/l	Quarterly	Quarterly
Thallium	0.0016	0.002	mg/l	Quarterly	Quarterly
Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs)					
Benzene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Carbon tetrachloride	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Semi-Annually	Semi-Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Semi-Annually	Semi-Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Dichloromethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Ethylbenzene	0.56	0.7	mg/l	Semi-Annually	Semi-Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Semi-Annually	Semi-Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Semi-Annually	Semi-Annually
Monochlorobenzene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Styrene	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
Tetrachloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Toluene	0.8	1.0	mg/l	Semi-Annually	Semi-Annually
Trihalomethanes (total)[28]	0.08	0.1	mg/l	Semi-Annually	Semi-Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Semi-Annually	Semi-Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Semi-Annually	Semi-Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Trichloroethylene	0.004	0.005	mg/l	Semi-Annually	Semi-Annually
Vinyl Chloride	0.0016	0.002	mg/l	Semi-Annually	Semi-Annually
Xylenes (Total)	8.0	10.0	mg/l	Semi-Annually	Semi-Annually

[28] Total Trihalomethanes (TTHMs) are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane

Table 10: RECLAMIED WATER MONITORING – CLASS A+[29]				
Reclaimed water monitoring under Table 10 shall be performed in addition to routine discharge monitoring required under Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd)				
Sampling Point Number	**Sampling Point Identification**		**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system		34° 33' 23"	111° 49' 56"
Parameter	**Discharge Limit (DL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Fecal Coliform Single-sample maximum:	23	CFU[30]	Daily[31]	Quarterly
Fecal Coliform: Four (4) of last seven (7) samples	Non-detect[32]	CFU	Daily Evaluation	Quarterly
Total Nitrogen[33]: Five-sample rolling geometric mean[34]	10.0	mg/l[35]	Monthly Calculation	Quarterly
Turbidity[36]: Single reading	5.0	NTU[37]	Daily[38]	Quarterly
Turbidity: 24-hour average	2.0	PFU[39]	Daily Calculation	Quarterly
Enteric Virus[40]: Four (4) of last seven (7) samples	Non-detect	CFU[41]	Monthly / Suspended[42]	Quarterly

[29] The permittee shall monitor for Class A+ Reclaimed Water Monitoring for discharge to the Irrigation Storage Pond and irrigation reuse at the Sports Complex. The WRF will not be producing two classes of effluent at the same time, but will be producing A+ or B+ depending on the effluent water quality. The effluent will be diverted to Class A+ uses only if it meets Class A+ requirements. However, if the effluent only meets Class B+ requirements, it will be diverted to Class B+ uses.

[30] CFU = Colony Forming Units per 100 ml. For CFU, a value of <1.0 shall be considered to be non-detect.

[31] For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four (4) samples in each seven-day period are obtained and analyzed.

[32] Non-detect requires entering "Compliance" or "Non-compliance" on the SMRF for each day of the reporting period. Evaluate the daily fecal coliform result along with the six (6) previous sample results. If four (4) or more of those results are non-detect, report "Compliance" for that day's entry on the SMRF. If four (4) or more of those results have detections of fecal coliform, report "Non-compliance" for that day's entry

[33] Total Nitrogen is the sum of Nitrate as N, Nitrite as N, and Total Kjeldahl Nitrogen (TKN)

[34] The five-sample rolling geometric mean is determined by multiplying the five (5) most recent monthly sample values together then taking the fifth root of the product. *Example:* $GM_5 = \sqrt[5]{(m_1)(m_2)(m_3)(m_4)(m_5)}$

[35] mg/l = milligrams per liter

[36] Turbidimeter shall be placed at a point in the wastewater treatment process after filtration and immediately before disinfection and shall have a signal averaging time not exceeding 120 seconds. All exceedances must be explained and submitted to the Department with the corresponding quarterly SMRF; occasional spikes due to back-flushing or instrument malfunction shall not be considered an exceedance

[37] NTU = Nephelometric Turbidity Units

[38] For the single turbidity reading, daily means the maximum reading during the 24-hour period.

[39] Plaque Forming Units per 40 Liters.

[40] Initial monthly enteric virus sampling shall be performed to indicate four (4) out of seven (7) sample results of non-detect.

[41] CFU = Colony Forming Units / 100 ml sample. For CFU, a value of <1.0 shall be considered to be non-detect.

[42] Enteric virus sampling shall resume only when the discharge limit for the 24-hour average for turbidity is exceeded for two (2) consecutive 24-hour monitoring periods. Monthly enteric virus monitoring shall continue until four (4) out of seven (7) consecutive sample results show no detection. During times when enteric virus sampling is suspended, enter "suspended" in the appropriate space on the SMRF

Table 11: RECLAMIED WATER MONITORING – CLASS B+[43]				
Reclaimed water monitoring under Table 11 shall be performed in addition to routine discharge monitoring required under Section 4.2, Table 8: ROUTINE DISCHARGE MONITORING – Phase I (0.65 mgd) and Table 9: ROUTINE DISCHARGE MONITORING – Phase II (1.3 mgd)				
Sampling Point Number	**Sampling Point Identification**		**Latitude (North)**	**Longitude (West)**
1	Sampler at the downstream end of the back-up chlorination system		34° 33' 23"	111° 49' 56"
Parameter	**Discharge Limit (DL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Fecal Coliform Single-sample maximum:	800	CFU[44]	Daily[45]	Quarterly
Fecal Coliform: Four (4) of last seven (7) samples	200	CFU	Daily Evaluation[46]	Quarterly
Total Nitrogen[47]: Five-sample rolling geometric mean[48]	10.0	mg/l[49]	Monthly Calculation	Quarterly

[43] The permittee shall monitor for Class B+ Reclaimed Water Monitoring for discharge to the Duck Ponds and the Truck Fill Station.
[44] CFU = Colony Forming Units per 100 ml. For CFU, a value of <1.0 shall be considered to be non-detect. The WRF will not be producing two classes of effluent at the same time, but will be producing A+ or B+ depending on the effluent water quality. The effluent will be diverted to Class A+ uses only if it meets Class A+ requirements. However, if the effluent only meets Class B+ requirements, it will be diverted to Class B+ uses.
[45] For fecal coliform, "daily" sampling means every day in which a sample can practicably be obtained and delivered in sufficient time for proper analysis, provided that no less than four (4) samples in each seven-day period are obtained and analyzed.
[46] Requires entering "Compliance" or "Non-compliance" on the SMRF for each day of the reporting period. Evaluate the daily fecal coliform result along with the six (6) previous sample results. If four (4) or more of those results are equal to or less than 200 CFU, report "Compliance" for that day's entry on the SMRF. If four (4) or more of those results are greater than 200 CFU, report "Non-compliance" for that day's entry.
[47] Total Nitrogen is the sum of Nitrate as N, Nitrite as N, and Total Kjeldahl Nitrogen (TKN)
[48] The five-sample rolling geometric mean is determined by multiplying the five (5) most recent monthly sample values together then taking the fifth root of the product. *Example:* $GM_5 = \sqrt[5]{(m_1)(m_2)(m_3)(m_4)(m_5)}$
[49] mg/l = milligrams per liter

Table 12: GROUNDWATER MONITORING – POC No. 1					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
3	POC No. 1 Located at the south end of the lagoon plant			34° 33' 16"	111° 51' 00"
Parameter	**Alert Level (AL)**	**Aquifer Quality Limit (AQL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Nitrogen[50]:	8.0	10.0	mg/l[51]	Monthly Calculation	Quarterly
Nitrate-Nitrite as N	8.0	10.0	mg/l	Monthly Calculation	Quarterly
Total Kjeldahl Nitrogen (TKN)	Not Applicable[52]	Not Applicable	mg/l	Monthly	Quarterly
Fecal Coliform	Not Applicable	Non-detect[53]	CFU[54]	Monthly	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Annually	Annually
Fluoride	Not Applicable	14.2	mg/l	Annually	Annually
Metals (Dissolved)					
Antimony	0.0048	0.006	mg/l	Annually	Annually
Arsenic	Not Applicable	0.0723	mg/l	Annually	Annually
Barium	1.60	2.00	mg/l	Annually	Annually
Beryllium	0.0032	0.004	mg/l	Annually	Annually
Cadmium	0.004	0.005	mg/l	Annually	Annually
Chromium	0.08	0.1	mg/l	Annually	Annually
Lead	0.04	0.05	mg/l	Annually	Annually
Mercury	0.0016	0.002	mg/l	Annually	Annually
Nickel	0.08	0.1	mg/l	Annually	Annually
Selenium	0.04	0.05	mg/l	Annually	Annually
Thallium	0.0016	0.002	mg/l	Annually	Annually

[50] Total Nitrogen is the sum of Nitrate as N, Nitrite as N, and Total Kjeldahl Nitrogen (TKN)
[51] mg/l = milligrams per liter
[52] Not Applicable means that monitoring is required, but no limits have been specified at the time of permit issuance
[53] For CFU, a value of <1.0 shall be considered to be non-detect
[54] CFU = Colony Forming Units per 100 ml

Table 12: GROUNDWATER MONITORING – POC No. 1 (Continued)					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
3	POC No. 1 Located at the south end of the lagoon plant			34° 33' 16"	111° 51' 00"
Parameter	**Alert Level (AL)**	**Aquifer Quality Limit (AQL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs)					
Benzene	0.004	0.005	mg/l	Annually	Annually
Carbon tetrachloride	0.004	0.005	mg/l	Annually	Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Annually	Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Annually	Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Annually	Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Annually	Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Annually	Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Annually	Annually
Dichloromethane	0.004	0.005	mg/l	Annually	Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Annually	Annually
Ethylbenzene	0.56	0.7	mg/l	Annually	Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Annually	Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Annually	Annually
Monochlorobenzene	0.08	0.1	mg/l	Annually	Annually
Styrene	0.08	0.1	mg/l	Annually	Annually
Tetrachloroethylene	0.004	0.005	mg/l	Annually	Annually
Toluene	0.8	1.0	mg/l	Annually	Annually
Trihalomethanes (total)[55]	0.08	0.1	mg/l	Annually	Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Annually	Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Annually	Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Annually	Annually
Trichloroethylene	0.004	0.005	mg/l	Annually	Annually
Vinyl Chloride	0.0016	0.002	mg/l	Annually	Annually
Xylenes (Total)	8.0	10.0	mg/l	Annually	Annually

[55] Total Trihalomethanes are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane.

Table 13: GROUNDWATER MONITORING – POC No. 3					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
4	POC No. 3 Located at the south of the South Duck Pond			34° 33' 08"	111° 49' 54"
Parameter	**Alert Level (AL)**	**Aquifer Quality Limit (AQL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Total Nitrogen[56]:	8.0	10.0	mg/l[57]	Monthly Calculation	Quarterly
Nitrate-Nitrite as N	8.0	10.0	mg/l	Monthly Calculation	Quarterly
Total Kjeldahl Nitrogen (TKN)	Not Applicable[58]	Not Applicable	mg/l	Monthly	Quarterly
Fecal Coliform	Not Applicable	Non-detect[59]	CFU[60]	Monthly	Quarterly
Cyanide (as free cyanide)	0.16	0.2	mg/l	Annually	Annually
Fluoride	3.2	4.0	mg/l	Annually	Annually
Metals (Dissolved)					
Antimony	0.0048	0.006	mg/l	Annually	Annually
Arsenic	Not Applicable	0.0644	mg/l	Annually	Annually
Barium	1.60	2.00	mg/l	Annually	Annually
Beryllium	0.0032	0.004	mg/l	Annually	Annually
Cadmium	0.004	0.005	mg/l	Annually	Annually
Chromium	0.08	0.1	mg/l	Annually	Annually
Lead	0.04	0.05	mg/l	Annually	Annually
Mercury	0.0016	0.002	mg/l	Annually	Annually
Nickel	0.08	0.1	mg/l	Annually	Annually
Selenium	0.04	0.05	mg/l	Annually	Annually
Thallium	0.0016	0.002	mg/l	Annually	Annually

[56] Total Nitrogen is the sum of Nitrate as N, Nitrite as N, and Total Kjeldahl Nitrogen (TKN)
[57] mg/l = milligrams per liter
[58] Not Applicable means that monitoring is required, but no limits have been specified at the time of permit issuance
[59] For CFU, a value of <1.0 shall be considered to be non-detect
[60] CFU = Colony Forming Units per 100 ml

Table 13: GROUNDWATER MONITORING – POC No. 3 (Continued)					
Sampling Point Number	**Sampling Point Identification**			**Latitude (North)**	**Longitude (West)**
4	POC No. 3 Located at the south of the South Duck Pond			34° 33' 08"	111° 49' 54"
Parameter	**Alert Level (AL)**	**Aquifer Quality Limit (AQL)**	**Units**	**Sampling Frequency**	**Reporting Frequency**
Volatile and Semi-Volatile Organic Compounds (VOCs and SVOCs)					
Benzene	0.004	0.005	mg/l	Annually	Annually
Carbon tetrachloride	0.004	0.005	mg/l	Annually	Annually
o-Dichlorobenzene	0.48	0.6	mg/l	Annually	Annually
para-Dichlorobenzene	0.06	0.075	mg/l	Annually	Annually
1,2-Dichloroethane	0.004	0.005	mg/l	Annually	Annually
1,1-Dichloroethylene	0.0056	0.007	mg/l	Annually	Annually
cis-1,2-Dichloroethylene	0.056	0.07	mg/l	Annually	Annually
trans-1,2-Dichloroethylene	0.08	0.1	mg/l	Annually	Annually
Dichloromethane	0.004	0.005	mg/l	Annually	Annually
1,2-Dichloropropane	0.004	0.005	mg/l	Annually	Annually
Ethylbenzene	0.56	0.7	mg/l	Annually	Annually
Hexachlorobenzene	0.0008	0.001	mg/l	Annually	Annually
Hexachlorocyclopentadiene	0.04	0.05	mg/l	Annually	Annually
Monochlorobenzene	0.08	0.1	mg/l	Annually	Annually
Styrene	0.08	0.1	mg/l	Annually	Annually
Tetrachloroethylene	0.004	0.005	mg/l	Annually	Annually
Toluene	0.8	1.0	mg/l	Annually	Annually
Trihalomethanes (total)[61]	0.08	0.1	mg/l	Annually	Annually
1,1,1-Trichloroethane	0.16	0.2	mg/l	Annually	Annually
1,2,4 - Trichlorobenzene	0.056	0.07	mg/l	Annually	Annually
1,1,2 - Trichloroethane	0.004	0.005	mg/l	Annually	Annually
Trichloroethylene	0.004	0.005	mg/l	Annually	Annually
Vinyl Chloride	0.0016	0.002	mg/l	Annually	Annually
Xylenes (Total)	8.0	10.0	mg/l	Annually	Annually

[61] Total Trihalomethanes are comprised of Bromoform, Bromodichloromethane, Chloroform, and Dibromochloromethane.

Table 14: FACILITY INSPECTION AND OPERATIONAL MONITORING			
The permittee shall record the inspection performance levels in a log book as per Section 2.7.2, and report any violations or exceedances as per Section 2.7.3. In the case of an exceedance, identify which structure exceeds the performance level in the log book.			
Pollution Control Structure/Parameter	**Performance Level**	**Inspection Frequency**	**Reporting Frequency**
Treatment Plant Components	Good working condition	Weekly	See Section 2.7.3
Freeboard for Sludge Lagoon	Three (3) Vertical Feet	Weekly	
Freeboard for Sludge Drying Beds	Six (6) Inches	Weekly	
Duck Pond Freeboard	Three (3) Vertical Feet	Weekly	
Duck Pond Berm Integrity	No visible structural damage, breach, or erosion of embankments	Weekly	

5.0 REFERENCES AND PERTINENT INFORMATION

The terms and conditions set forth in this permit have been developed based upon the information contained in the following, which are on file with the Department:

APP Application, dated:	6/10/2021
Contingency Plan, dated:	2/24/2020

6.0 NOTIFICATION PROVISIONS

6.1. Annual Registration Fees

The permittee is notified of the obligation to pay an Annual Registration Fee to ADEQ. The Annual Registration Fee is based on the amount of daily influent or discharge of pollutants in gallons per day (gpd) as established by A.R.S. § 49-242.

6.2. Duty to Comply

[A.R.S. §§ 49-221 through 263]

The permittee is notified of the obligation to comply with all conditions of this permit and all applicable provisions of Title 49, Chapter 2, Articles 1, 2 and 3 of the Arizona Revised Statutes, Title 18, Chapter 9, Articles 1 through 4, and Title 18, Chapter 11, Article 4 of the Arizona Administrative Code. Any permit non-compliance constitutes a violation and is grounds for an enforcement action pursuant to Title 49, Chapter 2, Article 4 or permit amendment, suspension, or revocation.

6.3. Duty to Provide Information

[A.R.S. §§ 49-243(K)(2) and 49-243(K)(8)]

The permittee shall furnish to the Director, or an authorized representative, within a time specified, any information which the Director may request to determine whether cause exists for amending or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

6.4. Compliance with Aquifer Water Quality Standards

[A.R.S. §§ 49-243(B)(2) and 49-243(B)(3)]

The permittee shall not cause or contribute to a violation of an Aquifer Water Quality Standard (AWQS) at the applicable point of compliance (POC) for the facility. Where, at the time of issuance of the permit, an aquifer already exceeds an AWQS for a pollutant, the permittee shall not discharge that pollutant so as to further degrade, at the applicable point of compliance for the facility, the water quality of any aquifer for that pollutant.

6.5. Technical and Financial Capability

[A.R.S. §§ 49-243(K)(8) and 49-243(N) and A.A.C. R18-9-A202(B) and R18-9-A203(F) and (F)]

The permittee shall have and maintain the technical and financial capability necessary to fully carry out the terms and conditions of this permit. Any bond, insurance policy, trust fund, or other financial assurance mechanism provided as a demonstration of financial capability in the permit application, pursuant to A.A.C. R18-9-A203(C), shall be in effect prior to any discharge authorized by this permit and shall remain in effect for the duration of the permit.

6.6. Reporting of Bankruptcy or Environmental Enforcement

[A.A.C. R18-9-A207(C)]

The permittee shall notify the Director within five days after the occurrence of any one of the following:

1. the filing of bankruptcy by the permittee; or
2. the entry of any order or judgment not issued by the Director against the permittee for the enforcement of any environmental protection statute or rule.

6.7. Monitoring and Records

[A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A206]

The permittee shall conduct any monitoring activity necessary to assure compliance with this permit, with the applicable water quality standards established pursuant to A.R.S. §§ 49-221 and 49-223 and §§ 49-241 through 49-252.

6.8. Inspection and Entry

[A.R.S. §§ 49-1009, 49-203(B), and 49-243(K)(8)]

In accordance with A.R.S. §§ 41-1009 and 49-203(B), the permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to enter and inspect the facility as reasonably necessary to ensure compliance with Title 49, Chapter 2, Article 3 of the Arizona Revised Statutes, and Title 18, Chapter 9, Articles 1 through 4 of the Arizona Administrative Code and the terms and conditions of this permit.

