NOTICE OF ENGINEERING COMMITTEE MEETING

Covering Design, Construction, Capital Improvement, Master Plan and other Engineering, Operational and Planning Related Matters

NOTICE IS HEREBY GIVEN that the San Lorenzo Valley Water District has called a meeting of the Engineering Committee to be held on **Tuesday, March 10, 2020 1:30 p.m.**, at the Operations Building, 13057 Highway 9, Boulder Creek, California.

AGENDA

1. Convene Meeting/Roll Call

2. Oral Communications
   This portion of the agenda is reserved for Oral Communications by the public for items which are not on the Agenda. Please understand that California law (The Brown Act) limits what the Board can do regarding issues raised during Oral Communication. No action or discussion may occur on issues outside of those already listed on today's agenda. Any person may address the Committee at this time, on any subject that lies within the jurisdiction of the District. Normally, presentations must not exceed five (5) minutes in length, and individuals may only speak once during Oral Communications. Any Director may request that the matter be placed on a future agenda or staff may be directed to provide a brief response.

3. Old Business:
   Members of the public will be given the opportunity to address each scheduled item prior to Committee action. The Chairperson of the Committee may establish a time limit for members of the public to address the Committee on agendized items.

   A. LOMPICO TANKS UPDATE
      Discussion and possible action by the Committee regarding an update from the Engineering Manager on the contracts for construction and construction management of the Lompico Tanks.

   B. LYON SLIDE PROJECT UPDATE
      Discussion and possible action by the Committee regarding the update on the RFP for an Environmental Consultant, currently being advertised.

4. New Business:
   Members of the public will be given the opportunity to address each scheduled item prior to Committee action. The Chairperson of the Committee may establish a time limit for members of the public to address the Committee on agendized items.

   A. BEAR CREEK ESTATES WASTEWATER ALTERNATIVES ANALYSIS
      Discussion and possible action by the Committee regarding the update from the Engineering Manager regarding the BCEW project.

B. PIPELINE REPLACEMENT PROJECT
Discussion and possible action by the Committee regarding the Pipeline Replacement Project.

5. Informational Material: None.

6. Adjournment

In compliance with the requirements of Title II of the American Disabilities Act of 1990, the San Lorenzo Valley Water District requires that any person in need of any type of special equipment, assistance or accommodation(s) in order to communicate at the District's Public Meeting can contact the District Office at (831) 338-2153 a minimum of 72 hours prior to the scheduled meeting.

Agenda documents, including materials related to an item on this agenda submitted to the Committee after distribution of the agenda packet, are available for public inspection and may be reviewed at the office of the District Secretary, 13060 Highway 9, Boulder Creek, CA 95006 during normal business hours. Such documents may also be available on the District website at www.slvwd.com subject to staff's ability to post the documents before the meeting.

Certification of Posting

I hereby certify that on March 6, 2020, I posted a copy of the foregoing agenda in the outside display case at the District Office, 13060 Highway 9, Boulder Creek, California, said time being at least 72 hours in advance of the meeting of the Engineering Committee of the San Lorenzo Valley Water District in compliance with California Government Code Section 54956.

Executed at Boulder Creek, California, on March 6, 2020.

_____
Holly B. Hossack, District Secretary
San Lorenzo Valley Water District

San Lorenzo Valley Water District
Bear Creek Estates Wastewater Treatment Facilities Alternative Memorandum

Date: February 20, 2020
Prepared by: Cindy Bertsch, PE and Joe Riess, PE

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1. Executive Summary

The San Lorenzo Valley Water District (District) owns and operates the Bear Creek Estates wastewater system. The system includes 1.2 miles of gravity collection sewers, two pump stations and a wastewater treatment facility (WWTF). A Notice of Violation of Wastewater Discharge Permit was issued on April 1, 2016 due to ongoing violations including insufficient nitrogen reduction since 2007 and excess flow over the permitted amount. Below are the recommended steps to start on the repair of the collection system and replacement of the treatment facility.

