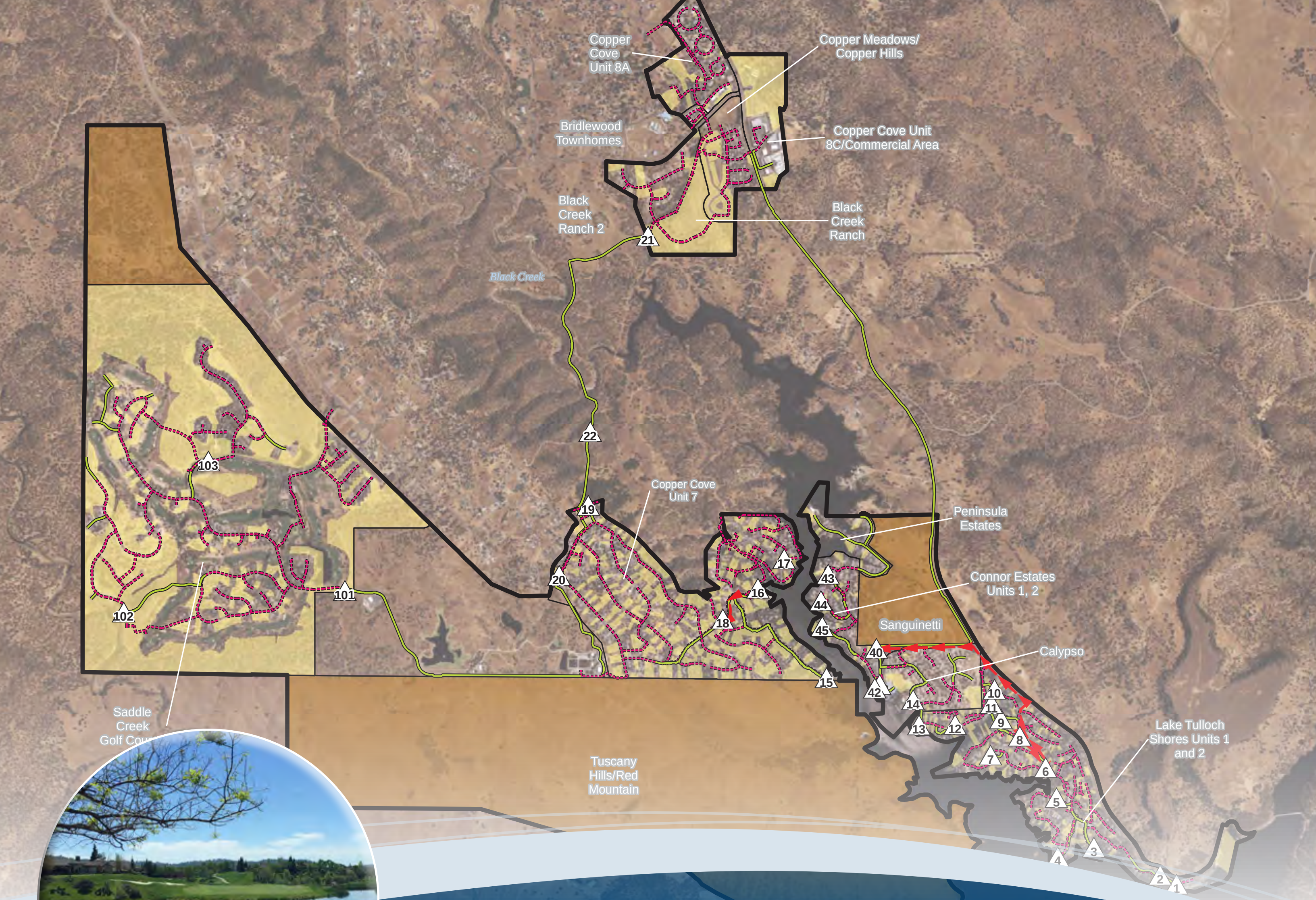

Calaveras County Water District

DRAFT

Copper Cove Wastewater System Master Plan

January 2018

Kennedy/Jenks Consultants

Draft
Copper Cove
Wastewater System Master Plan

January 2018

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Appendix

List of Abbreviations and Acronyms

AA	average annual
AAF	average annual flow
ac-ft	acre-foot or acre-feet
ADWF	average dry weather flow
BOD_5	Biochemical Oxygen Demand
CAGR	compound annual growth rate
CCWD	Calaveras County Water District
CCWWS	Copper Cove Wastewater System
CCWWTF	Copper Cove Wastewater Treatment Facility
CDPH	California Department of Health Services (now the Division of Drinking Water [DDW])
DAF	dissolved air flotation
DDW	Division of Drinking Water
DIP	ductile iron piping
DSOD	Department of Safety of Dams
ESFUs	equivalent single family units
ft	feet
gpd	gallons per day
gpm	gallons per minute
HP	horsepower
I&I	infiltration and inflow
lb	pound
LAA	land application area
LCWWS	La Contenta Wastewater System
MD	maximum day
MDF	maximum day flow
MGD	million gallons per day
MM	maximum month
MMF	maximum month flow
MPN	most probable number
PVC	polyvinyl chloride
PWWF	peak wet weather flow
RAS	return activated sludge
RWF	recycled water facility
RWQCB	Regional Water Quality Control Board
SCGC	Saddle Creek Golf Course
SFF	submerged fixed film
SSO	sanitary sewer overflow
su	standard units
SWRCB	State Water Resources Control Board
TKN	Total Kjeldahl Nitrogen
TSS	total suspended solids
UV	ultra-violet light
VCP	vitrified clay piping
WAS	waste activated sludge
WDR	Waste Discharge Requirements

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Executive Summary

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Section 1: Introduction

The Copper Cove Wastewater System (CCWWS) Master Plan (Master Plan) was developed to describe a series of cost-effective, phased improvements to accommodate planned growth, comply with current and future regulations and improve operations. This section presents the background along with Master Plan goals and objectives.

1.1: Background

Calaveras County Water District (CCWD) was formed in 1946 to provide water and sewer service to the residents of Calaveras County. CCWD is a not-for-profit public agency, governed by a publically elected five-member Board of Directors. CCWD owns and operates six small isolated systems and six major wastewater treatment plants, the largest being Copper Cove Wastewater Treatment Plant (CCWWTF).

CCWWTF was constructed in the early 1970's and is used to treat all of the wastewater generated from the communities of Copper Cove, Conner Estates, Copper Meadows, Saddle Creek and Lake Tulloch.

As of March 2017, there are approximately 1,679 residential connections and 26 commercial connections serving approximately 4,500 people. Altogether, current connections equate to a total of 1,770 equivalent single family units (ESFUs) as defined by CCWD's Wastewater Design and Construction Standards (District Standards) (CCWD, 2009) and the Calaveras County General Plan Land Use Designations for Commercial properties. Recent average dry weather flows (ADWFs) [1] have been between 0.15 and 0.18 million gallons per day (MGD). CCWWTF currently has a permitted ADWF capacity of 0.230 MGD.[2]

CCWWS consists of the collection system, CCWWTF and treated effluent storage and disposal facilities. Disinfected tertiary effluent as defined by the California Code of Regulations, Title 22 is produced by the CCWWTF and used to irrigate the Saddle Creek Golf Course (SCGC) in accordance with Order No. R5-2013-0072-01 and R5-2010-0070.

1.2: Goals and Objectives

The goal of this project is to develop a Master Plan that:

- Is tailored specifically for the District's CCWWS,
- Accommodates planning growth,
- Represents a series of phased and cost-effective improvements, and
- Is leveraged in the District's upcoming capital improvement and financial plans.

Review of the CCWWS indicates that current wastewater flows and operating conditions require it to operate near or above its rated capacity. Service to infill and/or future developments may be limited unless capacity upgrades are implemented relatively soon. Master Plan objectives are to:

- Define existing and planned growth within the service area and project flows and loads,
- Compare approaches to increase capacity, comply with regulations and improve operations,

[1] ADWF measured in July, August and September in accordance with R5-2010-0070 Section B.1
[2] As described in the draft Report of Waste Discharge (CCWD, March 18, 2017).

- Identify and describe triggers for recommended improvements,
- Recommend service of phased, cost-effective collection, treatment, storage and disposal facilities solutions that meet near-term (Phase 1) needs, and
- Determine and describe improvements recommended for Buildout.

Section 2: Wastewater System Planning Criteria

This section describes CCWWS planning criteria, including the service area, wastewater characteristics and phasing requirements. This information will be drawn from and will serve as the basis for subsequent evaluations, comparisons and recommendations.

2.1: Service Area

The CCWWS provides wastewater service for CCWD's largest system. The existing service area is approximately 1,336 acres, and includes the communities of Copper Cove, Conner Estates, Copper Meadows, Saddle Creek and Lake Tulloch. As shown in Figure 1, residential homes are located along both sides of the Black Creek Arm of Lake Tullock, which requires the conveyance and collection system to circumvent a large portion of the shoreline.

Figure 1 is a map showing the service area boundary and locations of the CCWWTF and the SCGC. As shown, the CCWWS service area primarily consists of existing development, infill and 2 future developments. Several developments adjacent to the service area are served by individual septic systems and, as indicated in Figure 1, are not anticipated to be served by the CCWWS in the future.

2.1.1: Existing Customers and Occupied Parcels

The CCWWS is comprised of wastewater collection, treatment, storage and disposal facilities currently serving 1,679 ESFUs and 26 commercial connections for a total of 1,770 ESFUs. Existing customers and occupied parcels within the CCWWS are shown in Figure 2. A list of existing customers and occupied parcels was provided by CCWD and is attached to the Appendix for reference.

2.1.2: Future Developments

For the purposes of the Master Plan, future development is defined as large vacant parcels that would require extension of the existing CCWWS collection system to provide wastewater service. Figure 3 shows future Buildout developments and Table 1 presents a summary of future development projections.

Table 1. Future Development Projections

Reference No.	Future Developments	Description and Status	ESFUs
1	Copper Mill Town Center	Residential (Condominiums)	28
2	Tuscany Hills / Red Mountain		300
		Buildout Subtotal	**328**
		Total	**328**

2.1.3: Infill

For the purposes of the Master Plan, infill is defined as empty parcels within the CCWWS service area that are neither occupied, categorized as future development, nor require extension of the existing CCWWS collection system for service. Infill parcels are shown in Figure 4. The estimated number of infill connections in terms of ESFUs is 1,021.

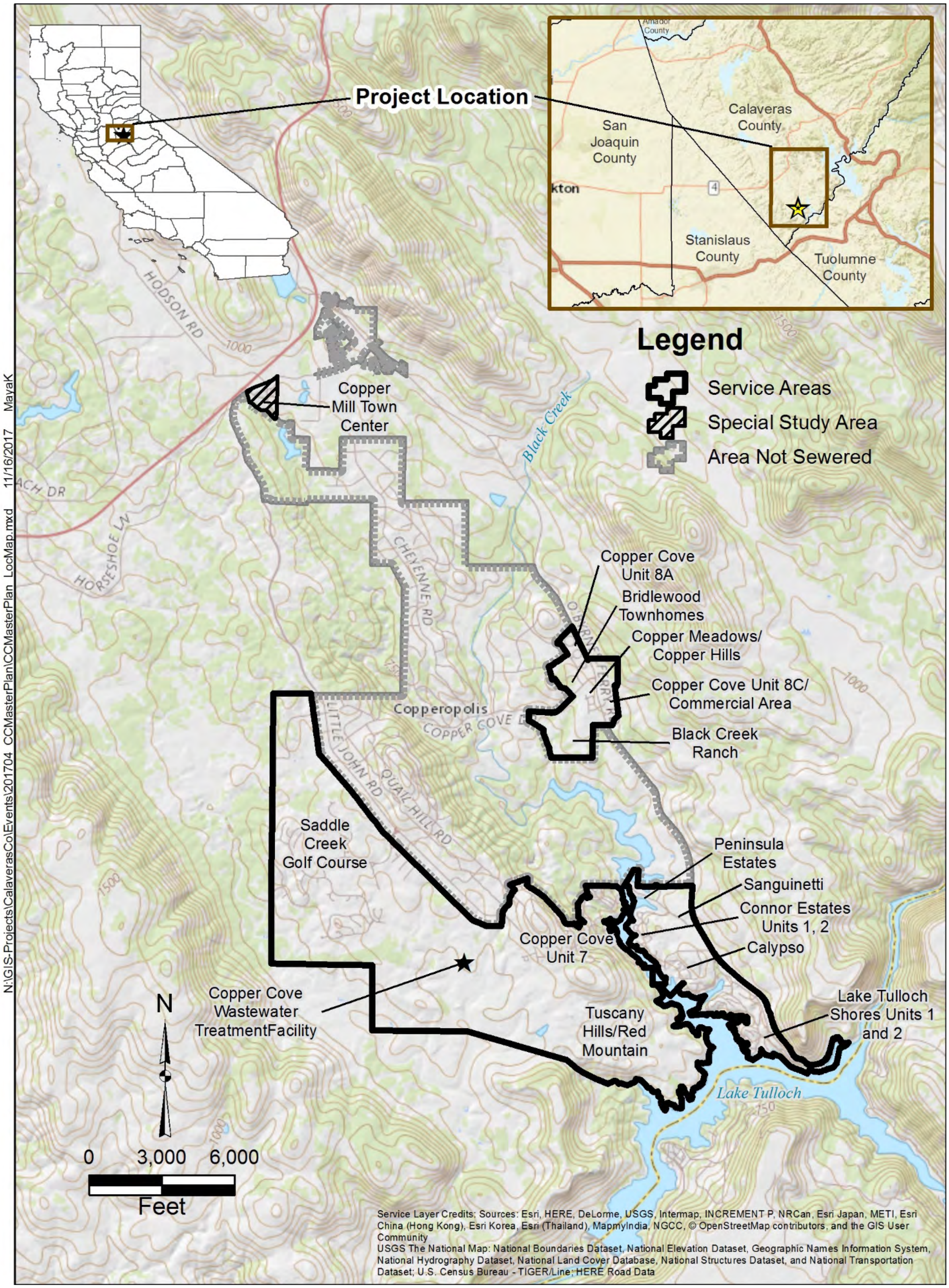

Figure 1. Copper Cove Wastewater System Service Area

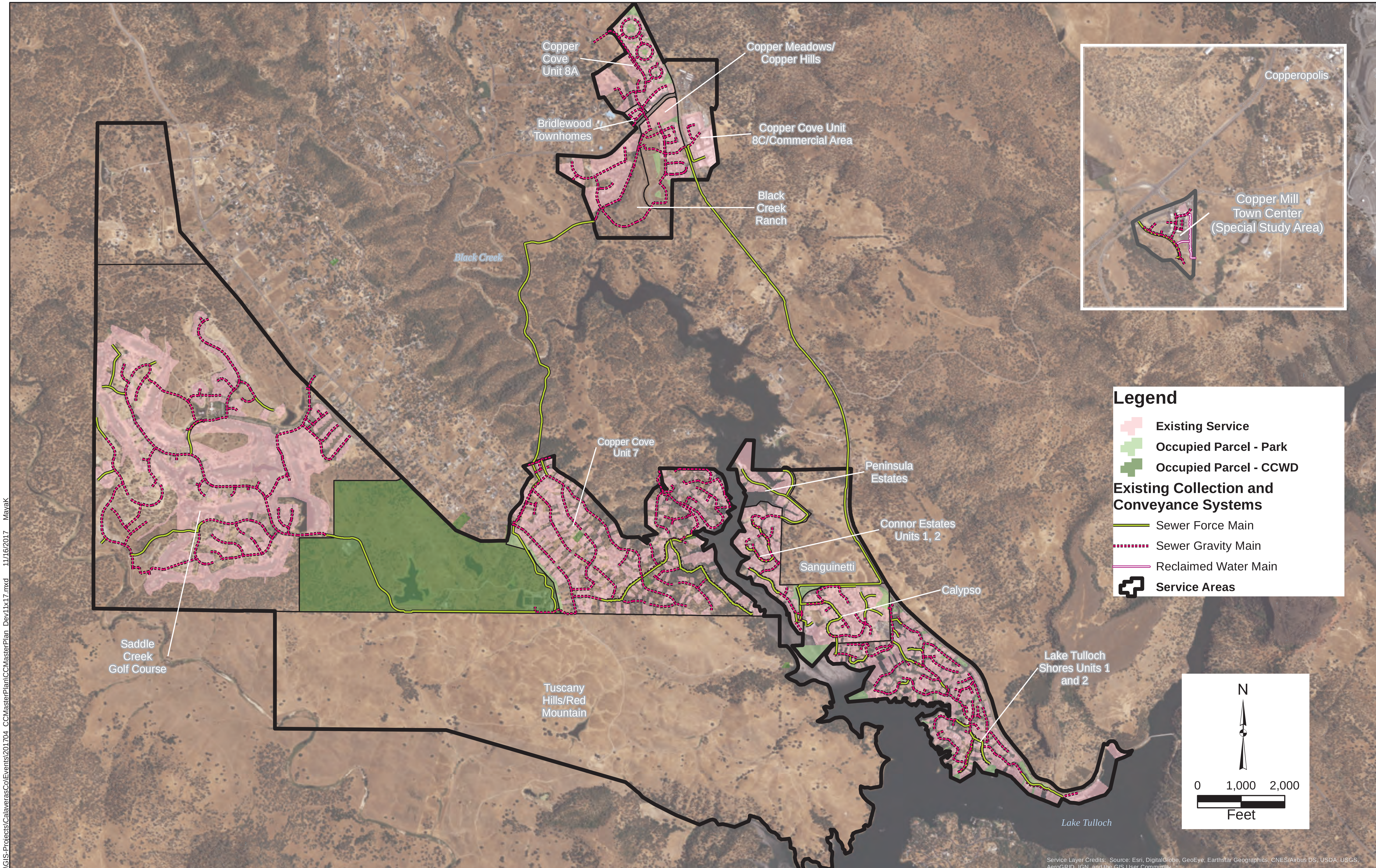

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Figure 2. Existing Customers and Occupied Parcels

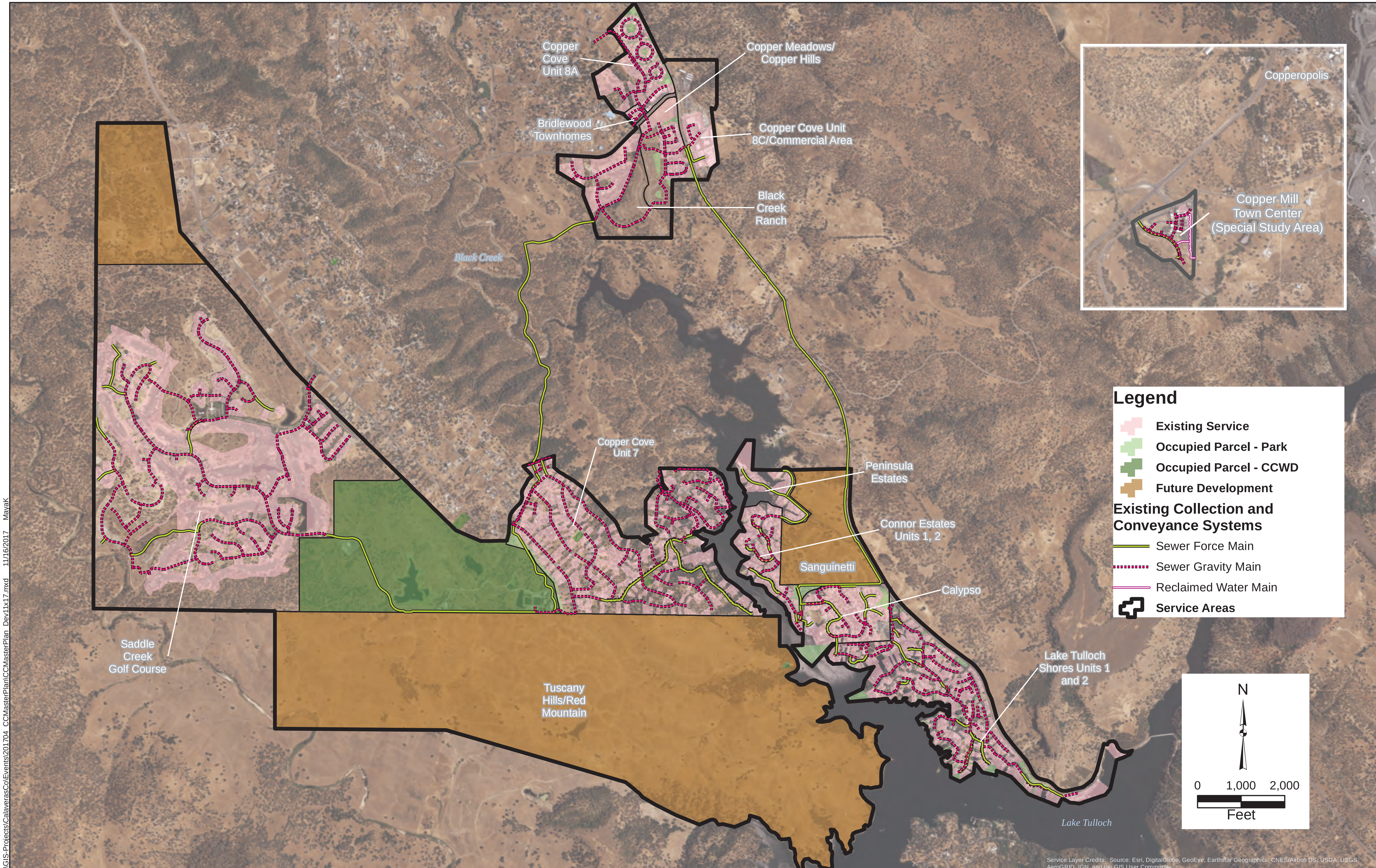

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Figure 3. Future Developments

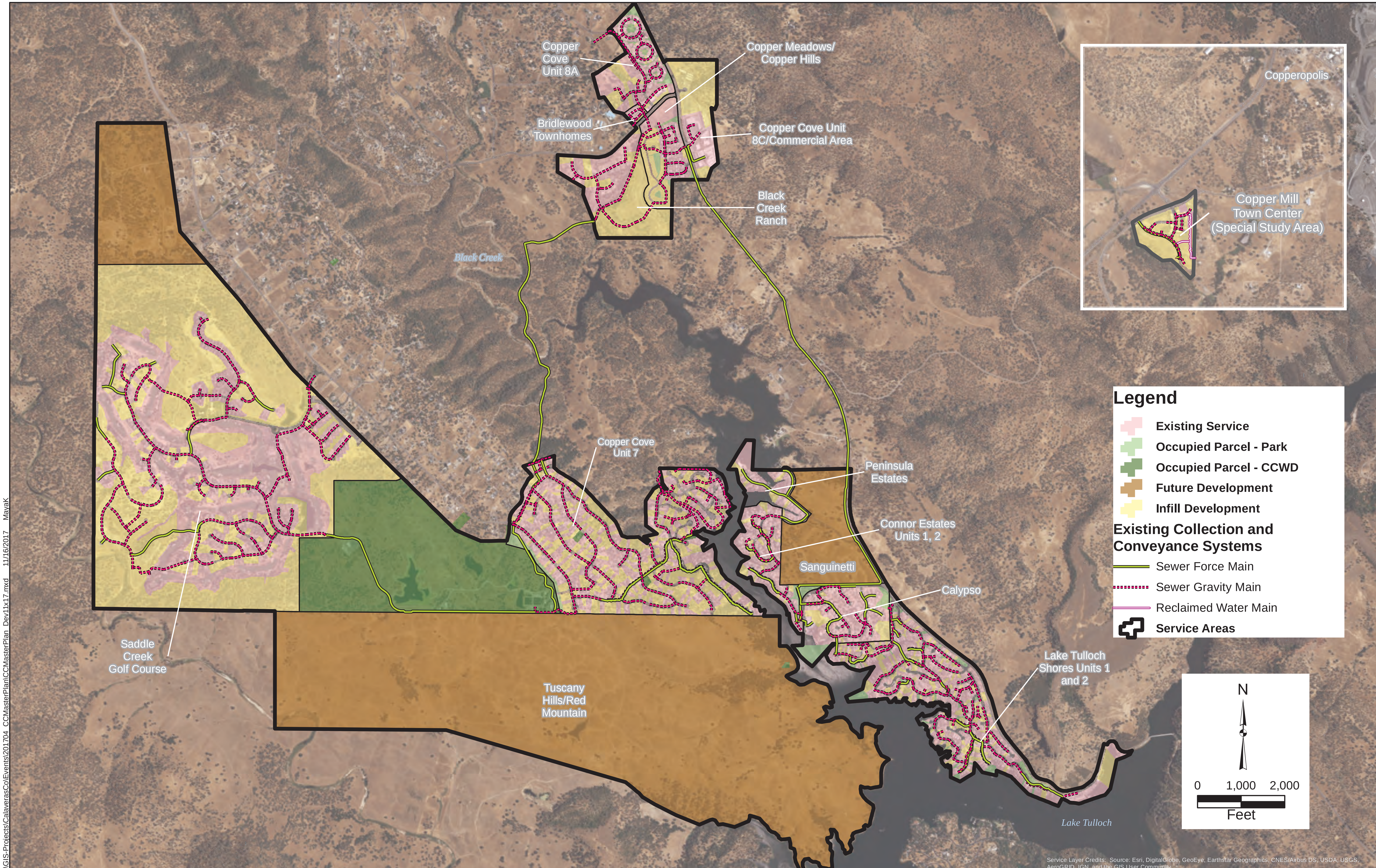

Figure 4. Infill

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2.1.4: Summary of Existing and Future Service Area Connections

Table 2 presents a summary of existing and future service area projections. These projections, in combination with unit flow factors will serve as the basis for projecting raw wastewater influent flows. Buildout projections indicate that the number of connections within the service is anticipated to increase by about 75 percent.

Table 2. Service Area Projections (ESFUs)

Service Area Component	Existing	Phase 1	Buildout
Existing and Occupied Parcels	1,770	1,770	1,770
Infill	0	1,021	1,021
Future Development	0	0	328
Total	**1,770**	**2,791**	**3,119**

2.2: District Standards

The District Standards were adopted by the Board of Directors in 2009 (CCWD, 2009), and provides procedures and minimum guidelines for the planning, design, and construction of CCWD wastewater systems and facilities. District Standards apply to existing wastewater systems being expanded, modified, upgraded and rehabilitated as well as to the construction of new facilities.

2.2.1: Unit ADWF Factor

The District Standards identify equivalent single-family dwelling units, ESFUs, to standardize flows for different types of service connections based on typical demand. ESFUs are used to project future wastewater ADWFs and peak wet weather flows (PWWFs.) The District Standards state a unit ADWF factor of 195 gallons per day (gpd) per ESFU (gpd/ESFU) shall be used for projecting future development wastewater contributions.

Table 3 presents a summary of the historic number of connections in terms of ESFUs and ADWFs. As indicated in Table 3 and illustrated in Figure 5, the highest historic value of 106 gpd/ESFU occurred in 2011, and the next highest value of 97 gpd/ESFU occurred in 2013. As anticipated, averages for the last three to five years are lower, due to drought and mandatory water conservation cutbacks, and are between 88 and 97 gpd/ESFU.