6.9. Duty to Modify

[A.R.S. § 49-243(K)(8) and A.A.C. R18-9-A211]

The permittee shall apply for and receive a written amendment before deviating from any of the designs or operational practices authorized by this permit.

6.10. Permit Action: Amendment, Transfer, Suspension, and Revocation

[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

This permit may be amended, transferred, suspended, or revoked for cause, under the rules of the Department. The permittee shall notify the Groundwater Protection Value Stream in writing within 15 days after any change in the owner or operator of the facility. The notification shall state the permit number, the name of the facility, the date of property transfer, and the name, address, and phone number where the new owner or operator can be reached. The operator shall advise the new owner or operators of the terms of this permit and the need for permit transfer in accordance with the rules.

7.0 ADDITIONAL PERMIT CONDITIONS

7.1. Other Information

[A.R.S. § 49-243(K)(8)]

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit the correct facts or information.

7.2. Severability

[A.R.S. §§ 49-201, 49-241 through 251, A.A.C. R18-9-A211, R18-9-A212 and R18-9-A213]

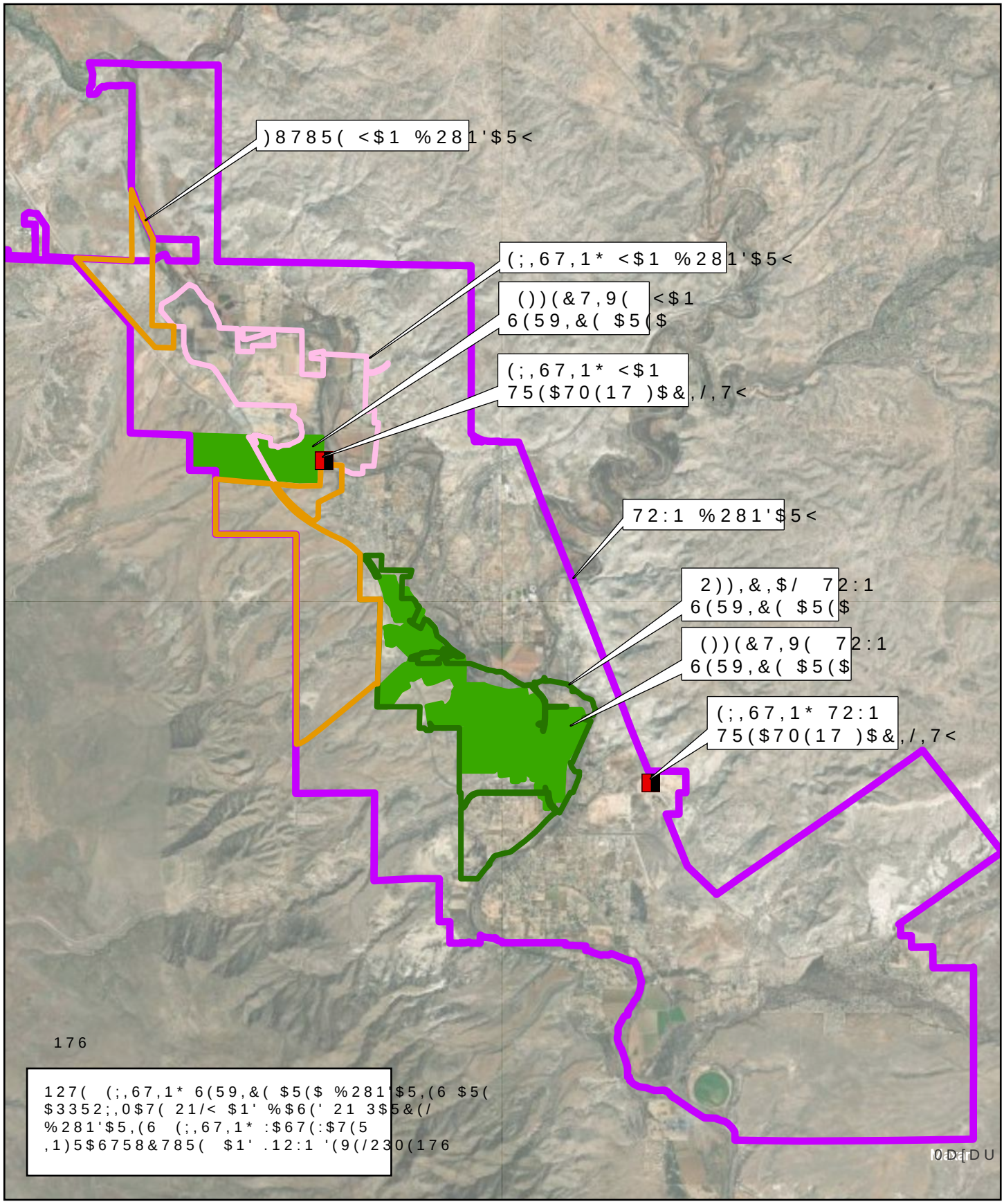
The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby. The filing of a request by the permittee for a permit action does not stay or suspend the effectiveness of any existing permit condition.

7.3. Permit Transfer

This permit may not be transferred to any other person except after notice to and approval of the transfer by the Department. No transfer shall be approved until the applicant complies with all transfer requirements as specified in A.A.C. R18-9-A212(B) and (C).

Wastewater System Master Plan

Appendix C Existing Service Area



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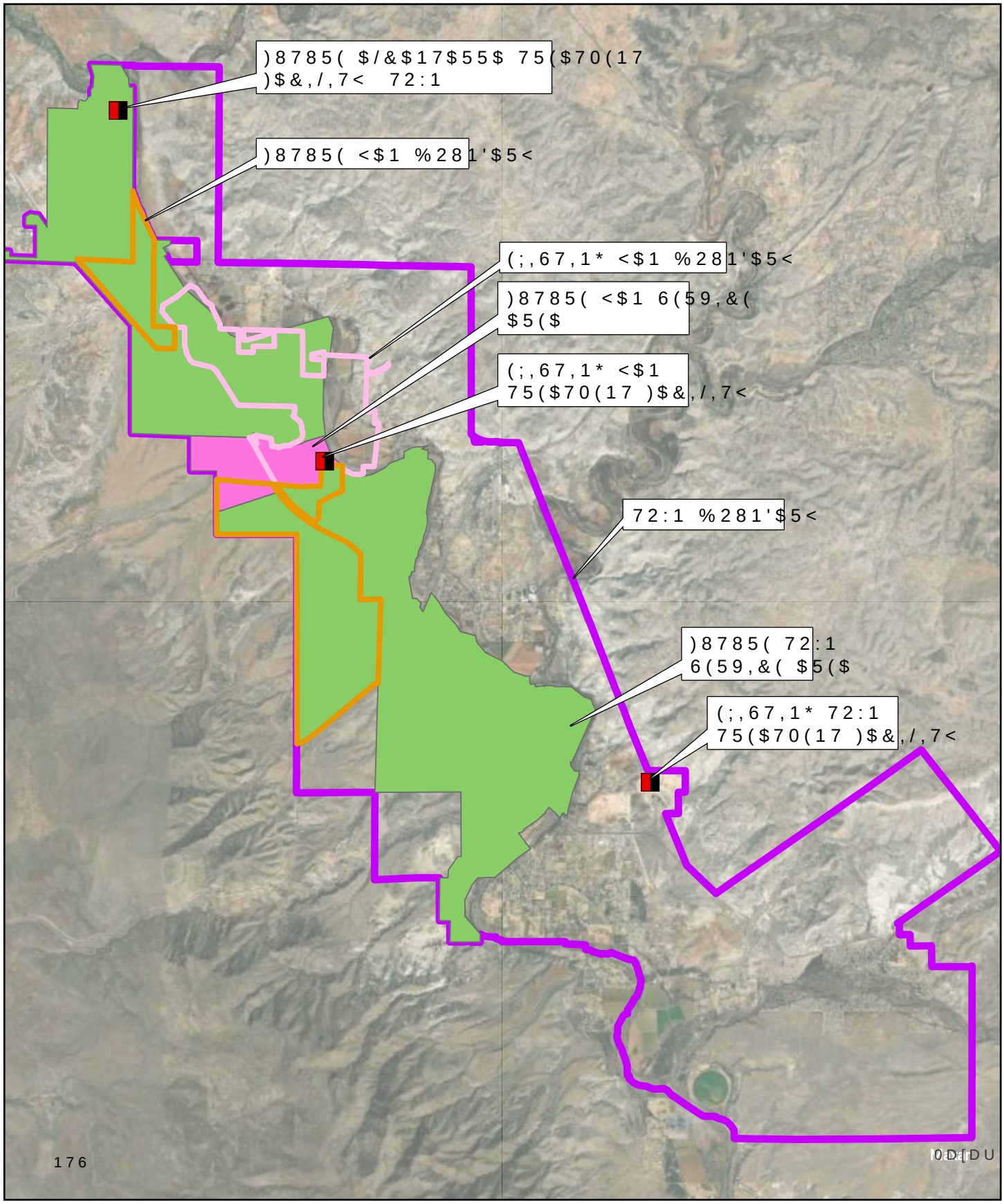
CAMP VERDE
THE CENTER OF IT ALL — ARIZONA

WATERWORKS ENGINEERS

Wastewater System Master Plan

Appendix D 2050 Service Area



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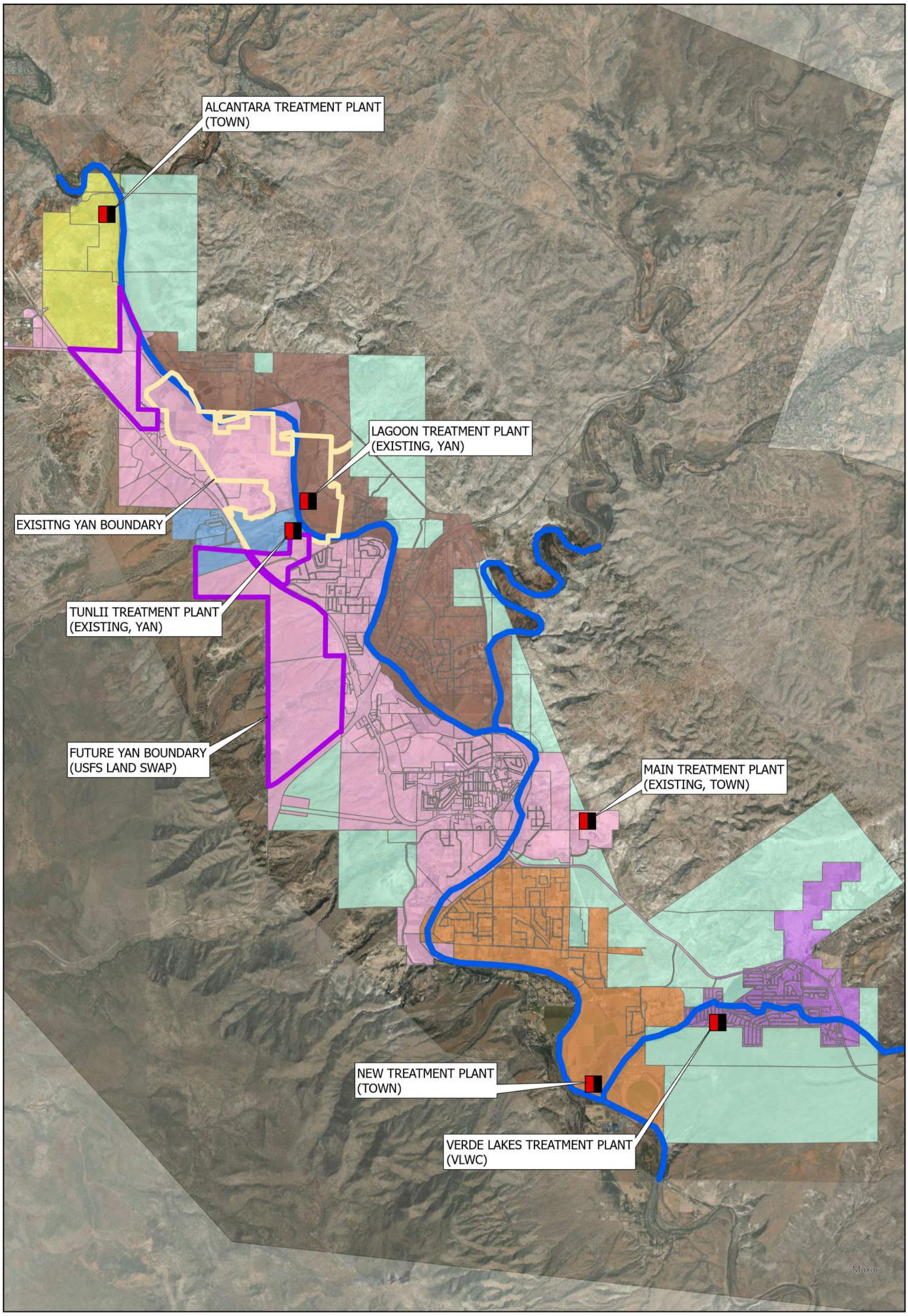
Wastewater System Master Plan

Appendix E Buildout Plant Service Area



BUILDOUT TREATMENT PLANT SERVICE AREAS
TOWN OF CAMP VERDE WASTEWATER MASTER PLAN
CAMP VERDE, AZ
SEPTEMBER 2024

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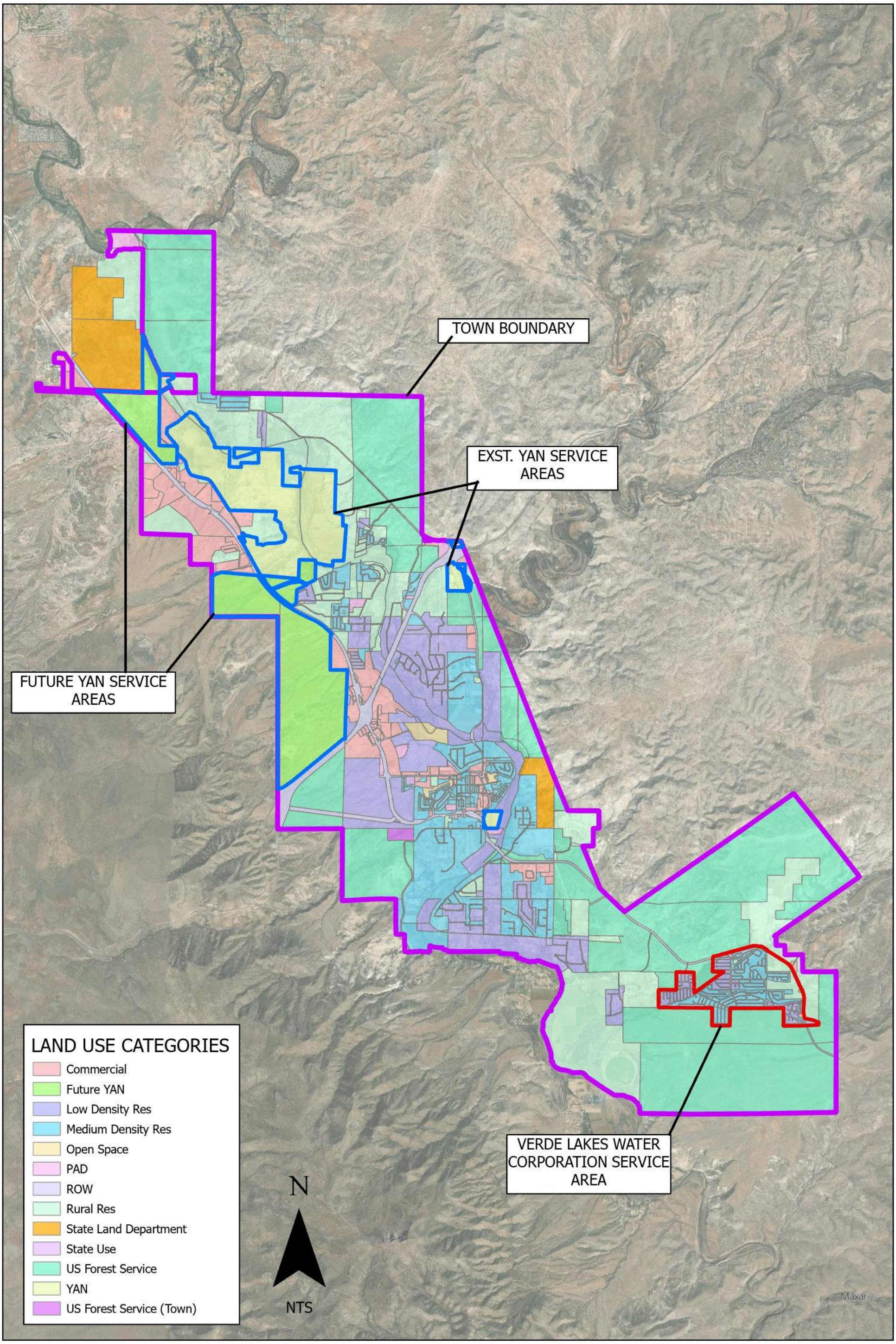
Wastewater System Master Plan