1. The first step is to fix the collection system so the WWTF influent is consistent in quality to facilitate future treatment facility design. To determine what needs to be fixed in the collection system we recommend implementing the collection system I&I improvements recommended in 2016 IEC Technical Memorandum 1 as follows:
    a. Perform video (CCTV) inspection between manholes 13 and 14.
    b. If there appears to be no sags in the existing pipeline between manholes 13 and 14, then replace the hundred 95 linear feet using cure in place (CIPP) technology. If there appear to be sags, then replace the pipe using open trench methods.
    c. A video (CCTV) inspection of the remainder of the collection system is recommended to identify sewers in need of rehabilitation.
    d. If further repairs are needed to the collection system
        i. Chemically grout manholes and install chimney seals.
        ii. Prepare a proposed project list based on CCTV data.
        iii. Identify funding if project list is extensive
2. While a longer-term solution is implemented for the treatment facility, we recommend implementing the recommendations in the following IEC Technical Memorandums to try to improve nitrogen removal.

    <u>2016 Memorandum 2</u>
    a. <u>Testing</u>: Conduct rigorous sampling to determine trickling filter performance. Obtain grab samples at several points in the process for key constituents.
    b. <u>Improve Process Control</u>: Verify blowers adequately sized for the height of water and sludge level above the diffusers. Maintain consistent dissolved oxygen levels. Obtain a new dissolved oxygen meter.
    c. <u>Alkalinity Addition</u>: Procure and install alkalinity feed system. Trickling filter performance should be independently verified prior to implementing feed system.

    <u>2018 Memorandum</u>
    a. Improve the microbiological population in the second stage trickling filter
    b. District could seed the second stage filter with wastewater from Tank 1. The District could slug feed wastewater from Tank 1 to trickling filter 3 while keeping adequate dissolved oxygen.
    c. Improve the mass of food or BOD in the second stage trickling filter.
3. Continue discussions with the County to determine what they need before they would take over operating the treatment facility and collection system.
4. To implement a longer-term solution for the treatment facility, we recommend hiring a consultant to assist with procuring outside funding for the design and construction of a new WWTF to replace the existing WWTF. A description of the steps required to replace the treatment facility and potential timeline for these steps are listed in Table 1.

Table 1. Steps to Replace Treatment Facility

Step	Description	Timeline
1	• Identify potential funding sources for treatment plant replacement including design and construction	6 months
2	• Prepare preliminary design for selected WWTF alternative including detailed capital and O&M cost estimates for use in funding application(s) • Complete a rate study to assess what monthly rates are needed so they are sufficient to cover operating the system, paying off existing debt, and paying towards future collection system and treatment replacement needs • Complete and submit funding application, including Technical, Managerial and Financial (TMF) requirements	6 months
3	• Review of financial application by funding entity	1 year
4	• Establish new sewer rates as soon as funding is approved	-
5	• Prepare construction documents for WWTF • Coordinate with Regional Board for requirements to update Waste Discharge Requirements (e.g. preparation of Report of Waste Discharge)	8 months
6	• Construct new WWTF	1 year

2. Background and Purpose

The San Lorenzo Valley Water District (District) owns and operates the Bear Creek Estates wastewater system. The system includes 1.2 miles of gravity collection sewers, two pump stations and a wastewater treatment facility (WWTF). A Notice of Violation of Wastewater Discharge Permit was issued on April 1, 2016 due to ongoing violations including insufficient nitrogen reduction since 2007 and excess flow over the permitted amount. Several memoranda have been prepared for the District to propose solutions including the following:

- Technical Memorandum No.1 – Collection Systems Inflow and Infiltration Assessment (IEC, July 29, 2016) (2016 Memorandum 1)
- Technical Memorandum No.2 – Wastewater Treatment Plant Process Assessment (IEC, July 29, 2016) (2016 Memorandum 2)
- 2018 Bear Creek Wastewater Treatment Plant Wastewater Collection and Treatment System Improvements Report (IEC, October 2018) (2018 Memorandum)

Based on recommendations from the 2016 Memorandum 2, the District modified the WWTF to improve nitrogen removal by installing a blower in Clarifier 1 in 2017. The additional dissolved oxygen did not improve the nitrogen removal per the 2018 Memorandum.