Table 3. Historic Number of Connections and ADWFs

Year	No. of Connections[1]	Growth Rate (%)[2]	ESFUs[3]	ADWF[4] (MGD)	Unit ADWF Factor[5] (gpd/ESFU)
2010	1,736	0.35	1,720	0.16[7]	93
2011	1,742	0.40	1,726	0.18	106
2012	1,749	0.46	1,733	0.16	92
2013	1,757	1.02	1,741	0.17	97
2014	1,775	0.06	1,759	0.16	92
2015	1,776	0.06	1,760	0.16	89
2016	1,777	0.45	1,761	0.16	88
2017	1,785[6]	-na-	1,769	-na-	-na-
				Average	**90**

1. Number of connections provided by CCWD and reflects historic 2010-2017 data
2. Growth rate calculated based on number of connections
3. 2010 through 2016 ESFUs estimated based on the current number of ESFUs (1,769 for 2017 provided by CCWD) and calculated growth rates
4. ADWFs were CCWD provided, reflect historic data and are based on ADWF measured in July, August, and September per R5-2010-0070 Section B.1
5. ADWF/ESFU calculated by dividing ADWF by the number of ESFUs
6. Data set includes January through March 2017
7. Arithmetic average of ADWF peaking factors between 2011 and 2016

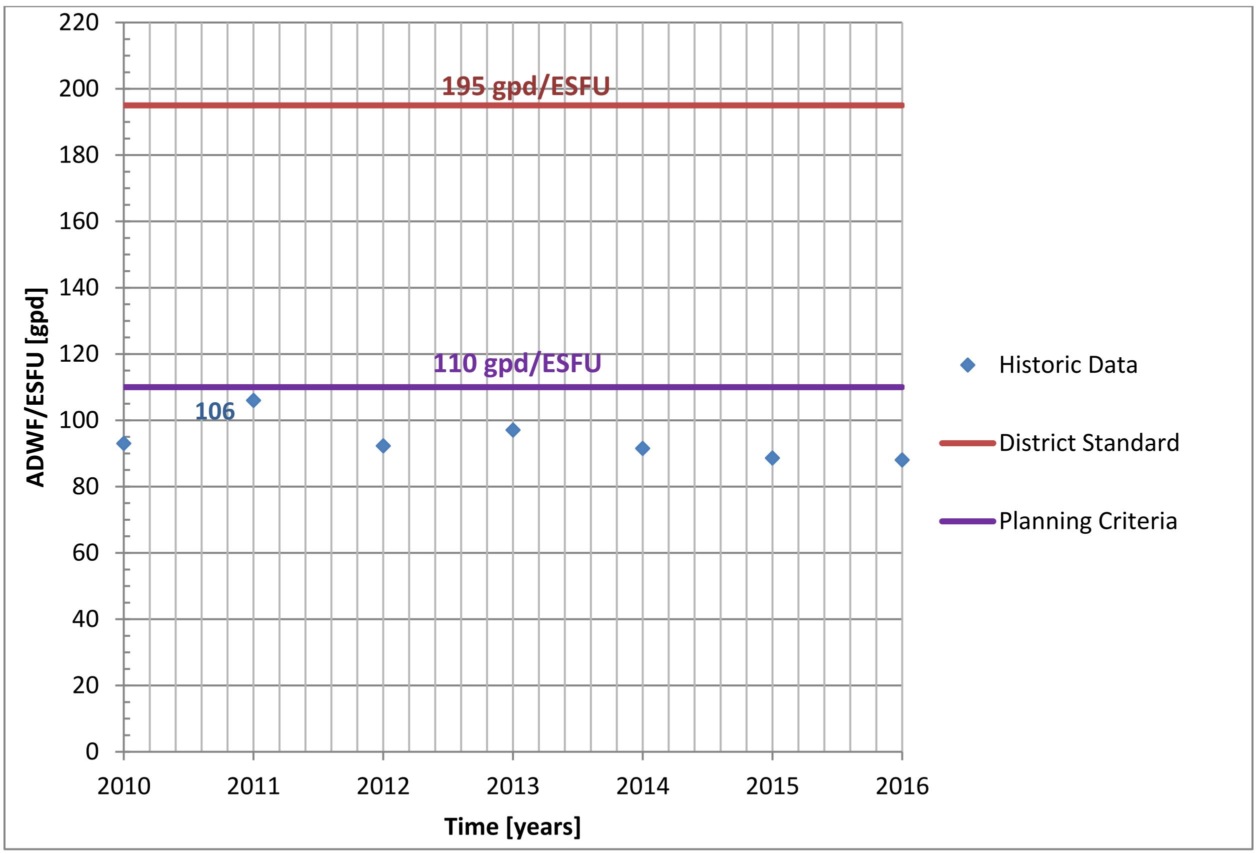

Figure 5. Recommended and Historic Unit ADWF Factors

Historic unit ADWF factors and the District standard of 195 gpd/ESFU were discussed with CCWD staff during the kickoff meeting on September 9, 2016 (CCWD, 2016a). During these discussions, it was decided that for the purposes of the Master Plan, unit ADWF factors of 195 gpd/ESFU and one other value would be used to establish a range of projected future connections and influent flows. As shown in Figure 5, a value of 110 gpd/ESFU is recommended because (1) it is greater than all historic unit flow factors between 2010 and 2016, which is a desirable outcome, and (2) provides a relatively small cushion (i.e., 3.8%) above the highest historic flow factor of 106 gpd/ESFU. The District Standard of 195 gpd/ESFU provides a relatively large cushion above the highest historic flow factor. (i.e., 85% compared to the historic 2011 value of 106 gpd/ESFU).

2.3: Wastewater Characteristics

Existing wastewater characteristics representing current flows and pollutant loadings were developed. Characteristics are compared to current CCWWTF operation conditions later in this report to (1) determine the relative degree of loading as compared to established governing design/operating criteria for each facility and each major individual unit process within each facility and (2) identify future improvements needed to accommodate the future development projections.

Table 4 is a summary of historic ADWFs, average annual flows (AAFs), maximum month flows (MMFs) and maximum day flows (MDFs) developed from historic operating data obtained from CCWD. Characteristics for these specific conditions (e.g., average annual, maximum month and maximum day) were developed because these conditions correspond to specific regulatory requirements. The methodology described in Table 4 and the District Standards were used to project PWWFs. District Standard 1.2.1 defines PWWF as the number of ESFUs multiplied by a unit flow factor of 195 gpd/ESFUs and a peaking factor of 3.0.

Table 4. Historic Influent Flows and Peaking Factors

Year	ADWF[1] (MGD)	AAF (MGD)	MMF (MGD)	MDF (MGD)
2011	0.183	0.191	0.355	0.705
2012	0.160	0.180	0.247	0.503
2013	0.169	0.159	0.247	0.296
2014	0.161	0.157	0.247	0.517
2015	0.156	0.153	0.247	0.763
2016	0.155	0.187	0.247	0.738
Average=	0.16	0.17	0.26	0.59
Peaking Factors (ratio to ADWF, unitless)				
2011	1.00	1.04	1.94	3.85
2012	1.00	1.12	1.54	3.14
2013	1.00	0.94	1.46	1.75
2014	1.00	0.98	1.54	3.21
2015	1.00	0.98	1.58	4.89
2016	1.00	1.20	1.59	4.76
Average=	1.00	1.05	1.61	3.60

1. ADWF measured in July, August, and September in accordance with R5-2010-0070 Section B.1.

ADWFs shown in Table 4 are the arithmetic average of daily influent flows for July through September. As described in Table 4, the current ADWF is estimated to be 0.16 MGD. ADWFs are anticipated to provide an approximation of the CCWWS service area base wastewater flows with no or limited direct rainfall contribution, infiltration or inflow and will serve as the basis for projecting future AAFs, MMFs, and MDFs.

2.3.1: Future Flow Projections

Historic 2011 through 2016 flows and peaking factors were averaged to estimate current AAF, MMF, and MDF conditions and project future AAFs, MMFs and MDFs. The current PWWF was estimated using District Standard 1.2.1, and historic data obtained from CCWD for the 2016/2017 wet season. During that season, actual rainfall totals measured at the CCWWTF were 38.0 inches, which is within 3% of the 100-yr annual level of precipitation of 39.0 inches per year for the CCWWTF. The PWWF measured during the 2016/2017 wet season at the CCWWTF was 0.94 MGD and occurred on January 11, 2017. Analysis of the historic data and comparison to the existing indicates that:

1. PWWF infiltration and inflow (I&I) rates for the existing service area (i.e., 756 acres) is estimated at 1,032 gpd/acre and

2. PWWF I&I rates for the Lift Station 22 service area (i.e., 301.4 acres) is estimated at 1,299 gpd/acre.

These results indicate that existing development located along the east side of Black Creek Arm of the Lake Tulloch contributes about 55% of the overall estimated PWWF I&I, whereas existing development located west side of the Black Creek Arm of Lake Tulloch (i.e., 454.6 acres) only contributes about 45% even though it is 50% larger.

Future ADWFs were projected using unit flow factors of 110 and 195 for new connections and adding the projected additional ADWF to the current ADWF of 0.16 MGD. AAF, MMF and MDF were estimated using peaking factors indicated in Table 5. PWWFs were estimated by adding ADWF and I&I projections. Future I&I contributions were assumed to be equal to the historic average of 1,032 gpd/acre. As shown in Table 5, projections are estimated using both the District Standard of 195 gpd/ESFU and historic average of 110 gpd/ESFU.

Table 5. Projected Phase 1 and Buildout Flows

Condition	Current[3]	Phase 1 - Infill (MGD)[4]		Buildout (MGD)[5]	
		110 gpd/ESFU	195 gpd/ESFU	110 gpd/ESFU	195 gpd/ESFU
ADWF	0.16	0.27	0.36	0.31	0.42
AAF	0.17	0.28	0.38	0.32	0.44
MMF	0.26	0.43	0.58	0.50	0.68
MDF	0.59	0.97	1.30	1.12	1.51
PWWF[1]	1.03	0.92	1.63	1.03	1.82
PWWF[2]	0.94	2.12	2.21	3.45	3.56

1. PWWF calculated from CCWD Standard 1.2.1: PWWF = 195 gpd/ESFU, multiplied by number of ESFUs, multiplied by a peaking factor of 3, or historic 110 gpd/ESFU, multiplied by number of ESFUs, multiplied by a peaking factor of 3.
2. CCWWTP Station flow record from roughly 10 pm, January 10, 2017 through 20 minutes past midnight on January 11, 2017 indicate a PWWF of 655 gallons per minute (gpm) which is equivalent to 0.94 MGD.
3. Existing occupied skewered area = 756 acres (does not include roads, streets, highways, open space, etc.).
4. Estimated Phase 1 sewered area = 1,796 acres (1,040 acres of infill added).
5. Estimated Buildout sewered area = 3,043 acres (two developments totaling 1,247 acres added to Phase 1).

2.3.2: Historic and Future Pollutant Load Projections

Table 6 is a summary of historic pollutant loading conditions, including average annual (AA), maximum month (MM) and maximum day (MD), for five-day Biochemical Oxygen Demand (BOD_5) and total suspended solids (TSS). Historic data were plotted using a lognormal cumulative probability density function to determine the 50-, 91.7- and 99.7-percentile probabilities correlating to the AA, MM and MD conditions. AA represents the 50-percentile value; MM reflects 11 out of 12 months or the 91.7-percentile value and MD reflects 364 out of 365 days or the 99.7 percentile value. Pollutant load peaking factors are also presented in Table 6 which reflects the ratio to the AA pollutant loads. The AA, MM, and MD BOD_5 and TSS pollutant loadings and peaking factors were averaged and used to reflect current loading conditions.

Table 6. Historic Raw Wastewater Pollutant Loadings and Peaking Factors

Year	AA	MM	MD	AA	MM	MD
Historic BOD_5 Loadings (lbs/day)				**BOD_5 Loading Peaking Factors**		
2012	258	358	420	1.00	1.39[1]	1.63[1]
2013	274	380	446	1.00	1.39[1]	1.63[1]
2014	354	375	385	1.00	1.06	1.09
2015	225	345	440	1.00	1.53	1.96
2016	250	393	460	1.00	1.57	1.84
Average	**272**	**370**	**430**	**1.0**	**1.4**	**1.6**
Historic TSS Loadings (lbs/day)				**TSS Loading Peaking Factors**		
2012	304	720	1,011	1.00	2.37[1]	3.32[1]
2013	338	799	1,122	1.00	2.37[1]	3.32[1]
2014	330	743	1,105	1.00	2.25	3.35
2015	280	800	1,060	1.00	2.86	3.79
2016	250	500	710	1.00	2.00	2.84
Average	**300**	**713**	**1,002**	**1.0**	**2.4**	**3.3**

1. Average of PFs from 2015 to 2016.
na = not available.

Current BOD_5 and TSS loads of 272 and 300 lbs/day, were divided by the current number of connections (i.e., 1,770 ESFUs) to determine unit pollutant loading factors of 0.15 lb BOD_5/d ESFU and 0.17 lb TSS/d ESFU, respectively. These values will serve as the basis for projecting future average annual pollutant loading conditions.

Raw wastewater influent samples were collected on May 9, 16, 23 and 30, 2017 and analyzed for Total Kjeldahl Nitrogen (TKN) by an outside, certified laboratory. Analyses results, shown in Table 7, indicate that TKN concentrations were 86, 54, 120 and 67 mg-N/L, respectively. Estimated TKN loads were 108, 70, 148 and 125 lb-N/d, respectively. The overall average TKN load was 113 lb-N/day

Table 7. Existing TKN Loads

Sample Date	TKN Concentration (mg-N/L)	Total Influent Flow (MGD)	TKN (lb-N/day)
May 9, 2017	86	0.150	107.6
May 16, 2017	54	0.156	70.3
May 23, 2017	120	0.148	148.1
May 30, 2017	67	0.223	124.6
Average	**82**	**0.169**	**112.6**

2.3.3: Projected Flows and Loads

Table 8 is a summary of projected raw wastewater flows and pollutant loadings to the CCWWTF for Phase 1 and Buildout. Projected flows for Phase 1 and Buildout were estimated and added to existing conditions using both 110 and 195 gpd/ESFU. Projected TKN loads represent an average of the data collected in May 2017, found in Table 7, and BOD_5 peaking factors found in Table 6.

Table 8. Projected Flows and Pollutant Loads

Parameter	Average Dry Weather	Average Annual	Maximum Month	Maximum Day	Peak Wet Weather
Current					
Flow (MGD)	0.16	0.17	0.26	0.59	0.94
BOD_5 (lbs/day)	na	272	370	430	na
TSS (lbs/day)	na	300	713	1,002	na
TKN (lb-N/day)	na	113	158	180	na
Phase 1					
Flow (MGD) 195 gpd/ESFU	0.36	0.38	0.58	1.30	2.21
Flow (MGD) 110 gpd/ESFU	0.27	0.28	0.43	0.97	2.12
BOD_5 (lbs/day)	na	429	600	686	na
TSS (lbs/day)	na	473	1,135	1,561	na
TKN (lb-N/day)	na	178	249	284	na
Buildout					
Flow (MGD) 195 gpd/ESFU	0.42	0.44	0.68	1.51	3.56
Flow (MGD) 110 gpd/ESFU	0.31	0.32	0.50	1.12	3.45
BOD_5 (lbs/day)	na	479	671	767	na
TSS (lbs/day)	na	529	1,269	1,745	na
TKN (lb-N/day)	na	198	278	318	na

na = not available.

2.4: Phasing Requirements

The following will serve as guidelines for the phasing of recommended improvements:

- Phase 1 and Buildout development to be based on projections of 2,790 and 3,118 ESFUs.
- ADWFs to be based on unit flow factors of 110 and 195 gpd/ESFU.
- Rated ADWF capacities of the CCWWTF to reflect existing rated capacity of 0.23.
- Incremental treated effluent storage and disposal capacity increases to be defined by CCWD. Most likely treated effluent storage improvements to be limited to a single expansion of Pond 6 and/or wet season discharge.
- The scope of this Master Plan is limited to identifying CCWWS improvements and estimated budgeted costs required to serve planned growth. Other requirements (e.g., environmental, traffic, etc.) may have an impact on development timing but are NOT considered in this report.

Section 3: Regulatory Requirements

Regulatory requirements specific to the Copper Cove collection, secondary wastewater treatment and storage, tertiary treatment facilities and an on-site land application area (LAA) are specified in Waste Discharge Requirements Order No. R5-2010-070. The latest requirements specific to tertiary wastewater treatment and recycled water irrigation reuse at the SCGC are specified in National Pollution Discharge Elimination System Order R5-2016-0065 (NPDES Permit). These permits are described below.

3.1: Waste Discharge Requirements Order

Waste Discharge Requirements Order No. R5-2010-0070 (WDR) prescribes specific requirements for the District's CCWWS with respect to wastewater collection, secondary treatment and storage facilities and the LAA. The WDR was originally adopted by the Central Valley Regional Water Quality Control Board (RWQCB) on June 16, 2000 as WDR Order No. 5-00-136[3]. The following are summaries of key requirements derived from the WDR:

1. The WWTP consist of the headworks, two aerated ponds operated in parallel (Ponds 1 and 2; each pond equipped with 4, 15 HP aerators), a partially aerated and settling pond (Pond 4), polishing and storage pond (Pond 6), tertiary filtration and ultraviolet light (UV) disinfection. Pond 3 is currently out of service and Pond 5 is only used for emergencies. The contents of Pond 6 can be land applied to the LAA in accordance with the WDR.
2. Currently the WWTP has a permitted ADWF[4] capacity of 0.23 MGD, 0.28 MGD MMF capacity and maximum annual total flow rate of 92.95 million gallons per year.
3. Approximately 35 acres of the LAA can be used to dispose of secondary effluent from Pond 6. Runoff that occurs within the LAA is returned to Pond 6 by graded slopes of the LAA.
4. The annual average level of precipitation measured at the CCWWTF is approximately 21.6 inches per year; the 100-year return period annual precipitation is estimated to be 39.0 inches per year.
5. Treated effluent, prior to discharge to Pond 6 shall not exceed the numerical limits described in Table 9 nor the total coliform and pH sections below.
    - Median total coliform concentration shall not exceed most probable number (MPN) of 23 per 100 milliliters using results of the last seven (7) days of analyses which have been completed.
    - Median total coliform concentration shall not exceed MPN of 240 per 100 milliliters in more than one (1) sample in any 30-day period.
    - pH measured in ponds shall be greater than or equal to 6.5 standard units (su) and less or equal to 10 su.
6. The operation of the CCWWTF or LAA shall not cause groundwater to contain constituent concentrations in excess of the following concentrations (see Table 10).

[3] Order No. 5-00-136 has been rescinded and superseded by the WDR.
[4] Based on July, August and September flows as described in Article B.1.

Table 9. Numerical Treatment Effluent Limitations – Copper Cove WDR

Constituent	Units	Numerical Limit	
		Monthly Average	Daily Maximum
BOD_5	mg/L	30	80
Total Nitrogen	mg-N/L	10	--
Total Dissolved Solids	mg/l	450	600
Sodium	mg/L	69	--
Chloride	mg/L	106	

Table 10. Groundwater Numerical Limitations

Constituent	Units	Limit
Chloride	mg/L	106
Boron	mg/L	0.7
Iron	mg/L	0.3
Manganese	mg/L	0.05
Sodium	mg/L	69
Total Dissolved Solids	**mg/L**	**450**
Nitrate	mg-N/L	10
Bromoform	µg/L	4
Bromodichloromethane	µg/L	0.27
Chloroform	µg/L	1.1
Dibromochloromethane	µg/L	0.37
Total Coliform Organisms	**MPN/100 mL**	**< 2.2**

3.2: NPDES Permit

The NPDES Permit was adopted on May 31, 2013, is scheduled to expire May 1, 2018 and states that the discharger shall file a Report of Waste Discharge no later than November 2, 2017. The jurisdictional wetland system is regulated by a US Army Corps of Engineers Clean Water Action Section 404 Permit (404 Permit). The wetland system also includes several man-made and natural lakes, including Mitchell Lake. The 404 Permit requires that all ponds and wetland areas have a continuous supply of water to maintain minimum levels. Therefore, SCGC uses water from Pond NC-2D when necessary to supply makeup water to the wetlands, excluding Mitchell Lake which is a tributary to Little Johns Creek. The District discharges tertiary treated effluent to Pond NC-2D and at times this water is discharged to the jurisdictional wetlands, which have been defined as waters of the United States, within the Middle San Joaquin, Lower Merced, Lower Stanislaus Watershed. The following are summaries of key requirements derived from the NPDES Permit:

A. See Section 3.1, Item 1 above for a description of the CCWWTF. Treated effluent can be discharged to SCGC Pond NC-2D between April 1 and December 31 (defined in the NPDES Permit as discharge season).
B. The NPDES Permit authorizes the surface water discharge of up to 0.95 MGD of disinfected tertiary treated wastewater to the SCGC during the discharge season.
C. During the discharge season, tertiary treated effluent is collected in the Recycled Water Storage Tank and conveyed to Pond NC-2D located on the SCGC to be used for golf course irrigation or to provide makeup water for the wetland system.
D. Tertiary filtration and UV disinfection are typically started up in April 1 and operated until Pond 6 is empty (e.g., treat Pond 6 effluent flows through the remainder of the year). When

the demand for irrigation water exceeds recycled water production capacity of the existing tertiary filtration and UV disinfection systems, raw water from Lake Tulloch is used for makeup.

E. The NPDES Permit Amendment added a new monitoring location, REC-002, located in Pond NC-2D prior to discharge to the jurisdictional wetlands. The new monitoring location provides representative samples of the discharge to the jurisdictional wetland and is used to evaluate compliance with the effluent limitations for ammonia and nitrate plus nitrite.
F. The District completed construction of a new UV disinfection system in September 2006 and has entirely discontinued the use of liquid hypochlorite. All recycled water is now disinfected via UV and chlorine is no longer used in any stage of the treatment process. Therefore, the District no longer demonstrates reasonable potential to cause or contribute to an exceedance of the applicable water quality objectives for total residual chlorine and dichlorobromomethane, and will not produce disinfection byproducts such as chloroform. The NPDES Permit Amendment removed effluent limitations specific to total residual chlorine and dichlorobromomethane as well as monitoring requirements for total residual chlorine, chloroform, and dichlorobromomethane indicated above in Table 9 and Table 10.
G. Treated effluent discharged into Pond NC-2D shall maintain compliance with the following limitations shown in Table 11.
   - pH shall be greater than or equal to 6.5 su and less than or equal to 8.5 su.
   - There shall be no chronic toxicity in the effluent. Survival of aquatic organisms in 96-hour bioassays of undiluted effluent shall be no less than:
     - 70%, minimum for any one bioassay; and
     - 90%, median for any three consecutive bioassays.
   - Total Coliform Organisms shall not exceed:
     - 2.2 MPN/100 mL, as a 7-day median;
     - 23 MPN/100 mL, more than once in any 30-day period; and
     - 240 MPN/100 mL, at any time.

Table 11. NPDES Permit Limitations

Parameter	Units	Effluent Limitations		
		Monthly Average	Weekly Average	Daily Maximum
BOD_5	mg/L	10	15	20
	lb/d[1]	79	119	158
TSS	mg/L	10	15	20
	lb/d[1]	79	119	158
Aluminum[2]	μg/L	310	623	
Ammonia	mg-N/L	0.74		2.2
	lb-N/d[1]	5.9		17
Electrical Conductivity	μmhos/cm	900		
Manganese[2]	μg/L	97	242	
Nitrate Plus Nitrite	mg-N/L	10		

1. Mass-based effluent limitations are based on a flow of 0.95 MGD.
2. Total recoverable.

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Section 4: Evaluation of Existing Wastewater System

This section describes the existing collection, treatment, storage and disposal facilities that make up the CCWWS along with their rated capacities where applicable.

4.1: Collection and Conveyance

The following are descriptions of the existing sewer collection system, force mains and lift stations that convey wastewater from the service area to the CCWWTF for subsequent treatment, storage and disposal.

4.1.1: Sewer Collection System

The existing collection system, shown in Figure 6, was originally constructed in the early 1970s to serve the Copper Cove subdivision. The Lake Tulloch Shores subdivision was also being developed around the same time, and rather than building its own wastewater treatment plant, it was connected to Copper Cove facilities using a 6-inch sewer line that conveyed water underneath Lake Tulloch. The O'Byrnes Ferry force main replaced this sewer pipeline in June 1993. Other sewer pipelines located below Lake Tullock have already or are in the process of being removed as well to limit the potential impact of a sanitary sewer overflow (SSO).

The collection system is comprised of approximately 98,675 lineal feet (18.7 miles) of sewer piping and 32 lift stations. The collection system begins in Lake Tulloch Unit 2 where the sewers carry raw wastewater from Manhole 1 to Manhole 102 in a combination of 4-inch and 8-inch PVC pipelines. Within Lake Tulloch Unit 2 are Lift Stations 1 through 9. These stations convey raw wastewater from the Poker Flat Lodge along O'Byrnes Ferry Road and Poker Flat Road to Lift Stations 12 and 13, located in Lake Tulloch Unit 1 along Lake View Court. Together with wastewater pumped from Lift Stations 10 and 11, wastewater is conveyed from Lake Tulloch Unit 1 to Lift Station 40 located in Connors Estates Unit 2. Lift Station 43, located along Bluff View Road, conveys raw wastewater from Connors Estates Unit 1 to Connor Estates Unit 2, which has five lift stations, (Lift Stations 40, 41, 42, 44 and 45). Raw wastewater is then pumped to Lift Station 21 (located at the extreme north end of Lake Tulloch), which in turn conveys it around the lake to Lift Station 22 located on the northwest side Lake Tulloch. Lift Stations 15 through 20 are located in Copper Cove Unit 7 and convey raw wastewater from that unit to the trunk sewer from where it is conveyed by gravity to the CCWWTF. Lift Station 23, located along the Oak Creek Drive, conveys wastewater from the Saddle Creek service area to the CCWWTF. Figure 6 shows the location of the District's lift stations within the CCWWS.

Lift Stations 12 and 13 are located along Lake View Court near Lake Tulloch. The majority of the wastewater generated from Lake Tulloch Units 1 and 2 is currently routed through these stations. To minimize the potential for a SSO, a bypass around these lift stations is to be installed. The bypass would be added to route wastewater directly from Lift Station 8 to Lift Station 40 or to Lift Station 40's force main. This interconnection is estimated to decrease PWWFs routed through Lift Stations 12 and 13 by 80 percent and reduce the level of improvements required for Lift Stations 12 and 13.

The collection system is known to consists of at least three different types of pipe material-polyvinyl chloride (PVC), ductile iron piping (DIP), and vitrified clay piping (VCP). The District has a CCTV truck which is used to monitor the collection system. Table 12 is a summary of the number of lineal feet, manholes and piping material in specific developments.