Appendix F Land Use



CAMP VERDE
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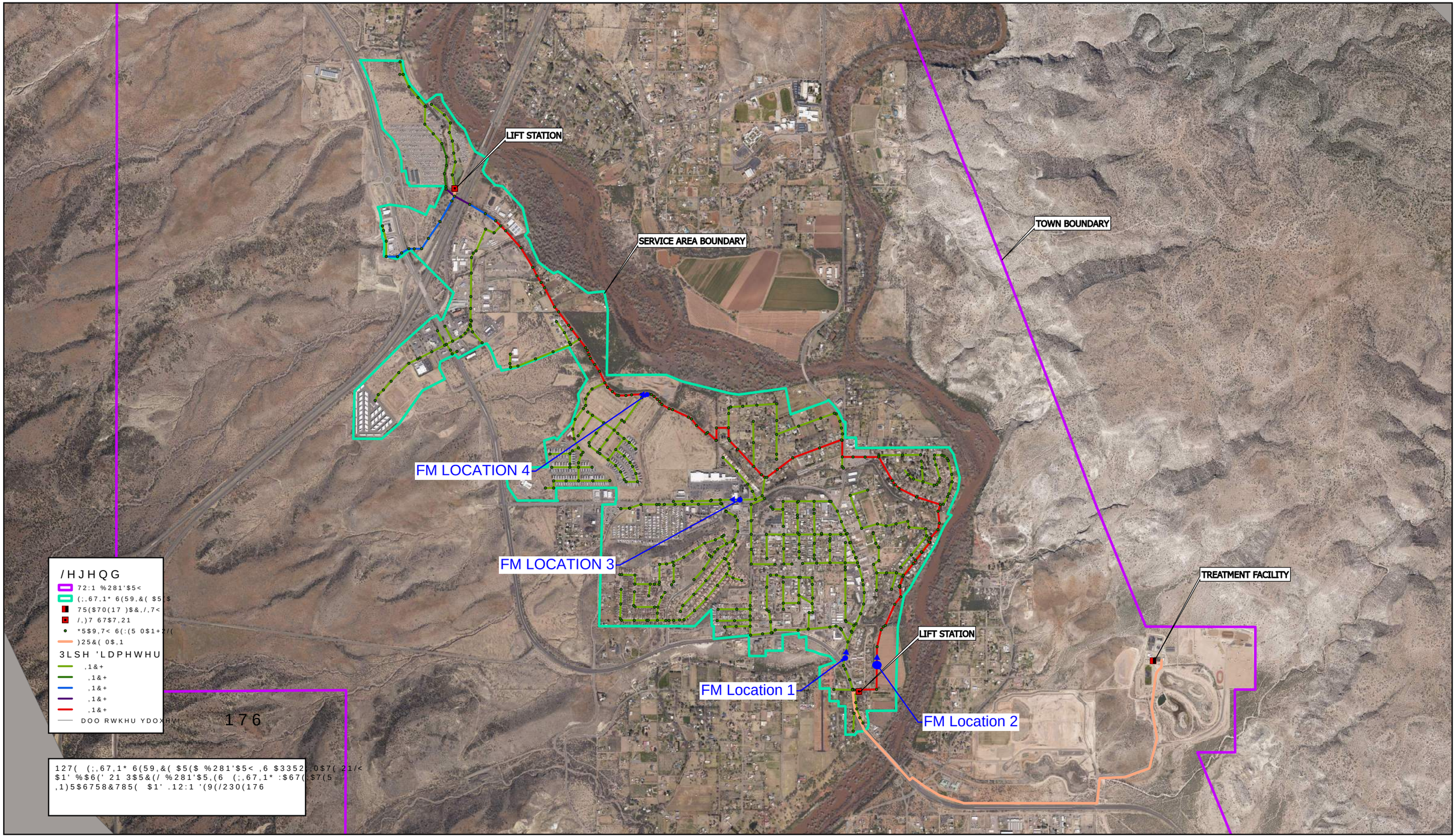
LAND USE MAP
CAMP VERDE MASTER PLAN
CAMP VERDE, AZ
MARCH 2024

WATERWORKS ENGINEERS

Wastewater System Master Plan

Appendix G Diurnal Curves and Flow Monitoring



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CAMP VERDE
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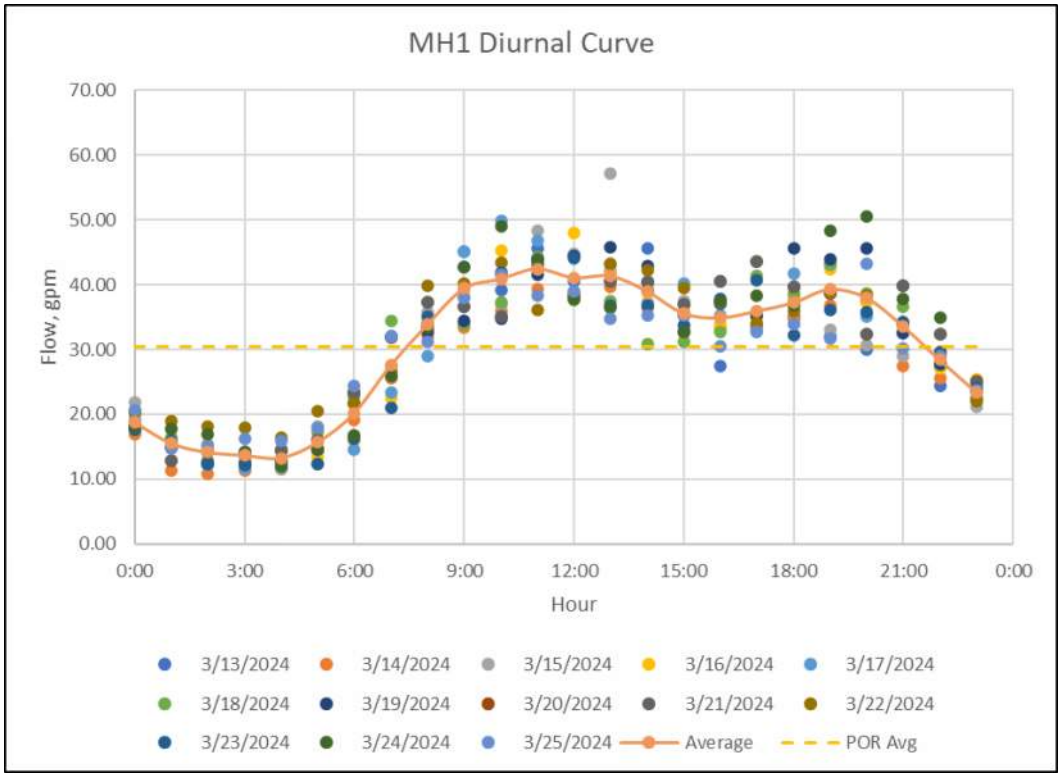
MH1 Diurnal Curve
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Flow, gpm
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Hour
3/13/2024
3/14/2024
3/15/2024
3/16/2024
3/17/2024
3/18/2024
3/19/2024
3/20/2024
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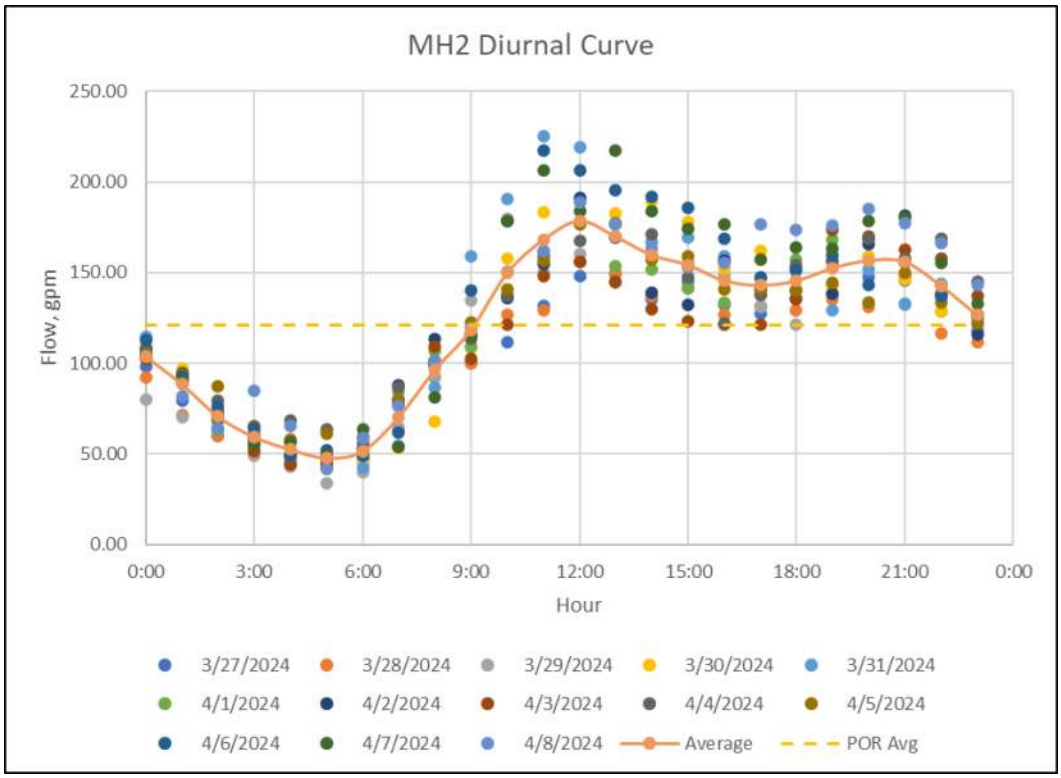
3/23/2024
3/24/2024
3/25/2024
Average
POR Avg


MH2 Diurnal Curve
250.00
200.00
150.00
100.00
50.00
0.00
Flow, gpm
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Hour
3/27/2024
3/28/2024
3/29/2024
3/30/2024
3/31/2024
4/1/2024
4/2/2024
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4/6/2024
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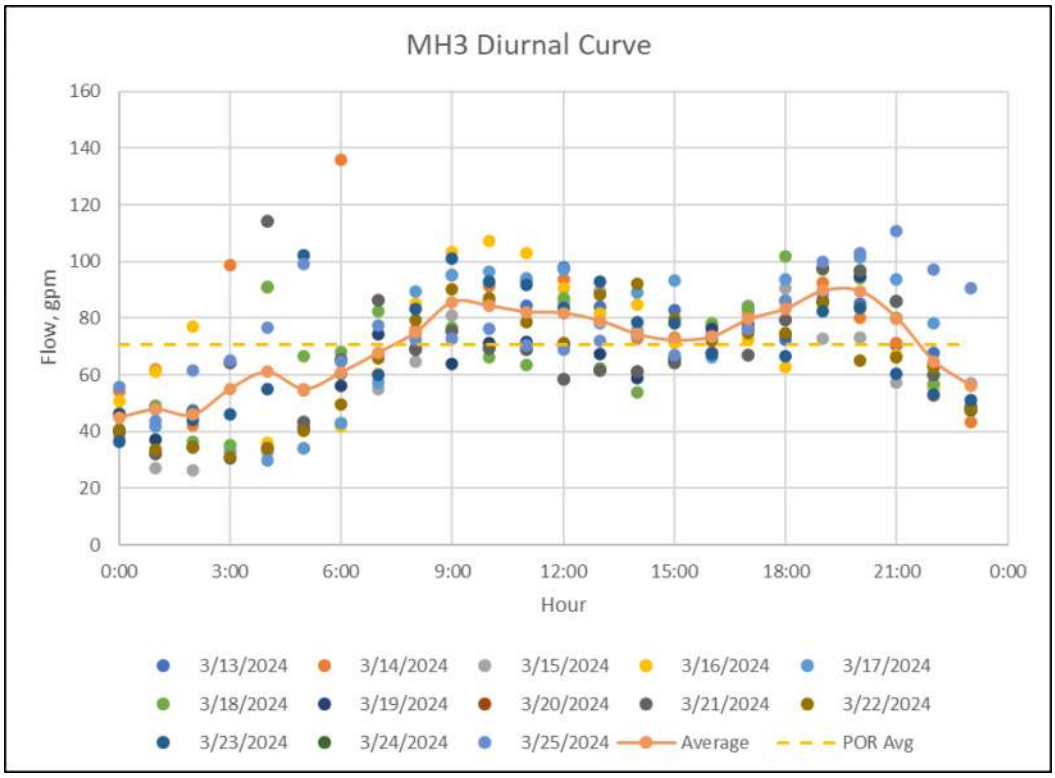
Average
POR Avg


MH3 Diurnal Curve
Flow, gpm
160
140
120
100
80
60
40
20
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
Hour
3/13/2024
3/14/2024
3/15/2024
3/16/2024
3/17/2024
3/18/2024
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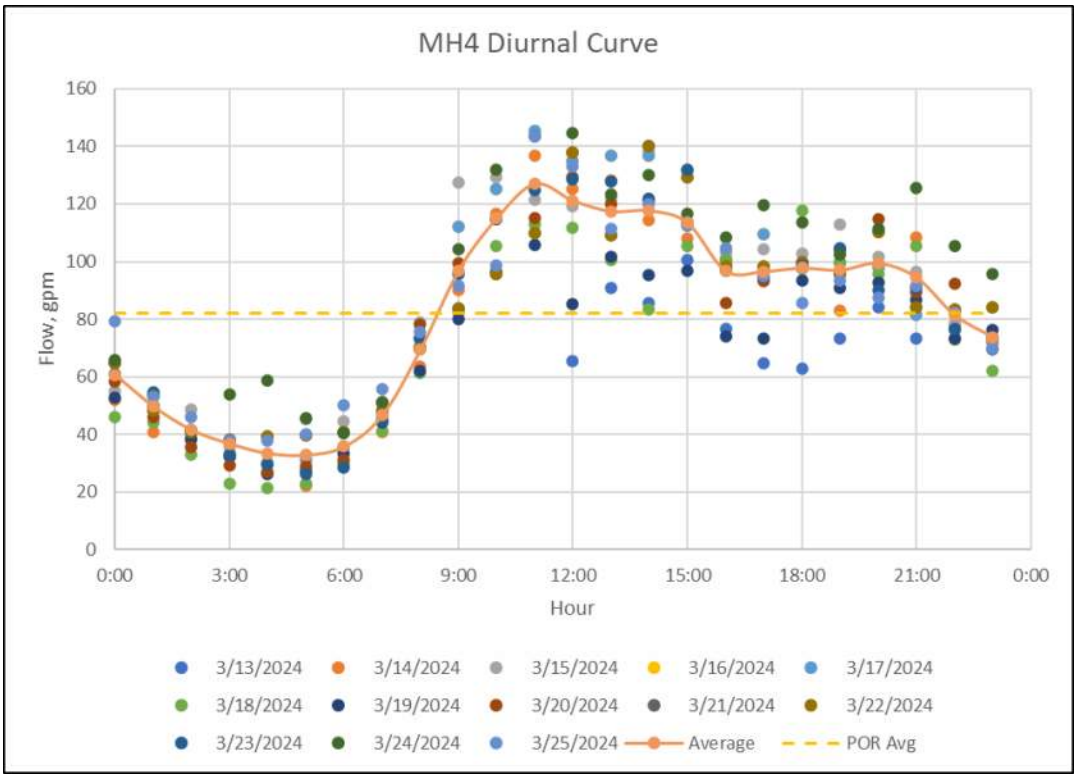
MH4 Diurnal Curve
Flow, gpm
160
140
120
100
80
60
40
20
0
0:00
3:00
6:00
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12:00
15:00
18:00
21:00
0:00
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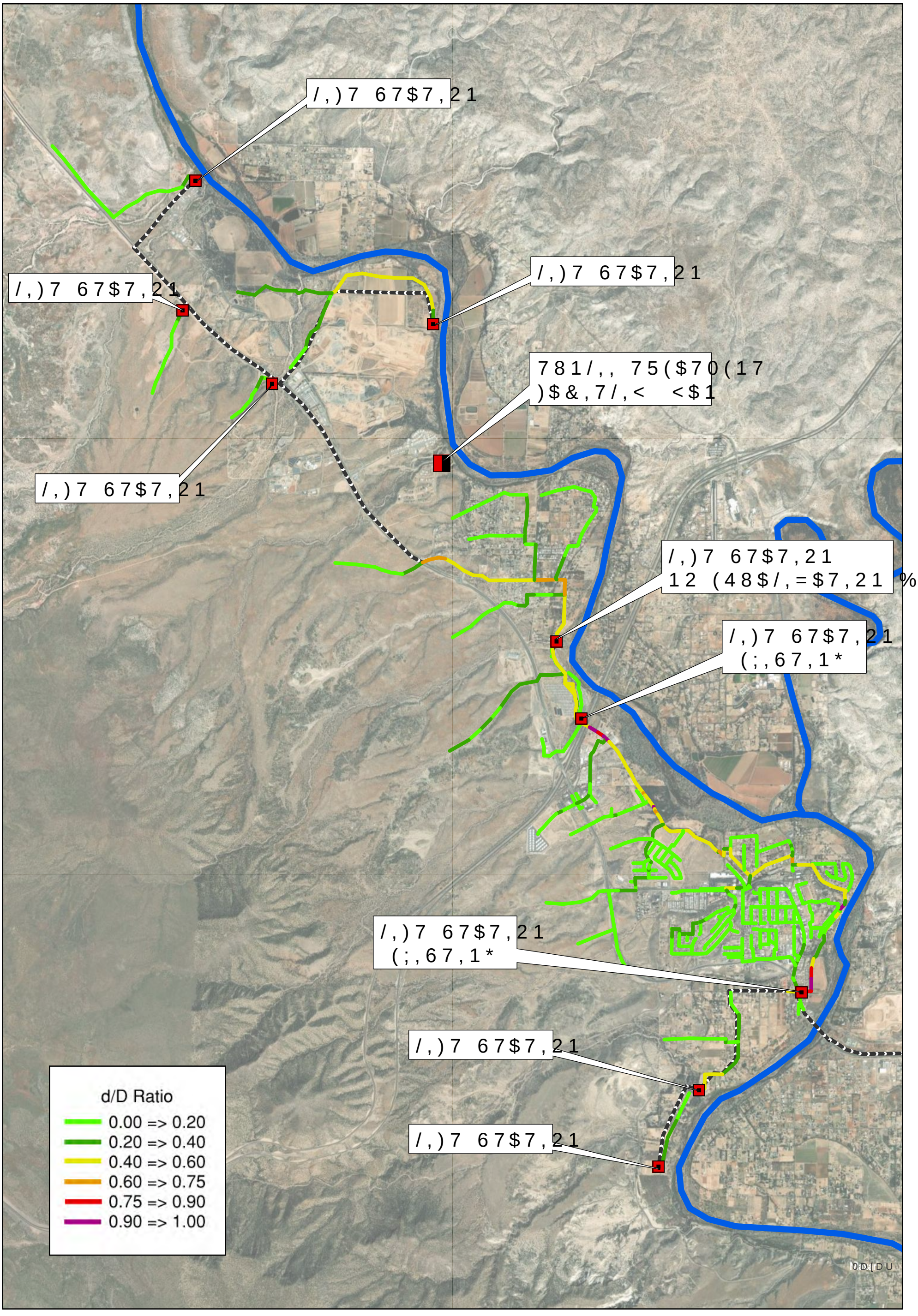
Wastewater System Master Plan

Appendix H Equalization Basin (I-17)