The improvements recommended in previous memorandums that have not been implemented are summarized below:

<u>2016 Memorandum 2 Recommendations</u>

- <u>Testing</u>: Conduct rigorous sampling to determine trickling filter performance. Obtain grab samples at several points in the process for key constituents.
- <u>Improve Process Control</u>: Verify blowers adequately sized for the height of water and sludge level above the diffusers. Maintain consistent dissolved oxygen levels. Obtain a new dissolved oxygen meter.
- <u>Alkalinity Addition</u>: Procure and install alkalinity feed system. Trickling filter performance should be independently verified prior to implementing feed system.

<u>2018 Memorandum Recommendations</u>

- Improve the microbiological population in the second stage trickling filter
- District could seed the second stage filter with wastewater from Tank 1. The District could slug feed wastewater from Tank 1 to trickling filter 3 while keeping adequate dissolved oxygen.
- Improve the mass of food or BOD in the second stage trickling filter.

The purpose of this project is to analyze wastewater treatment alternatives to determine how to best comply with the California Regional Water Quality Control Board's (Regional Board) Waste Discharge Requirements Order No. 00-043 for nitrogen. Per the permit, nitrogen must be reduced by 50% compared to the influent nitrogen, and nitrate (as NO_3) in groundwater samples taken from the monitoring wells around the effluent leachfield may not exceed a maximum contaminant level of 45 mg/L.

The collection system inflow and infiltration issue is being addressed as part of a separate effort by the District. The collection system improvements recommended in the 2016 Memorandum 1 should be implemented to reduce the amount of infiltration and inflow (I&I) entering the system and reduce peak

flows to the WWTF. Limiting I&I is important because large amounts of stormwater would change the temperature of the influent wastewater and reduce the concentration of food for the biological process. Both of these influent changes would detrimentally affect treatment. Additionally, reducing I&I would reduce the capacity required for any new treatment equipment. For the purposes of this report, it is assumed that the peak flow to the WWTF will not exceed the permitted limit of 32,500 gallons per day (gpd).

3. Project Location

The Bear Creek Estates subdivision was first developed between 1963 and 1965, and later expanded in 1975. A private developer constructed the District's wastewater collection system and septic disposal system in 1985. The Wastewater System was acquired by the District when the development requested annexation into the District's water system. The WWTF serves 56 parcels in the Bear Creek Estates neighborhood. The area is assumed to be built out because the Santa Cruz County unincorporated area is projected to have slow growth over the next fifteen years.

The parcels served by the WWTF are shown in Figure 1. The existing WWTF is located off Bear Creek Road in Boulder Creek as shown in Figure 2. There are no nearby wastewater treatment facilities in neighboring jurisdictions.

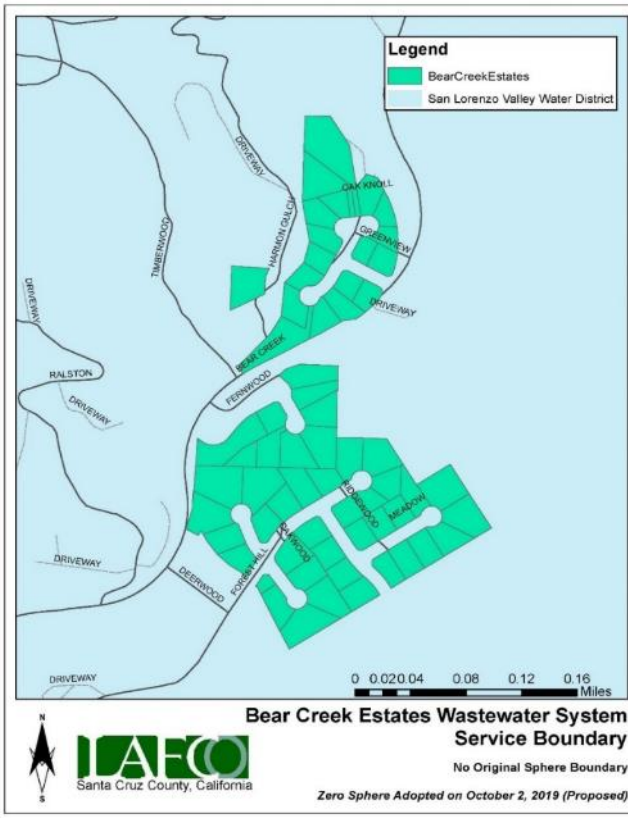

Figure 1. Bear Creek Estates Parcels

Figure 2. Project Location

4. Treatment System Problem Description and Assumptions

Treatment Goal: A robust treatment system to reduce the influent nitrogen by at least 50 percent. The groundwater nitrate in the leachfield cannot exceed 45 mg/L. Total nitrogen is defined as the sum of Total Kjeldahl Nitrogen (TKN= ammonia +organic nitrogen) and nitrate/nitrite.