Table 12. Summary of Existing Collection System

Development	Sewer Length (ft)	Diameter (inch)	Material	Number of Manholes
Lake Tulloch				
Unit 1	4,300	6 and 8	PVC	21
Unit 2	16,500	6 and 8	PVC	111
Connor Estates				
Unit 1	1,300	6	PVC	6
Unit 2	3,800	6	PVC	25
Copper Meadows	1,275	8		5
Copper Cove				
Unit 7	37,000	6	VCP	153
Unit 8A	7,500	6 and 8	PVC	32
Saddle Creek				
Unit 1	11,800	6 and 10	PVC	61
Unit 2A	3,200	6 and 10	PVC	18
Unit 2B, 2C, 2D	7,000	6	PVC	35
Unit 3A	4,100	6	PVC	18
Unit 3B	900	6	PVC	5

Source: Report of Waste Discharge (CCWD, 2017)

4.1.2: Lift Stations

All Copper Cove lift stations are continuously monitored through SCADA. The SCADA feeds information back to the CCWWTF. Unusual conditions (e.g., power failure) are sent to the CCWWTF and an alarm is sent to the District collection staff. The SCADA system consists of a series of PLC's, radio transmitters and Wonderware Operating System. The lift stations are checked a minimum of once per week and cleaned a minimum of once per year.

The majority of Copper Cove lift stations have standby generators which come on automatically in the event of loss of power from PG&E. The generators are checked on a bi-weekly basis. Each generator is equipped with a smart transfer switch, which has a downloadable program that District staff use to troubleshoot if there is a problem.

The District currently has a total of 5 lift stations equipped with overflow tanks (Lift Stations 15, 18, X, Y and Z).

A summary of design and estimated operating parameters for each lift station is presented in Table 13. Data reported in this table was obtained from the 2005 Copper Cove Wastewater Facility Plan (CCWD, 2005). Firm capacities are based on the estimated pumping capacity with the largest pump out of service. Estimated PWWFs are based on the number of connections (i.e., ESFUs), 195 gpd/ESFUs and I&I contribution of 1,032 gpd/acre.

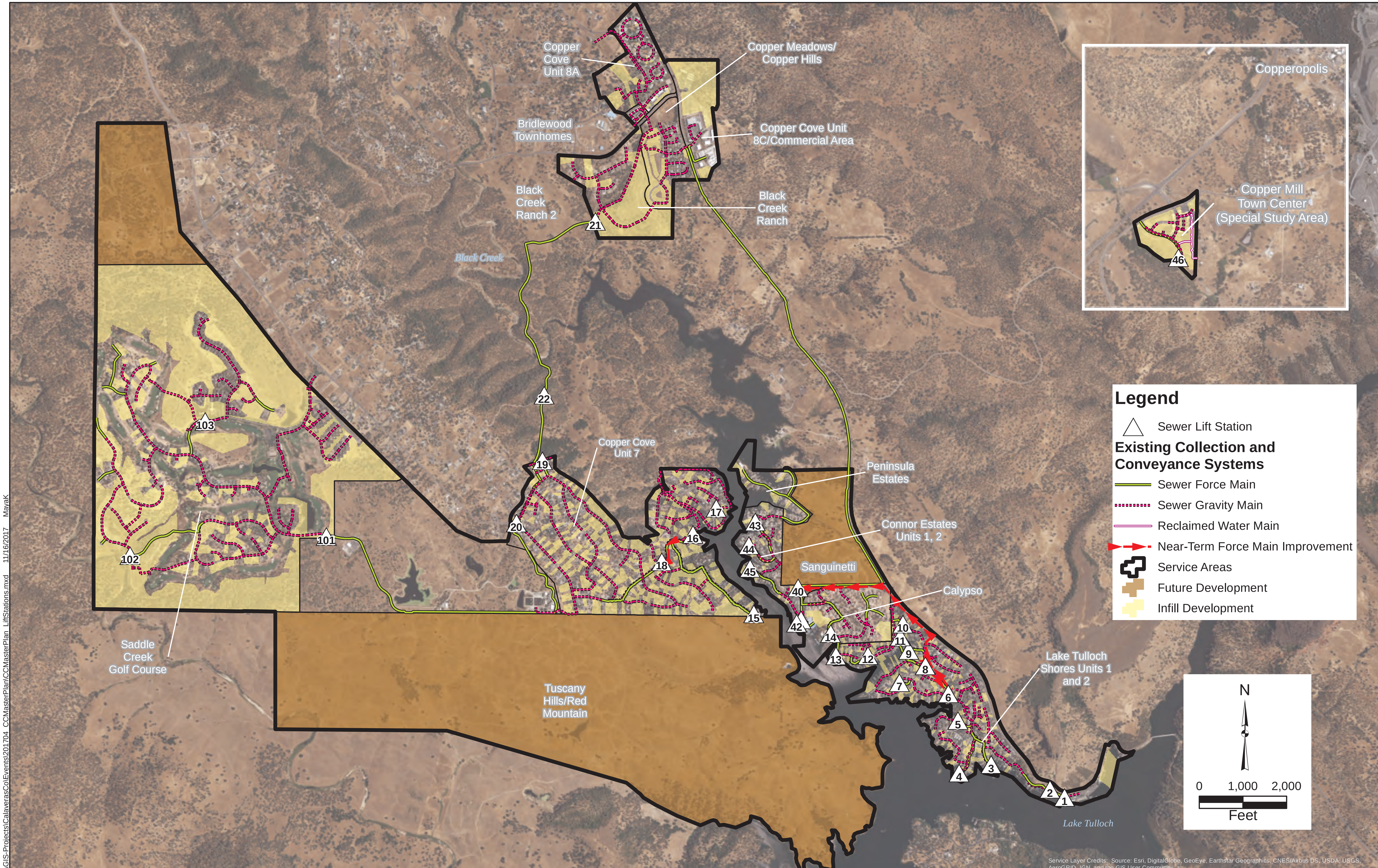

Figure 6. Copper Cove Collection System, Force Mains and Lift Stations

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Table 13. Copper Cove Lift Station Design and Operating Parameters

LS	Subdivision	Firm Capacity (gpm)	Wet Well Type	Wet Well Volume (gal)	Buildout Connections (ESFUs)	Service Area (acres)	PWWF (gpm, min)	Proximity to Lake Tulloch
1	Poker Flat Lodge	130	Fiberglass	2000	5	16.9	13	Yes
2	Poker flat Road	50	Fiberglass	2000	10	8.8	20	Yes
3	Mother Shipton	100	Fiberglass	2000	45	17.6	39	Yes
4	Sandy Bar Drive	100	Fiberglass	2000	96	27.3	72	Yes
5	Foothill Drive	130	Fiberglass	2000	30	7.0	9	
6	Sunrise Road	352	Concrete	3400	121	32.6	167	
7	Bret Harte Drive	100	Concrete	2000	23	9.8	10	
8	Jimmy Way	376	Concrete	3000	119	36.7	47	
9	Millie Court	77	Concrete	2000	14	3.6	4	
10	Poker Flat Road	146	Concrete	1800	28	8.4	10	
11	Eagle Point	244	Concrete	1800	7	1.8	2	
12	Lower Thompson Lane	430	Concrete	1500	61	20.9	35	Yes
13	Lakeview Road	430	Concrete	1800	17	5.1	41	Yes
14					129	62.9	62	Yes
15	Lakeshore Drive	450	Concrete	5500	114	50.3	51	Yes
16	Kiva Drive	500	Concrete	3800	109	46.0	120	Yes
17	Lacross Court	270	Fiberglass	2000	51	18.8	20	Yes
18	Kiva Drive/Tewa Court	500	Concrete	7200	203	80.7	205	
19	Moccasin Court	15	Concrete	350	12	5.1	5	
20	Little John Road	300	Concrete	1200	139	55.7	64	
21	**Lower Cross Country**	**300**	Concrete	6200	453	309.6	**634**	
22	**Upper Cross Country**	**460**	Concrete	2600	no sewer shed		**634**	
40	**Connors Estates Drive**	**300**	Concrete	30000	no sewer shed		**350**	Yes
41	Connors Estates Drive	282	Steel	1500	21	8.5	79	Yes
42	Connors Estates Drive	100	Fiberglass	1500	8	2.5	3	
43	Passeo Delago	92	Fiberglass	1750	88	44.2	44	Yes
44	Brandon Court	50	Fiberglass	1750	23	9.6	10	Yes
45	Shoreline Court	50	Fiberglass	1750	35	13.1	68	Yes
46					27	86.3	65	
101	Saddle Creek Main	1200	Concrete	10000	335	516.2	754	
102	**Saddle Creek Drive**	**100**	**Fiberglass**	**9000**	**132**	**168.4**	**156**	
103	Oak Creek Drive	420	Fiberglass	8500	133	204.2	182	

Source: 2005 Facilities Plan (CCWD, 2005)

4.2: Wastewater Treatment Facility

The CCWWTF was originally constructed in the early 1970s and consisted of a flow diversion box, two aerated ponds (Pond 1 and Pond 2) followed by two non-aerated ponds (Pond 3 and Pond 4). The facility went through several modifications after the original construction. Currently the CCWWTF has a permitted ADWF capacity of 0.23 MGD.

A summary of existing unit treatment processes, criteria governing the unit's capacity and current loading conditions is presented in Table 14. A site plan and process flow schematic of the existing CCWWTF are shown in Figure 7 and Figure 8, respectively.

4.2.1: Headworks

The headworks at the CCWWTF consists of a pumping station, ultrasonic flow meter, mechanical screen with integral washer/compactor and bypass Parshall flume. Screened wastewater flows are conveyed by the Influent Pump Station through the screen to the Diversion Box where the flow is split, then conveyed to Ponds 1 and 2.

CCWWTF operators collect grit and screenings in a bag and, when the bag is full, empty the bag into a dumpster. Dumpsters are taken to the Calaveras County Rock Creek Landfill for subsequent disposal. CCWWTF screenings represent approximately 600 pounds per year.

4.2.2: Secondary Treatment

Ponds 1 and 2 received screened wastewater, operate in parallel and are equipped with 4, 15 horsepower (HP) mechanical aerators to provide complex mix and aerobic conditions to support biological treatment. Combined flows from Ponds 1 and 2 are conveyed by gravity to Pond 4. Pond 4 is equipped with a single 15 HP mixer/aerator. Pond 4 functions as a settling/polishing pond. Pond 3 is not utilized for treatment.

In 1990, two storage ponds (Pond 5 and 6) and a 35-acre spray field were added. Pond 6 has a capacity of 210 acre-feet at the height of the spillway, and Pond 5 has a storage capacity of 40 acre-ft. Pond 6 is used for storage of secondary effluent prior to processing at the recycled water facility to meet disinfected tertiary standards. During the irrigation season, Pond 4 and 6 contents are blended and processed by the recycled water facility prior to conveyance to the SCGC.

The District has no future plans to operate Pond 5 given that the pond storage volume is less than the annual volume of runoff entering the pond in a heavy precipitation year (40 acre-ft volume versus 53 acre-ft of runoff).

4.2.3: Tertiary Treatment and Disinfection

In 2000, the District installed the recycled water facility to produce disinfected tertiary effluent for subsequent use at the SCGC in accordance with applicable regulatory requirements. The tertiary treatment plant originally consisted of a packaged Microfloc® Adsorption Clarifier and Mixed Media Tertiary Filtration System and chlorine disinfection. The District installed and switched to UV disinfection in 2008.

Filtered effluent is disinfected in an open channel Trojan UV3000 Plus system which has been in operation since September 2008. The UV system has five banks (four duty/one standby), each with 24 lamps per bank, 120 lamps total.

The UV system consists of 4-duty/1-standby banks with 4 modules per bank and 6 lamps per module (24 lamps per bank and 120 lamps total). The UV system was originally designed based on a hydraulic capacity between 0.5 and 1.0 MGD with the following criteria:

- Minimum Dose (with one bank out of service): < 100,000 μWs/cm^2
- End of Lamp Adjust Factor: 82 %
- Fouling Factor: 0.95
- Disinfection Standard (7-day median): ≤ 2.2 coliform/100 mL
- Theoretical Dose (with one bank out of service): 108,680 μWs/cm2

The UV system was designed in accordance with NWRI/AWWARF guidelines and dose requirements as prescribed by the California Division of Drinking Water (DDW). A Checkpoint Bioassay Report was prepared by the District in 2012 at the request of the DDW. The reported was prepared to determine best operating control practices and validate the treatment capacity of the system. Results shown in Table 14 reflect the Checkpoint Bioassay Report results as opposed to the theoretical UV disinfection capacity previously described.

4.2.4: Storage and Disposal

As previously described, Pond 6 is used for effluent storage. The location of the CCWWTF and SCGC are shown in Figure 9. The District and SCGC owners intend to maximize the use of recycled water use for golf course irrigation. Historic SCGC irrigation demands are estimated to be between 445 and 630 acre-ft per year with an average of 515 acre-ft per year.

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Table 14. Unit Processes, Governing Criteria and Operating Conditions

Facility and/or Unit Process	Governing Criterion or Criteria	Units	Operating Conditions, gpm if not noted: Current	Operating Conditions, gpm if not noted: At Capacity	Rated Capacity: % Loaded	Rated Capacity: MGD	Notes
Headworks							
Influent chopper pumps	3 pumps, two duty; one standby.	Each 15 HP pump has rated capacity of 875 gpm.	652	1,750	37	2.5	Replace with 1,400 gpm pumps to serve Buildout (Phase 1 Expansion Project)
Mechanically cleaned screen w/integral washer-compactor	2.0 MGD	Manufacturer and model	652	1,388	47	2.0	Add second 2.0 MGD unit when PWWF exceed 2.0 MGD.
Bypass Parshall flume		12-inch throat	652	7,220	9	10.4	
Secondary Treatment Ponds							
Pond 1 - aerated, complete mix; parallel to Pond 2	Maximum day Hydraulic Retention Time (HRT) of 9 days (minimum)	Volume of 6.8 acre-ft, surface area of 0.7 acres, 12 ft depth, 4-15 HP surface aerators	205	7.5	120	0.25	
Pond 2 - aerated, complete mix; parallel to Pond 1	Maximum day HRT of 9 days (minimum)	Volume of 6.8 acre-ft, surface area of 0.7 acres, 12 ft depth, 4-15 HP surface aerators	205	7.5	120	0.25	
Pond 4 - partially aereated/partially mixed facultative	Maximum day HRT of 6 days (minimum)	Volume of 9.3 acre-ft, surface area of 1.0 acres, 12 ft depth, 1-15 HP surface aerators	409	5.1	175	0.5	
Recycled Water Facility							
Adsorption Clarifier	TBD	Trident 700					
Mixed Media Filter	Maximum Hydraulic Loading Rate (5 gpm/sf) with one unit out of service (assumed to be equivalent to Maximum Day Conditions)	Trident 700; 140 ft^2 media area (per Title 22 Engineering Report)	659	350	188	0.5	Maximum throughput is reported to be limited to about 0.5 MGD
UV Disinfection	Capacity with 1 module in standby and 55% UVT. Per Checkpoint Bioassay Results (May 2012)	4 Trojan UV3000 Plus banks - 4 modules per bank, 6 lamps per module	111	375	30	0.5	Reflects capacity described in *Checkpoint Bioassay Results for the Trojan UV3000PLUSTM Systems at the La Contenta and Copper Cove WRPS* (May 2012)
	Capacity with all but 1 bank in standby mode and 65% UVT. Per Checkpoint Bioassay Results (May 2012)	4 Trojan UV3000 Plus banks - 4 modules per bank, 6 lamps per module	729	924	79	1.3	
Storage - Pond 6	Adequate storage to accommodate 100-yr levels of annual precipitation	210 acre-ft storage capacity (at spillway)	303 acre-ft	210 acre-ft	144	0.14	Based on water balance submitted to RWQCB in July 2017. Assumes no surface water discharge
Effluent Disposal (Saddle Creek Golf Course)	Effluent disposal at agronomic rates	503.2 acre-ft per year at average levels of precipitation and 454.8 AFY at 100-yr conditions	374 AFY	455 AFY	82	0.19	Based on water balance submitted to RWQCB in July 2017. Pond 6 evaporation subtracted from estimated recycled water production. Assumes no surface water discharge.

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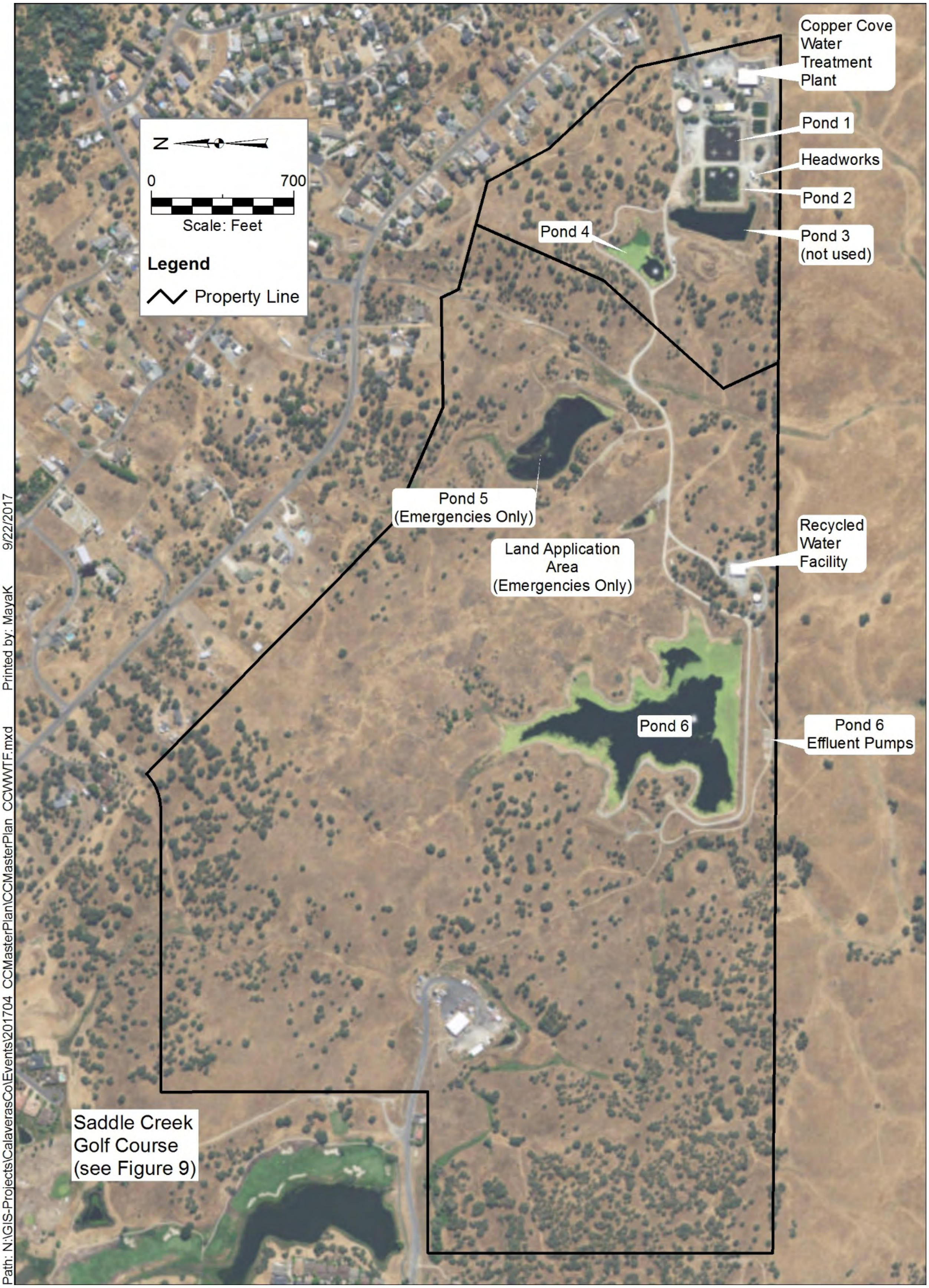

Figure 7. Copper Cove Wastewater Treatment Facility Site Plan

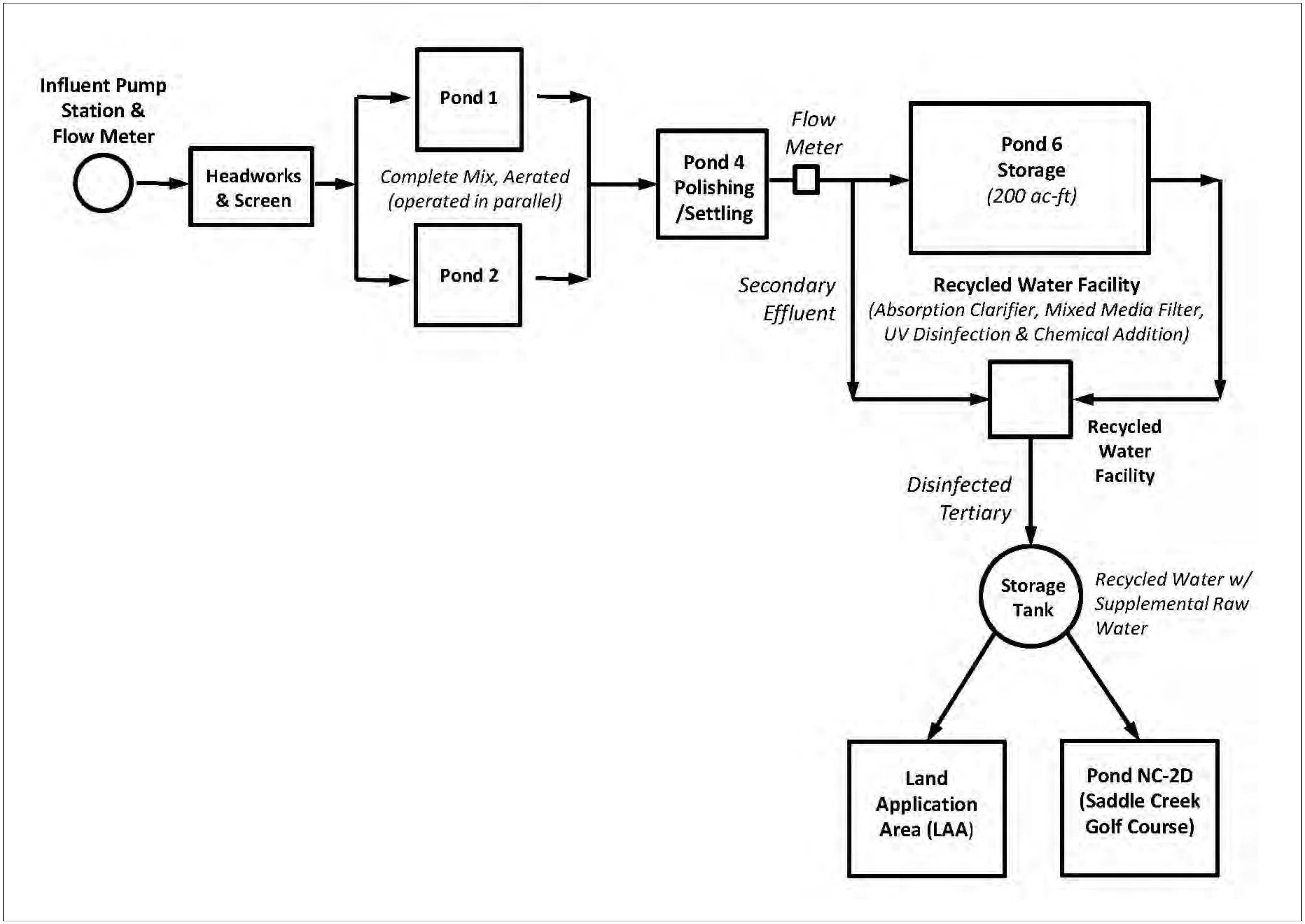

Figure 8. Process Flow Schematic

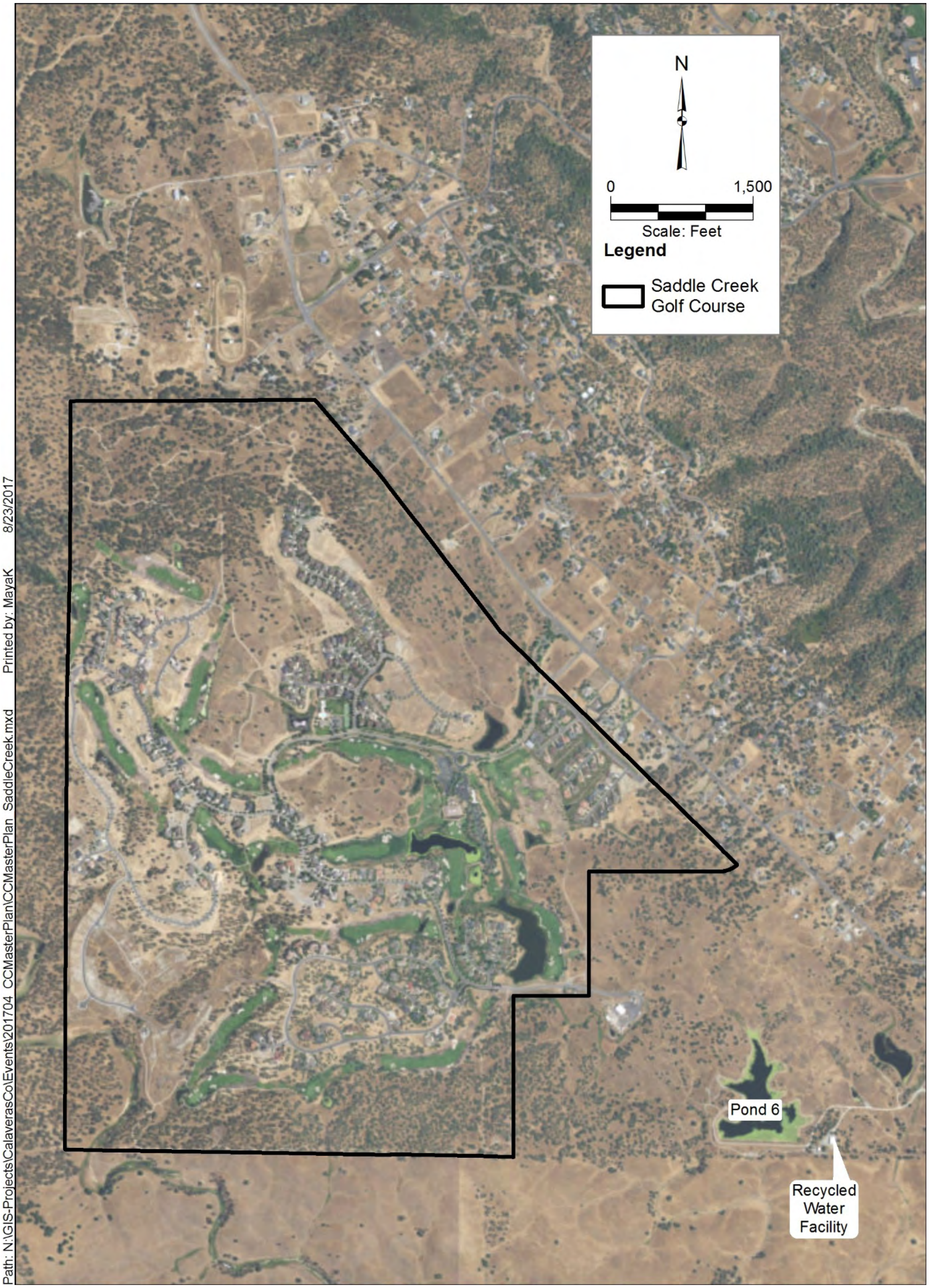

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Figure 9. Saddle Creek Golf Course Property

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Section 5: Evaluation of Alternatives

This section describes the development, evaluation and comparison of alternatives to accommodate planned growth, and address the need to discharge treated effluent during the 2016/17 nondischarge season. Improvements to the CCWWS components and facilities were identified, discussed with CCWD staff and are described below.