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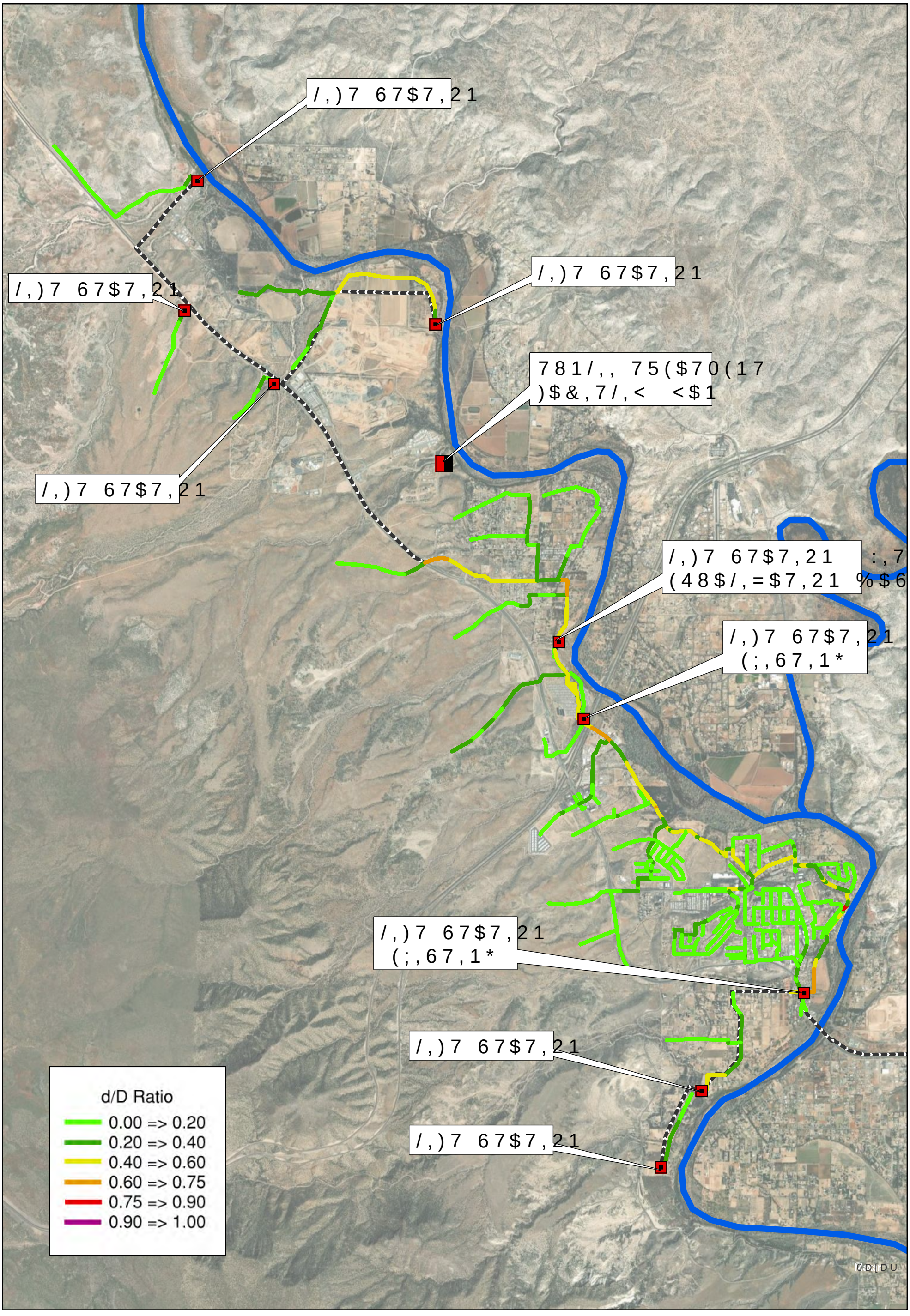

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&$03 9(5'($=
6(37(0%(5

CAMP VERDE
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Wastewater System Master Plan

Appendix I Design Recommendations

General Gravity Sewer Design

Design Parameter	City of Cottonwood[1]	City of Prescott[2]	Recommended
Gravity Main Velocity	2 ft/s < V < 10 ft/s	2 ft/s < V < 10 ft/s (never >15ft/s)	2 ft/s < V < 10 ft/s
Force Main Velocity	3 ft/s < V < 7 ft/s	-	3 ft/s < V < 7 ft/s
d/D for new gravity sewer (<12")	0.50	0.50	0.50
d/D for new gravity sewer (=>12")	0.75	0.75	0.75
max d/D for existing mains	0.90	-	0.75
Gravity Main Roughness	n = 0.013	-	n = 0.013
Force Main Roughness	c = 120 (max)	-	c = 120
Design Flows	No general land Use flows provided.	See table.	See table. 2/3 of Water Master Plan for planning purposes.
	per AAC for specific uses	per AAC for specific uses	per AAC for specific uses
Dry Weather Peaking Factor (New Developments)	per AAC Table	per AAC Table	per AAC Table
Wet Weather Peaking Factor (New Developments)	Dry Weather Peak +10%	Dry Weather Peak +10%	N/A

1. *Cottonwood 2023 Engineering Design Standards Manual*
2. *2016 City of Prescott General Engineering Standards* manual and *Water and Wastewater Models* Report

Minimum Pipe Slopes

Pipe Size	ADEQ Bulletin 11 (Assuming n=0.013	Cottonwood	Prescott	Recommended
8	0.0033	0.005	0.0034 (0.005 preferred)	0.0034
10	0.0024	0.0025	0.0025	0.0025
12	0.0019	0.0020	0.0020	0.0020
14		0.0016	0.0016	0.0016
16		0.0014	0.0014	0.0014
18	0.0011 (0.0011)	0.0012	0.0012	0.0012
20		0.0010	0.0010	0.0010
24		0.00008	0.0008	0.0008

Note: Prescott and Cottonwood based on 2.0 ft/s (flowing full) plus 0.0001 ft/ft.

Wastewater Generation by Land Use

Land Use Type	Prescott	Recommended (2/3 Water Demand)
Industrial, gpad	60-470	N/A
Business General (Commercial), gpad	430-1,585	800
Rural Residential, gpad	105	60
Low Density Residential, gpad	125-260	145
Medium Density Residential, gpad	335-340	904
Multi-Family, gpad	555-560	-
PAD, gpad	-	1,840
YAN, gpad	-	309

Wastewater System Master Plan

Appendix J 2050 System Layout

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86)6 /$1' 6:$3

/,)7 67$7,21

(;,67,1* <$1 %281'$5<

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781/,, 75($70(17 3/$17
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6(59,&($5($ %281'$5<

75($70(17)$&,/,7<
(;,6,71* 72:1

/,)7 67$7,21

/,)7 67$7,21
(;,67,1*

/,)7 67$7,21

LEGEND

- MANHOLE
- LIFT STATION
- TREATMENT FACILITY

GRAVITY MAIN
- EXISTING
- PROPOSED
- 8-INCH
- 10-INCH
- 12-INCH
- 15-INCH
- 18-INCH
- 21-INCH

FORCE MAIN
- 3-INCH
- 4-INCH
- 6-INCH
- 10-INCH
- 12-INCH

FACILITY SERVICE AREA
- ALCANTARRA
- MAIN PLANT
- NO PLANNED SERVICE
- TUNLII

CAMP VERDE
THE CENTER OF IT ALL — ARIZONA

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Drinking Water
Waste Water
Recycled Water
WATERWORKS
ENGINEERS

Wastewater System Master Plan

Appendix K BioWin Model Report

BioWin user and configuration data

Project details

Project name: 23-087 Camp Verde **Project ref.: 23-074**

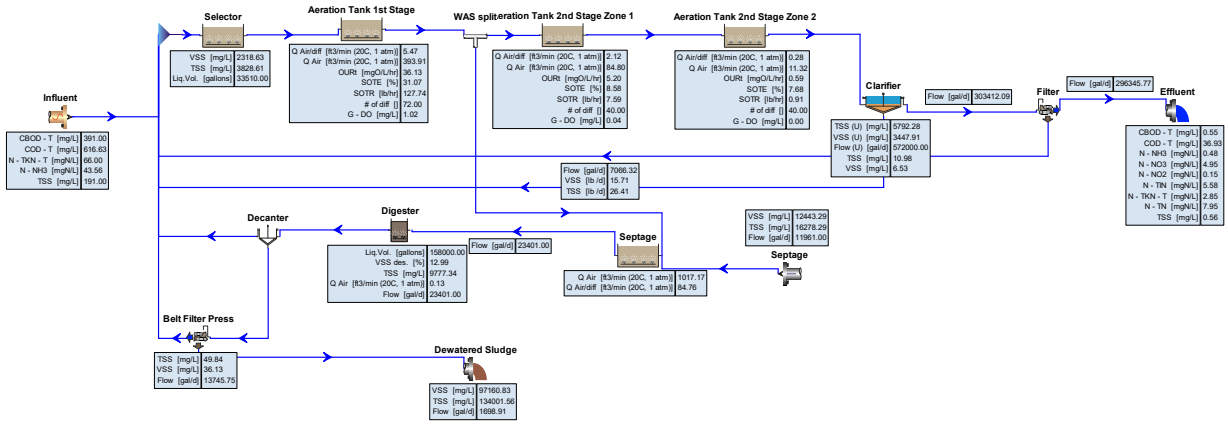
Plant name: Camp Verde **User name: davidk**

Created: 3/15/2024 **Saved: 8/21/2024**

SRT: 6.5 days at steady state

Temperature: 20.0°C

Flowsheet



Configuration information for all Digester - Aerobic units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Digester	1.580E+5	1320.0956	16.000	48

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Digester	0.1

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Digester	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0

Configuration information for all Bioreactor units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Selector	3.351E+4	279.9772	16.000	8
Aeration Tank 1st Stage	1.649E+5	1378.0294	16.000	72
Aeration Tank 2nd Stage Zone 1	8.100E+4	676.7579	16.000	40
Aeration Tank 2nd Stage Zone 2	8.100E+4	676.7579	16.000	40
Septage	4.070E+4	340.0499	16.000	12

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Selector	0.1
Aeration Tank 1st Stage	1.0
Aeration Tank 2nd Stage Zone 1	0.5
Aeration Tank 2nd Stage Zone 2	0.1
Septage	0.1

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Selector	0.0500	0.3800	1.0000	0.0380	0.7620	1.1772	29.4289	0.9997	0	0
Aeration Tank 1st Stage	1.2400	0.8960	0.8880	1.2500	0.4572	0.2943	30.0000	2.9999	0	0
Aeration Tank 2nd Stage Zone 1	0.0500	0.3800	1.0000	1.2500	0.4572	1.1772	29.4289	0.9997	0	0
Aeration Tank 2nd Stage Zone 2	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0
Septage	0.0500	0.3800	1.0000	0.5382	0.2500	1.1772	40.0000	0.9997	0	0

Configuration information for all Influent - BOD units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	282652.7776
BOD - Total Carbonaceous mgBOD/L	391.00
Volatile suspended solids mg/L	144.00
Total suspended solids mg/L	191.00
N - Total Kjeldahl Nitrogen mgN/L	66.00
P - Total P mgP/L	6.50
S - Total S mgS/L	10.00
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	6.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.3362
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220
Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4

FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Clarifier - Ideal units

Physical data

Element name	Volume[gallons]	Area[ft2]	Depth[ft]
Clarifier	1.149E+5	960.0000	16.000

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Clarifier	Flow paced	200.00 %

Element name	Average Temperature	Reactive	Percent removal	Blanket fraction
Clarifier	Uses global setting	No	99.90	0.50

Configuration information for all Influent - COD units

Operating data Average (flow/time weighted as required)

Element name	Septage
Flow	11961
COD - Total mgCOD/L	31900.00
N - Total Kjeldahl Nitrogen mgN/L	588.00
P - Total P mgP/L	210.00
S - Total S mgS/L	0
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	50.00
ISS Total mgISS/L	3835.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Septage
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.2500
Fac - Acetate [gCOD/g of readily biodegradable COD]	2.000E-3
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.8400
Fus - Unbiodegradable soluble [gCOD/g of total COD]	1.000E-3
Fup - Unbiodegradable particulate [gCOD/g of total COD]	5.000E-3
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.1650
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.4290
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220
Fsr - Reduced sulfur [H2S] [gS/gS]	0
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4

FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Separator - Dewatering unit units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Belt Filter Press	Fraction	0.11
Filter	Flow paced	2.50 %

Element name	Percent removal
Belt Filter Press	99.70
Filter	95.00

Configuration information for all Clarifier - Point (volumeless) units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Decanter	Fraction	0.66

Element name	Percent removal
Decanter	99.80

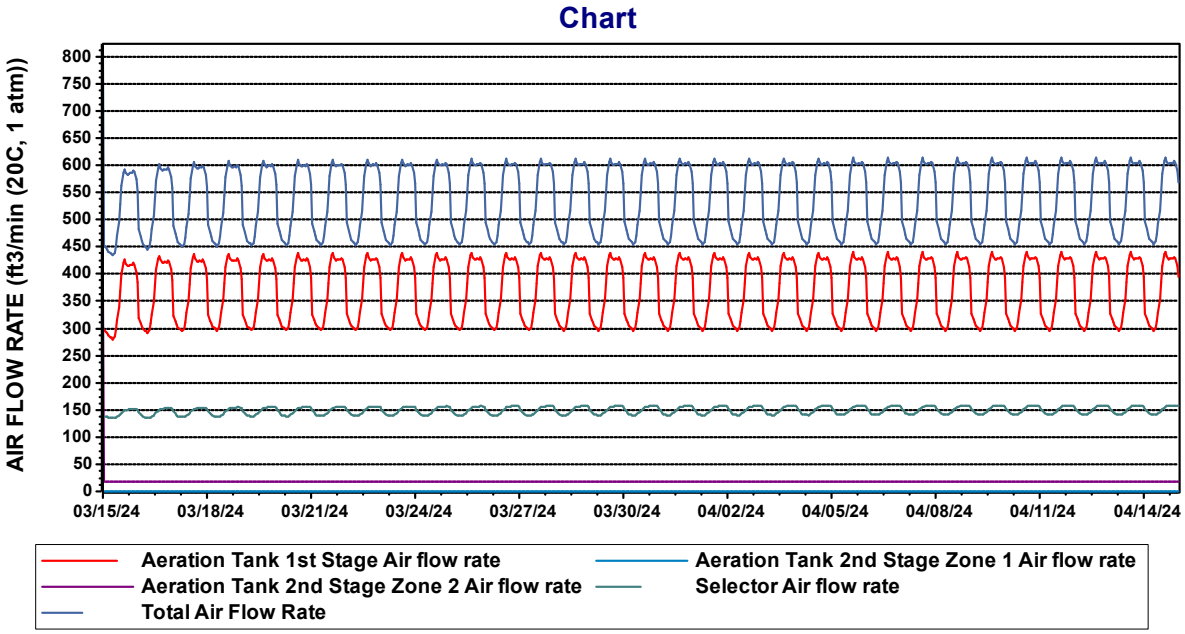
Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

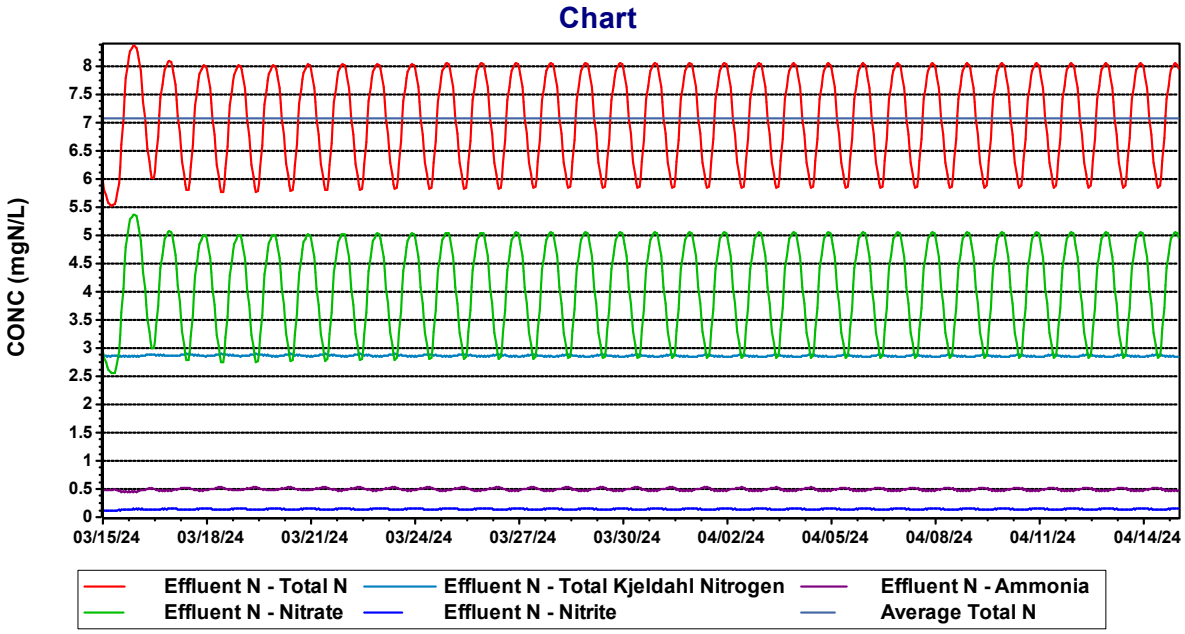
Element name	Split method	Average Split specification
WAS split	Flow paced	4.00 %

BioWin Album

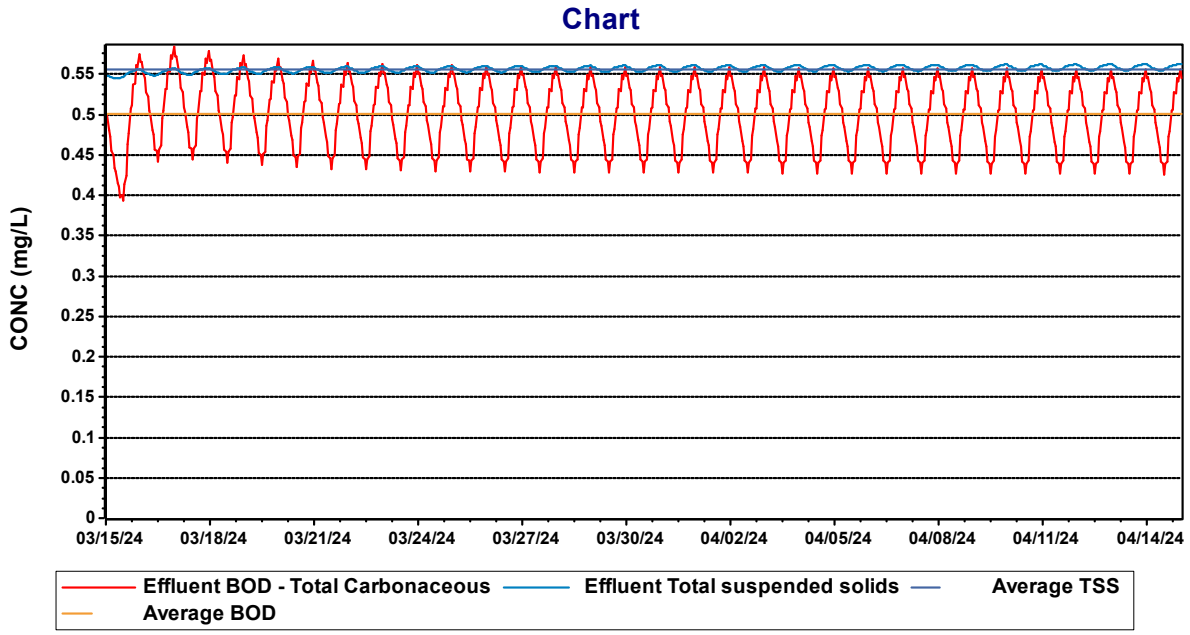
Album page - Airflow Rate



Album page - Effluent N concentrations



Album page - TSS & BOD



Global Parameters (Same for all model)