Previous Treatment Methods: Originally the treatment plant consisted of a package Smith and Loveless activated sludge system. Per District staff, the system was difficult to operate because there was not enough biological mass for treatment.

The activated sludge plant was replaced with a one-of-a-kind trickling filter using Orenco components. Similar trickling filters designed by the same company were installed at other plants in California using different designs for each one. The trickling filters designed by the original company are no longer available for purchase. Since installation, the existing trickling filter process has not met permit requirements for nitrogen reduction in the effluent.

Wet Weather Flow: The treatment system should be capable of treating the permitted peak wet weather flow rate of 32,500 gpd. The collection system I&I problem must be resolved prior to, or in conjunction with, the treatment plant improvements.

Existing Facility Infrastructure: Based on discussions with District staff, it is assumed that the existing concrete below-grade tanks are in satisfactory condition and may be reused as part of the retrofitted or new treatment system. The tanks should be inspected during final design activities to confirm this assumption.

Effluent Disposal Method: It is assumed that the existing leach field is in satisfactory condition and treated effluent will continue to be sent to the leach field.

Future Permit Requirements: The treatment system effluent should be able to meet future permit requirements. Currently, the Regional Board does not anticipate the permit requirements changing within the next permit renewal cycle.

Wastewater Rates: Since 2019, rates have increased each year by 20% and will continue to do so through at least 2021. In 2020 and 2021 monthly rates per connection are $214.56 and $257.47, respectively. Per LAFCO's report, the Bear Creek Estates monthly wastewater fees are the highest in Santa Cruz County.

Disadvantaged Unincorporated Community: In 2017, the California statewide median household income was $67,169[1], and 80% of that was $53,735. Based on the criteria set forth by SB 244, LAFCO's analysis indicates that there are no areas in the Bear Creek Estates Wastewater System designated as a disadvantaged unincorporated community.

Potential Regional Board Fines: The Regional Board has not issued any monetary fines against the District to date for permit non-compliance. It is up to the Regional Board's discretion if fines will be applied and could be thousands of dollars per day for being out of compliance with permit. These assessed fines may not be used to retrofit or replace the system and would be an additional cost to the District. Therefore, it is highly recommended that the District select a treatment alternative and address the I&I problems in the collection system in a timely fashion to move towards full compliance.

[1] 2013-2017 American Community Survey 5-year Estimates as stated in LAFCO report

5. Treatment Alternatives

Several potential wastewater treatment alternatives are discussed in this section.

5.1. Alternative 1- Retrofit Existing System

The existing treatment system was evaluated to determine if it is cost effective to modify it or if it needs replacement to meet the permit requirements. The facility is currently being operated in the following manner: The first of two original septic tanks (Tank 1) provides primary settling of solids. The second tank (Tank 2) is located below the first pair of trickling filters (Trickling Filter 1). The Tank 1 effluent flows to Tank 2 where a pump conveys the primary effluent to the top of two polyethylene trickling filter tanks. The wastewater flows down through the filter media which is randomly packed media (BioPac SF-30 manufactured by Jaeger USA). Wastewater from the trickling filter flows in a discharge pipe to Tank 3 where blowers add dissolved oxygen into the water during (currently only during daylight hours due to noise concerns). The wastewater flows by gravity to Tank 4 and flow is split to the recirculation splitter valve located in Tank 2 and to the Effluent Tank. From the Effluent Tank the water is pumped to the leach field.

5.1.1. Existing System Model

The treatment system was modeled as it currently configured and operated using BioWin, a wastewater treatment process simulator that uses biological, chemical, and physical process models. The treatment plant model is shown in Figure 3.