5.1: Collection and Conveyance Systems

Service area topographic, future development locations, existing service area were reviewed and evaluated. The evaluation led to the recommendation that the two Buildout developments, Tuscan Hills/Red Mountain and Copper Mill would be served by new lift stations. The number and locations of the lift stations serving Tuscan Hills/Red Mountain will likely be influenced by development phasing. It is recommended that the Copper Mill development be served by a single lift station which ties into the existing conveyance and collection system. The following is a summary of estimated lift station firm capacities associated with both developments:

- Copper Mill: 1 lift station serving 28 ESFUs; firm capacity of TBD
- Tuscan Hills (total combined): Multiple lift stations serving 300 ESFUs; firm capacity of TBD

5.2: Wastewater Treatment, Storage and Disposal

The following are descriptions of the alternatives to improve the existing CCWWTF unit processes. Descriptions of the rational used for the development of other unit process/facility improvements are described in this section.

5.2.1: Headworks

The headworks consist of a pumping station, mechanical screen and bypass flume. Both the pumping station and screen will require improvement to accommodate future flows as described below.

5.2.1.1: Influent Pumps

Replace the three (3) existing pumps with larger capacity units (e.g., 1,250 to 1,400 gpm) when PWWFs exceed 2.5 MGD to accommodate projected flows at Buildout.

5.2.1.2: Influent Screening

The existing mechanical screen is less than 10 years old and was placed into service around 2009 as part of the Phase 1 Expansion Project. The anticipated useful life expectancy of mechanical equipment similar to the screen is typically 20 to 30 years of service depending on serval factors such as the application, frequency and duration of operation, degree of maintenance and history and installation / construction methods. Replacement of the screen is recommended when the existing units approaches or exceeds its useful life expectancy which is anticipate to occur well into the future (around 2030 to 2040 timeline). Furthermore, it is recommended that a second screen be installed when PWWFs exceed the screen's capacity of 2.0 MGD. It is recommended that the type of screen be reviewed in the future given that screening technology will continue to evolve over time.

5.2.2: Long-Term Treatment, Storage and Disposal Alternatives

The following alternatives were considered and discussed with District staff then reviewed and evaluated further:

- Alternative 1 – Storage of Secondary Effluent in Pond 6. This alternative is based on continued treated effluent disposal via beneficial recycled water use. Alternative 1 is estimated to require approximately 490 acre-foot of storage and about 865 acre-ft per year of recycled water demand to accommodate the Buildout projections. In addition, review of historic groundwater data indicates the potential need to line Pond 6 along with installation of dissolved air flotation (DAF) for solids removal upstream of a new more modern recycled water facility (RWF). Estimated DAF and RWF capacity requirements to accommodate projected recycled water demands at Buildout are 2.0 MGD as compared to the estimated 1.05 MGD DAF and RWF capacity requirements needed to serve current SCGC irrigation demands. A process flow diagram of Alternative 1 is shown in Figure 10.

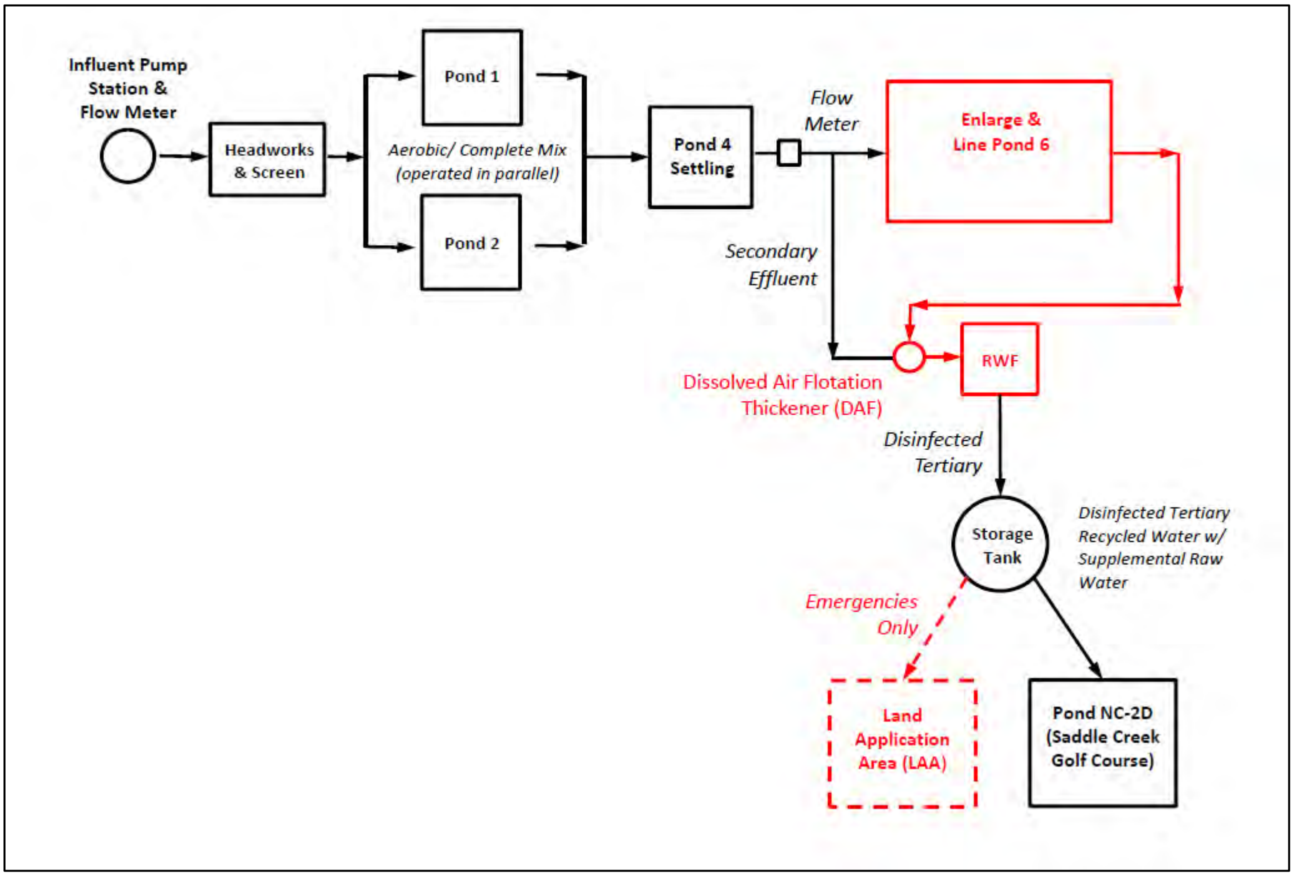

Figure 10. Alternative 1 Process Flow Diagram

- Alternative 2 – Storage of Disinfected Tertiary in Pond 6. This alternative is based on installing nitrification/denitrification improvements within Ponds 1, 2 and 4 and routing all secondary effluent through a new DAF and RWF prior to routing to Pond 6 for subsequent storage. From Pond 6, disinfected tertiary recycled water would be discharged for either beneficial recycled water use (i.e., golf course irrigation) and/or surface water discharge. DAF and RWF capacities associated with this alternative are similar to those described for Alternative 1. A process flow diagram of this alternative is shown in Figure 11.

CCWD met with the RWQCB on June 15, 2017. The potential to obtain a wet season surface water NPDES discharge permit similar to the Forest Meadows wastewater treatment facility was discussed at the meeting. RWQCB staff appeared to be open to this approach. Compared to the current NPDES permit, the primary benefit of the wet season discharge permit are the ammonia discharge requirements. The current CCWWTF discharge permit has a 30-day ammonia discharge concentration limit of 0.74 mg-N/L, which is based upon an effluent dominated stream (i.e., no dilution credit) as compared to the Forest Meadows NPDES permit which contains an ammonia discharge concentration limit of 13 mg-N/L, which is based on a higher level of dilution.

Several methods to achieve nitrification/denitrification improvements within Ponds 1, 2 and 4 were identified and discussed with CCWD staff. Such methods included AeroModTM, conversion to an extended aeration activated sludge process with external circular secondary clarifiers, submerged fixed film (SFF) media with recycle and aeration improvements (e.g., Invent) coupled with ballasted enhanced clarification (e., BioMag). For comparison purposes, the SFF technology was selected for the development of Alternative 2 and will serve as the basis for costs. A primary advantage this technology has over the other technologies is the ability to phase SFF media installation over time to accommodate development and measured effluent ammonia concentrations. It is assumed that selection of the preferred implement nitrification / denitrification technology for Ponds 1, 2 and 4 improvements would be made during preliminary design stage. A technical memorandum describing the SFF technology has been prepared and is attached in the Appendix.

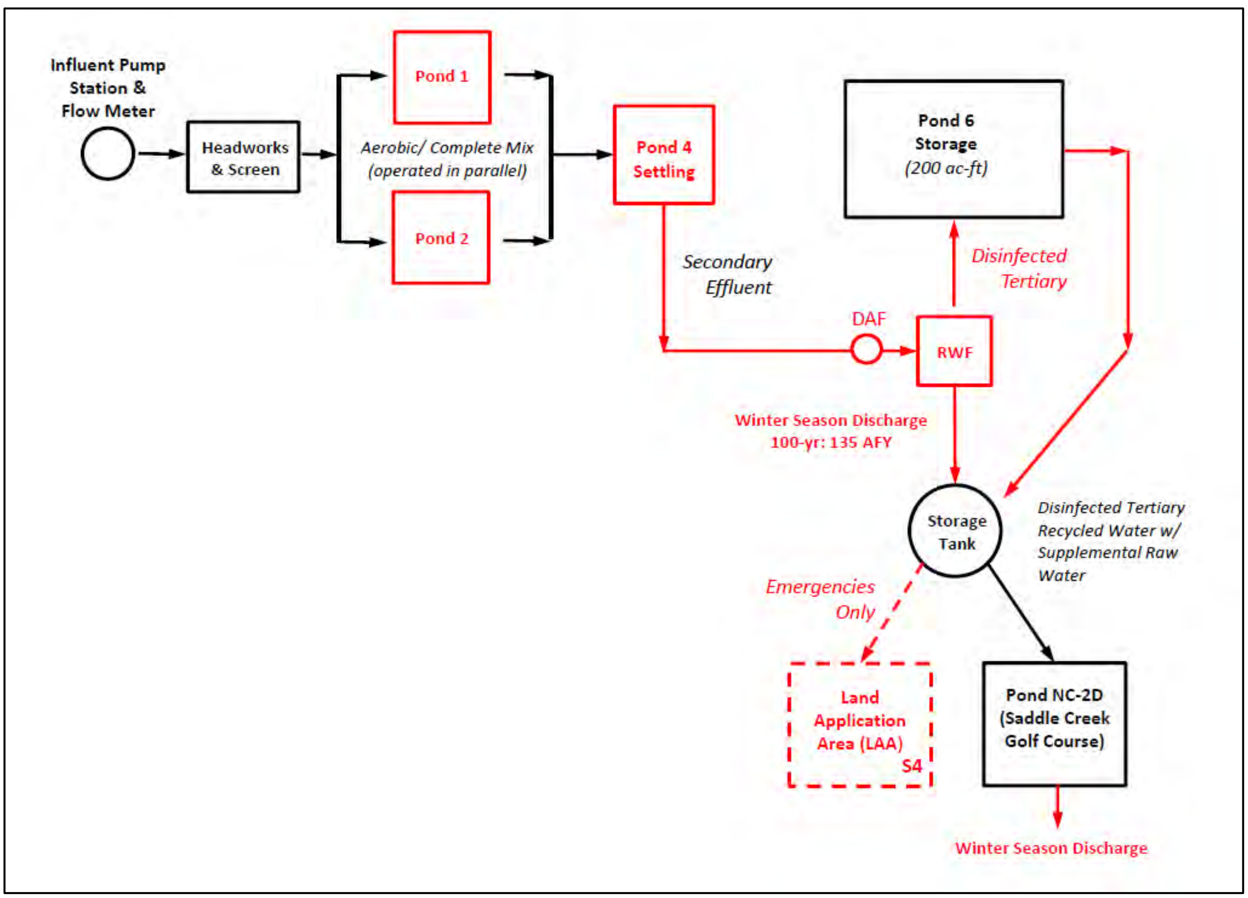

Figure 11. Alternative 2 Process Flow Diagram

Table 15 presents a summary of comparative costs for Alternatives 1 and 2. As shown, Alternative 2 is anticipated to have a lower cost than the other alternative. Calculations, meeting agenda and minutes associated with these efforts can be found in the Appendix.

Table 15. Budgetary Construction Costs to Serve Buildout

Component and Improvements		Alternative 1 Construction Cost ($ Millions)	Alternative 2 Construction Cost ($ Millions)
Wastewater Treatment Facility			
	Pond 1, 2 and 4 Nitrification / Denitrification Improvements	Not applicable	5.5
Recycled Water Facility			
	Dissolved Air Flotation (Solids Removal)	2.3	2.3
	Recycled Water Facility	2.5	2.5
Seasonal Storage			
	Pond 6 Expansion	6.0	Not applicable
	Line Pond 6	5.5	Not applicable
Treated Effluent Disposal/Reuse			
	Beneficial Reuse	Assumes future demand increased to 865 AFY	Could be limited to SCGC or increased if available
	Surface Water Discharge	Not applicable	Limited to Wet Season
Total Estimated Construction Cost ($ Millions)		**$16.3**	**$10.3**

Table 16 presents a comparison of Alternatives 1 and 2. The following are descriptions of the comparison criteria and rational for assigning the scores.

- **Construction Cost**: See Table 15
- **Operation and Maintenance Cost**: Alternative 1 assumes continued operation and expansion of the mechanical surface aerators to provide sufficient aeration and mixing. Surface aerators are considered inefficient when compared to the Alternative 2 aeration technologies and cannot mix without adding dissolved oxygen (not-ideal for denitrification). Based on this assessment Alternative 1 operation and maintenance costs are considered to be higher than Alternative 2.
- **Total Cost of Ownership (Net Present Worth)**: Alternative 1 capital and O&M costs are considered to be lower than Alternative 2, therefore Alternative 2 is considered to have a lower total cost of ownership compared to Alternative 1.

Table 16. Comparison of Alternatives

Comparison Criteria		Alternative 1	Alternative 2
Cost			
	Capital	-	+
	Operation and Maintenance	0	+
	Total Cost of Ownership (NPW)	-	+
Regulatory Compliance		-	+
Environmental Permitting		+	0
DSOD Permitting		-	0
	Relative Score	-3	+4

- **Regulatory Compliance**: Total coliform groundwater and ammonia surface water discharge concentration requirements are considered to be key regulations. Alternative 1 addresses the potential for coliform groundwater impacts via the installation of a liner (e.g., hypalon) which could tear or rupture over time. Alternative 2 mitigates both of the key regulations via treatment and conveyance improvements which are anticipated to improve the quality of effluent stored in Pond 6, conveyed to the SCGC or discharged.
- **Environmental Permitting**: Alternative 1 would result in the expansion of Pond 6 which could be considered to be an improvement to the local environmental and wildlife.
- **Department of Safety of Dams (DSOD) Permitting**: CCWD has already obtained a permit from the DSOD for the expansion of Pond 6. However, construction would have to begin before July 2018, otherwise CCWD will have to reapply for the DSOD permit.

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References

Calaveras County Water District. 2016a (September). La Contenta Wastewater System Master Plan Kick-off Meeting Minutes. Prepared by Kennedy/Jenks Consultants. Rancho Cordova, CA.

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Calaveras County. 2015 (November). Calaveras County General Plan Land Use Element. Planning Commission Recommendation. <http://planning.calaverasgov.us/GeneralPlanUpdate.aspx> Accessed February 13, 2016.

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Appendix

22 September 2017

Memorandum

To: Kevin Kennedy

From: Eun Kim and Ryan Holloway

Subject: Copper Cove WWTP Treatment Capacity Evaluation
K/J 1670021*00

Executive Summary

Preliminary modeling, design, and cost estimates were developed for Copper Cove WWTP to identify a potential cost-effective method to meet existing effluent discharge requirements from Pond 4 under Buildout maximum month conditions. Proposed improvements considered for meeting current discharge requirements was to install submerged fixed film (SFF) reactors in Pond 4 for nitrification and in Ponds No. 1 and No. 2 for denitrification. A schematic drawing of the improvements is shown in Figure 1 and the proposed layout is shown in Figure 10. The estimated cost to purchase and install the SFF reactors including the associated piping and equipment, contractor overhead, profit and fees, contingency, and other associated costs at the Buildout condition is $6,770,000.

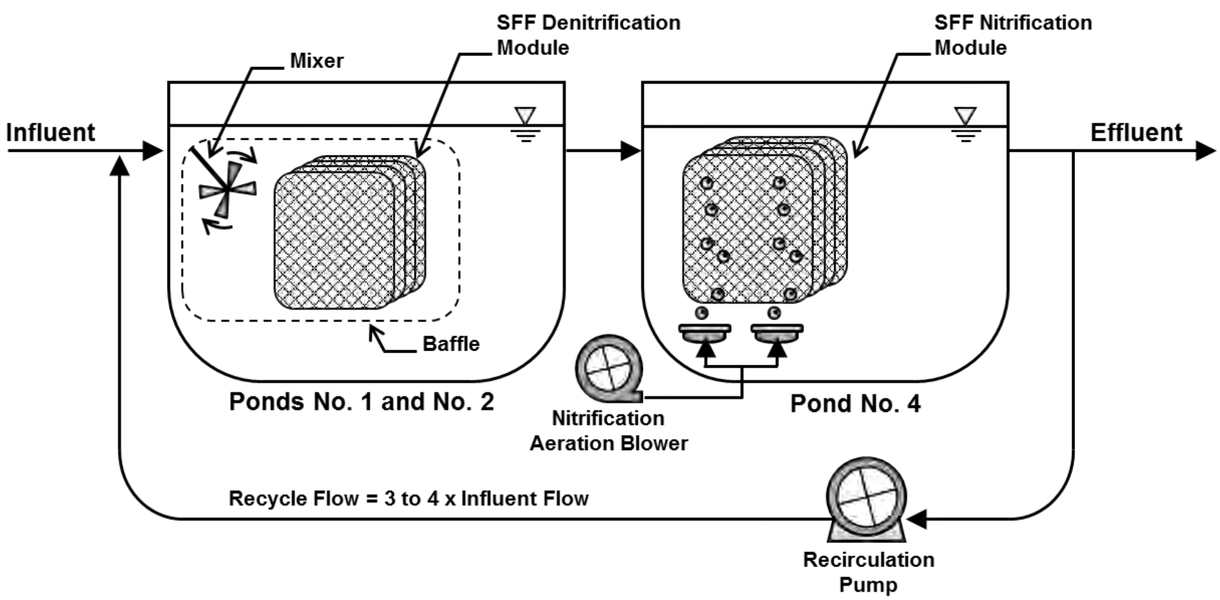


Figure 1. Schematic illustration of proposed SFF modules installed in Ponds 1 and 2 for denitrification and in Pond 4 for nitrification

Introduction

The Copper Cove Wastewater Treatment Plant (CCWWTP) consists of headworks, secondary wastewater treatment and storage facilities, tertiary treatment and recycled water conveyance facilities. The secondary process includes two aerated ponds (Ponds 1 and 2) operated in parallel, followed by a partially aerated pond (Pond 4). Secondary effluent from Pond 4 is stored in Pond 6 prior to tertiary treatment, which includes coagulation-flocculation, clarification, two-stage filtration and UV disinfection.

The purpose of this evaluation is to determine if there is sufficient treatment capacity in Ponds 1, 2, and 4 to meet the current effluent discharge requirements (summarized in Table 1) and store disinfected tertiary recycled water in Pond 6. This technical memorandum contains a preliminary treatment capacity evaluation for organic removal and solids production, a review of historical plant monitoring data, treatment evaluation for nitrogen removal, and potential improvements needed to increase capacity.

Table 1 – Copper Cove Wastewater Treatment Plant 30-day Permit Requirements

Waste Discharge Requirements	
Biological Oxygen Demand (BOD_5), mg/L	30
Total Nitrogen (TN), mg/L-N	10
NPDES Discharge Permit Requirements	
Biological Oxygen Demand (BOD_5), mg/L	10
Ammonium (NH_4), mg/L-N	0.74
Nitrite (NO_2) + Nitrate (NO_3), mg/L-N	10

Preliminary Model for BOD_5 Removal

The preliminary modeling effort focused on soluble biological oxygen demand (sBOD) and total suspended solids (TSS) removal through the pond system. The minimum required power for aeration and mixing for Ponds 1 and 2 and minimizing solids deposition in Pond 4 were also modeled. Nitrogen removal was not considered in this preliminary modeling effort but is included in the revised model provided later in this technical memorandum.

The Copper Cove WWTP's aerated (Ponds 1 and 2) and facultative (Pond 4) ponds were modeled using established empirical equations. Ponds 1 and 2 were modeled as fully-aerated and fully-mixed lagoons to estimate sBOD removal, mixed liquor suspended solids (MLSS) concentration, and minimum power required for aeration and mixing. Volatile solids (VS) removal was also estimated for Ponds 1 and 2; however, solids removal by settling was not considered for Ponds 1 and 2 because the ponds were assumed to be fully mixed. Pond 4 was modeled as a partially-aerated and partially-mixed facultative pond to estimate sBOD removal, MLSS concentration, minimum power required for mixing, and total suspended solids (TSS) removal. The pond system was modeled at the maximum monthly flow (MMF) described in Waste Discharge Requirements as well as projected future flows for Phase 1 and Buildout. The results from the preliminary model are shown in Figure 2.

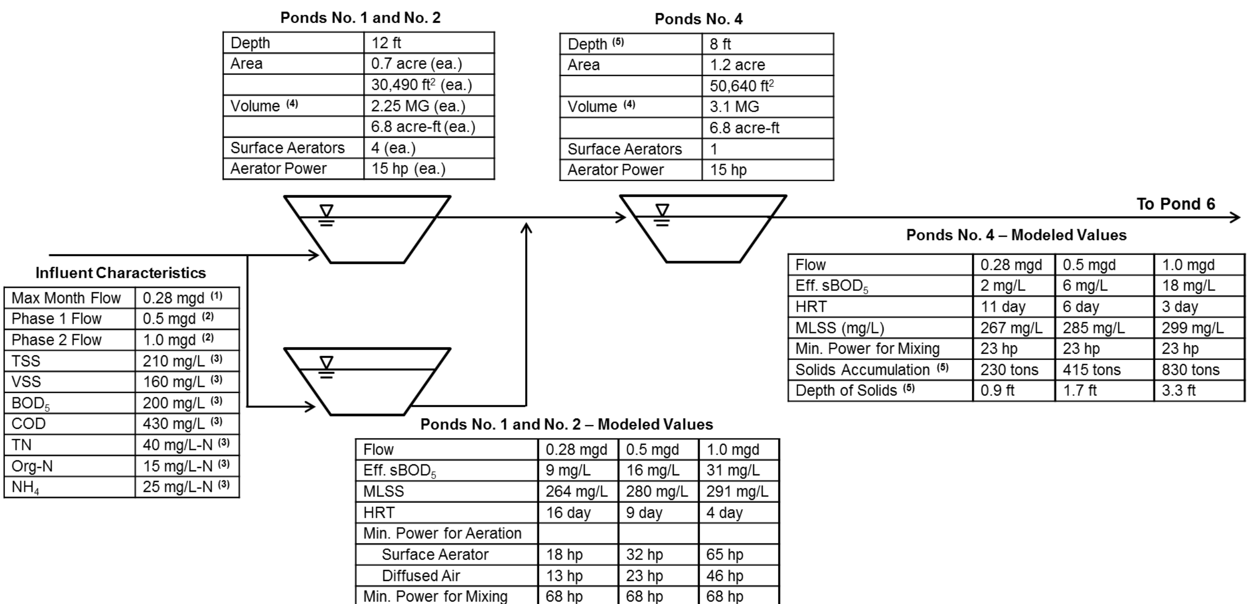
Summary of Preliminary Results – Ponds 1 and 2

The results from the preliminary modeling for Ponds 1 and 2 indicate there may be additional capacity to accommodate a flow of about 1 mgd. This is evident from the calculated hydraulic retention time (HRT), effluent sBOD, and minimum power required for aeration at the MMF and projected Phase 1 flow. The HRT at the MMF (16 days) and Phase 1 flow (9 days) is longer than the recommended HRT used for fully-mixed aerobic ponds of 3 to 6 days. The effluent sBOD concentration from Ponds 1 and 2 is anticipated to be well below 30 mg/L for both the MMF and Phase 1 scenarios. The minimum required power for aeration at the MMF (18 hp) and Phase 1 (32 hp) flow conditions are significantly less than the power provided by (60 hp) the surface aerators currently installed in the ponds.

Summary of Preliminary Results – Ponds 4

The results from the preliminary modeling for Ponds 4 indicate there may be additional capacity to meet recommended minimum HRT and required effluent sBOD concentration requirements up to a flow of 1 mgd. However, solids accumulation in Pond 4 will have to be managed more frequently at higher influent flows to maintain Pond 4 treatment capacity. Estimated HRTs at the MMF (11 days), Phase 1 (6 days), and Buildout (4 days) scenarios are all within the recommended HRT used for facultative ponds, typically 4-10 days. The effluent sBOD concentration is below 30 mg/L for the ponds at the modeled MMF, Phase 1, and Buildout scenarios. The estimated buildup of solids in Pond 4 is minimal at the MMF (0.9 ft) but exceeds 40 percent of the total pond depth for the Buildout scenario.

Memorandum



Ponds No. 1 and No. 2

Depth	12 ft
Area	0.7 acre (ea.)
	30,490 ft^2 (ea.)
Volume (4)	2.25 MG (ea.)
	6.8 acre-ft (ea.)
Surface Aerators	4 (ea.)
Aerator Power	15 hp (ea.)