Common

Name	Default	Value	
Hydrolysis rate [1/d]	2.1000	2.1000	1.0290
Hydrolysis half sat. [-]	0.0600	0.0600	1.0000
External organics hydrolysis rate [1/d]	2.1000	2.1000	1.0290
External organics hydrolysis half sat. [-]	0.0600	0.0600	1.0000
Anoxic hydrolysis factor [-]	0.2800	0.2800	1.0000
Anaerobic hydrolysis factor (AS) [-]	0.0400	0.0400	1.0000
Anaerobic hydrolysis factor (AD) [-]	0.5000	0.5000	1.0000
Adsorption rate of colloids [L/(mgCOD d)]	0.1500	0.1500	1.0290
Ammonification rate [L/(mgCOD d)]	0.0800	0.0800	1.0290
Assimilative nitrate/nitrite reduction rate [1/d]	0.5000	0.5000	1.0000
Endogenous products decay rate [1/d]	0	0	1.0000

Ammonia oxidizing

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9000	0.9000	1.0720
Substrate (NH4) half sat. [mgN/L]	0.7000	0.7000	1.0000
Byproduct NH4 logistic slope [-]	50.0000	50.0000	1.0000
Byproduct NH4 inflection point [mgN/L]	1.4000	1.4000	1.0000
Denite DO half sat. [mg/L]	0.1000	0.1000	1.0000
Denite HNO2 half sat. [mgN/L]	5.000E-6	5.000E-6	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiHNO2 [mmol/L]	5.000E-3	5.000E-3	1.0000

Nitrite oxidizing

Name	Default	Value	
Max. spec. growth rate [1/d]	0.7000	0.7000	1.0600
Substrate (NO2) half sat. [mgN/L]	0.1000	0.1000	1.0000
Aerobic decay rate [1/d]	0.1700	0.1700	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0800	0.0800	1.0290
KiNH3 [mmol/L]	0.0750	0.0750	1.0000

Anaerobic ammonia oxidizing

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2000	0.2000	1.1000
Substrate (NH4) half sat. [mgN/L]	2.0000	2.0000	1.0000
Substrate (NO2) half sat. [mgN/L]	1.0000	1.0000	1.0000
Aerobic decay rate [1/d]	0.0190	0.0190	1.0290

Anoxic/anaerobic decay rate [1/d]	9.500E-3	9.500E-3	1.0290
Ki Nitrite [mgN/L]	1000.0000	1000.0000	1.0000
Nitrite sensitivity constant [L / (d mgN)]	0.0160	0.0160	1.0000

Ordinary heterotrophic

Name	Default	Value	
Max. spec. growth rate [1/d]	3.2000	4.0000	1.0290
Substrate half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Anoxic growth factor [-]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.6200	0.8000	1.0290
Anoxic decay rate [1/d]	0.2330	0.4000	1.0290
Anaerobic decay rate [1/d]	0.1310	0.1310	1.0290
Fermentation rate [1/d]	1.6000	1.6000	1.0290
Fermentation half sat. [mgCOD/L]	5.0000	5.0000	1.0000
Fermentation growth factor (AS) [-]	0.2500	0.2500	1.0000
Free nitrous acid inhibition [mol/L]	1.000E-7	1.000E-7	1.0000

Heterotrophic on industrial COD

Name	Default	Value	
Maximum specific growth rate on Ind #1 COD [1/d]	4.3000	4.3000	1.0290
Substrate (Ind #1) half sat. [mgCOD/L]	1.0000	1.0000	1.0000
Inhibition coefficient for Ind #1 [mgCOD/L]	60.0000	60.0000	1.0000
Anaerobic growth factor for Ind #1 [mgCOD/L]	0.0500	0.0500	1.0000
Maximum specific growth rate on Ind #2 COD [1/d]	1.5000	1.5000	1.0290
Substrate (Ind #2) half sat. [mgCOD/L]	30.0000	30.0000	1.0000
Inhibition coefficient for Ind #2 [mgCOD/L]	3000.0000	3000.0000	1.0000
Anaerobic growth factor for Ind #2 [mgCOD/L]	0.0500	0.0500	1.0000
Maximum specific growth rate on Ind #3 COD [1/d]	4.3000	4.3000	1.0290

Substrate (Ind #3) half sat. [mgCOD/L]	1.0000	1.0000	1.0000
Inhibition coefficient for Ind #3 COD [mgCOD/L]	60.0000	60.0000	1.0000
Anaerobic growth factor for Ind #3 [mgCOD/L]	0.0500	0.0500	1.0000
Maximum specific growth rate on adsorbed hydrocarbon COD [1/d]	2.0000	2.0000	1.0290
Substrate (adsorbed hydrocarbon) half sat. [-]	0.1500	0.1500	1.0000
Anaerobic growth factor for adsorbed hydrocarbons [mgCOD/L]	0.0100	0.0100	1.0000
Adsorption rate of soluble hydrocarbons [l/(mgCOD d)]	0.2000	0.2000	1.0000

Methylotrophic

Name	Default	Value	
Max. spec. growth rate [1/d]	1.3000	1.3000	1.0720
Methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Denite N2 producers (NO3 or NO2) [-]	0.5000	0.5000	1.0000
Aerobic decay rate [1/d]	0.0400	0.0400	1.0290
Anoxic/anaerobic decay rate [1/d]	0.0300	0.0300	1.0290
Free nitrous acid inhibition [mmol/L]	1.000E-7	1.000E-7	1.0000

Phosphorus accumulating

Name	Default	Value	
Max. spec. growth rate [1/d]	0.9500	0.9500	1.0000
Max. spec. growth rate, P-limited [1/d]	0.4200	0.4200	1.0000
Substrate half sat. [mgCOD(PHA)/mgCOD(Zbp)]	0.1000	0.1000	1.0000
Substrate half sat., P-limited [mgCOD(PHA)/mgCOD(Zbp)]	0.0500	0.0500	1.0000
Magnesium half sat. [mgMg/L]	0.1000	0.1000	1.0000
Cation half sat. [mmol/L]	0.1000	0.1000	1.0000
Calcium half sat. [mgCa/L]	0.1000	0.1000	1.0000
Aerobic/anoxic decay rate [1/d]	0.1000	0.1000	1.0000
Aerobic/anoxic maintenance rate [1/d]	0	0	1.0000
Anaerobic decay rate [1/d]	0.0400	0.0400	1.0000

Anaerobic maintenance rate [1/d]	0	0	1.0000
Sequestration rate [1/d]	4.5000	4.5000	1.0000
Anoxic growth factor [-]	0.3300	0.3300	1.0000

Propionic acetogenic

Name	Default	Value	
Max. spec. growth rate [1/d]	0.2500	0.2500	1.0290
Substrate half sat. [mgCOD/L]	10.0000	10.0000	1.0000
Acetate inhibition [mgCOD/L]	10000.0000	10000.0000	1.0000
Anaerobic decay rate [1/d]	0.0500	0.0500	1.0290
Aerobic/anoxic decay rate [1/d]	0.5200	0.5200	1.0290

Methanogenic

Name	Default	Value	
Acetoclastic max. spec. growth rate [1/d]	0.3000	0.3000	1.0290
H2-utilizing max. spec. growth rate [1/d]	1.4000	1.4000	1.0290
Acetoclastic substrate half sat. [mgCOD/L]	100.0000	100.0000	1.0000
Acetoclastic methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
H2-utilizing CO2 half sat. [mmol/L]	0.1000	0.1000	1.0000
H2-utilizing substrate half sat. [mgCOD/L]	1.0000	1.0000	1.0000
H2-utilizing methanol half sat. [mgCOD/L]	0.5000	0.5000	1.0000
Acetoclastic propionic inhibition [mgCOD/L]	10000.0000	10000.0000	1.0000
Acetoclastic anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
Acetoclastic aerobic/anoxic decay rate [1/d]	0.6000	0.6000	1.0290
H2-utilizing anaerobic decay rate [1/d]	0.1300	0.1300	1.0290
H2-utilizing aerobic/anoxic decay rate [1/d]	2.8000	2.8000	1.0290

Sulfur oxidizing

Name	Default	Value	
Maximum specific growth rate (sulfide) [1/d]	0.7500	0.7500	1.0290
Maximum specific growth rate (sulfur) [1/d]	0.1000	0.1000	1.0290
Substrate (H2S) half sat. [mgS/L]	1.0000	1.0000	1.0000
Substrate (sulfur) half sat. [mgS/L]	1.0000	1.0000	1.0000
Anoxic growth factor [-]	0.5000	0.5000	1.0000
Decay rate [1/d]	0.0400	0.0400	1.0290

Sulfur reducing

Name	Default	Value	
Propionic max. spec. growth rate [1/d]	0.5830	0.5830	1.0350
Propionic acid half sat. [mgCOD/L]	295.0000	295.0000	1.0000
Hydrogen sulfide inhibition coefficient [mgS/L]	185.0000	185.0000	1.0000
Sulfate (SO4=) half sat. [mgS/L]	2.4700	2.4700	1.0000
Decay rate [1/d]	0.0185	0.0185	1.0350
Acetotrophic max. spec. growth rate [1/d]	0.6120	0.6120	1.0350
Acetic acid half sat. [mgCOD/L]	24.0000	24.0000	1.0000
Hydrogen sulfide inhibition coefficient [mgS/L]	164.0000	164.0000	1.0000
Sulfate (SO4=) half sat. [mgS/L]	6.4100	6.4100	1.0000
Decay rate [1/d]	0.0275	0.0275	1.0350
Hydrogenotrophic max. spec. growth rate with SO4= [1/d]	2.8000	2.8000	1.0350
Hydrogenotrophic max. spec. growth rate with S [1/d]	0.1000	0.1000	1.0350
Hydrogen half sat. [mgCOD/L]	0.0700	0.0700	1.0000
Hydrogen sulfide inhibition coefficient [mgS/L]	550.0000	550.0000	1.0000
Sulfate (SO4=) half sat. [mgS/L]	6.4100	6.4100	1.0000
Sulfur (S) half sat. [mgS/L]	50.0000	50.0000	1.0000
Decay rate [1/d]	0.0600	0.0600	1.0350

pH

Name	Default	Value
Ordinary heterotrophic low pH limit [-]	4.0000	4.0000
Ordinary heterotrophic high pH limit [-]	10.0000	10.0000
Methylotrophic low pH limit [-]	4.0000	4.0000
Methylotrophic high pH limit [-]	10.0000	10.0000
Autotrophic low pH limit [-]	5.5000	5.5000
Autotrophic high pH limit [-]	9.5000	9.5000
Phosphorus accumulating low pH limit [-]	4.0000	4.0000
Phosphorus accumulating high pH limit [-]	10.0000	10.0000
Ordinary heterotrophic low pH limit (anaerobic) [-]	5.5000	5.5000
Ordinary heterotrophic high pH limit (anaerobic) [-]	8.5000	8.5000
Propionic acetogenic low pH limit [-]	4.0000	4.0000
Propionic acetogenic high pH limit [-]	10.0000	10.0000
Acetoclastic methanogenic low pH limit [-]	5.0000	5.0000
Acetoclastic methanogenic high pH limit [-]	9.0000	9.0000
H2-utilizing methanogenic low pH limit [-]	5.0000	5.0000
H2-utilizing methanogenic high pH limit [-]	9.0000	9.0000

Switches

Name	Default	Value
Ordinary heterotrophic DO half sat. [mgO2/L]	0.1500	0.1500
Phosphorus accumulating DO half sat. [mgO2/L]	0.0500	0.0500
Anoxic/anaerobic NOx half sat. [mgN/L]	0.1500	0.1500
Ammonia oxidizing DO half sat. [mgO2/L]	0.2500	0.2500
Nitrite oxidizing DO half sat. [mgO2/L]	0.5000	0.5000
Anaerobic ammonia oxidizing DO half sat. [mgO2/L]	0.0100	0.0100
Sulfur oxidizing sulfate pathway DO half sat. [mgO2/L]	0.2500	0.2500
Sulfur oxidizing sulfur pathway DO half sat. [mgO2/L]	0.0500	0.0500
Anoxic NO3(->NO2) half sat. [mgN/L]	0.1000	0.1000
Anoxic NO3(->N2) half sat. [mgN/L]	0.0500	0.0500
Anoxic NO2(->N2) half sat. (mgN/L)	0.0100	0.0100

NH3 nutrient half sat. [mgN/L]	5.000E-3	5.000E-3
PolyP half sat. [mgP/mgCOD]	0.0100	0.0100
VFA sequestration half sat. [mgCOD/L]	5.0000	5.0000
P uptake half sat. [mgP/L]	0.1500	0.1500
P nutrient half sat. [mgP/L]	1.000E-3	1.000E-3
Autotrophic CO2 half sat. [mmol/L]	0.1000	0.1000
H2 low/high half sat. [mgCOD/L]	1.0000	1.0000
Propionic acetogenic H2 inhibition [mgCOD/L]	5.0000	5.0000
Synthesis anion/cation half sat. [meq/L]	0.0100	0.0100

Common

Name	Default	Value
Biomass/Endog Ca content (gCa/gCOD)	3.912E-3	3.912E-3
Biomass/Endog Mg content (gMg/gCOD)	3.912E-3	3.912E-3
Biomass/Endog other cations content (mol/gCOD)	5.115E-4	5.115E-4
Biomass/Endog other Anions content (mol/gCOD)	1.410E-4	1.410E-4
N in endogenous residue [mgN/mgCOD]	0.0700	0.0700
P in endogenous residue [mgP/mgCOD]	0.0220	0.0220
Ca content of slowly biodegradabe (gCa/gCOD)	3.912E-3	3.912E-3
Mg content of slowly biodegradabe (gMg/gCOD)	3.700E-4	3.700E-4
Endogenous residue COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Particulate substrate COD:VSS ratio [mgCOD/mgVSS]	1.6327	1.6327
Particulate inert COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000
Cellulose COD:VSS ratio [mgCOD/mgVSS]	1.4000	1.4000
External organic COD:VSS ratio [mgCOD/mgVSS]	1.6000	1.6000
Molecular weight of other anions [mg/mmol]	35.5000	35.5000
Molecular weight of other cations [mg/mmol]	39.0983	39.0983

Ammonia oxidizing

Name	Default	Value
Yield [mgCOD/mgN]	0.1500	0.1500
Denite NO2 fraction as TEA [-]	0.5000	0.5000
Byproduct NH4 fraction to N2O [-]	2.500E-3	2.500E-3
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Nitrite oxidizing

Name	Default	Value
Yield [mgCOD/mgN]	0.0900	0.0900
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Anaerobic ammonia oxidizing

Name	Default	Value
Yield [mgCOD/mgN]	0.1140	0.1140
Nitrate production [mgN/mgBiomassCOD]	2.2800	2.2800
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Ordinary heterotrophic

Name	Default	Value
Yield (aerobic) [-]	0.6660	0.3000
Yield (fermentation, low H2) [-]	0.1000	0.1000
Yield (fermentation, high H2) [-]	0.1000	0.1000
H2 yield (fermentation low H2) [-]	0.3500	0.3500
H2 yield (fermentation high H2) [-]	0	0
Propionate yield (fermentation, low H2) [-]	0	0
Propionate yield (fermentation, high H2) [-]	0.7000	0.7000
CO2 yield (fermentation, low H2) [-]	0.7000	0.7000
CO2 yield (fermentation, high H2) [-]	0	0
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Endogenous fraction - aerobic [-]	0.0800	0.0800
Endogenous fraction - anoxic [-]	0.1030	0.1030
Endogenous fraction - anaerobic [-]	0.1840	0.1840
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield (anoxic) [-]	0.5400	0.2000
Yield propionic (aerobic) [-]	0.6400	0.6400
Yield propionic (anoxic) [-]	0.4600	0.4600
Yield acetic (aerobic) [-]	0.6000	0.6000
Yield acetic (anoxic) [-]	0.4300	0.4300
Yield methanol (aerobic) [-]	0.5000	0.5000
Adsorp. max. [-]	1.0000	1.0000
Max fraction to N2O at high FNA over nitrate [-]	0.0500	0.0500
Max fraction to N2O at high FNA over nitrite [-]	0.1000	0.1000

Ordinary heterotrophic on industrial COD

Name	Default	Value
Yield Ind #1 COD (Aerobic) [-]	0.5000	0.5000
Yield Ind #1 COD (Anoxic) [-]	0.4000	0.4000
Yield Ind #1 COD (Anaerobic) [-]	0.0400	0.0400

COD:Mole ratio - Ind #1 COD [gCOD/Mol]	224.0000	224.0000
Yield Ind #2 COD (Aerobic) [-]	0.5000	0.5000
Yield Ind #2 COD (Anoxic) [-]	0.4000	0.4000
Yield Ind #2 COD (Anaerobic) [-]	0.0500	0.0500
COD:Mole ratio - Ind #2 COD [gCOD/Mol]	240.0000	240.0000
Yield on Ind #3 COD (Aerobic) [-]	0.5000	0.5000
Yield on Ind #3 COD (Anoxic) [-]	0.4000	0.4000
Yield on Ind #3 COD (Anaerobic) [-]	0.0400	0.0400
COD:Mole ratio - Ind #3 COD [gCOD/Mol]	288.0000	288.0000
Yield enmeshed hydrocarbons (Aerobic) [-]	0.5000	0.5000
Yield enmeshed hydrocarbons (Anoxic) [-]	0.4000	0.4000
Yield enmeshed hydrocarbons (Anaerobic) [-]	0.0400	0.0400
COD:Mole ratio - Hydrocarbon COD [gCOD/Mol]	336.0000	336.0000
Hydrocarbon COD:VSS ratio [mgCOD/mgVSS]	3.2000	3.2000
Max. hydrocarbon adsorp. ratio [-]	1.0000	1.0000
Yield of Ind #1 on Ind #3 COD (Aerobic) [-]	0	0
Yield of Ind #1 on Ind #3 COD (Anoxic) [-]	0	0
Hydrocarbon Yield on Ind #3 COD (Aerobic) [-]	0	0
Hydrocarbon Yield on Ind #3 COD (Anoxic) [-]	0	0

Methylotrophic

Name	Default	Value
Yield (anoxic) [-]	0.4000	0.4000
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Max fraction to N2O at high FNA over nitrate [-]	0.1000	0.1000
Max fraction to N2O at high FNA over nitrite [-]	0.1500	0.1500

Phosphorus accumulating

Name	Default	Value
Yield (aerobic) [-]	0.6390	0.6390
Yield (anoxic) [-]	0.5200	0.5200
Aerobic P/PHA uptake [mgP/mgCOD]	0.9300	0.9300
Anoxic P/PHA uptake [mgP/mgCOD]	0.3500	0.3500
Yield of PHA on Ac sequestration [-]	0.8890	0.8890
N in biomass [mgN/mgCOD]	0.0700	0.0700
N in sol. inert [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous part. [-]	0.2500	0.2500
Inert fraction of endogenous sol. [-]	0.2000	0.2000
P/Ac release ratio [mgP/mgCOD]	0.5100	0.5100
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
Yield of low PP [-]	0.9400	0.9400
Mg to P mole ratio in polyphosphate [mmolMg/mmolP]	0.3000	0.3000
Cation to P mole ratio in polyphosphate [meq/mmolP]	0.1500	0.1500
Ca to P mole ratio in polyphosphate [mmolCa/mmolP]	0.0500	0.0500