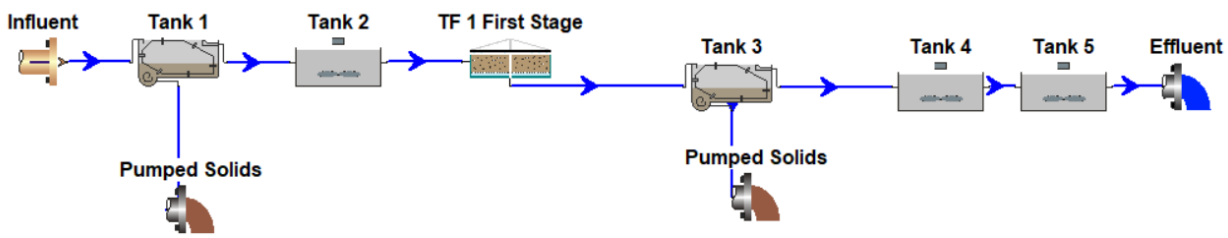

Figure 3. Model Representation of WWTF

5.1.1.1. Modeled Influent

The model was modified until the modeled effluent values matched the observed WWTF effluent data listed in 2016 Memorandum 2 Table 1A for 2013-2014 the as follows.

Total Suspended Solids (TSS). Significant amounts of TSS are removed in the treatment process. Per the data in Table 1A, there is approximately 91% removal. Per the 2018 Memorandum, there is an average removal of 80%.

Biological Oxygen Demand (BOD). Significant amounts of BOD are removed in the treatment process. Per the data in Table 1A, there is approximately 94% removal. Per the 2018 Memorandum, there is an average removal of 80%.

Total Nitrogen. Some total nitrogen is removed, but a significant amount is not removed. This is likely due to organic nitrogen in the solids that settle out in the tanks. Per the data in Table 1A, there is approximately 32% removal. Per the 2018 Memorandum, there is an average removal of 20%.

Ammonia/Nitrate. Minimal reduction in ammonia and nitrate occurs. It appears that nitrification, the process of converting ammonia to nitrate, is not occurring. Per the data in Table 1A, there is approximately 10% removal of ammonia and nitrate increased.

5.1.1.2. Modeled Treatment Units

The removal of influent constituents by treatment unit is discussed below.

Trickling Filter. Nutrient removal typically occurs in the biological treatment part of the treatment plant such as the trickling filter. The existing trickling filter is a one-of-a-kind design that is different than a conventional trickling filter design. For example, tricking filters usually have vented (passive or active) underdrains combined with a top vent to be able to circulate air the entire trickling filter system to facilitate nutrient removal. The existing trickling filter has a small top vent, but no underdrain. Therefore, the trickling filter was modeled assuming the natural decay of air coming from the top vent through the top, middle, and bottom sections of the filter. The air flow of the trickling filter was set at a constant 0.5 cubic feet per minute of air in the top filter third. The BioWin model modeled the gas-liquid mass transfer in all three filter sections and calculated the dissolved oxygen in all three sections.

Tanks. To match the observed significant removal of TSS and BOD, but not Total Nitrogen, the model was modified to remove influent solids in Tank 1 before the trickling filter. Additionally, some solids were settled after the trickling filter to remove the biomass created in the trickling filter that sloughs off from the filter. At the facility design flow rate of 12,000 gallons per day (gpd), the hydraulic residence time in Tank 1 is approximately 32 hours, which allows time for settlement of solids. Per the District, Tank 1 solids are pumped out approximately twice a year at 15,000 gallons during each cleaning. The other WWTF tanks are pumped periodically after visual inspections approximately every two years. For modeling purposes, the solids were assumed to be wasted from the tanks daily.

5.1.2. Model Modifications to Improve Nitrogen Removal

More nutrient removal needs to occur in the trickling filter to be able to remove nitrogen. Dissolved oxygen in all three sections of the trickling filter media appears to be limiting the amount of nitrogen removal that occurs in the trickling filter. The air flow of the trickling filter was increased to provide a constant 50 cubic feet per minute of air in the top filter third. The BioWin model modeled the gas-liquid mass transfer in all three filter sections and the calculated the dissolved oxygen for all three sections. The trickling filter model was also modified by assuming 75% effective area instead of 50% effective area for the trickling filter media to provide more room for the biomass to grow.