Ponds No. 4

Depth (5)	8 ft
Area	1.2 acre
	50,640 ft^2
Volume (4)	3.1 MG
	6.8 acre-ft
Surface Aerators	1
Aerator Power	15 hp

Influent Characteristics

Max Month Flow	0.28 mgd (1)
Phase 1 Flow	0.5 mgd (2)
Phase 2 Flow	1.0 mgd (2)
TSS	210 mg/L (3)
VSS	160 mg/L (3)
BOD_5	200 mg/L (3)
COD	430 mg/L (3)
TN	40 mg/L-N (3)
Org-N	15 mg/L-N (3)
NH_4	25 mg/L-N (3)

Ponds No. 4 – Modeled Values

Flow	0.28 mgd	0.5 mgd	1.0 mgd
Eff. $sBOD_5$	2 mg/L	6 mg/L	18 mg/L
HRT	11 day	6 day	3 day
MLSS (mg/L)	267 mg/L	285 mg/L	299 mg/L
Min. Power for Mixing	23 hp	23 hp	23 hp
Solids Accumulation (5)	230 tons	415 tons	830 tons
Depth of Solids (5)	0.9 ft	1.7 ft	3.3 ft

Ponds No. 1 and No. 2 – Modeled Values

Flow	0.28 mgd	0.5 mgd	1.0 mgd
Eff. $sBOD_5$	9 mg/L	16 mg/L	31 mg/L
MLSS	264 mg/L	280 mg/L	291 mg/L
HRT	16 day	9 day	4 day
Min. Power for Aeration			
Surface Aerator	18 hp	32 hp	65 hp
Diffused Air	13 hp	23 hp	46 hp
Min. Power for Mixing	68 hp	68 hp	68 hp

Notes:

(1) Max Month Flow adapted from Copper Cove WWTP WDR.
(2) Phase 1 and Phase 2 flows adapted from Copper Cove WWTP's Phase 1 Expansion Drawings.
(3) Influent concentrations adapted from Wastewater Engineering Treatment and Reuse (Metcalf and Eddy, 2003).
(4) Pond volume adapted Copper Cove WWTP's Phase 1 Expansion Drawings.
(5) Pond depth estimated from hydraulic profile in Copper Cove WWTP's Phase 1 Expansion Drawings.
(6) Solids accumulation and depth calculated over a four-year period.

Figure 2. Copper Cove WWTP preliminary modeling input and results.

Historical Plant Monitoring Data Review

There is inherent uncertainty in modeling pond/lagoon treatment systems due to non-ideal operation conditions such as reduced HRT due to short circuiting, solids accumulation in poorly mixed areas, seasonal autotrophic biological activities; therefore, it is important to calibrate the model using historical plant monitoring data. Prior to assessing nitrogen removal through the existing secondary treatment system, the historical plant monitoring data from January 2012 through June 2017 were reviewed to revise some of the modeling assumptions used in the preliminary evaluation. Historic monitoring data used to calibrate the preliminary model are presented on Figures 3 through 8.

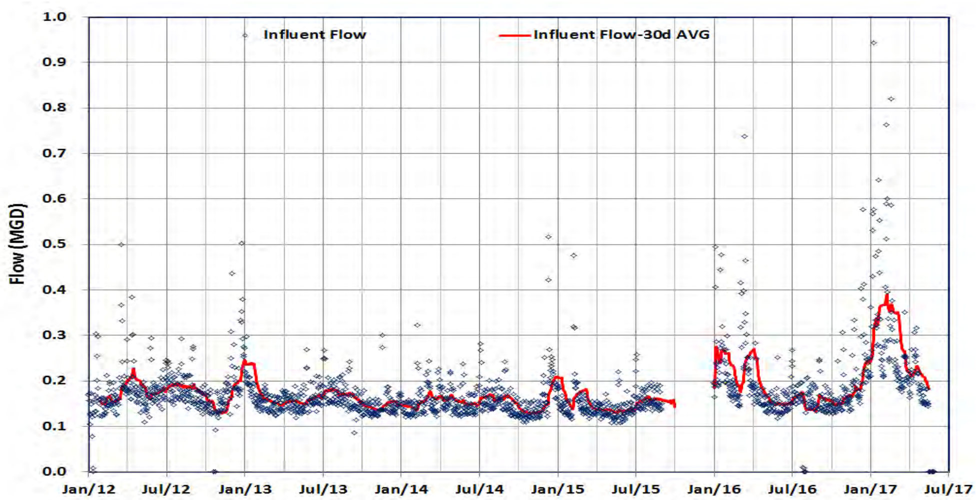


Figure 3. Influent wastewater flow from 2012 to 2017.

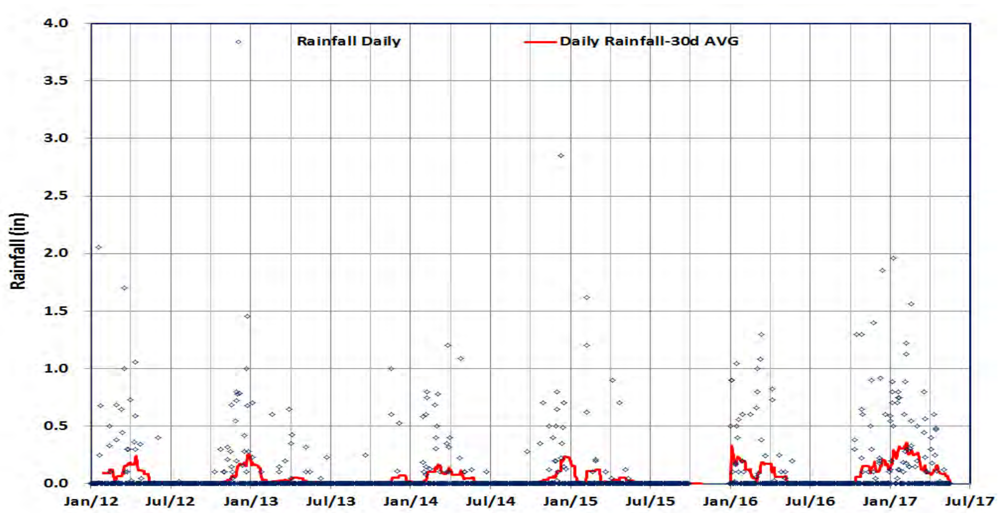


Figure 4. Daily rainfall from 2012 to 2017.

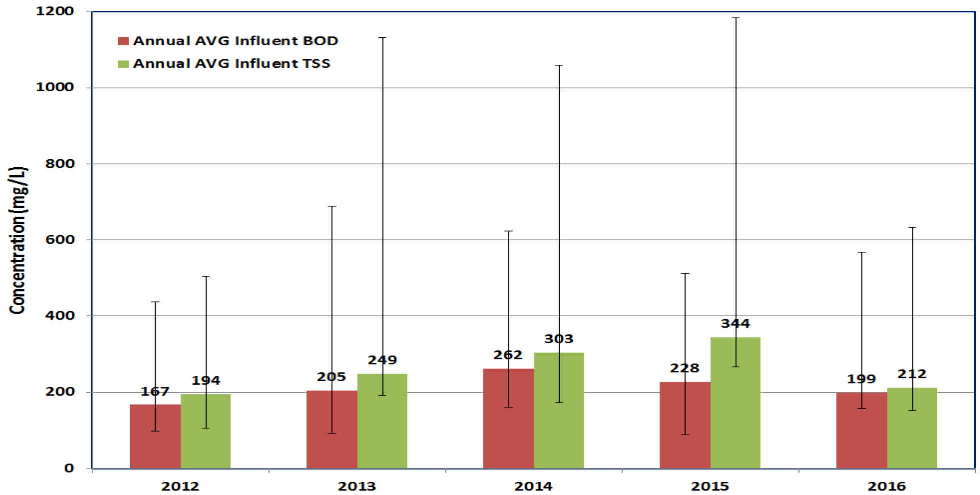


Figure 5. 2012 through 2016 annual average influent BOD_5 and TSS concentrations. Average values are indicated in the figure, bars are provided to show maximum and minimum mesured concentrations.

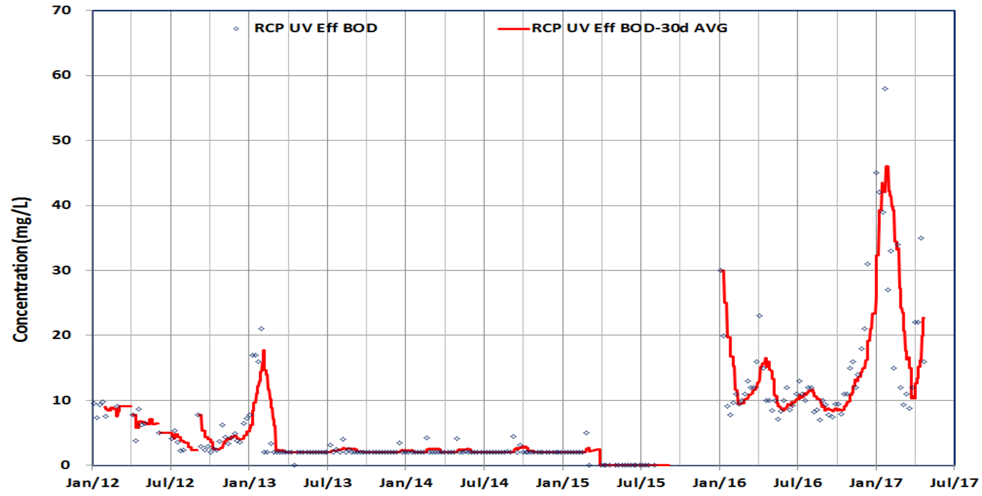


Figure 6. 2012 through 2017 BOD_5 concentrations.

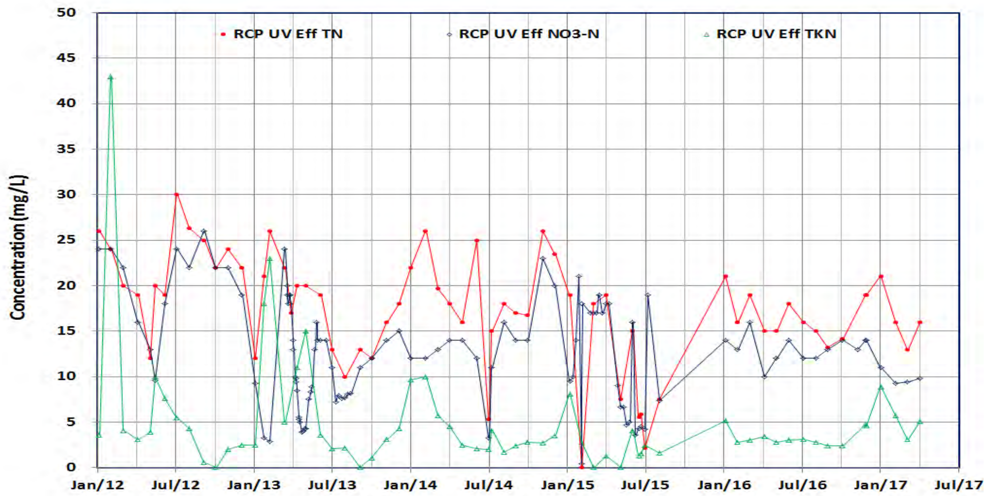


Figure 7. 2012 through 2017 effluent TN, TKN, and NO3-N concentrations.

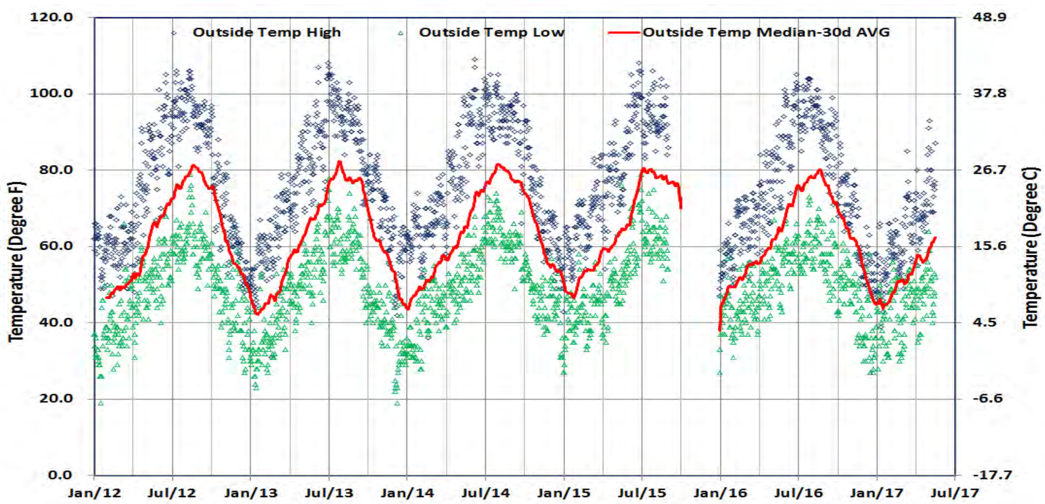


Figure 8. 2012 through 2017 outside high, low, and calculated median temperatures.

Influent wastewater flows to the CCWWTP (Figure 3) were about 0.18 MGD during the dry seasons but increased substantially during the wet seasons. The maximum monthly average influent flow increased to 0.4 mgd in 2017 due to significant and continuous rainfall starting in January 2017 (see Figure 4). Influent BOD_5 and TSS concentrations were measured only once a month starting in July 2013 which makes it impossible to assess changes in monthly trends. However, annual average influent BOD_5 and TSS concentrations appeared to increase between

2012 and 2015 (see Figure 5). The reason the influent concentration increased during these years is not known, but may be associated with a decrease in influent flow and an increase in wastewater strength because of prolonged drought conditions and water conservation measures.

Effluent BOD_5 concentrations from the recycled water facility were consistently below 30 mg/L before spiking to almost 40 mg/L at the beginning of 2017 (see Figure 6). The increase in the effluent BOD_5 concentration in 2017 may be due to increased influent flows washing settled organic solids out of the pond system. This reasoning is supported by the consistent effluent TN, NH_4, and NO_3 concentrations measured from January 2012 through February 2017 (see Figure 7). If the higher BOD_5 concentrations measured in 2017 were associated with reduced performance or insufficient treatment capacity, an increase in effluent TN would also be expected.

Although the effluent TN concentrations have been consistent over time, the recycled water facility effluent TN concentrations regularly exceeded the monthly average discharge limit of 10 mg/L (see Figure 8). Based on the NO_3-N concentrations, Pond 1, 2 and 4 treatment capacity was sufficient to provide full nitrification during the dry seasons. Around January in each year, the recycled water plant effluent TKN concentrations increased but the effluent NO_3-N concentrations decreased, which is indicative of nitrification inhibition. Low ambient (see Figure 8) and wastewater temperatures in January would have been the likely cause for the reduced nitrification as opposed to increased HRT through the ponds.

Revised Model for BOD_5 and Nitrogen Removal

Conditions observed on 1/28/2017, 1/13/2016, 2/6/2013, and 7/15/2013 were incorporated into the preliminary model, then the revised model results were compared to the historic 1/28/2017, 1/13/2016, 2/6/2013, and 7/15/2013 monitoring data. The ambient temperature was revised based on the median outside temperature calculated from the outside high and low temperatures.

As shown in Table 2, there are large differences between the estimated Pond 4 effluent BOD_5 concentrations and the measured recycled water facility effluent BOD_5 concentrations. The model assumes ideal conditions for mixing and HRT through the ponds without any dead space or space occupied by deposited solid; both of which could be factors that account for the difference between the model results and historic monitoring data. Also, the limited number of data available to estimate the influent BOD_5 concentration and calculate the recycled water facility effluent BOD_5 concentrations could be another reason for the difference.

As discussed earlier, the current process does not consistently meet the recycled water facility effluent TN discharge requirement. The increased TKN and nitrification inhibition around

January 2017 and the high nitrate concentrations observed during the dry seasons have been the primary reasons for the higher than expected effluent TN concentrations.

Table 2 – Model estimates and historic monitoring data comparison

Historic Monitoring Data					
Parameter	Unit	1/28/2017	1/13/2016	2/6/2013	7/15/2013
Influent Flow	mgd	0.37	0.25	0.18	0.18
Influent BOD_5	mg/L	199	228	208	243
Ambient Temperature	°C	7.0	8.0	7.0	25.0
Model Results					
Parameter	Unit	1/28/2017	1/13/2016	2/6/2013	7/15/2013
Pond 1 & 2 Eff BOD_5	mg/L	24	19	14	5
Preliminary Model Pond 4 Effluent BOD_5	mg/L	13	9	6	1
Measured RWF[(a)] Eff BOD_5	mg/L	46	30	18	<2.2
Revised Model[(b)] Pond 4 Effluent BOD_5	mg/L	32	24	16	2

Notes:
(a) Recycled Water Facility (RWF)
(b) Reaction rates and pond capacities are de-rated to reduce the differences in Pond 4 effluent BOD5 concentrations derived from the historic monitoring data and model results.

The lowest historical monthly ambient median temperature was 6 °C, which corresponded to a calculated Pond 1 and 2 water temperature and Pond 4 water temperature of 10 and 7 °C, respectively. The theoretical minimum solids retention time (SRT) needed to provide full nitrification at 10 and 7 °C under ideal conditions, would be 9 and 13 days, respectively. For pond systems, the HRT is equal to the SRT without recirculation of suspended solids to the ponds. The HRT through Pond 1 and 2, and Pond 4 are estimated to be 9 and 6 days at 0.5 mgd, respectively assuming the full pond volume and no short-circuiting or solids accumulation. Although the HRT is theoretically long enough to support nitrification, the actual HRT is likely shorter than the modeled or theoretical HRT due to short circuiting and solids accumulation resulting in complete inhibition of nitrification at influent flows exceeding 0.5 mgd.

Treatment Capacity Improvements

To meet the TN discharge requirement of 10 mg/L year-round, additional nitrification and denitrification capacity will be necessary. There are many ways to provide this additional capacity including the addition of submerged fixed film (SFF) modules to the ponds, which is one of the simpler alternatives specific to pond systems and can be done incrementally (e.g., in phases). Another method is to convert Ponds 1 and 2 to an extended aeration activated sludge process (similar to the La Contenta Wastewater Treatment Plant) and add external circular secondary clarifiers. For the purposes of this technical memorandum as well as the master plan, the SFF alternative was assumed.

As shown in Figure 9, SFF media modules consist of polyester web media attached to a stainless-steel frame. The web is woven through the stainless-steel frame to create uniform spacing to allow proper and uniform flow through the SFF modules and aeration of the media. A stainless-steel bottom plate supports the media modules that sit on the bottom of the ponds. The sides of the media are enclosed by a fabric shroud, which helps direct air towards the media. The modules are delivered completely pre-assembled, requiring only connection of the air supply hoses and physical placement in the ponds. Placement of the modules doesn't require specialized equipment. They are typically unloaded using a forklift and a boom truck or a crane are used to position the units into the ponds.

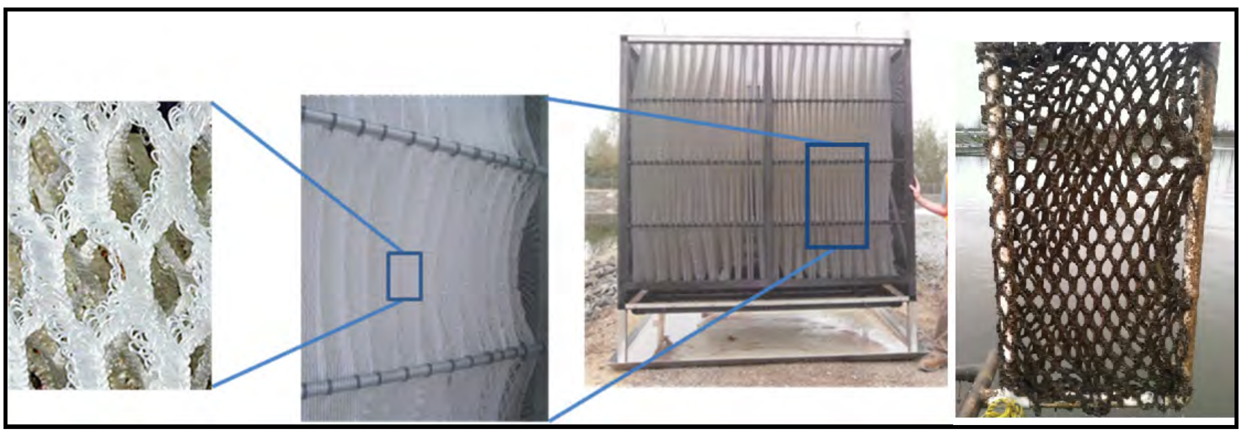


Figure 9. Typical SFF media module.

Organic material (BOD_5), ammonia-N, and nutrients (nitrogen and phosphorus) are removed as wastewater flows past the biofilm. Microorganisms use substances in the wastewater to grow and reproduce. The attached growth system allows for a relatively high number of microorganisms to be maintained within the process rather than being washed out with the effluent during high flows or settling in the ponds. Excess biological solids that accumulate on the media are removed via air scouring and settle in partially mixed lagoons.

SFF modules could be added to Pond 4 to provide additional capacity for BOD_5 removal and to fully nitrify any remaining ammonia-nitrogen. To meet the total nitrogen requirements, nitrified effluent from Pond 4 must be recirculated back to Pond 1 and 2 where modules combined with floating baffles (or concrete walls) would be located within anoxic zones to support denitrification.

The design conditions assumed for this improvement along with anticipated Pond 4 effluent concentrations and a budgetary quote for the major equipment are provided in Table 3. The proposed layout of the new nitrification and denitrification SFF modules is shown in Figure 10.

Estimated costs are based on the current NPDES requirements, which are based on an effluent dominated stream (i.e., no dilution). Such conditions (e.g., no dilution) did not coincide with the District's discharge during the 2017 winter season. Costs are anticipated to decrease significantly if a seasonal discharge, similar to the Forest Meadows WWTP, were to be obtained. Such a permit is anticipated to be less stringent and include higher total nitrogen, ammonia and nitrate requirements.

Table 3 – SFF Media System Preliminary Design Parameters and Estimated System Costs

Nitrification and Denitrification Modeling Inputs and Results

Parameter	Unit	Buildout	Modeled Effluent Conc.	Requirements
Influent Max Month Flow	mgd	0.68	-	-
Influent BOD_5	lbs/day	671	-	-
Influent TKN	lbs/day	278	-	-
Pond No. 4 Effluent BOD_5	mg/L	-	< 3[a]	< 10
Pond No. 4 Effluent NH_3-N	mg/L	-	< 0.5	< 0.74
Pond No. 4 Effluent NO_3	mg/L	-	< 5[b]	< 10

Nitrification and Denitrification Improvement Costs

Parameter	Material Cost (Total), $	Installation Cost, $	Total Cost, $
New Pump Station			
Pump Station	56,250	56,250	112,500
Submersible Propeller Pump, 10 hp	20,000	4,000	24,000
12" Recirculation Pipe (Sch. 80 PVC)	21,300	22,365	43,665
12" Gate Valves (2)	13,250	500	13,750
12" Flow Meter	8,000	4,500	12,500
Meter Valve Box	3,000	2,000	5,000
Distribution Box Connection	500	1,000	1,500
Above Ground Electrical Work[c]	-	-	276,941
Nitrification System			
Nitrification SFF Modules (36)	1,381,976	207,296	1,589,273

Nitrification Blower	160,000	16,000	176,000
10" Air Supply Pipe (Type 304 SS)	37,244	12,593	49,837
Nitrification Blower Building	90,000	90,000	180,000
Demo Existing Aerators	-	3,000	5,400
Denitrification System			
Denitrification SFF Modules	388,500	38,850	427,350
Denitrification Mixers	70,000	10,500	80,500
Denitrification Air Scour Compressor	8,500	4,000	12,500
Control Panel	20,000	4,000	24,000
1.5" Air Scour Piping (Type 305 SS)	8,800	2,838	11,638
Equipment and Installation Subtotal			3,046,354
Estimated Markup (78%)			2,376,156
Construction Subtotal			5,416,520
Additional Costs			
Item		Percent	Item Cost, $
Design Engineering		10%	541,652
Legal/Administration		5%	270,826
Construction Management		10%	541,652
Total System Cost			**6,770,000[(d)]**

Notes:

(a) Pond 4 effluent target for soluble BOD_5. The effluent target for total BOD_5 is 10 mg/L and SFF shall remove most soluble BOD_5 to minimize the effluent total BOD_5 to account for a potential increase of particulate BOD_5 in the occurrence of settled solids re-suspension during wet weather.

(b) Pond 4 effluent target for soluble total nitrogen. The effluent target for total nitrogen is 10 mg/L and SFF shall guarantee removal of soluble total nitrogen.

(c) Estimate based on lump sum.

(d) Estimated markup includes site overhead (10%), design contingency (30%), escalation to midpoint of construction (6%), bonds and insurance (2%), and contractor's fees (15%).

(e) Estimate accuracy -30% ($4,739,000) to + 50% ($10,155,000).

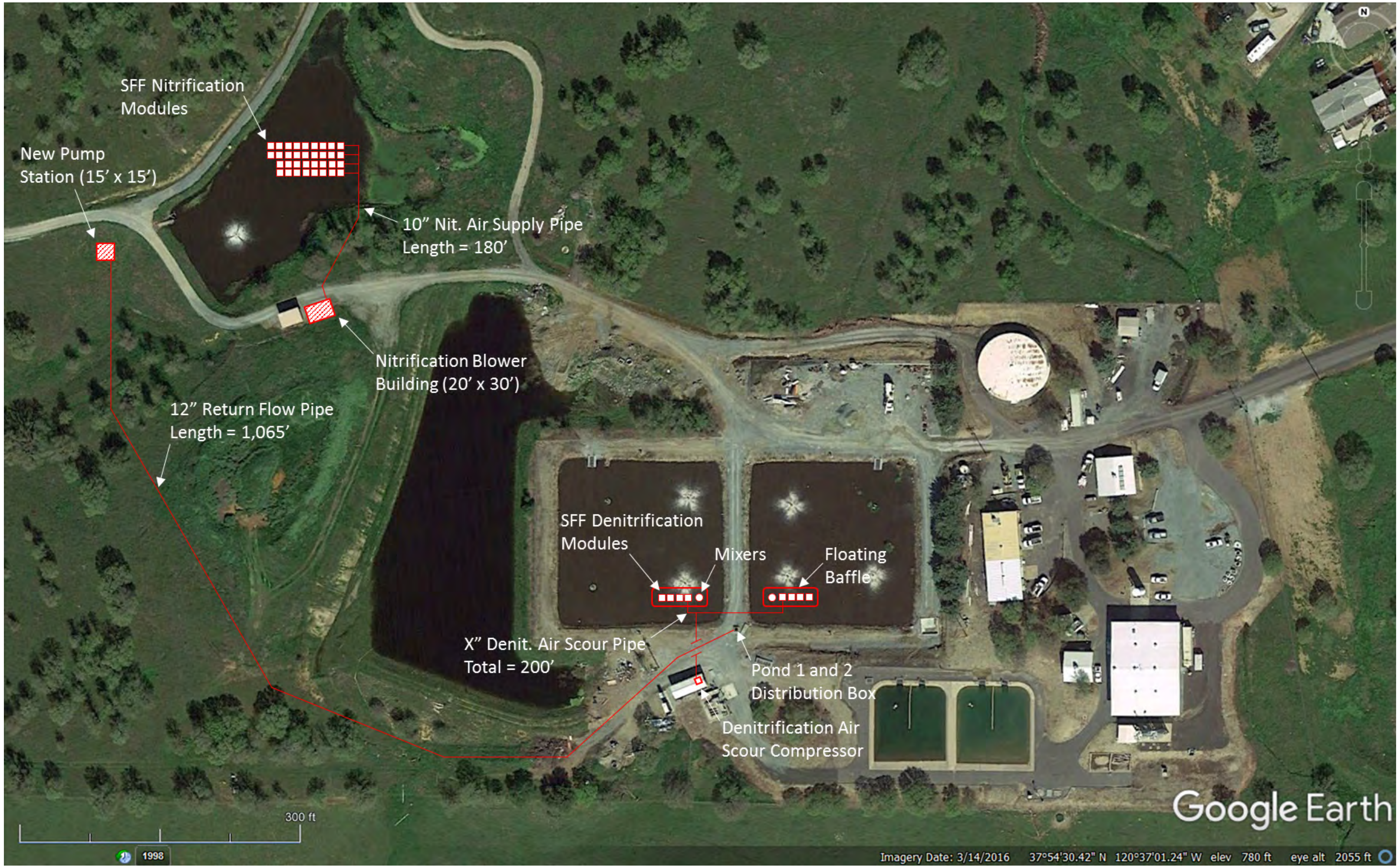


Figure 10. Preliminary layout for Capacity Improvement with SFF Modules

Kevin Kennedy

From: Ryan Holloway
Sent: Tuesday, September 12, 2017 11:37 AM
To: Kevin Kennedy
Cc: Eun Kim
Subject: FW: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System
Attachments: Entex Technologies -Copper Cove, CA (BOD-NH3) SFF P7132R5 09-11-2017.pdf

Hi Kevin,

Attached is the revised cost estimate for a submerged fixed film system designed at Buildout 1 (0.68 mgd) for a Pond 4 effluent BOD and NH3 concentrations of < 3 mg/L (filtered) and < 13 mg/L (filtered), respectively. The new cost including markups, design engineering, legal, and construction management is $4,085,000. The revised cost table is provided below.