Propionic acetogenic

Name	Default	Value
Yield [-]	0.1000	0.1000
H2 yield [-]	0.4000	0.4000
CO2 yield [-]	1.0000	1.0000
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Methanogenic

Name	Default	Value
Acetoclastic yield [-]	0.1000	0.1000
Acetoclastic yield on methanol[-]	0.1000	0.1000
H2-utilizing yield [-]	0.1000	0.1000
H2-utilizing yield on methanol [-]	0.1000	0.1000
N in acetoclastic biomass [mgN/mgCOD]	0.0700	0.0700
N in H2-utilizing biomass [mgN/mgCOD]	0.0700	0.0700
P in acetoclastic biomass [mgP/mgCOD]	0.0220	0.0220
P in H2-utilizing biomass [mgP/mgCOD]	0.0220	0.0220
Acetoclastic fraction to endog. residue [-]	0.0800	0.0800
H2-utilizing fraction to endog. residue [-]	0.0800	0.0800
Acetoclastic COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200
H2-utilizing COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Sulfur oxidizing

Name	Default	Value
Yield (aerobic) [mgCOD/mgS]	0.5000	0.5000
Yield (Anoxic) [mgCOD/mgS]	0.3500	0.3500
N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

Sulfur reducing

Name	Default	Value
Yield [mgCOD/mg H2 COD]	0.0712	0.0712
Yield [mgCOD/mg Ac COD]	0.0470	0.0470
Yield [mgCOD/mg Pr COD]	0.0384	0.0384

N in biomass [mgN/mgCOD]	0.0700	0.0700
P in biomass [mgP/mgCOD]	0.0220	0.0220
Fraction to endogenous residue [-]	0.0800	0.0800
COD:VSS ratio [mgCOD/mgVSS]	1.4200	1.4200

General

Name	Default	Value
Tank head loss per metre of length (from flow) [m/m]	2.500E-3	2.500E-3
BOD calculation rate constant for Xsc degradation [/d]	0.5000	0.5000
BOD calculation rate constant for Xsp (and hydrocarbon) degradation [/d]	0.5000	0.5000
BOD calculation rate constant for Xeo degradation [/d]	0.5000	0.5000

Heating fuel/Chemical Costs

Name	Default	Value
Methanol [$/gal]	1.6656	1.6656
Ferric chloride [$/lb Fe]	0.5307	0.5307
Ferric sulfate [$/lb Fe]	0.3583	0.3583
Ferrous chloride [$/lb Fe]	0.2767	0.2767
Ferrous sulfate [$/lb Fe]	1.0750	1.0750
Aluminum sulfate [$/lb Al]	0.7666	0.7666
Aluminum chloride [$/lb Al]	0.8981	0.8981
Poly Aluminum Chloride (PAC) [$/lb Al]	0.5307	0.5307
Natural gas [$/MMBTU]	3.1652	3.1652
Heating oil [$/gal]	1.8927	1.8927
Diesel [$/gal]	2.6498	2.6498
Custom fuel [$/gal]	3.7854	3.7854
Biogas sale price [$/MMBTU]	2.1101	2.1101

Anaerobic digester

Name	Default	Value
Bubble rise velocity (anaerobic digester) [cm/s]	23.9000	23.9000
Bubble Sauter mean diameter (anaerobic digester) [cm]	0.3500	0.3500
Anaerobic digester gas hold-up factor []	1.0000	1.0000

Combined Heat and Power (CHP) engine

Name	Default	Value
Methane heat of combustion [kJ/mole]	800.0000	800.0000
Hydrogen heat of combustion [kJ/mole]	240.0000	240.0000
CHP engine heat price [$/kWh]	0	0
CHP engine power price [$/kWh]	0.1500	0.1500

Calorific values of heating fuels

Name	Default	Value
Calorific value of natural gas [kJ/kg]	48000	48000
Calorific value of heating fuel oil [kJ/kg]	42000	42000
Calorific value of diesel [kJ/kg]	46000	46000
Calorific value of custom fuel [kJ/kg]	32000	32000

Density of liquid heating fuels

Mass transfer

Name	Default	Value	
Kl for H2 [m/d]	17.0000	17.0000	1.0240
Kl for CO2 [m/d]	10.0000	10.0000	1.0240
Kl for NH3 [m/d]	1.0000	1.0000	1.0240
Kl for CH4 [m/d]	8.0000	8.0000	1.0240
Kl for N2 [m/d]	15.0000	15.0000	1.0240
Kl for N2O [m/d]	8.0000	8.0000	1.0240
Kl for H2S [m/d]	1.0000	1.0000	1.0240
Kl for Ind #1 COD [m/d]	0	0	1.0240
Kl for Ind #2 COD [m/d]	0.5000	0.5000	1.0240
Kl for Ind #3 COD [m/d]	0	0	1.0240
Kl for O2 [m/d]	13.0000	13.0000	1.0240

Henry's law constants

Name	Default	Value	
CO2 [M/atm]	3.4000E-2	3.4000E-2	2400.0000
O2 [M/atm]	1.3000E-3	1.3000E-3	1500.0000
N2 [M/atm]	6.5000E-4	6.5000E-4	1300.0000
N2O [M/atm]	2.5000E-2	2.5000E-2	2600.0000
NH3 [M/atm]	5.8000E+1	5.8000E+1	4100.0000
CH4 [M/atm]	1.4000E-3	1.4000E-3	1600.0000
H2 [M/atm]	7.8000E-4	7.8000E-4	500.0000
H2S [M/Atm]	1.0000E-1	1.0000E-1	2200.0000
Ind 1 [M/Atm]	1.9000E+3	1.9000E+3	7300.0000
Ind 2 [M/Atm]	1.8000E-1	1.8000E-1	2200.0000
Ind 3 [M/Atm]	1.5000E-1	1.5000E-1	1900.0000

Properties constants

Name	Default	Value
K in Viscosity = K e ^(Ea/RT) [Pa s]	6.849E-7	6.849E-7
Ea in Viscosity = K e ^(Ea/RT) [j/mol]	1.780E+4	1.780E+4
Y in ML Viscosity = H2O viscosity * (1+A*MLSS^Y) [-]	1.0000	1.0000
A in ML Viscosity = H2O viscosity * (1+A*MLSS^Y) [m3/g]	1.000E-7	1.000E-7
A in ML Density = H2O density + A*MLSS [(kg/m3)/(g/m3)]	3.248E-4	3.248E-4
A in Antoine equn. [T in K, P in Bar {NIST}]	5.2000	5.2000
B in Antoine equn. [T in K, P in Bar {NIST}]	1734.0000	1734.0000
C in Antoine equn. [T in K, P in Bar {NIST}]	-39.5000	-39.5000

Metal salt solution densities

Name	Default	Value
Ferric chloride solution density [kg/m3]	3820.0000	3820.0000
Ferric sulfate solution density [kg/m3]	4800.0000	4800.0000
Ferrous chloride solution density [kg/m3]	3160.0000	3160.0000
Ferrous sulfate solution density [kg/m3]	1150.0000	1150.0000
Aluminum sulfate solution density [kg/m3]	1950.0000	1950.0000
Aluminum chloride solution density [kg/m3]	2480.0000	2480.0000

Mineral precipitation rates

Name	Default	Value	
Vivianite precipitation rate [L/(mol d)]	1.000E+5	1.000E+5	1.0240
Vivianite redissolution rate [L/(mol d)]	1.000E+5	1.000E+5	1.0240
Vivianite half sat. [mgTSS/L]	0.0100	0.0100	1.0000
FeS precipitation rate [L/(mol d)]	1000.0000	1000.0000	1.0240
FeS redissolution rate [L/(mol d)]	10.0000	10.0000	1.0240
FeS half sat. [mgTSS/L]	0.1000	0.1000	1.0000
Struvite precipitation rate [L^2/(mol^2 d)]	3.000E+10	3.000E+10	1.0240
Struvite redissolution rate [L^2/(mol^2 d)]	3.000E+11	3.000E+11	1.0240

Struvite half sat. [mgTSS/L]	1.0000	1.0000	1.0000
Brushite precipitation rate [L/(mol d)]	1.000E+6	1.000E+6	1.0000
Brushite redissolution rate [L/(mol d)]	10000.0000	10000.0000	1.0000
Brushite half sat. [mgTSS/L]	1.0000	1.0000	1.0000
HAP precipitation rate [g/d]	5.000E-4	5.000E-4	1.0000

Mineral precipitation constants

Name	Default	Value
Vivianite solubility product [mol/L]^5	1.710E-36	1.710E-36
FeS solubility product [mol/L]^2	4.258E-4	4.258E-4
Struvite solubility product [mol/L]^3	6.918E-14	6.918E-14
Brushite solubility product [mol/L]^2	2.490E-7	2.490E-7

Fe rates

Name	Default	Value	
A in aging rate = A * exp(-G/B) [1/d)]	16.1550	16.1550	1.0000
B in aging rate = A * exp(-G/B) [1/s)]	57.3000	57.3000	1.0000
HFO(L) aging rate factor	2.500E-4	2.500E-4	1.0000
HFO(H) with H2PO4- bound aging factor []	1.000E-5	1.000E-5	1.0000
HFO(L) with H2PO4- bound aging factor []	0.4000	0.4000	1.0000
H2PO4- coprecipitation rate [mol/(L d)]	1.500E-9	1.500E-9	1.0000
H2PO4- Adsorption rate [mol /(L d)]	2.000E-11	2.000E-11	1.0000
H+ competition for HFO(H) protonation sites [L/(mmol . d)]	1000.0000	1000.0000	1.0000
H+ competition for HFO(L) protonation sites [L/(mmol . d)]	100.0000	100.0000	1.0000

Fe constants

Name	Default	Value
Ferric active site factor(high) [{mol Sites}/{mol HFO(H)}]	4.0000	4.0000
Ferric active site factor(low) [{mol Sites}/{mol HFO(L)}]	2.4000	2.4000
H+ competition level for Fe(OH)3 [mol/L]	7.000E-7	7.000E-7
Equilibrium constant for FeOH3-H2PO4- [{mf HFO(H).H2PO4}/({mol H2PO4-}{mf HFO(H)}^2)]	2.000E-9	2.000E-9
Colloidal COD removed with Ferric [gCOD/Fe active site]	80.0000	80.0000
Minimum residual P level with iron addition [mgP/L]	0.0150	0.0150
HFO(H) with H2PO4- P release factor	10000.0000	10000.0000
HFO(L) with H2PO4- P release factor	10000.0000	10000.0000

Fe RedOx rates

Name	Default	Value	
Iron reduction using acetic acid	1.000E-7	1.000E-7	1.0000
Half Sat. acetic acid	0.5000	0.5000	1.0000
Iron reduction using propionic acid	1.000E-7	1.000E-7	1.0000
Half Sat. propionic acid	0.5000	0.5000	1.0000
Iron reduction using dissolved hydrogen gas	1.000E-7	1.000E-7	1.0000
Half Sat. dissolved hydrogen gas	0.5000	0.5000	1.0000
Iron reduction using hydrogen sulfide	5.000E-5	5.000E-5	1.0000
Half Sat. hydrogen sulfide	0.5000	0.5000	1.0000
Iron oxidation rate (aerobic)	1.000E-3	1.000E-3	1.0000
Abiotic iron reduction using acetic acid	2.000E-5	2.000E-5	1.0000
Abiotic iron reduction using propionic acid	2.000E-5	2.000E-5	1.0000
Abiotic iron reduction using dissolved hydrogen gas	2.000E-5	2.000E-5	1.0000
Abiotic iron reduction using hydrogen sulfide	2.000E-5	2.000E-5	1.0000
Abiotic iron oxidation rate (aerobic)	1.0000	1.0000	1.0000

CEPT rates

Name	Default	Value

HFO colloidal adsorption rate	1.0000	1.0000	1.0000
Residual Xsc for adsorption to HFO	5.0000	5.0000	1.0000
Slope for Xsc residual	1.0000	1.0000	1.0000
HAO colloidal adsorption rate	1.0000	1.0000	1.0000
Residual Xsc for adsorption to HAO	5.0000	5.0000	1.0000
Slope for Xsc residual	1.0000	1.0000	1.0000

Al rates

Name	Default	Value	
A in aging rate = A * exp(-G/B) [1/d)]	16.1550	16.1550	1.0000
B in aging rate = A * exp(-G/B) [1/s)]	57.3000	57.3000	1.0000
HAO(L) aging rate factor	2.500E-4	2.500E-4	1.0000
HAO(H) with H2PO4- bound aging factor []	1.000E-5	1.000E-5	1.0000
HAO(L) with H2PO4- bound aging factor []	0.4000	0.4000	1.0000
H2PO4- coprecipitation rate [mol/(L d)]	1.500E-9	1.500E-9	1.0000
H2PO4- Adsorption rate [mol /(L d)]	1.000E-9	1.000E-9	1.0000

Al constants

Name	Default	Value
Al active site factor(high) [{mol Sites}/{mol HAO(H)}]	3.0000	3.0000
Al active site factor(low) [{mol Sites}/{mol HAO(L)}]	1.5000	1.5000
Equilibrium constant for AlOH3-H2PO4- [{mf HAO(H).H2PO4}/({mol H2PO4-}{mf HAO(H)}^2)]	8.000E-10	8.000E-10
Colloidal COD removed with Al [gCOD/Al active site]	30.0000	30.0000
Minimum residual P level with Al addition [mgP/L]	0.0150	0.0150
HAO(H) with H2PO4- P release factor	10000.0000	10000.0000
HAO(L) with H2PO4- P release factor	10000.0000	10000.0000

Pipe and pump parameters

Name	Default	Value
Static head [ft]	0.8202	0.8202
Pipe length (headloss calc.s) [ft]	164.0420	164.0420
Pipe inside diameter [in]	19.68504	19.68504
K(fittings) - Total minor losses K	5.0000	5.0000
Pipe roughness [in]	0.00787	0.00787
'A' in overall pump efficiency = A + B*Q + C*(Q^2)[-]	0.8500	0.8500
'B' in overall pump efficiency = A + B*Q + C*(Q^2)[[-]/(gal/d)]	0	0
'C' in overall pump efficiency = A + B*Q + C*(Q^2)[[-]/(gal/d)^2]	0	0

Fittings and loss coefficients ('K' values)

Name	Default	Value
Pipe entrance (bellmouth)	0.0500	1.0000
90° bend	0.7500	5.0000
45° bend	0.3000	2.0000
Butterfly value (open)	0.3000	1.0000
Non-return value	1.0000	0
Outlet (bellmouth)	0.2000	1.0000

Aeration

Name	Default	Value
Surface pressure [kPa]	101.3250	101.3250
Fractional effective saturation depth (Fed) [-]	0.3250	0.3250
Supply gas CO2 content [vol. %]	0.0400	0.0400
Supply gas O2 [vol. %]	20.9500	20.9500
Off-gas CO2 [vol. %]	2.0000	2.0000
Off-gas O2 [vol. %]	18.8000	18.8000
Off-gas H2 [vol. %]	0	0

Off-gas NH3 [vol. %]	0	0
Off-gas CH4 [vol. %]	0	0
Off-gas N2O [vol. %]	0	0
Surface turbulence factor [-]	2.0000	2.0000
Set point controller gain []	1.0000	1.0000

MABR Membrane effective diffusivities

Name	Default	Value	
O2 [m2/s]	2.500E-11	2.500E-11	1.0000
N2 [m2/s]	1.900E-11	1.900E-11	1.0000
CO2 [m2/s]	1.960E-11	1.960E-11	1.0000
H2 [m2/s]	5.850E-11	5.850E-11	1.0000
CH4 [m2/s]	1.963E-11	1.963E-11	1.0000
NH3 [m2/s]	2.000E-11	2.000E-11	1.0000
N2O [m2/s]	1.607E-11	1.607E-11	1.0000
H2S [m2/s]	1.530E-11	1.530E-11	1.0000
Ind 1 [m2/s]	7.240E-12	7.240E-12	1.0000
Ind 2 [m2/s]	8.900E-12	8.900E-12	1.0000
Ind 3 [m2/s]	7.960E-12	7.960E-12	1.0000

MABR Membrane transfer factors

Name	Default	Value	
O2 []	1.0000	1.0000	1.0000
N2 []	1.0000	1.0000	1.0000
CO2 []	1.0000	1.0000	1.0000
H2 []	1.0000	1.0000	1.0000
CH4 []	1.0000	1.0000	1.0000
NH3 []	1.0000	1.0000	1.0000
N2O []	1.0000	1.0000	1.0000

H2S []	1.0000	1.0000	1.0000
Ind 1 []	1.0000	1.0000	1.0000
Ind 2 []	1.0000	1.0000	1.0000
Ind 3 []	1.0000	1.0000	1.0000

Blower

Name	Default	Value
Intake filter pressure drop [psi]	0.5076	0.5076
Pressure drop through distribution system (piping/valves) [psi]	0.4351	0.4351
Adiabatic/polytropic compression exponent (1.4 for adiabatic)	1.4000	1.4000
'A' in blower efficiency = A + B*Qa + C*(Qa^2)[-]	0.7500	0.7500
'B' in blower efficiency = A + B*Qa + C*(Qa^2)[[-]/(ft3/min (20C, 1 atm))]	0	0
'C' in blower efficiency = A + B*Qa + C*(Qa^2)[[-]/(ft3/min (20C, 1 atm))^2]	0	0

Diffuser

Name	Default	Value
k1 in C = k1(PC)^0.25 + k2	1.2400	1.2400
k2 in C = k1(PC)^0.25 + k2	0.8960	0.8960
Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	0.8880	0.8880
Area of one diffuser [ft2]	0.4413	0.4413
Diffuser mounting height [ft]	0.8202	0.8202
Min. air flow rate per diffuser ft3/min (20C, 1 atm)	0.2943	0.2943
Max. air flow rate per diffuser ft3/min (20C, 1 atm)	5.8858	5.8858
'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2 [psi]	0.4351	0.4351
'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2[psi/(ft3/min (20C, 1 atm))]	0	0
'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2[psi/(ft3/min (20C, 1 atm))^2]	0	0

Surface aerators

Name	Default	Value
Surface aerator Std. oxygen transfer rate [lb O /(hp hr)]	2.46697	2.46697

Modified Vesilind

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [ft/min]	0.387	0.387
Vesilind hindered zone settling parameter (K) [L/g]	0.370	0.370
Clarification switching function [mg/L]	100.000	100.000
Specified TSS conc.for height calc. [mg/L]	2500.000	2500.000
Maximum compactability constant [mg/L]	15000.000	15000.000
Maximum compactability slope [L/mg]	0.010	0.010