Eun had a few drawbacks to this design she shared with the manufacturer and myself. There is a potential for nitrite accumulation if insufficient air to oxidize ammonia all of the way to nitrite. Nitrite accumulation is harmful to the bacteria and can result in increased effluent ammonia concentrations. Wayne from Entex Technologies did not think this would be a problem up to a flow of approximately 1 MGD. There also may be a need for alkalinity addition because we will no longer be recovery any alkalinity through denitrification. Alkalinity dosing equipment and chemical cost are not included in the cost estimate

Please let me know if you have any additional questions,
Ryan

Nitrification and Denitrification Improvement Costs

Parameter	Material Cost (Total), $	Installation Cost, $	Total Cost, $
New Pump Station			
~~Pump Station~~	~~56,250~~	~~56,250~~	~~112,500~~
~~Submersible Propeller Pump, 10 hp~~	~~20,000~~	~~4,000~~	~~24,000~~
~~12" Recirculation Pipe (Sch. 80 PVC)~~	~~21,300~~	~~22,365~~	~~43,665~~
~~12" Gate Valves (2)~~	~~13,250~~	~~500~~	~~13,750~~

~~12" Flow Meter~~	~~8,000~~	~~4,500~~	~~12,500~~
~~Meter Valve Box~~	~~3,000~~	~~2,000~~	~~5,000~~
~~Distribution Box Connection~~	~~500~~	~~1,000~~	~~1,500~~
Above Ground Electrical Work[c]	-	-	276,941
Nitrification System			
Nitrification SFF Modules (26)	998,094	149,714	1,147,800
Nitrification Blower	160,000	16,000	176,000
10" Air Supply Pipe (Type 304 SS)	37,244	12,593	49,837
Nitrification Blower Building	90,000	90,000	180,000
Demo Existing Aerators	-	3,000	5,400
~~**Denitrification System**~~			
~~Denitrification SFF Modules~~	~~388,500~~	~~38,850~~	~~427,350~~
~~Denitrification Mixers~~	~~70,000~~	~~10,500~~	~~80,500~~
~~Denitrification Air Scour Compressor~~	~~8,500~~	~~4,000~~	~~12,500~~
~~Control Panel~~	~~20,000~~	~~4,000~~	~~24,000~~
~~1.5" Air Scour Piping (Type 305 SS)~~	~~8,800~~	~~2,838~~	~~11,638~~
Equipment and Installation Subtotal			1,836,000
Estimated Markup (78%)			1,432,000
Construction Subtotal			3,268,000

Additional Costs

Item		Percent	Item Cost, $
Design Engineering		10%	326,800
Legal/Administration		5%	163,404
Construction Management		10%	326,800
Total System Cost			**4,085,000**

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Monday, September 11, 2017 12:28 PM
To: Ryan Holloway <RyanHolloway@kennedyjenks.com>; Eun Kim <EunWKim@KennedyJenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Ryan –

Please review the enclosed. Thanks for considering Webitat.

Wayne Flournoy
President
Entex Technologies Inc.
919-619-8862 phone
919-287-2258 fax
Wayne.Flournoy@EntexInc.com
www.EntexInc.com

From: Ryan Holloway [mailto:RyanHolloway@kennedyjenks.com]
Sent: Friday, September 8, 2017 7:12 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>; Eun Kim <EunWKim@KennedyJenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Wayne,

I have been working on the Copper Cove aerated lagoon project with Eun. We recently received a request for the cost of the fixed film system at Buildout 1 (0.68 mgd) and a required average monthly effluent NH4 concentration of 13 mg/L from Pond No. 4. We were asked to assume there is no effluent NO2+NO3 or Total Nitrogen requirement.

Thanks for all of the help you have given us on this project.
Please let me know if you have any questions.
Ryan

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Thursday, August 17, 2017 10:34 AM
To: Eun Kim <EunWKim@KennedyJenks.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Eun –

- Please provide itemized cost for each component included in the budgetary quotes provided for Buildout 1 at 0.68 MGD (breakdown costs for the blowers, control panel, and submersible mixers) We estimated: Mixers = $70k, PLC = $20k, Blowers = $160k (note that we did not account for the concept of a local blower as identified in your bullet below).
- How much of airflow is needed to provide the scour air needed for the 8 denitrification modules? I guess that it could be scheduled per the pond and scour 4 modules at a time. Running the airline from the blowers near the Pond 4 to Pond 1 and 2 may cost too much. If you are okay, we would like to have a separate blower (or air compressor) for the denitrification modules. If you agree, could you provide the approximate cost for the air compressor needed for the 4 modules? A local blower for the denite units would be fine. 75 scfm is all that is needed to scour 1 unit at a time. A local controller may be needed to open and close solenoid valves. Even with scouring one unit at a time, the blower would not run most of the time. Typically scouring for 10-15 minutes per unit would be sufficient. The scour cycle should be variable between once a day up to once a week.
- Could you provide the blower cut sheet for the proposed 1195 scfm blower (probably 10 psig will be good enough)? If not, I can check with Aerzen for the selection. We don't do equipment selection normally until submittals are underway. I think Aerzen can give you a good selection.
- For the recirculation pump for denitrification, I think that 4Q may provide some safety factor for the desired nitrate limit of 10 mg/L at the end and sending 80% of nitrate back to denitrification modules? Do you agree? Yes, that sounds like a good plan. Be sure to include a vfd and plenty of turn-down capacity. With the long HRT in the lagoon we can likely get away with a higher internal recycle so I like this idea.

Wayne Flournoy
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www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Wednesday, August 16, 2017 5:55 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Wayne,

I have some additional requests and question on the quotes.

- Please provide itemized cost for each component included in the budgetary quotes provided for Buildout 1 at 0.68 MGD (breakdown costs for the blowers, control panel, and submersible mixers)
- How much of airflow is needed to provide the scour air needed for the 8 denitrification modules? I guess that it could be scheduled per the pond and scour 4 modules at a time. Running the airline from the blowers near the Pond 4 to Pond 1 and 2 may cost too much. If you are okay, we would like to have a separate blower (or air compressor) for the denitrification modules. If you agree, could you provide the approximate cost for the air compressor needed for the 4 modules?
- Could you provide the blower cut sheet for the proposed 1195 scfm blower (probably 10 psig will be good enough)? If not, I can check with Aerzen for the selection.
- For the recirculation pump for denitrification, I think that 4Q may provide some safety factor for the desired nitrate limit of 10 mg/L at the end and sending 80% of nitrate back to denitrification modules? Do you agree?

I will check with you tomorrow to go over these questions and requests.

Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Friday, July 14, 2017 1:29 PM

To: Eun Kim <EunWKim@KennedyJenks.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

You are correct, the temperature made very little difference. I have corrected it in this version, and included a schematic to show the layout of the modules. The modules will ship with integral channeling baffles.

Wayne Flournoy
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Wayne.Flournoy@EntexInc.com
www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Friday, July 14, 2017 2:42 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: FW: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

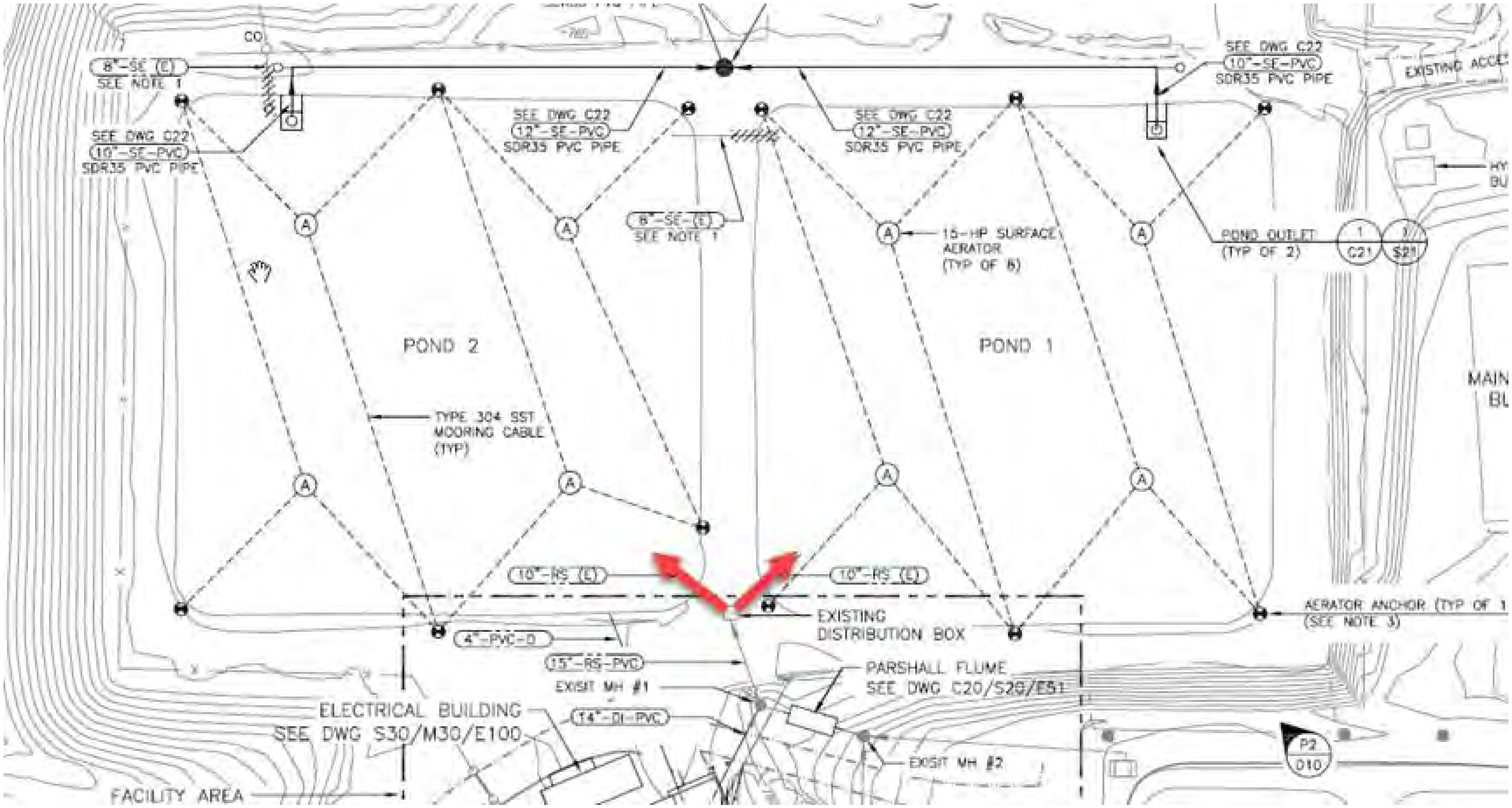
Wayne,

For the TN proposal, please use 10 degree C for the design temperature. Although I think that it won't make any difference as the hetertrophic bacteria and BOD removal are not impacted by the temperature very much.

As shown below, the influent flow is flown to the corner of the two ponds from the distribution box. In the preliminary layout attached, I proposed to create an anoxic zone around the injection point.
Do you suggest building a plug-flow type channel shape area with the floating baffles instead? If so, could you send me a rough sketch of your suggestion? There are only 8 modules in each lagoon for Buildout 2 condition. Is it necessary to install additional mixers to direct the flow to the modules? If so, could you also include approximate positon of the three mixers with 8 modules?

Thank you!

Eun



From: Eun Kim
Sent: Monday, July 10, 2017 1:32 PM
To: 'Wayne Flournoy'
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Wayne,

Sorry for bothering you again. The design conditions are revised for three phases as shown below. Could you please provide updated proposals for BOD+NH3 removal and TN removal in each phase?

Basis of Design Provided to Entex

BOD5 and NH3 Removal in Pond 4		Phase 1	Buildout1	Buildout2
Flow	MGD	0.58	0.68	1.61
BOD5	mg/L	32	32	48
NH3-N	mg/L	30	29	29
Design Temp	°C	7	7	7
Target Filtered BOD5	mg/L	< 3	< 3	< 3
Target NH3-N	mg/L	< 0.5	< 0.5	< 0.5

TN removal in Pond 1 and Pond 2		Phase 1	Buildout1	Buildout2
Flow	MGD	0.58	0.68	1.61
BOD5	mg/L	131	117	96
NO3-N	mg/L	30	29	29
Design Temp	°C	10	10	10
Target Filtered TN	mg/L	< 5	< 5	< 5

Note: Influent BOD5 to Pond 1 and 2

Pond 4 Effluent Discharge Limits		
BOD5	mg/L	<10
NH3-N	mg/L	<0.74
TN	mg/L	<10

It will be great if you can provide the revised quotes and proposals by the end of this week or early next week.

Also, please check the attached preliminary layout of the SFF modules and let me know if you have any comments or suggestions. The modules in Pond 4 are concentrated around the inlet as the remaining space should be used for the solids settling and storage and also to reduce the construction cost. The number of modules will be updated per the updated quotes later.

Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Monday, June 19, 2017 9:49 AM
To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

That is correct, the aeration capacity remains the same.

Wayne Flournoy
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From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Monday, June 19, 2017 12:48 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Wayne,

There is no change in the blower rated capacity. Please confirm if this is correct. If not, please send me the updated quote with the correct aeration capacity needed.
Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Monday, June 19, 2017 9:41 AM
To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

My apologies, I thought I sent this out.

Wayne Flournoy
President
Entex Technologies Inc.

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919-287-2258 fax
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www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Monday, June 19, 2017 12:37 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Wayne,

Did you have a chance to update the quote based on the updated temperature and the BOD removal requirement given below? If so, please send me the updated quotes. Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Wednesday, June 14, 2017 8:36 AM
To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

I should be able to get this out by the end of today.

Thanks,

Wayne Flournoy
President
Entex Technologies Inc.
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919-287-2258 fax
Wayne.Flournoy@EntexInc.com
www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Wednesday, June 14, 2017 11:28 AM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Wayne,

Your proposal only shows the nitrification needed for the condition but the additional BOD removal needed. The effluent soluble CBOD5 given for each flow condition should be also removed by the biofilm. I also reviewed their historical data and the low monthly water temperature seems to be about 7 degree C, not 10 degree C in the Pond 4 where the bioweb for nitrification and additional CBOD removal is placed. There is no need to update the denitrification proposal (the temperature of the first lagoon will be about 10 degree C).

Could you consider these and send me the updated proposal?

Phase 1 Flow = 0.5 MGD
Low Monthly Water Temperature Assumed: **7 degree C**
Water depth of partially aerated facultative lagoon: 8 ft
Effluent Ammonia-N Concentration from Aerated Lagoons = 25 mg/L
Effluent Soluble CBOD5 Concentration from Aerated Lagoons = 16 mg/L

Phase 2 Flow = 1.0 MGD
Low Monthly Water Temperature Assumed: **7 degree C**
Water depth of partially aerated facultative lagoon: 8 ft
Effluent Ammonia-N Concentration from Aerated Lagoons = 25 mg/L
Effluent Soluble CBOD5 Concentration from Aerated Lagoons = 31 mg/L

Goal - Provide BioWeb for full nitrification of 25 mg/L of ammonia and the total removal of the effluent soluble CBOD5.

Please let me know if you have any questions. Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Friday, June 09, 2017 9:10 AM
To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

Enclosed please find our proposal for Webitat for Lagoons for BOD and ammonia removal.

I'll work on the Anoxic Webitat proposal next.

Thanks,

Wayne Flournoy

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Wayne.Flournoy@EntexInc.com
www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Thursday, June 8, 2017 1:29 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

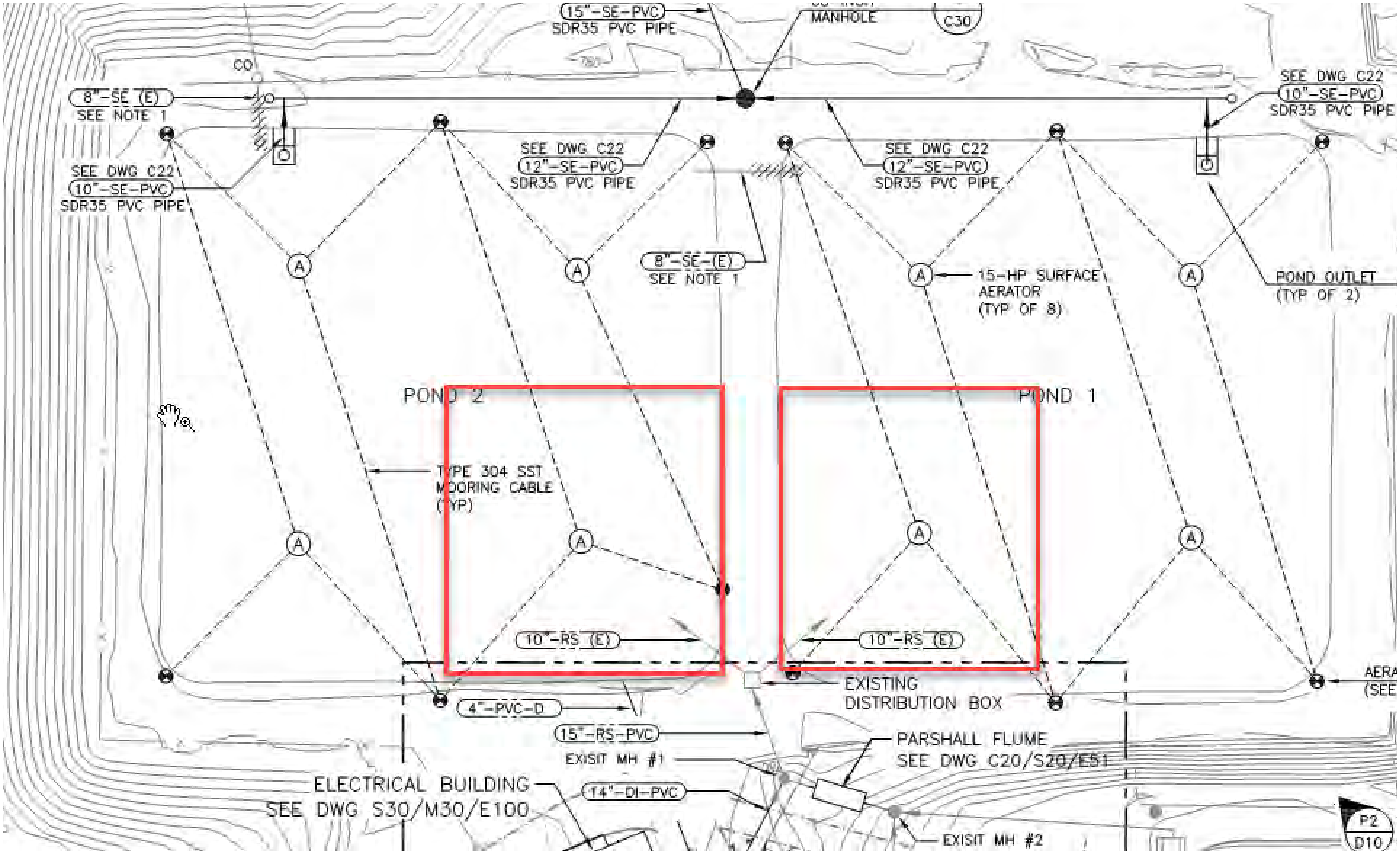
Wayne,

Once the HRT in the lagoon is reduced at the future projected flows, there will be no nitrification at all. The lagoon will lose its nitrification capacity completely due to the short HRT (SRT), not sufficient reaction time for nitrification. So the BioWeb should support nitrification for the entire flow.

Yes, I am very interested in the denitrification option. I guess that you already know the required return flow rate to meet about TN of 10 mg/L limit. If you have some calculations developed for the denitrification part, please proceed and send me the detailed calculation first for the required amount of BioWeb. The highlighted area below near the inlet of Pond 1 and Pond 2 could be used for the anoxic condition, and the return flow may go to the distribution box. The depth of these ponds is 12 feet, deeper than the partially aerated pond.

Thank you.

Eun



From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Thursday, June 08, 2017 10:08 AM
To: Eun Kim

Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

This is very helpful. If you're OK, I will base my designs on the lagoon being able to treat 0.25 MGD by itself, leaving the Webitat to handle 0.25 MGD and 0.75 MGD respectively for the two cases.

Are you interested in Webitat for denitrification as discussed in the two presentations I sent?

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From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Thursday, June 8, 2017 1:03 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

They have TN limit all year-round not only for summer time. So the system needs to provide nitrogen removal during the winter time. Based on the current DMR data, the effluent from the partially aerated lagoon contains about 9 mg/L of TKN (and 40 mg/L BOD) at about 0.24 MGD in January 2017. We are adding the Bioweb near the inlet to that lagoon. Once the flow is increased to 0.5 MGD, the HRT in the lagoon will be reduced to half which is not long enough to provide any nitrification at the low temperature. I also run a BioWin model to confirm this (no nitrification at the projected future flows). The model assumes ideal condition and even says that the lagoon will provide almost full nitrification at 0.28 MGD at 10 degree C. If we consider the other alternatives, the same design criteria will be given. As this is for a preliminary evaluation to determine the most preferable alternative, the detailed design criteria can be developed later if the client like this idea.

Thank you.

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Thursday, June 08, 2017 9:53 AM
To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

I can do that, what I'll do is assume the lagoon removes no ammonia, and that all nitrification will be done on the BioWeb. It should be a very conservative design.

Wayne Flournoy
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www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Thursday, June 8, 2017 12:49 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Wayne,

I'm going to check the recent operating data to confirm if the plant fully nitrify during the winter time and will provide you the current condition too. However, we need estimation for all three flow scenarios. Please proceed with the two flow scenarios given below. I will send you the current condition today.

Thank you!

Eun

From: Wayne Flournoy [mailto:Wayne.Flournoy@entexinc.com]
Sent: Thursday, June 08, 2017 7:20 AM

To: Eun Kim
Cc: Ryan Holloway
Subject: RE: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Eun –

What is the flow and approximate temperature that the lagoon is capable of nitrifying now? I don't want to overdesign.

Thanks,

Wayne Flournoy
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Wayne.Flournoy@EntexInc.com
www.EntexInc.com

From: Eun Kim [mailto:EunWKim@KennedyJenks.com]
Sent: Wednesday, June 7, 2017 6:03 PM
To: Wayne Flournoy <Wayne.Flournoy@entexinc.com>
Cc: Ryan Holloway <RyanHolloway@kennedyjenks.com>
Subject: Copper Cove WWTP - Preliminary Budgetary Request for Webitat System

Hi Wayne,

I'm doing some preliminary capacity evaluation for the Copper Cove WWTP in Copperopolis, CA. Currently, the wastewater to the treatment plant is treated through two aerated lagoons run in parallel followed by one partially aerated facultative lagoon (Pond124.pdf attached). The existing system seems to be able to provide full nitrification throughout the year at the current wastewater flow unless the temperature in the lagoon drops significantly. However, the nitrification may be stopped during winter, once the flow to the plant is increased in the future. The plant has a discharge limit for total nitrogen from the partially aerated facultative lagoon effluent after it is disinfected. So we try to include the addition of webitat modules to the partially aerated facultative pond (Pond4.pdf) as one of the potential upgrade options to increase the nitrification and BOD5 removal capacity of the existing lagoons for the future projected design flows.
Could you check the two phased flows provided below and send me a preliminary budgetary proposal for each flow scenario including # of webitat modules needed for each flows, dimension of the module, the total aeration capacity and # of blowers needed for the system. Please include the blower cost in the quote and let me know. Please let me know if you need any additional information or questions. It will be great if you can send me the budgetary quotes by next Monday.

Phase 1 Flow = 0.5 MGD
Low Monthly Water Temperature Assumed: **10 degree C**
Water depth of partially aerated facultative lagoon: 8 ft
Effluent Ammonia-N Concentration from Aerated Lagoons = 25 mg/L
Effluent Soluble CBOD5 Concentration from Aerated Lagoons = 16 mg/L

Phase 2 Flow = 1.0 MGD
Low Monthly Water Temperature Assumed: **10 degree C**
Water depth of partially aerated facultative lagoon: 8 ft
Effluent Ammonia-N Concentration from Aerated Lagoons = 25 mg/L
Effluent Soluble CBOD5 Concentration from Aerated Lagoons = 31 mg/L

Thank you!

Eun

Eun Woong Kim, P.E.
Kennedy/Jenks Consultants
1191 2nd Avenue, Suite 630 **|** Seattle, WA 98101
P: 253.835.6400 **|** F: 253.952.3435 **|** Direct: 253.835.6445

Engineering a Clean Water Environment

September 11, 2017

To: Ryan Holloway
Kennedy/Jenks Consultants
1191 2nd Avenue, Suite 630
Seattle, WA 98101

Sub: Copper Cove, CA Lagoon WWTP –
Entex Webitat^{TM} for Lagoons Proposal #7132R5

Dear Ryan,

On behalf of Entex Technologies, thank you for the opportunity to present a conceptual design for your treatment upgrade. Enclosed please find Entex's design concept and budgetary price for the referenced application. A detailed scope of supply can be found at the end of this proposal.

Technology Selection
Entex's Webitat for Lagoons system c/w high-strength, lock-knit BioWeb^{TM} fixed media, integrated aeration, and blowers.

Treatment Objective
Provide for removal of NH_3-N (to 13 mg/l) and BOD_5 at 0.68 MGD

Treatment Concept
Provide Webitat units for the aerated facultative pond, each with an integral coarse bubble aeration system.

Price:

Case	Flow (MGD)	# of Modules	Price
Buildout 1	0.68	26 total	$ 1,176,540.00 USD

Delivery: Ex Works Factory, Freight excluded

Sincerely,

Wayne Flournoy
President
Entex Technologies Inc.

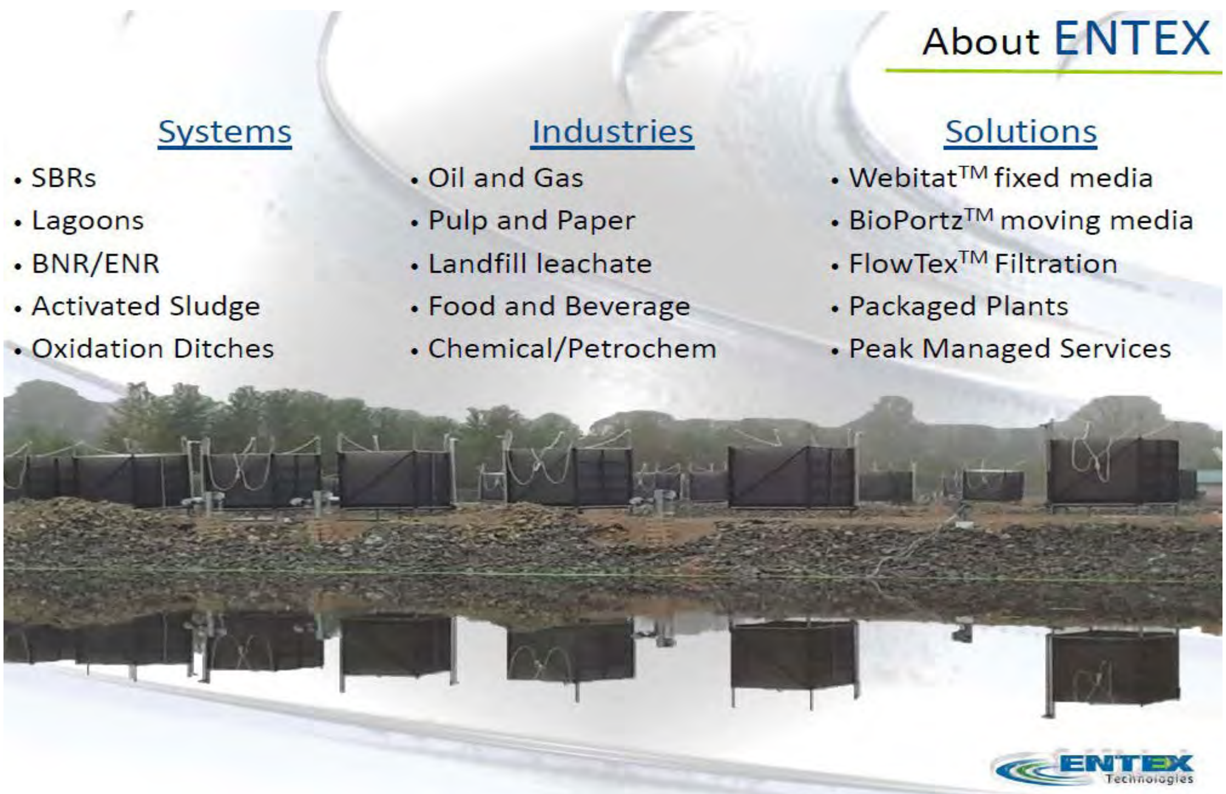
400 Silver Cedar Court, Suite 200, Chapel Hill, NC 27514
919.933.2770 phone 919.287.2258 fax www.entexinc.com

1. About Entex

Entex Technologies offers an unequaled selection of advanced wastewater treatment solutions for municipal and industrial applications alike, including turnkey installation services. Our solutions effectively address space constraints and budget concerns, as well as ever increasing demands for higher quality effluent and increased plant capacity. Technologies provided by Entex have been selected with confidence to treat more than 70 million gallons per day of design capacity.

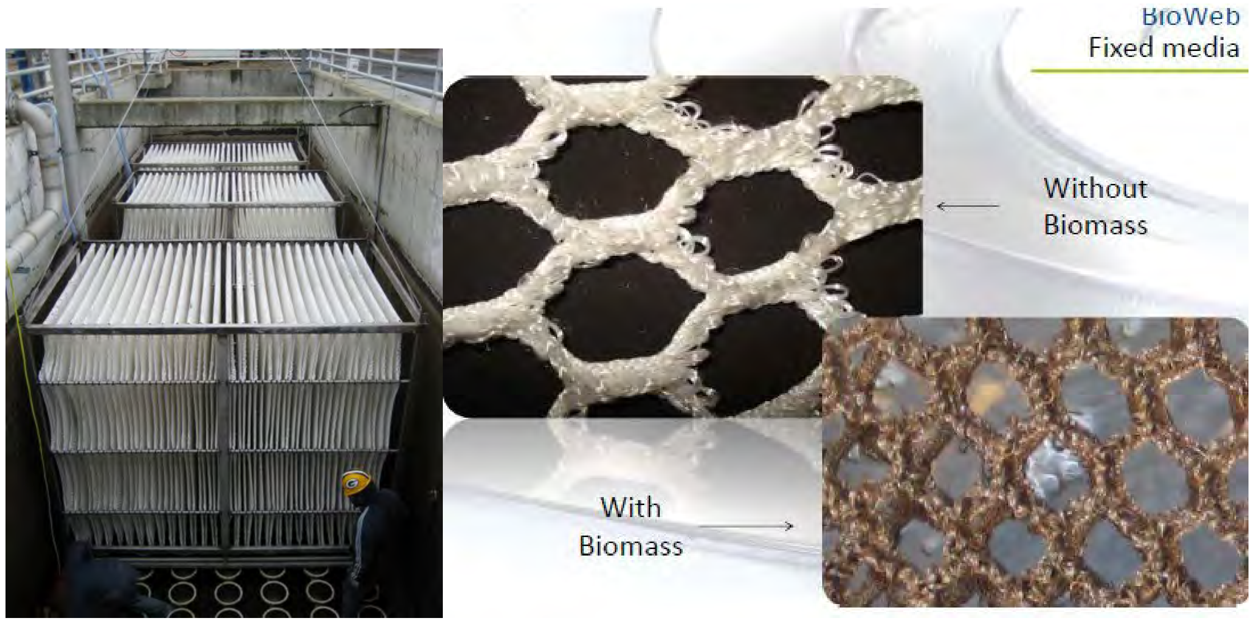
Entex provides biological systems for carbon and nutrient removal, including phosphorus and nitrogen control. As a provider of both fixed and moving media processes, Entex offers an unbiased design assessment. The Entex team has been involved in over 750 installations with over a combined 100 years of experience. Additionally, Entex offers a flexible suite of tertiary filtration systems that have been Title 22 approved by the State of California for reuse quality effluent. Entex's filtration systems are designed to further polish final effluent and reduce turbidity for reuse purposes.

Entex provides the ability to upgrade treatment facilities to meet the needs of increased capacity and improved effluent discharge requirements, often without the need for additional treatment basins. These systems provide powerful solutions to the challenges facing wastewater treatment systems, offering extraordinary levels of performance typically at a substantially lower cost than conventional solutions.



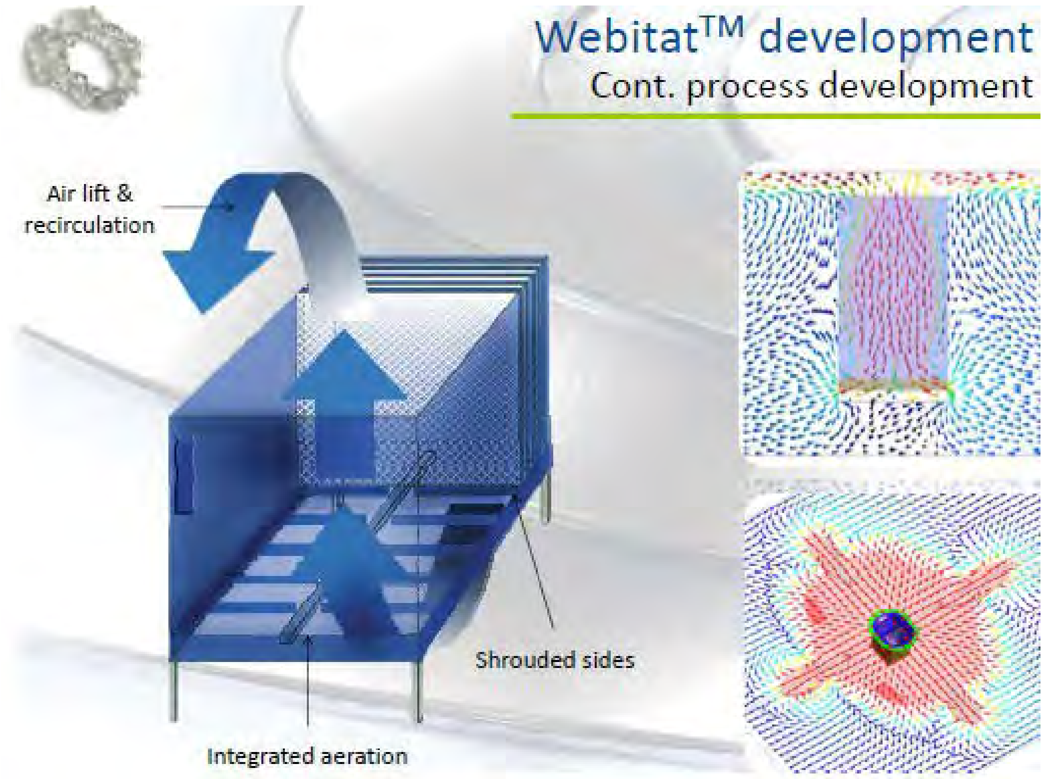
2. About BioWeb™

Entex's BioWeb is a patented, high strength (+1,000 lbs), lock-knit polyester textile designed to enhance and stabilize microorganism colonization within biological wastewater treatment applications such as Lagoons, SBRs, Oxidation Ditches and Activated Sludge. By introducing a protected surface, microorganisms are immobilized and increase concentration, thereby increasing the ability to degrade wastewater constituents. Individual filaments form small loops that extend from the textile, providing growth sites for biomass. The material is lock-knit and is guaranteed not to unravel or dislodge. Each textile row is secured to a complete welded 304L SS frame, ensuring the BioWeb will remain intact. Additionally, BioWeb is installed in a continuous sheet with ~4-inches between vertical rows to allow a greater open area.



3. About Webitat™

Entex's patented, award winning Webitat process utilizes BioWeb media and allows a proactive control of the attached biofilm thickness by incorporating an integrated aeration mechanism below each Webitat frame. This dedicated aeration ensures a high rate of shear and serves to create an air lift effect, enabling a localized continuous recirculation of substrate. As a result, substrate transfer and diffusion rates can be optimized. Each Webitat is shrouded to confine and direct the integrated aeration into the BioWeb media, increasing scour and recirculation efficiency. The integral aeration flux rate can be controlled via dedicated Webitat process valving to provide proactive operation and process control. The enclosed Webitat module operates as its own high-rate biological reactor, enhancing mixing and biomass inventory. Once installed, the modules do not require access. The construction and configuration allow for maintenance free operation.



Integral Aeration

4. Website links

For additional product information, reference installations and videos, please visit the following links:

Entex: **www.entexinc.com**
Webitat: **http://www.entexinc.com/solutions/webitat-lagoon**
BioWeb: **http://www.entexinc.com/solutions/bioweb**

Clare MI: *http://www.entexinc.com/installations/2012-07-09-15-09-29/clare-mi*
Snohomish WA: *http://www.entexinc.com/installations/2012-07-09-15-09-29/snohomish-wa*
Kenosha Beef WI: *http://www.entexinc.com/installations/kenosha-beef/*
Mt Wolf PA: *http://entexinc.com/installations/bioweb/mt-wolf*
Johnston PA: *http://entexinc.com/installations/bioweb/johnstown-pa*
Coeur d'Alene ID: *http://entexinc.com/installations/bioweb/coeur-dalene*

5. Basis of design

Entex's preliminary design assessment has been based on the following characterization.

Case	Buildout 1	Effluent
Flow (MGD)	0.68	
BOD_5 (mg/L)	48	< 3 (filtered)
NH_3 – N (mg/L)	29	< 13 (filtered)
Design Temp (°C)	10 (min.)	--
Aeration (scfm)	1,160	--
Air/Module (scfm)	45	--

Table 1. Water Quality and IFAS Characterization

1) Influent is assumed to be screened, biodegradable, free of metals and inhibitory substances.
2) Sufficient micronutrients, nitrogen and phosphorus will be provided.
3) pH shall range between 6.5 to 8.5, and shall be adjusted to provide consistent influent pH

6. Design Concept

Twenty-Six (26) Webitat units for 0.68 MGD will be installed in the aerated facultative pond. Each Webitat unit comes assembled with its own dedicated coarse bubble diffuser system. The Webitat modules come pre-assembled and ready to lift into the basins. These modules come with a base plate and are designed to sit on the bottom of the pond. After lifting and fixing the modules in place, air lines need to be run from the blower to each module. Each module will have a dedicated 3-inch drop pipe with a male NPT connection (hose, fittings, and or additional piping outside of the Webitat are not included).

7. Operation

Once installed, the modules are self-cleaning with the integral aeration providing biological scour to manage biomass growth on the Webitat unit. The BioWeb material and SS frame structure are estimated to last up to 30 years. Webitat units do not require maintenance beyond maintaining air flow from the blowers. Frames are complete welded 304L SS. Entex's integrated aeration requires no maintenance as it is a non-clog, coarse bubble design. Periodic maintained is required for the blowers. Otherwise, this system is maintenance free.

8. Scope of supply

Each ENTEX project is custom engineered. Typical drawings may be provided upon request.

Webitat Modules	A total of: • Buildout 1 - 0.68 MGD: Twenty-Six (26) Webitat modules will be provided with BioWeb Media, welded 304L SS frame, lifting lugs and baseplate for weight dispersion. Each Webitat unit will be approximately 7.5 ft. w x 8 ft. l x 7.5 ft. high (6.5 BioWeb height). Integrated PVC Webitat aeration included for all units c/w 3-inch diameter drop pipe.
Blowers	• Phase 1 - 0.68 MGD: 2 blowers, 1 duty/1 standby capable of 1,160 scfm at 8 ft. water depth.
Control Panel	Control panel with Webitat for Lagoons logic for periodic air scour

Additional items included:

- Process Engineering for all equipment, equipment sizing and selection
- Review and approval of P&I Diagram for the ENTEX scope of supply
- Preliminary General Arrangement Drawings, review and approval of final General Arrangement Drawings for the ENTEX supplied equipment
- Review of biological process reactor drawings, excluding structural design
- Manufacturers' service for installation inspection
- Startup supervision and training

Items excluded (not all inclusive):

- Isolation valves, automated valve
- Unloading and storage of materials on-site
- Concrete tankage, foundation or secondary containment/spill retention.
- Interconnecting piping, valves and interconnections.
- Electrical, including motor controllers and all electrical interconnections.
- Start-up and operation, including any analytical work.
- Anchor bolts and/or hold down beams
- Turbidimeter, chemical addition, nutrient addition and chemical analysis.
- Influent and effluent pumping
- Covers, hoists or walkways

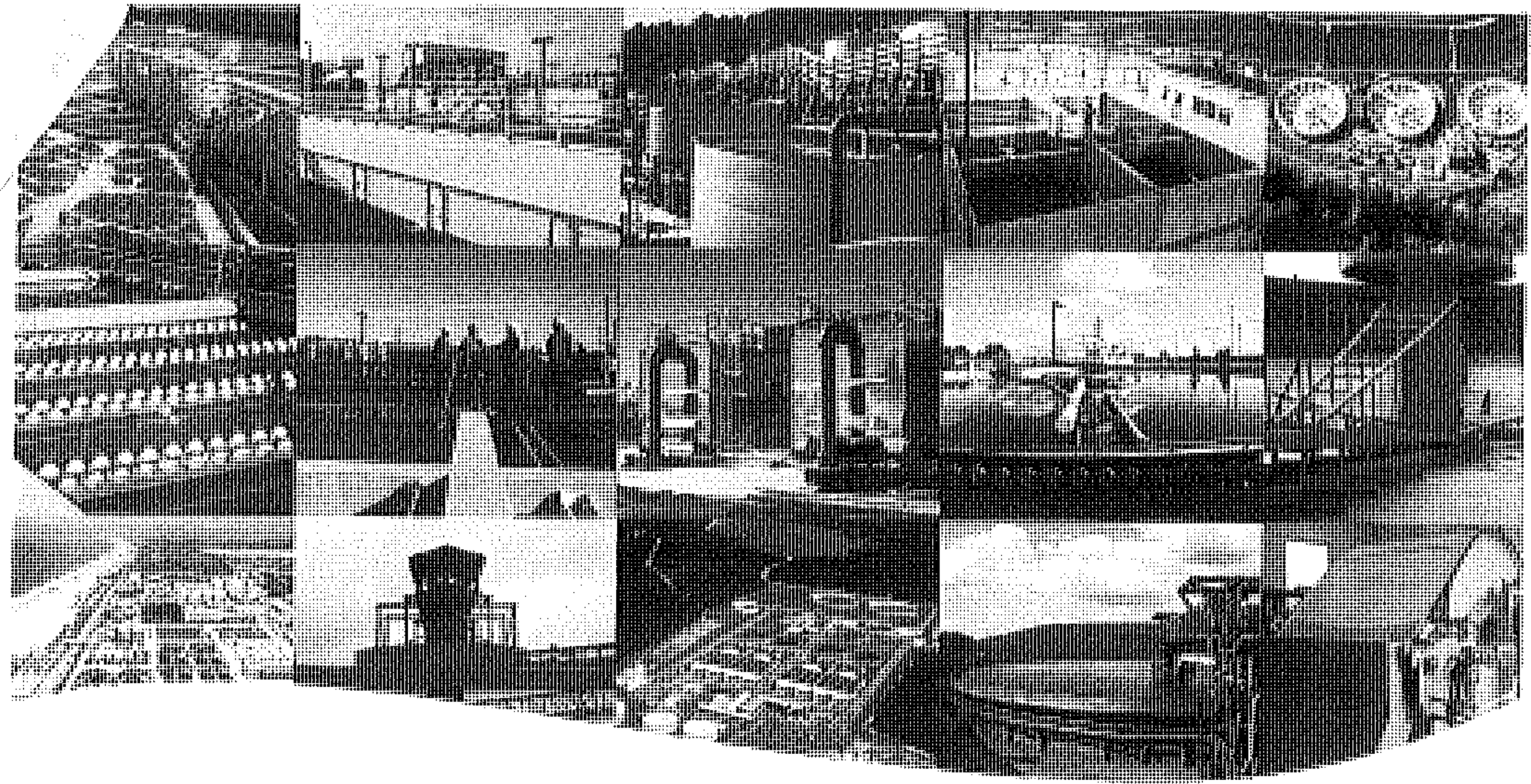
- Installation, other than factory pre-assembled components.
- Freight excluded
- Customs, insurance, taxes etc.

9. Contact Information

Should you have any questions regarding the material found in this proposal, please do not hesitate to contact me.

Sincerely,

Wayne Flournoy
President
400 Silver Cedar Court
Suite 200
Chapel Hill, NC 27514
(919) 619-8861
Wayne.Flournoy@EntexInc.com
www.entexinc.com



Copper Cove WWTP

California

Engineer
Kennedy/Jenks Consultants

Represented by
Nate Miller
MISCOwater
Pleasanton, California
(415) 794-0984
nmiller@miscowater.com

Furnished by
Adrian Williams
awilliams@westech-inc.com

WESTECH

WesTech Opportunity Number: 1760406
Friday, August 11, 2017

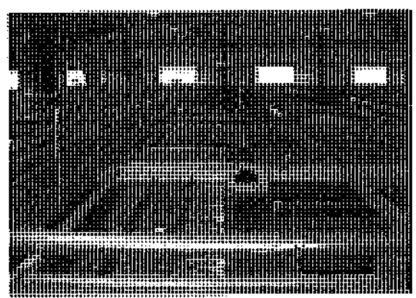
SYSTEM CERTIFICATION ISO 9001 SGS

Item A: TRIDENT® HS Unit

We are proposing a Trident HS Package Treatment system for this project. The system is designed as follows:

Design Criteria	
Model	HS-1400A
Number of Units	2
Tank Dimensions	33 ft 10 in long x 12 ft 3 in wide x 10 ft 6 in high
Trident HS Design Flow	1,400 gpm
Trident HS Design Flow per Unit	700 gpm
Tube Settler Loading Rate	5 gpm/ft^2
Adsorption Clarifier Loading Rate	10 gpm/ft^2
Mixed Media Filter Loading Rate	5 gpm/ft^2

Technical Description:



The Trident® HS system combines tube settlers, Adsorption Clarification and mixed media filtration in a single package treatment system. Raw water is mixed with recirculated sludge and chemically conditioned before being sent to the tube settler section. The tube settler section removes gross solids. Operating in an enhanced coagulation mode, this section provides excellent TOC removal as well as providing good treatment for low quality or flashy waters. Settled sludge is recirculated back to the raw water to build large, fast settling particles and optimize chemical usage. Partially clarified water is then sent to the Adsorption Clarifier stage, where particles that do not easily settle are removed. The water then flows by gravity to a mixed media filter, where small particulates are removed. An optional UV disinfection system inactivates pathogens prior to discharge.

Key Features and Benefits

- Multi-barrier system provides consistently excellent water quality.
- Superlative performance on low quality and flashy waters.
- High rate system minimizes footprint.
- Package treatment system reduces construction time and cost.

The following budget pricing includes:
Type 304 Stainless Steel tanks, bare metal on the bottom. Tube settlers, sludge removal drive and header, sludge recirculation pump, and clarifier transfer pump. Pumps include VFD controller with integral motor starter. Adsorption Clarifier® system (AC) media and retaining screen. MULTIBLOCK® underdrains with Laser Shield™ media retainer, Mixed Media, MULTIWASH® media retaining baffles on filter washtrough. One skid mounted coagulant feed package. Two skid mounted polyelectrolyte feed packages. Influent, inter-clarifier and filter turbidimeters. Two air wash blowers. Automatic and manual valves. Static mixer for combined influent flow. Magnetic flow meters for influent, sludge recirculation and backwash. Ultrasonic level transmitters for tube clarifier and filter. Compressed air system including air dryer and motor starter. Control system with master and local panels. Programmable Logic Controller (PLC) is included for controlling operating and cleaning cycles. Programming includes AQUARITROL® III chemical dosage control system. Freight to the jobsite and startup service.

Trident HS Web Site

This proposal has been reviewed and is approved for issue by Michael Stotzer on August 11, 2017.

Item B – Circular Dissolved Air Flotation Unit

General Scope of Supply		
Description	**Dimension/Capacity**	**Unit**
Number of Units	2	Each
Application	WAS	-
DAF Diameter	35	ft
DAF Side Wall Depth	11	ft
Design Flow Rate	1	MGD
Design Recycle Rate	836	gpm
Feed Suspended Solids	5000	mg/L
Feed Oils and Grease	0	mg/L
Air to Solids Ratio	0.02	lb/lb
Hydraulic Loading Rate	1.69	gpm/ft2
Solids Loading Rate	1.91	lb/hr/ft2

Equipment Description

The system shall be designed to recirculate a portion of the clean effluent through a pressurization system. This pressurization system shall saturate the recycle with pressurized air and then inject the mixed solution into the DAF tank at the influent point of entry. Introduction of the air saturated liquid, influent feed, and the collection of floated solids shall be all accomplished in a single tank.

Detailed Scope of Supply

Item	Description	Material of Construction
Tank	Circular with external launders	Concrete (By Others)
Walkway/Platform Flooring	1-1/4" I-bar grating	Aluminum
Center Column/Center Shaft	8" Diameter Shaft	Carbon Steel
Feedwell Diameter	4 ft	Carbon Steel
Feedwell Total Height	4 ft	-
Float Box Width	6 ft	Carbon Steel
Skimmer Arms	8 full radius arms	Carbon Steel
Skimmer Blade Assembly	-	Aluminum
Rake Arms	2 full radius arms	Carbon Steel
Sludge Scraper Squeegee	-	304 Stainless Steel
Weirs	V-Notch	FRP
Baffles	5' Deep	Carbon Steel
Anchor Bolts & Fasteners	-	304 Stainless Steel

Segmented Rake Blades

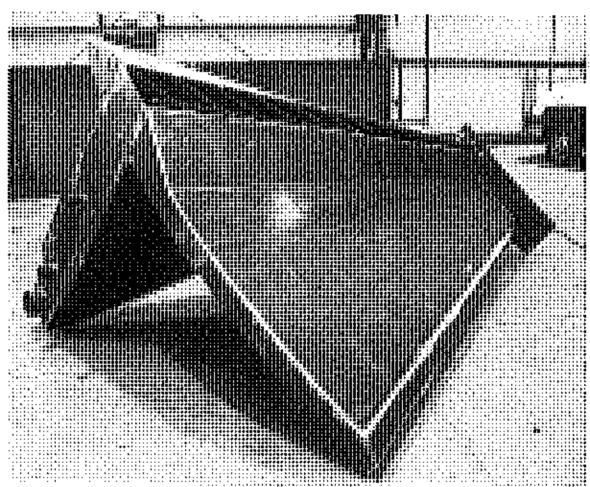
The segmented rake blades provide rapid solids removal. The rake arms have been designed to eliminate the need for underwater seals and bearings. The mechanical movement of sludge means that there are no orifices or pipes to plug.

Skimmer Arms and Float Box

Float skimmer mechanism arms designed to support the skimmer assembly components. Skimmers are supported from the center shaft and do not require the use of an end caster rolling on the float baffle.

Float Box

A float trough is provided with a beach at an optimal angle to maximize the amount of float removed with each skimmer pass.



Float Box

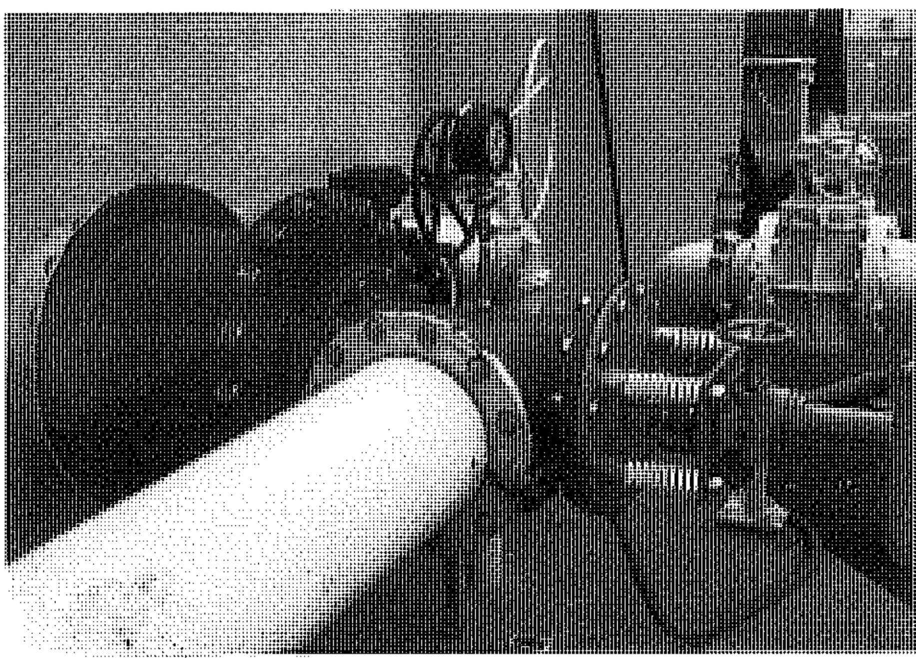
Feedwell

WesTech's feedwell is designed to dissipate the energy in the inlet flow, creating an even distribution of flow over the entire area of the separator as well as eliminating the potential for scouring of the sludge blanket. The feedwell also serves as a baffle to prevent short circuiting through the basin, eliminating dead spots and utilizing the entire basin volume.