Double exponential

Name	Default	Value
Maximum Vesilind settling velocity (Vo) [ft/min]	0.934	0.934
Maximum (practical) settling velocity (Vo') [ft/min]	0.615	0.615
Hindered zone settling parameter (Kh) [L/g]	0.400	0.400
Flocculent zone settling parameter (Kf) [L/g]	2.500	2.500
Maximum non-settleable TSS [mg/L]	20.0000	20.0000
Non-settleable fraction [-]	1.000E-3	1.000E-3
Specified TSS conc. for height calc. [mg/L]	2500.0000	2500.0000

Emission factors

Name	Default	Value

Carbon dioxide equivalence of nitrous oxide	296.0000	296.0000
Carbon dioxide equivalence of methane	23.0000	23.0000

Biofilm general

Name	Default	Value	
Attachment rate [g / (m2 d)]	8.0000	8.0000	1.0000
Attachment TSS half sat. [mg/L]	100.0000	100.0000	1.0000
Detachment rate [g/(m3 d)]	8000.0000	8000.0000	1.0000
Solids movement factor []	10.0000	10.0000	1.0000
Diffusion neta []	0.8000	0.8000	1.0000
Thin film limit [mm]	0.5000	0.5000	1.0000
Thick film limit [mm]	3.0000	3.0000	1.0000
Assumed Film thickness for tank volume correction (temp independent) [mm]	1.2500	1.2500	1.0000
Film surface area to media area ratio - Max.[ ]	1.0000	1.0000	1.0000
Minimum biofilm conc. for streamer formation [gTSS/m2]	4.0000	4.0000	1.0000

Maximum biofilm concentrations [mg/L]

Name	Default	Value	
Biomass - Ordinary heterotrophic	5.000E+4	5.000E+4	1.0000
Biomass - Methylotrophic	5.000E+4	5.000E+4	1.0000
Biomass - Ammonia oxidizing	1.000E+5	1.000E+5	1.0000
Biomass - Nitrite oxidizing	1.000E+5	1.000E+5	1.0000
Biomass - Anaerobic ammonia oxidizing	5.000E+4	5.000E+4	1.0000
Biomass - Phosphorus accumulating	5.000E+4	5.000E+4	1.0000
Biomass - Propionic acetogenic	5.000E+4	5.000E+4	1.0000
Biomass - Acetoclastic methanogenic	5.000E+4	5.000E+4	1.0000
Biomass - Hydrogenotrophic methanogenic	5.000E+4	5.000E+4	1.0000
Biomass - Endogenous products	3.000E+4	3.000E+4	1.0000
CODp - Slowly degradable particulate	5000.0000	5000.0000	1.0000

CODp - Slowly degradable colloidal	4000.0000	4000.0000	1.0000
CODp - Degradable external organics	5000.0000	5000.0000	1.0000
CODp - Undegradable non-cellulose	5000.0000	5000.0000	1.0000
CODp - Undegradable cellulose	5000.0000	5000.0000	1.0000
N - Particulate degradable organic	0	0	1.0000
P - Particulate degradable organic	0	0	1.0000
N - Particulate degradable external organics	0	0	1.0000
P - Particulate degradable external organics	0	0	1.0000
N - Particulate undegradable	0	0	1.0000
P - Particulate undegradable	0	0	1.0000
CODp - Stored PHA	5000.0000	5000.0000	1.0000
P - Releasable stored polyP	1.150E+6	1.150E+6	1.0000
P - Unreleasable stored polyP	1.150E+6	1.150E+6	1.0000
CODs - Complex readily degradable	0	0	1.0000
CODs - Acetate	0	0	1.0000
CODs - Propionate	0	0	1.0000
CODs - Methanol	0	0	1.0000
Gas - Dissolved hydrogen	0	0	1.0000
Gas - Dissolved methane	0	0	1.0000
N - Ammonia	0	0	1.0000
N - Soluble degradable organic	0	0	1.0000
Gas - Dissolved nitrous oxide	0	0	1.0000
N - Nitrite	0	0	1.0000
N - Nitrate	0	0	1.0000
Gas - Dissolved nitrogen	0	0	1.0000
P - Soluble phosphate	0	0	1.0000
CODs - Undegradable	0	0	1.0000
N - Soluble undegradable organic	0	0	1.0000
Influent inorganic suspended solids	1.300E+6	1.300E+6	1.0000
Precipitate - Struvite	8.500E+5	8.500E+5	1.0000
Precipitate - Brushite	1.165E+6	1.165E+6	1.0000
Precipitate - Hydroxy - apatite	1.600E+6	1.600E+6	1.0000
Precipitate - Vivianite	1.340E+6	1.340E+6	1.0000
HFO - High surface	5.000E+4	5.000E+4	1.0000
HFO - Low surface	5.000E+4	5.000E+4	1.0000

HFO - High with H2PO4- adsorbed	5.000E+4	5.000E+4	1.0000
HFO - Low with H2PO4- adsorbed	5.000E+4	5.000E+4	1.0000
HFO - Aged	5.000E+4	5.000E+4	1.0000
HFO - Low with H+ adsorbed	5.000E+4	5.000E+4	1.0000
HFO - High with H+ adsorbed	5.000E+4	5.000E+4	1.0000
HAO - High surface	5.000E+4	5.000E+4	1.0000
HAO - Low surface	5.000E+4	5.000E+4	1.0000
HAO - High with H2PO4- adsorbed	5.000E+4	5.000E+4	1.0000
HAO - Low with H2PO4- adsorbed	5.000E+4	5.000E+4	1.0000
HAO - Aged	5.000E+4	5.000E+4	1.0000
P - Bound on aged HMO	5.000E+4	5.000E+4	1.0000
Metal soluble - Magnesium	0	0	1.0000
Metal soluble - Calcium	0	0	1.0000
Metal soluble - Ferric	0	0	1.0000
Metal soluble - Ferrous	0	0	1.0000
Metal soluble - Aluminum	0	0	1.0000
Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Gas - Dissolved total CO2	0	0	1.0000
User defined - UD1	0	0	1.0000
User defined - UD2	0	0	1.0000
User defined - UD3	5.000E+4	5.000E+4	1.0000
User defined - UD4	5.000E+4	5.000E+4	1.0000
Biomass - Sulfur oxidizing	1.000E+5	1.000E+5	1.0000
Biomass - Sulfur reducing propionic acetogenic	5.000E+4	5.000E+4	1.0000
Biomass - Sulfur reducing acetotrophic	5.000E+4	5.000E+4	1.0000
Biomass - Sulfur reducing hydrogenotrophic	1.000E+5	1.000E+5	1.0000
Gas - Dissolved total sulfides	0	0	1.0000
S - Soluble sulfate	0	0	1.0000
S - Particulate elemental sulfur	5.000E+4	5.000E+4	1.0000
Precipitate - Ferrous sulfide	5.000E+4	5.000E+4	1.0000
CODp - Adsorbed hydrocarbon	5.000E+4	5.000E+4	1.0000
CODs - Degradable volatile ind. #1	0	0	1.0000
CODs - Degradable volatile ind. #2	0	0	1.0000
CODs - Degradable volatile ind. #3	0	0	1.0000

CODs - Soluble hydrocarbon	0	0	1.0000
Gas - Dissolved oxygen	0	0	1.0000

Effective diffusivities [m2/s]

Name	Default	Value	
Biomass - Ordinary heterotrophic	5.000E-14	5.000E-14	1.0290
Biomass - Methylotrophic	5.000E-14	5.000E-14	1.0290
Biomass - Ammonia oxidizing	5.000E-14	5.000E-14	1.0290
Biomass - Nitrite oxidizing	5.000E-14	5.000E-14	1.0290
Biomass - Anaerobic ammonia oxidizing	5.000E-14	5.000E-14	1.0290
Biomass - Phosphorus accumulating	5.000E-14	5.000E-14	1.0290
Biomass - Propionic acetogenic	5.000E-14	5.000E-14	1.0290
Biomass - Acetoclastic methanogenic	5.000E-14	5.000E-14	1.0290
Biomass - Hydrogenotrophic methanogenic	5.000E-14	5.000E-14	1.0290
Biomass - Endogenous products	5.000E-14	5.000E-14	1.0290
CODp - Slowly degradable particulate	5.000E-14	5.000E-14	1.0290
CODp - Slowly degradable colloidal	5.000E-10	5.000E-10	1.0290
CODp - Degradable external organics	5.000E-14	5.000E-14	1.0290
CODp - Undegradable non-cellulose	5.000E-14	5.000E-14	1.0290
CODp - Undegradable cellulose	5.000E-14	5.000E-14	1.0290
N - Particulate degradable organic	5.000E-14	5.000E-14	1.0290
P - Particulate degradable organic	5.000E-14	5.000E-14	1.0290
N - Particulate degradable external organics	5.000E-14	5.000E-14	1.0290
P - Particulate degradable external organics	5.000E-14	5.000E-14	1.0290
N - Particulate undegradable	5.000E-14	5.000E-14	1.0290
P - Particulate undegradable	5.000E-14	5.000E-14	1.0290
CODp - Stored PHA	5.000E-14	5.000E-14	1.0290
P - Releasable stored polyP	5.000E-14	5.000E-14	1.0290
P - Unreleasable stored polyP	5.000E-14	5.000E-14	1.0290
CODs - Complex readily degradable	6.900E-10	6.900E-10	1.0290
CODs - Acetate	1.240E-9	1.240E-9	1.0290
CODs - Propionate	8.300E-10	8.300E-10	1.0290

CODs - Methanol	1.600E-9	1.600E-9	1.0290
Gas - Dissolved hydrogen	5.850E-9	5.850E-9	1.0290
Gas - Dissolved methane	1.963E-9	1.963E-9	1.0290
N - Ammonia	2.000E-9	2.000E-9	1.0290
N - Soluble degradable organic	1.370E-9	1.370E-9	1.0290
Gas - Dissolved nitrous oxide	1.607E-9	1.607E-9	1.0290
N - Nitrite	2.980E-9	2.980E-9	1.0290
N - Nitrate	2.980E-9	2.980E-9	1.0290
Gas - Dissolved nitrogen	1.900E-9	1.900E-9	1.0290
P - Soluble phosphate	2.000E-9	2.000E-9	1.0290
CODs - Undegradable	6.900E-10	6.900E-10	1.0290
N - Soluble undegradable organic	6.850E-10	6.850E-10	1.0290
Influent inorganic suspended solids	5.000E-14	5.000E-14	1.0290
Precipitate - Struvite	5.000E-14	5.000E-14	1.0290
Precipitate - Brushite	5.000E-14	5.000E-14	1.0290
Precipitate - Hydroxy - apatite	5.000E-14	5.000E-14	1.0290
Precipitate - Vivianite	5.000E-14	5.000E-14	1.0290
HFO - High surface	5.000E-14	5.000E-14	1.0290
HFO - Low surface	5.000E-14	5.000E-14	1.0290
HFO - High with H2PO4- adsorbed	5.000E-14	5.000E-14	1.0290
HFO - Low with H2PO4- adsorbed	5.000E-14	5.000E-14	1.0290
HFO - Aged	5.000E-14	5.000E-14	1.0290
HFO - Low with H+ adsorbed	5.000E-14	5.000E-14	1.0290
HFO - High with H+ adsorbed	5.000E-14	5.000E-14	1.0290
HAO - High surface	5.000E-14	5.000E-14	1.0290
HAO - Low surface	5.000E-14	5.000E-14	1.0290
HAO - High with H2PO4- adsorbed	5.000E-14	5.000E-14	1.0290
HAO - Low with H2PO4- adsorbed	5.000E-14	5.000E-14	1.0290
HAO - Aged	5.000E-14	5.000E-14	1.0290
P - Bound on aged HMO	5.000E-14	5.000E-14	1.0290
Metal soluble - Magnesium	7.200E-10	7.200E-10	1.0290
Metal soluble - Calcium	7.200E-10	7.200E-10	1.0290
Metal soluble - Ferric	4.800E-10	4.800E-10	1.0290
Metal soluble - Ferrous	4.800E-10	4.800E-10	1.0290
Metal soluble - Aluminum	4.800E-10	4.800E-10	1.0290

Other Cations (strong bases)	1.440E-9	1.440E-9	1.0290
Other Anions (strong acids)	1.440E-9	1.440E-9	1.0290
Gas - Dissolved total CO2	1.960E-9	1.960E-9	1.0290
User defined - UD1	6.900E-10	6.900E-10	1.0290
User defined - UD2	6.900E-10	6.900E-10	1.0290
User defined - UD3	5.000E-14	5.000E-14	1.0290
User defined - UD4	5.000E-14	5.000E-14	1.0290
Biomass - Sulfur oxidizing	5.000E-14	5.000E-14	1.0290
Biomass - Sulfur reducing propionic acetogenic	5.000E-14	5.000E-14	1.0290
Biomass - Sulfur reducing acetotrophic	5.000E-14	5.000E-14	1.0290
Biomass - Sulfur reducing hydrogenotrophic	5.000E-14	5.000E-14	1.0290
Gas - Dissolved total sulfides	1.530E-9	1.530E-9	1.0290
S - Soluble sulfate	2.130E-10	2.130E-10	1.0290
S - Particulate elemental sulfur	5.000E-14	5.000E-14	1.0290
Precipitate - Ferrous sulfide	5.000E-14	5.000E-14	1.0290
CODp - Adsorbed hydrocarbon	5.000E-14	5.000E-14	1.0290
CODs - Degradable volatile ind. #1	7.240E-10	7.240E-10	1.0290
CODs - Degradable volatile ind. #2	8.900E-10	8.900E-10	1.0290
CODs - Degradable volatile ind. #3	7.960E-10	7.960E-10	1.0290
CODs - Soluble hydrocarbon	7.120E-10	7.120E-10	1.0290
Gas - Dissolved oxygen	2.500E-9	2.500E-9	1.0290

EPS Strength coefficients [ ]

Name	Default	Value	
Biomass - Ordinary heterotrophic	1.0000	1.0000	1.0000
Biomass - Methylotrophic	1.0000	1.0000	1.0000
Biomass - Ammonia oxidizing	5.0000	5.0000	1.0000
Biomass - Nitrite oxidizing	25.0000	25.0000	1.0000
Biomass - Anaerobic ammonia oxidizing	10.0000	10.0000	1.0000
Biomass - Phosphorus accumulating	1.0000	1.0000	1.0000
Biomass - Propionic acetogenic	1.0000	1.0000	1.0000
Biomass - Acetoclastic methanogenic	1.0000	1.0000	1.0000

Biomass - Hydrogenotrophic methanogenic	1.0000	1.0000	1.0000
Biomass - Endogenous products	1.0000	1.0000	1.0000
CODp - Slowly degradable particulate	1.0000	1.0000	1.0000
CODp - Slowly degradable colloidal	1.0000	1.0000	1.0000
CODp - Degradable external organics	1.0000	1.0000	1.0000
CODp - Undegradable non-cellulose	1.0000	1.0000	1.0000
CODp - Undegradable cellulose	1.0000	1.0000	1.0000
N - Particulate degradable organic	1.0000	1.0000	1.0000
P - Particulate degradable organic	1.0000	1.0000	1.0000
N - Particulate degradable external organics	1.0000	1.0000	1.0000
P - Particulate degradable external organics	1.0000	1.0000	1.0000
N - Particulate undegradable	1.0000	1.0000	1.0000
P - Particulate undegradable	1.0000	1.0000	1.0000
CODp - Stored PHA	1.0000	1.0000	1.0000
P - Releasable stored polyP	1.0000	1.0000	1.0000
P - Unreleasable stored polyP	1.0000	1.0000	1.0000
CODs - Complex readily degradable	0	0	1.0000
CODs - Acetate	0	0	1.0000
CODs - Propionate	0	0	1.0000
CODs - Methanol	0	0	1.0000
Gas - Dissolved hydrogen	0	0	1.0000
Gas - Dissolved methane	0	0	1.0000
N - Ammonia	0	0	1.0000
N - Soluble degradable organic	0	0	1.0000
Gas - Dissolved nitrous oxide	0	0	1.0000
N - Nitrite	0	0	1.0000
N - Nitrate	0	0	1.0000
Gas - Dissolved nitrogen	0	0	1.0000
P - Soluble phosphate	0	0	1.0000
CODs - Undegradable	0	0	1.0000
N - Soluble undegradable organic	0	0	1.0000
Influent inorganic suspended solids	0.3300	0.3300	1.0000
Precipitate - Struvite	1.0000	1.0000	1.0000
Precipitate - Brushite	1.0000	1.0000	1.0000
Precipitate - Hydroxy - apatite	1.0000	1.0000	1.0000

Precipitate - Vivianite	1.0000	1.0000	1.0000
HFO - High surface	1.0000	1.0000	1.0000
HFO - Low surface	1.0000	1.0000	1.0000
HFO - High with H2PO4- adsorbed	1.0000	1.0000	1.0000
HFO - Low with H2PO4- adsorbed	1.0000	1.0000	1.0000
HFO - Aged	1.0000	1.0000	1.0000
HFO - Low with H+ adsorbed	1.0000	1.0000	1.0000
HFO - High with H+ adsorbed	1.0000	1.0000	1.0000
HAO - High surface	1.0000	1.0000	1.0000
HAO - Low surface	1.0000	1.0000	1.0000
HAO - High with H2PO4- adsorbed	1.0000	1.0000	1.0000
HAO - Low with H2PO4- adsorbed	1.0000	1.0000	1.0000
HAO - Aged	1.0000	1.0000	1.0000
P - Bound on aged HMO	1.0000	1.0000	1.0000
Metal soluble - Magnesium	0	0	1.0000
Metal soluble - Calcium	0	0	1.0000
Metal soluble - Ferric	0	0	1.0000
Metal soluble - Ferrous	0	0	1.0000
Metal soluble - Aluminum	0	0	1.0000
Other Cations (strong bases)	0	0	1.0000
Other Anions (strong acids)	0	0	1.0000
Gas - Dissolved total CO2	0	0	1.0000
User defined - UD1	0	0	1.0000
User defined - UD2	0	0	1.0000
User defined - UD3	1.0000	1.0000	1.0000
User defined - UD4	1.0000	1.0000	1.0000
Biomass - Sulfur oxidizing	1.0000	1.0000	1.0000
Biomass - Sulfur reducing propionic acetogenic	1.0000	1.0000	1.0000
Biomass - Sulfur reducing acetotrophic	1.0000	1.0000	1.0000
Biomass - Sulfur reducing hydrogenotrophic	1.0000	1.0000	1.0000
Gas - Dissolved total sulfides	0	0	1.0000
S - Soluble sulfate	0	0	1.0000
S - Particulate elemental sulfur	1.0000	1.0000	1.0000
Precipitate - Ferrous sulfide	1.0000	1.0000	1.0000
CODp - Adsorbed hydrocarbon	1.0000	1.0000	1.0000

CODs - Degradable volatile ind. #1	0	0	1.0000
CODs - Degradable volatile ind. #2	0	0	1.0000
CODs - Degradable volatile ind. #3	0	0	1.0000
CODs - Soluble hydrocarbon	0	0	1.0000
Gas - Dissolved oxygen	0	0	1.0000