Recycle System

Back Pressure Valve

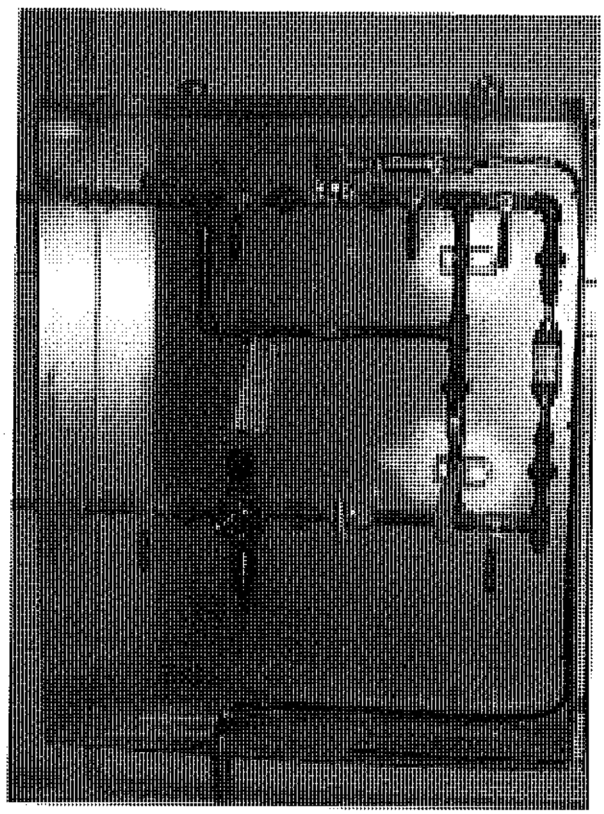
Back Pressure Valve	
Valve Type	Haymore
Diameter	8"
Pipe Material	Steel
Back Pressure Plate Material	304 SS
Hand Wheel Size	8"
Hand Wheel Material	Aluminum



Back Pressure Control Valve

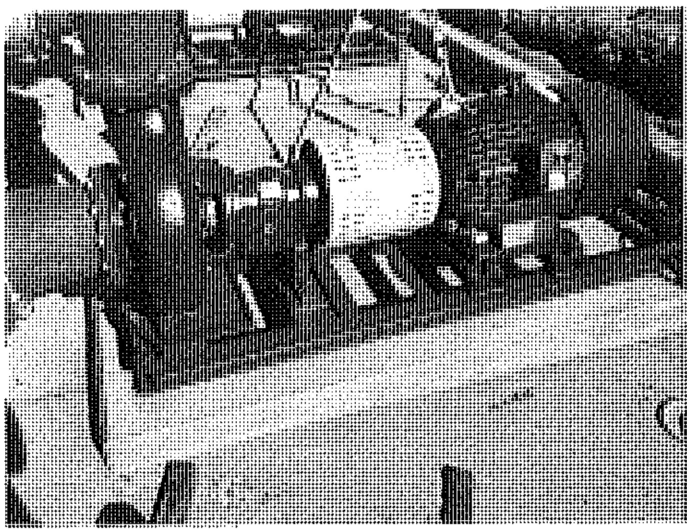
Air Flow Control Panel

Air Control Panel	
Dimensions	2' x 2' x 6"
Material	304 SS
Component List	Quantity
Pressure Regulator	1
Needle Valve	1
Isolation Ball Valves	7
Air Flow Meter	1
Solenoid Valve	1
Check Valve	1



Recycle Pump

Recycle Pump		
Quantity	2	1 duty, 1 standby
Type	ANSI	
Flow Rate (per pump)	836	gpm
TDH	175' (76 psi)	
Motor	TEFC	
Power	5-30	HP
Voltage	230/460	V
Phase	3	
Frequency	60	Hz



Air Compressor

Air Compressor		
Qty	1	
Type	Reciprocating	
Air feed rate	12	scfm
Discharge Pressure	80	psi
Motor	TEFC	
Power	75	HP
Voltage	230/460	V
Phase	3	
Frequency	60	Hz

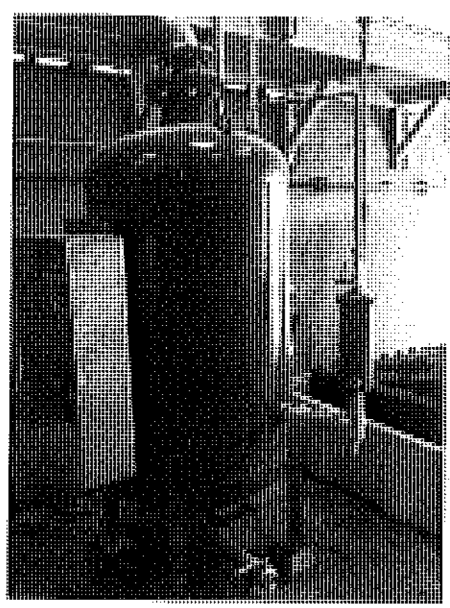
Saturation Tank

Saturation Tank

Material of Construction	Carbon Steel	
Diameter	54"	in
Shell Height	84"	in
Total Height	138"	in
Total Volume	947	gal
Recycle Flow	836	gpm
Theoretical Retention Time	1.13	min
Level Control Valve	Sewage Air Release	
Sight Glass	2	ft
Pressure Relief Valve	100	psi

Saturation Tank Nozzle Schedule

Description	Quantity	Size
Influent	1	8
Effluent	1	8
Manway	1	24"
PRV air connection	1	¾"
PRV Water Connection	1	2"
Pressure Gauge Connection	1	½"
Air Inlet	1	¾"
Sight Glass Connections	2	½"
Drain	1	2"



Drive Unit

WesTech drive units are delivered to the job site as a single, completely assembled and shop-tested unit, ready to be installed on the DAF center column. The result of a thorough design and meticulous component selection is a strong, reliable, high-quality drive that will provide a long service life with minimum maintenance.

Drive Unit

Description	Dimension/Capacity	Unit
Drive Type	25"	Shaft
Continuous-Rated Torque	10400	ft-lb
Rake Tip Speed	#	FPM
Motor	TEFC	-
Power	1	HP
Voltage	460	V
Phase	3	
Frequency	60	Hz
Overload Levels	14560 ft-lbs	Alarm Motor Cutout Backup Motor Cutout
Main Gear and Pinions Lubrication	Oil bath	-
Main Bearing and Reducers Lubrication	Grease	-

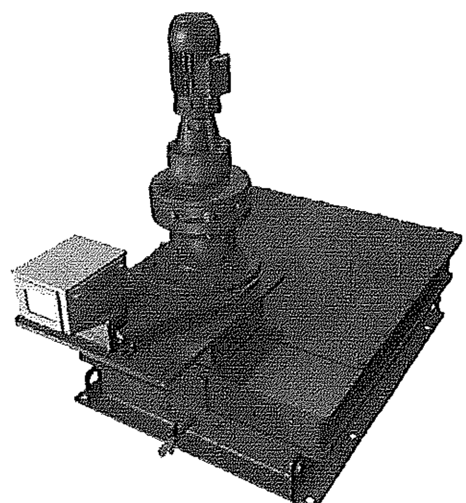
Direct Coupling

Direct coupling of motor/reducer/pinion shaft assembly eliminates chain or belt drive transmissions and increases efficiency. This arrangement also allows for direct and accurate torque monitoring with WesTech's Load Cell torque control.

Custom Design

One of the unique advantages of WesTech drives is the great flexibility of design. This allows the engineer to select a drive that will closely match the process and mechanical requirements. Using precision components manufactured by the foremost manufacturers in the industry, WesTech can guarantee the best quality.

The drive unit consists of electric motor, speed reducer, drive torque control, external gear with integral bearing, and an all steel housing.



WesTech's drive design includes direct in-line high-efficiency reducer and motor stacks, a durable precision bearing, state-of-the-art torque protection, and a customized design for each application.

Electric Motor
The electric motor, direct coupled to a speed reducer, operates the external gear by means of a pinion fastened to the output shaft of the speed reducer. The drive control pointer indicates the torque loading in percentages. The electric motor is totally enclosed, suitable for outdoor installation, but other commercially available motors to suit environment or service such as explosion proof, can be furnished. When required, a suitable variable speed drive can be added to vary the final RPM of the drive. This adjustment could allow the process to be more optimized, resulting in long-term savings.

Input Speed Reducer
The speed reducer, driven by the motor, is a completely sealed oil or grease lubricated unit. It is of a cycloidal type, which combines extremely high ratios with high efficiency and low wear in a compact unit. Torque transmitting elements roll, do not grind or slide, and because of this, the efficiency reaches 90 percent. Virtually, no wear failures have occurred in properly sized WesTech drives. Even after 30 years of operation, many WesTech Reducers are still in use.

Torkmatic™ Drive Control
The Torkmatic drive control indicates and senses the output torque of the drive main gear. At excessively high torques, an alarm will sound or the motor will stop, thus protecting the drive unit and mechanism as well as the process. The Load Cell torque control is extremely accurate at reading torque and is protected by a NEMA 4x outdoor enclosure. The drive control comes with a 4-20mA signal output for customer ease and control of the process from a remote location.

Precision Bearing Advantages

Precision manufacturing tolerances
The bearings utilized are acceptable for high load, high speed applications and are manufactured by recognized bearing companies. The use of these precision bearings is widespread among larger and more heavily loaded mechanisms common to the metallurgical industries.

Exceptional long life and load capacities of precision bearings
Instead of applying the bearing load in four points on the bearing balls as with standard strip liners, the precision bearing utilizes a full band contact race with hardness equal to that of the strip liners. Calculated bearing life is at least five times that for standard strip liners of the same ball size and diameter. The need for splitting gears and housings is eliminated because of superior service life.

Overturning Load Capacity
Strip liner bearings have no inherent overturning load capacity and must rely only on mechanism weight for this feature. This capacity of the precision bearing makes the possible tank setting, misalignment, and lack of precision leveling of the drive during installation and operation a far less determining factor in premature bearing failure.

Main Bearing Protection

WesTech gear housings protect from dirt and contamination by use of designed neoprene seals and gaskets, whereas strip liners can only use a loose susceptible felt seal. WesTech precision gears also allow the ability to have a separate sealed grease cavity for just the bearing which creates additional protection from contamination.

Controls and Instrumentation

Control Panel

The control panel will include rake drive stop-start push buttons, alarm light, alarm horn, alarm reset, heater, contacts for remote indication and control. Installation in the field will be by others.

Controls and Instrumentation

Description	Type	Included
Control Panel Type	NEMA 4X	Yes
Torque Transmitter	Electromechanical	Yes
Rake Arm Drive	VFD	Yes
Recycle pump	Starters	Yes
Air Compressor	Starter	Yes

Additional Information

Paint

Coating Area	SSPC	Brand	Product #	mils DFT per Coat	Coats
Submerged Steel	SP10	Tnemec	Series N140	4-6	2
Non Submerged Steel	SP6	Tnemec	Series N140	4-6	1
			Series 73	3-5	1

Weight

Mechanism Shipping Weight	Choose an item.	####
Drive Shipping Weight	Choose an item.	####
Tank Shipping Weight	Choose an item.	####
Heaviest Component	Choose an item.	####

On-Site Services

Field Services

Number of Trips	2	-
Time per Trip	2	Days

Included field service is for mechanical checkout and commissioning. Any additional trips that the customer may request can be purchased at the standard WesTech daily rates plus travel and living expenses.

Clarifications and Exclusions

Note: Any Item Not Listed Above To Be Furnished By Others.

Items not by WesTech:
Electrical wiring, conduit or electrical equipment; piping, valves, or fittings; fireproofing; fire and gas detection and alarming systems; oxygen analyzers or other similar analyzers; lubricating oil or grease; utilities; nitrogen for blanketing system; shop or field painting; field welding; erection; detail shop fabrication drawings; performance testing; unloading; storage; concrete work; foundation design; field service; (except as specifically noted).

This proposal has been reviewed and is approved for issue by Michael Vanderhooft on August 11, 2017.

Budget Pricing

Proposal Name: Copper Cove WWTP, California

Proposal Number: 1760406

Friday, August 11, 2017

1. Bidder's Contact Information

Company Name	WesTech Engineering, Inc.
Contact Name	Adrian Williams
Phone	801.265.1000
Email	awilliams@westech-inc.com
Address: Number/Street	3665 S West Temple
Address: City, State, Zip	Salt Lake City, UT 84115

2. Pricing

Currency		US Dollars

Scope of Supply

A:	TRIDENT® HS Unit	$1,200,000
B:	Circular Dissolved Air Flotation Unit	$S54,386
	Taxes (sales, use, VAT, IVA, IGV, duties, import fees, etc.)	Not Included

Prices are for a period not to exceed 30 days from date of proposal.

Field Service

Daily Rate	$960

Prices do not include field service unless noted, but it is available at the daily rate plus expenses. The customer will be charged for a minimum of three days for time at the jobsite. Travel will be billed at the daily rate. Any canceled charges due to the customer's request will be added to the invoice. The greater of visa procurement time or a two week notice is required prior to trip departure date.

3. Payment Terms

Submittals Approved	15%
Release for Fabrication	35%
Net 30 days from Shipment	50%

All payments are net 30 days. Partial shipments are allowed. Other terms per WesTech proforma invoice.

4. Schedule

Submittals, after PO receipt	8 to 10 Weeks
Customer Review Period	2 weeks
Ready to Ship, after Submittal Approval	18 to 20 weeks
Total Weeks from PO to Shipment	**28 to 32 weeks**

Terms & Conditions: This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

Freight: Prices quoted are **F.O.B. shipping point** with freight allowed to a readily accessible location nearest to jobsite. All claims for damage or loss in shipment shall be initiated by purchaser.

Paint: If your equipment has paint included in the price, please take note to the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up, and repair to shop painted surfaces are not by WesTech.

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cove WWTP
Location: Copperopolis, CA
Type: **Conceptual**

Prepared By: JLH/KK
Date Prepared: 22-Sep-17
K/J Proj. No.: 1670021*00

SUMMARY BY DIVISION

ITEM	ITEM DESCRIPTION		QTY	UNIT PRICE	DIRECT COST TOTAL	MARKUP %	ITEM COST INCLUDING MARKUPS
1	Nitrifcation & Denitrification System	LS	1	3,375,684	3,375,684	64%	5,536,121
2	Dissolved Air Floatation Thickeners	LS	1	1,357,300	1,357,300	64%	2,225,972
3	Recycled Water Facility	LS	1	1,512,500	1,512,500	64%	2,480,500
4	Pond 6 Expansion	LS	1	3,670,600	3,670,600	64%	6,019,784
5	Pond 6 Liner	LS	1	3,336,000	3,336,000	64%	5,471,040
	CONSTRUCTION SUBTOTAL			13,252,084	13,252,084		21,733,417
	Design Engineering	10%					2,173,342
	Legal/ Administration	5%					1,086,671
	Construction Management	10%					2,173,342
	PROJECT SUBTOTAL						27,170,000

The following markups have been allocated to each bid item:

Site Overhead/ General Conditions	10%	
Design/Estimating Contingency	20%	1.64
Escalate to Midpt of Const. @		(3% per year / 24 months out)
Escalate to Midpt of Const. @		
Bonds & Insurance	2%	
Contractors Fee @	15%	

Typically 30% contingency used for conceptual planning, however have manufacturer quotes provide high level of detail.

Estimate Accuracy	
+50%	-30%

Estimated Range of Probable Cost		
+50%	Total Est.	-30%
$40,755,000	$27,170,000	$19,019,000

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cover Wastewater System
Location: Copperopolis, CA
Estimate Type: Nitrification and Denitrification System

Prepared By: JLH
Date Prepared: 22-Sep-17
K/J Proj. No. 1670021*00

							Materials				Installation			Equipment		Sub-contractor		
Area / Bldg	CSI Spec. Division			Description	Qty	Units	$/Unit	Total	MH/ Unit	MHRS	Labor Rate	$/Unit	Total	$/Unit	Total	$/Unit	Total	Total
				Demo Existing Pond Aerator Equipment	3	EA						800.00	2,400	1,000.00	3,000			5,400
				Return Flow Pumping System														
				Pump Station	225	sq. ft.	250.00	56,250				250.00	56,250					112,500
				Propeller Pump, 10 hp	1	ea	20,000.00	20,000				4,000.00	4,000					24,000
				12" Pipe (Sch. 80 PVC) Buried	1065	ft	20.00	21,300				21.00	22,365					43,665
				12" Gate Valve	2	ea	6,625.00	13,250				250.00	500					13,750
				12" Flow Meter	1	ea	8,000.00	8,000				4,500.00	4,500					12,500
				Meter Valve Box	1	EA	3,000.00	3,000				2,000.00	2,000					5,000
				Distribution Box Connection	1	ls	500.00	500				1,000.00	1,000					1,500
				SFF Denitrification System														
				SFF Modules	8	ea	59,062.50	472,500				5,906.25	47,250					519,750
				Mixers	2	ea	35,000.00	70,000				5,250.00	10,500					80,500
				Control Panel	1	ea	20,000.00	20,000				4,000.00	4,000					24,000
				Air Scour Compressor	1	ea	8,500.00	8,500				4,000.00	4,000					12,500
				1.5" Air Scour Pipe (Type 304 SS -Sch 40)	200	ft	44.00	8,800				14.19	2,838					11,638
				SFF Nitrification System														
				SFF Modules	36	ea	43,388.00	1,561,968				6,508.20	234,295					1,796,263
				Nitrification Blower Building	600	sq. ft.	150.00	90,000				150.00	90,000					180,000
				Nitrification Blowers	1	ea	160,000.00	160,000				16,000.00	16,000					176,000
				10" Nit. Air Supply Pipe (Typ 304 SS sch 10) Abo	180	ft	206.91	37,244				69.96	12,593					49,837
				Electrical Work for Above	1	LS										306,880	306,880	306,880
	Grand Total																	3,375,684

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cover Wastewater System
Location: Copperopolis, CA
Estimate Type: Dissolved Air Flotation Thickener

Prepared By: JLH
Date Prepared: 22-Sep-17
K/J Proj. No. 1670021*00

	CSI Spec.						Materials		Installation					Equipment		Sub-contractor		
Area / Bldg	Division			Description	Qty	Units	$/Unit	Total	MH/ Unit	MHRS	Labor Rate	$/Unit	Total	$/Unit	Total	$/Unit	Total	Total
				Solids Pumping System														
				Pump Station	250	sq. ft.	250.00	62,500				250.00	62,500					125,000
				Centrifugal Pumps (2), 25 hp	2	ea	35,000.00	70,000				4,000.00	8,000					78,000
				6" Pipe (Sch. 80 PVC) Buried	4260	ft	20.00	85,200				21.00	89,460					174,660
				6" Isolation Valves	4	ea	4,625.00	18,500				250.00	1,000					19,500
				6" Flow Meter	1	ea	6,000.00	6,000				4,500.00	4,500					10,500
				Meter Valve Box	1	ea	2,500.00	2,500				2,000.00	2,000					4,500
				Connection to Existing WTP Drying Beds	1	ls	2,500.00	2,500				1,000.00	1,000					3,500
				Dissolved Air Flotation Thickeners (1)														
				DAF Equipment	1	ea	554,386.00	554,386				55,438.60	55,439					609,825
				Concrete slab on grade (90 by 70 ft)	97	CY	200.00	19,310				250.00	24,137					43,447
				DAF Tank Foundation	1	ea	50,000.00	50,000				5,000.00	5,000					55,000
				Influent Piping Modifications and Additions	1	ls	50,000.00	50,000				5,000.00	5,000					55,000
				Effluent Piping Modifications and Additions	1	ls	50,000.00	50,000				5,000.00	5,000					55,000
				Electrical and Instrumentation Work for Above	1	LS										123,393	123,393	123,393
Grand Total																		1,357,300

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cover Wastewater System
Location: Copperopolis, CA
Estimate Type: Recycled Water Facility

Prepared By: JLH
Date Prepared: 22-Sep-17
K/J Proj. No. 1670021*00

							Materials		Installation					Equipment		Sub-contractor		
Area / Bldg	CSI Spec. Division			Description	Qty	Units	$/Unit	Total	MH/ Unit	MHRS	Labor Rate	$/Unit	Total	$/Unit	Total	$/Unit	Total	Total
				Recycled Water Facility														
				RWF Equipment	1	ea	1,200,000.00	1,200,000				120,000.00	120,000					1,320,000
				Utilize existing slab and canopy														
				Utilize existing RWF foundation														
				Influent Piping Modifications and Additions	1	ls	25,000.00	25,000				2,500.00	2,500					27,500
				Effluent Piping Modifications and Additions	1	ls	25,000.00	25,000				2,500.00	2,500					27,500
				Electrical and Instrumentation Work for Above	1	LS										137,500	137,500	137,500
Grand Total																		1,512,500

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cover Wastewater System
Location: Copperopolis, CA
Estimate Type: Pond Expansion to 441 AF

Prepared By: JLH
Date Prepared: 22-Sep-17
K/J Proj. No. 1670021*00

							Materials		Installation					Equipment		Sub-contractor		
Area / Bldg	CSI Spec. Division			Description	Qty	Units	$/Unit	Total	MH/ Unit	MHRS	Labor Rate	$/Unit	Total	$/Unit	Total	$/Unit	Total	Total
				Pond														
				Excavation	374293	CY						2.50	935,733					935,733
				Backfill and compact lagoon berms using excava	374293	CY						5.00	1,871,467					1,871,467
				Fine Grading	1,524,000	SF						0.47	716,280					716,280
				Gravel roadway around pond 6"	18,000	SY	6.30	113,400				1.87	33,696					147,096
	Grand Total																	3,670,600

OPINION OF PROBABLE CONSTRUCTION COST **KENNEDY/JENKS CONSULTANTS**

Client: Calaveras County Water District
Project: Copper Cover Wastewater System
Location: Copperopolis, CA
Estimate Type: Expanded Pond Liner

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Date Prepared: 22-Sep-17
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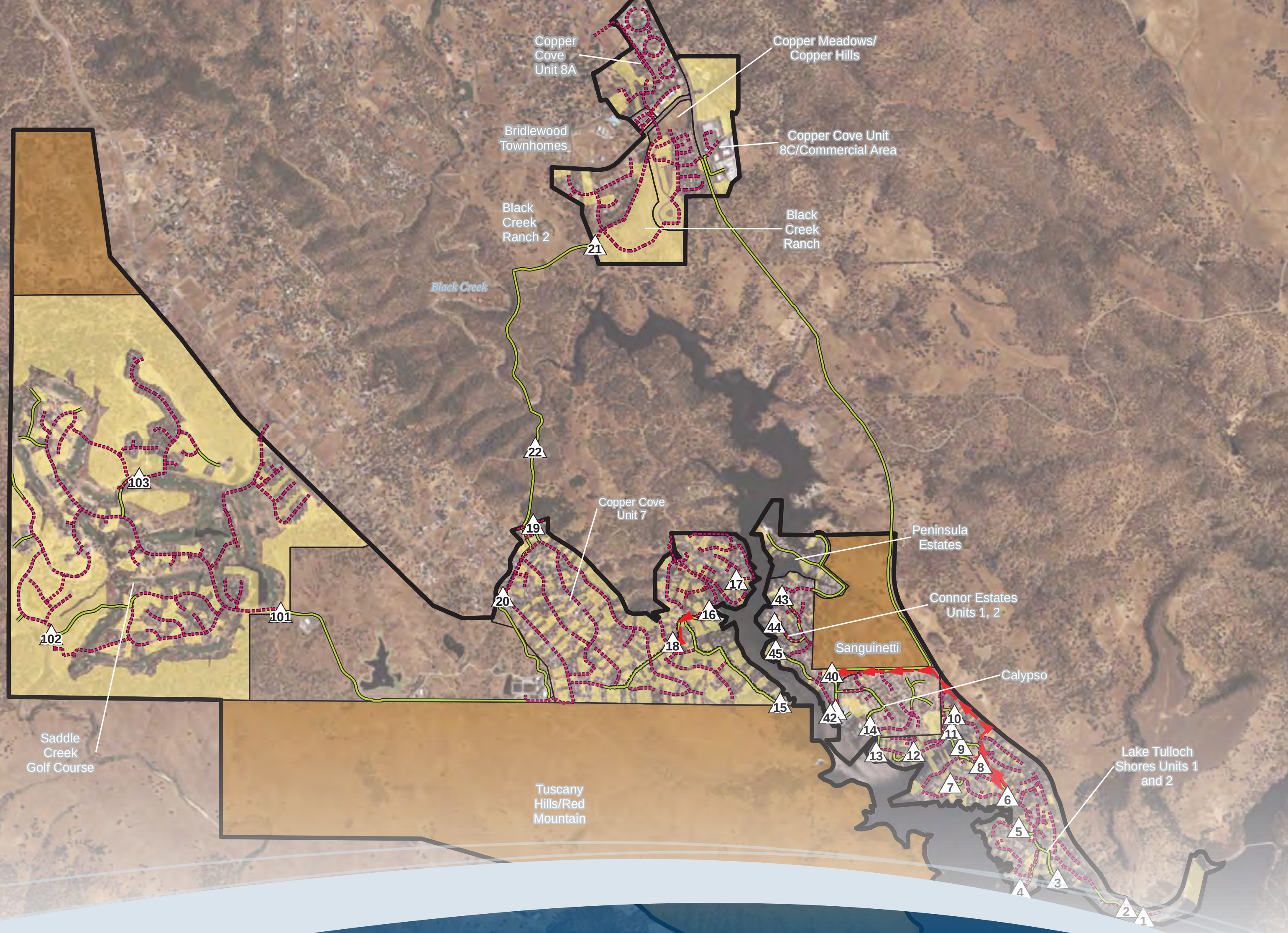
							Materials		Installation					Equipment		Sub-contractor		
Area / Bldg	CSI Spec. Division			Description	Qty	Units	$/Unit	Total	MH/ Unit	MHRS	Labor Rate	$/Unit	Total	$/Unit	Total	$/Unit	Total	Total
				Pond														
				Sand Bedding 6"	36,689	CY	20.00					5.00	183,444					183,444
				Geotextile	1,524,000	SF										0.15	228,600	228,600
				Lagoon Liner HDPE	1,524,000	SF										1.83	2,788,920	2,788,920
				Anchor Trench Excavation/ Backfill	9,000	LF						15.00	135,000					135,000
	Grand Total																	3,336,000



Kennedy/Jenks Consultants