BioWin user and configuration data

Project details

Project name: 23-087 Camp Verde **Project ref.: 23-074**

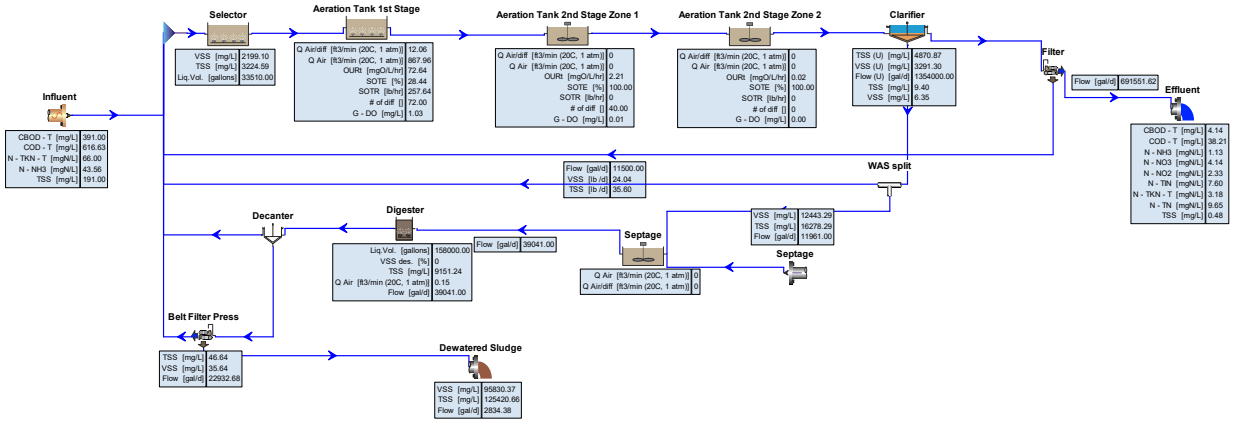
Plant name: Camp Verde **User name: jackiek**

Created: 3/15/2024 **Saved: 8/21/2024**

SRT: ** days**

Temperature: 20.0°C

Flowsheet



Configuration information for all Digester - Aerobic units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Digester	1.580E+5	1320.0956	16.000	48

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Digester	0.1

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Digester	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0

Configuration information for all Bioreactor units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Selector	3.351E+4	279.9772	16.000	8
Aeration Tank 1st Stage	1.650E+5	1378.5808	16.000	72
Aeration Tank 2nd Stage Zone 1	8.100E+4	676.7579	16.000	40
Aeration Tank 2nd Stage Zone 2	8.100E+4	676.7579	16.000	Un-aerated
Septage	4.070E+4	340.0499	16.000	Un-aerated

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Selector	0.1
Aeration Tank 1st Stage	1.0
Aeration Tank 2nd Stage Zone 1	1.0
Aeration Tank 2nd Stage Zone 2	0
Septage	0

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Selector	0.0500	0.3800	1.0000	0.0380	0.7620	1.1772	29.4289	0.9997	0	0
Aeration Tank 1st Stage	1.2400	0.8960	0.8880	1.2500	0.4572	0.2943	30.0000	2.9999	0	0
Aeration Tank 2nd Stage Zone 1	0.0500	0.3800	1.0000	1.2500	0.4572	1.1772	29.4289	0.9997	0	0
Aeration Tank 2nd Stage Zone 2	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0
Septage	0.0500	0.3800	1.0000	0.5382	0.2500	1.1772	40.0000	0.9997	0	0

Configuration information for all Influent - BOD units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	668097.2225
BOD - Total Carbonaceous mgBOD/L	391.00
Volatile suspended solids mg/L	144.00
Total suspended solids mg/L	191.00
N - Total Kjeldahl Nitrogen mgN/L	66.00
P - Total P mgP/L	6.50
S - Total S mgS/L	10.00
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	6.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.3362
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220
Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4

FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Clarifier - Ideal units

Physical data

Element name	Volume[gallons]	Area[ft2]	Depth[ft]
Clarifier	1.149E+5	960.0000	16.000

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Clarifier	Flow paced	200.00 %

Element name	Average Temperature	Reactive	Percent removal	Blanket fraction
Clarifier	Uses global setting	No	99.90	0.50

Configuration information for all Influent - COD units

Operating data Average (flow/time weighted as required)

Element name	Septage
Flow	11961
COD - Total mgCOD/L	31900.00
N - Total Kjeldahl Nitrogen mgN/L	588.00
P - Total P mgP/L	210.00
S - Total S mgS/L	0
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	50.00
ISS Total mgISS/L	3835.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Septage
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.2500
Fac - Acetate [gCOD/g of readily biodegradable COD]	2.000E-3
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.8400
Fus - Unbiodegradable soluble [gCOD/g of total COD]	1.000E-3
Fup - Unbiodegradable particulate [gCOD/g of total COD]	5.000E-3
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.1650
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.4290
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220

Fsr - Reduced sulfur [H2S] [gS/gS]	0
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Separator - Dewatering unit units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Belt Filter Press	Fraction	0.11
Filter	Flow paced	2.50 %

Element name	Percent removal
Belt Filter Press	99.70
Filter	95.00

Configuration information for all Clarifier - Point (volumeless) units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Decanter	Fraction	0.66

Element name	Percent removal
Decanter	99.80

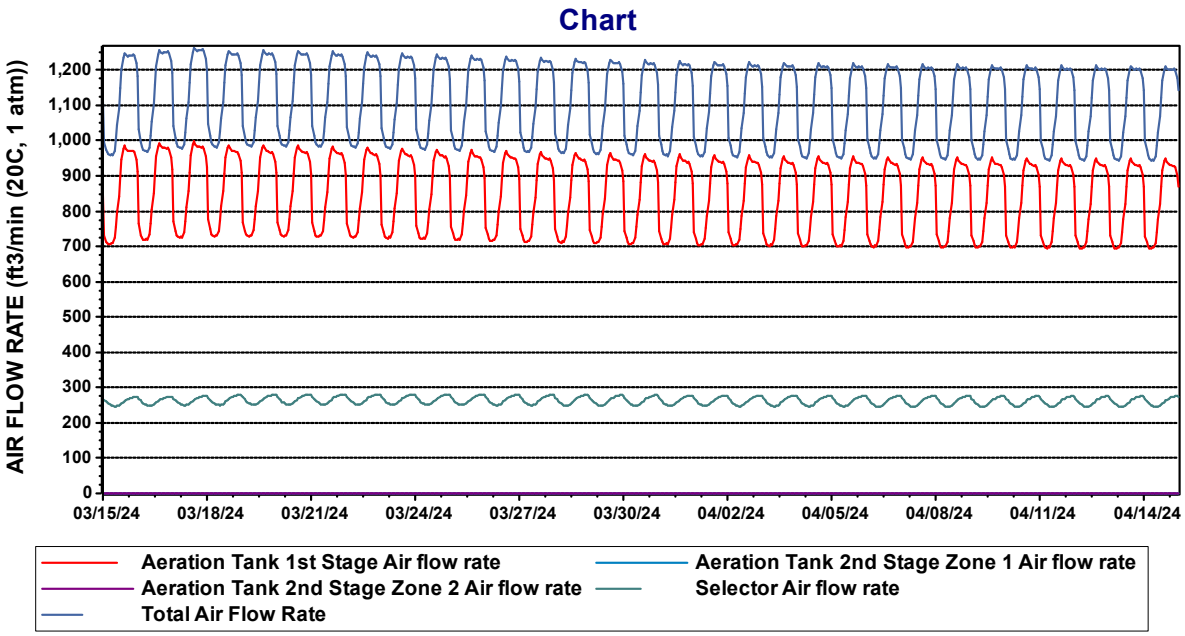
Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

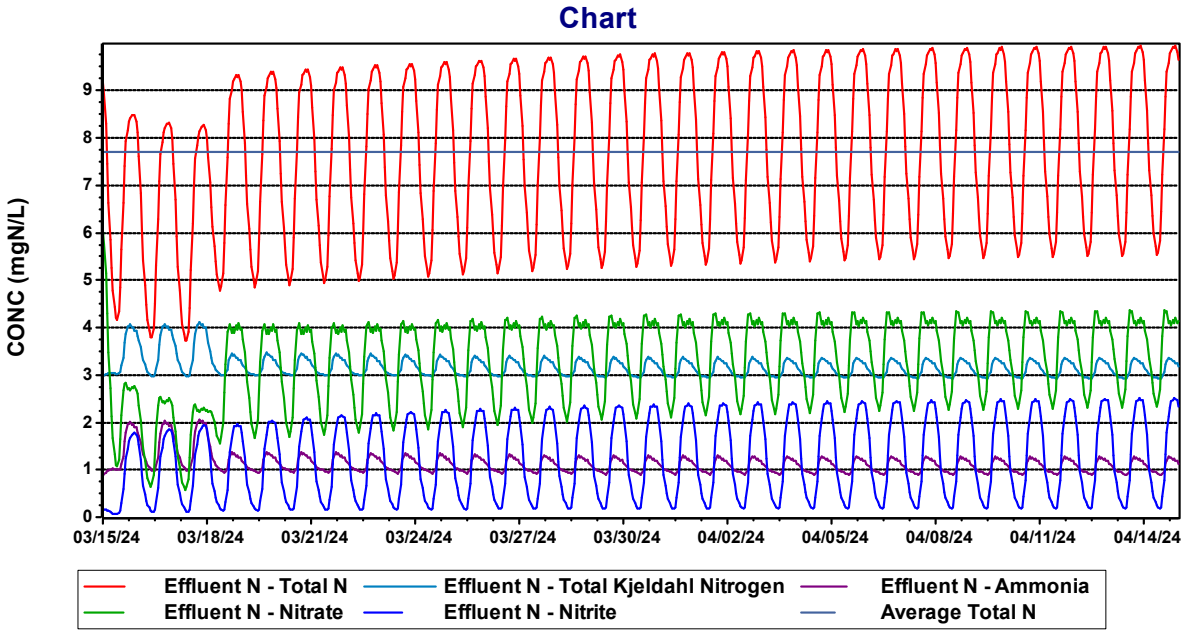
Element name	Split method	Average Split specification
WAS split	Flow paced	4.00 %

BioWin Album

Album page - Airflow Rate



Album page - Effluent N concentrations



BioWin user and configuration data

Project details

Project name: 23-087 Camp Verde **Project ref.: 23-074**

Plant name: Camp Verde **User name: jackiek**

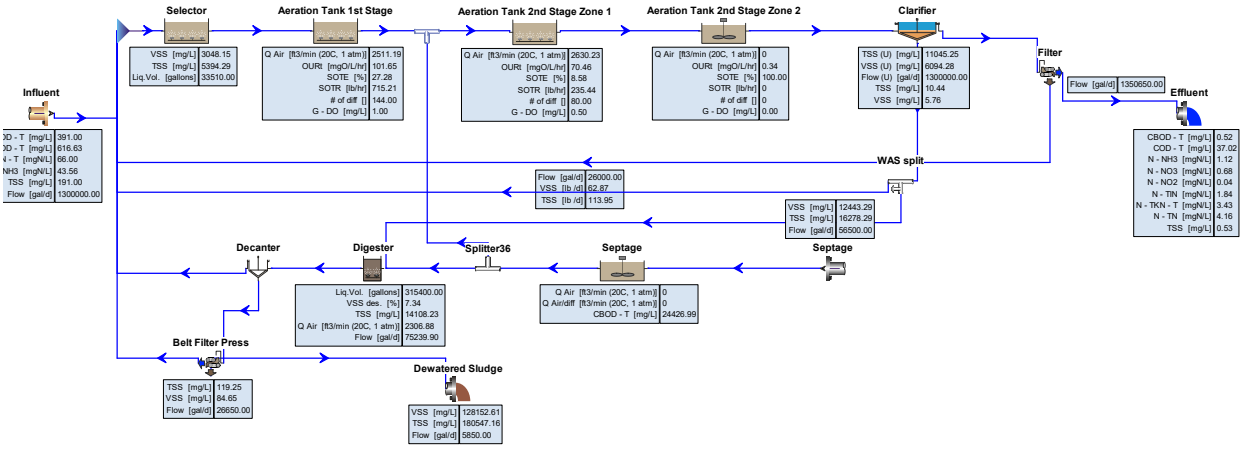
Created: 3/15/2024 **Saved: 8/21/2024**

Steady state solution

Target SRT: 3.50 days **SRT #0: 3.50 days**

Temperature: 20.0°C

Flowsheet



Configuration information for all Digester - Aerobic units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Digester	3.154E+5	2635.1781	16.000	96

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Digester	0.1

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Digester	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0

Configuration information for all Bioreactor units

Physical data

Element name	Volume [gallons]	Area [ft2]	Depth [ft]	# of diffusers
Selector	3.351E+4	279.9772	16.000	8
Aeration Tank 1st Stage	3.299E+5	2756.3261	16.000	144
Aeration Tank 2nd Stage Zone 1	1.620E+5	1353.5157	16.000	80
Aeration Tank 2nd Stage Zone 2	1.620E+5	1353.5157	16.000	Un-aerated

Septage	4.069E+4	339.9664	16.000	Un-aerated

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Selector	0.1
Aeration Tank 1st Stage	1.0
Aeration Tank 2nd Stage Zone 1	0.5
Aeration Tank 2nd Stage Zone 2	0
Septage	0

Aeration equipment parameters

Element name	k1 in C = k1(PC)^ 0.25 + k2	k2 in C = k1(PC)^ 0.25 + k2	Y in Kla = C Usg ^ Y - Usg in [m3/(m2 d)]	Area of one diffuser	Diffuser mounting height	Min. air flow rate per diffuser ft3/min (20C, 1 atm)	Max. air flow rate per diffuser ft3/min (20C, 1 atm)	'A' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'B' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2	'C' in diffuser pressure drop = A + B*(Qa/Diff) + C*(Qa/Diff)^2
Selector	0.0500	0.3800	1.0000	0.0380	0.7620	1.1772	29.4289	0.9997	0	0
Aeration Tank 1st Stage	1.2400	0.8960	0.8880	1.2500	0.4572	0.2943	30.0000	2.9999	0	0
Aeration Tank 2nd Stage Zone 1	0.0500	0.3800	1.0000	1.2500	0.4572	1.1772	29.4289	0.9997	0	0
Aeration Tank 2nd Stage Zone 2	0.0500	0.3800	1.0000	0.0380	0.4572	1.1772	29.4289	0.9997	0	0
Septage	0.0500	0.3800	1.0000	0.5382	0.2500	1.1772	40.0000	0.9997	0	0

Configuration information for all Influent - BOD units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	1300000
BOD - Total Carbonaceous mgBOD/L	391.00
Volatile suspended solids mg/L	144.00
Total suspended solids mg/L	191.00
N - Total Kjeldahl Nitrogen mgN/L	66.00
P - Total P mgP/L	6.50
S - Total S mgS/L	10.00
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	6.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.3362
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220

Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Clarifier - Ideal units

Physical data

Element name	Volume[gallons]	Area[ft2]	Depth[ft]
Clarifier	2.298E+5	1919.9871	16.000

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Clarifier	Flow paced	100.00 %

Element name	Average Temperature	Reactive	Percent removal	Blanket fraction

Clarifier	Uses global setting	No	99.90	0.50

Configuration information for all Influent - COD units

Operating data Average (flow/time weighted as required)

Element name	Septage
Flow	56500
COD - Total mgCOD/L	31900.00
N - Total Kjeldahl Nitrogen mgN/L	588.00
P - Total P mgP/L	210.00
S - Total S mgS/L	0
N - Nitrate mgN/L	0
pH	7.30
Alkalinity mmol/L	50.00
ISS Total mgISS/L	3835.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Septage
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.2500
Fac - Acetate [gCOD/g of readily biodegradable COD]	2.000E-3
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.8400
Fus - Unbiodegradable soluble [gCOD/g of total COD]	1.000E-3
Fup - Unbiodegradable particulate [gCOD/g of total COD]	5.000E-3
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.1650
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0700

Fpo4 - Phosphate [gPO4-P/gTP]	0.4290
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0220
Fsr - Reduced sulfur [H2S] [gS/gS]	0
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Separator - Dewatering unit units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Belt Filter Press	Fraction	0.18
Filter	Flow paced	2.00 %

Element name	Percent removal
Belt Filter Press	99.70
Filter	95.00

Configuration information for all Clarifier - Point (volumeless) units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
Decanter	Flow paced	2.50 %

Element name	Percent removal
Decanter	99.80

Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
WAS split	Flowrate [Side]	30039.9019958183
Splitter36	Flow paced	20.00 %

Wastewater System Master Plan

Appendix L Water Balance

EFFLUENT WATER BALANCE

Current, mg/mo	8.62	1.364	Future Ratio				
Future, mg/mo	11.8	0.39	Maximum Effluent, mgd				
Evaporation Ponds - Future							
Month-Year	**Effluent (+), mg**	**Precipitation (+), mg**	**Irrigation (-), mg**	**Evaporation (-), mg**	**Infiltration (-),mg**	**Net Volume, mg**	**Cummulative Volume, mg**
Apr-22	10.18	0.00	1.35	3.05	6.42	0.00	0.00
May-22	10.43	0.00	2.21	3.78	6.64	0.00	0
Jun-22	10.42	0.19	3.21	4.76	6.42	0.00	0
Jul-22	9.37	0.49	4.53	5.16	6.64	0.00	0
Aug-22	10.30	0.66	3.58	4.65	6.64	0.00	0
Sep-22	10.57	0.47	2.66	4.24	6.42	0.00	0
Oct-22	10.48	0.48	3.39	2.87	6.64	0.00	0
Nov-22	10.37	0.07	1.22	1.79	6.42	1.00	1
Dec-22	10.90	0.51	0.67	1.50	6.64	2.60	4
Jan-23	10.21	0.77	0.12	1.32	6.64	2.91	7
Feb-23	9.38	0.34	0.02	1.59	5.99	2.12	9
Mar-23	12.74	0.78	0.27	1.85	6.64	4.76	13
Apr-23	12.98	0.00	0.77	2.90	6.42	2.89	16
May-23	11.10	0.36	2.79	3.48	6.64	0.00	15
Jun-23	10.68	0.00	2.92	4.11	6.42	0.00	12
Jul-23	11.77	0.22	4.78	5.56	6.64	0.00	7
Aug-23	12.99	0.84	1.63	4.82	6.64	0.74	8
Sep-23	12.57	0.41	0.89	3.98	6.42	1.69	10
Oct-23	12.03	0.01	2.15	3.23	6.64	0.01	10
Nov-23	11.88	0.14	0.84	2.26	6.42	2.50	12
Dec-23	12.46	0.12	0.21	1.71	6.64	4.03	16
Jan-24	10.92	0.12	0.12	1.48	6.64	2.80	19
Feb-24	11.12	0.60	0.11	1.92	5.99	3.70	23
Mar-24	10.54	0.62	0.12	1.97	6.64	2.45	25