5.1.3. Model Summary

It appears that the existing treatment facility could be modified to ensure that there is enough dissolved oxygen throughout the entire depth of the trickling filter. Before making plant modifications, the dissolved oxygen of the trickling filter influent and effluent should be sampled before it intermixes with Tank 3 water to confirm if oxygen is making it throughout the entire trickling filter section. Modifications to increase dissolved oxygen throughout the trickling filter would include the following:

- Remove the filter media
- Install filter underdrains
- Install new media
- Add convective or forced air ventilation through the trickling filter

5.1.4. Potential Next Steps

The below potential efforts and improvements must be completed in the same timeframe because they are dependent on each other for the project to succeed.

WWTF Improvements: Multiple WWTF improvement alternatives have been recommended for the existing trickling filters in this study and previous studies noted above. Implementing these alternatives using a contract operator familiar with these (or similar) trickling filters systems would give the best chance for the existing system to meet permit at a relatively low cost. One of the initial recommendations to try is a more detailed assessment of the condition of the trickling filters by the contract operator implementing a rigorous sampling program.

The operator would provide daily hands-on adjustments to the WWTF over a period of several months to a year. After modification, the trickling filters would need frequent monitoring and adjustment to ensure staying in compliance. Key parameters include adequate dissolved oxygen, balance of solids, efficient recirculation rate, and making sure the biological growth is not killed off by improper operation or toxic chemicals in the influent. The results of the WWTF modifications may take up to 4 to 6 months to become evident. It should be noted that there is a potential that the system may not be consistently in compliance with the permit for nitrogen removal even after these efforts. This is based on analyzing several years of sampling data from a similar treatment plant that is much newer and has been operated by two different contract operators familiar with these types of systems.

Sampling: The nitrogen levels in the influent vary diurnally. Therefore, a composite sample for both the influent and effluent nitrogen samples is recommended. Water would be collected at different times of the day and combined into one sample to improve the representativeness of the sample.

Collection System: In addition to the trickling filter modification, this alternative requires fixing the collection system.

5.2. Alternative 2 - Replace Existing System

Parts of the existing plant have been in service since 1985 and may be nearing the end of useful life. The existing plant has also been retrofitted several times to resolve treatment issues which leads to treatment inefficiencies. Therefore, replacing the treatment plant with a new package treatment plant was analyzed. Existing concrete tanks that are in good condition may be utilized where feasible to reduce overall project costs. There are many different types and manufacturers of package plants. Several different levels of treatment and treatment methods were considered, as described below. Treatment alternatives are listed in order of lower levels of treatment to higher levels of treatment.

5.2.1. Undisinfected Enhanced Primary Treatment: Packed Bed Filter

Figure 4. AdvanTex Packed Bed Filter (Courtesy of Orenco Systems)

Undisinfected enhanced primary treatment is similar to the level of treatment currently in practice. Orenco Systems offers the AdvanTex system which is a recirculating packed-bed filter. The District has a significant investment in tankage and equipment at the treatment plant. Assuming the existing concrete tanks are in good condition, they may be reused as concrete is a major component of the cost for new facilities. The packed bed filter system uses a biofilm grown on a cloth material to remove nutrients. The lower loading rate for this system compared to the existing trickling filter allows for a thin biofilm to be grown that will not be sloughed off. The system can reportedly achieve 60% total nitrogen removal in optimal conditions. An example installation this shown in Figure 4. The tanks can either be fully buried as shown above, or partially buried.

Under this alternative, the filters are sized for a flowrate of 32,500 gpd for the peak wet weather flow to be equivalent to the other alternatives. However, the District should confirm actual flow rates to ensure the system is not undersized or oversized. Wastewater would be pumped from the collection system into a series of tanks. A fan would blow air across the media to provide ventilation. The fan uses less energy to provide air across the media than the currently used blowers.

In addition to the new treatment system, this alternative requires addressing I&I in the collection system and adding an alkalinity feed system. A contract operator is recommended to operate the facility. All of these improvements must be completed in the same timeframe, because they are dependent on each other for the project to succeed.

5.2.2. Secondary Treatment: Activated Sludge Package Plant

Secondary treatment provides a higher level treatment than primary treatment. A secondary treatment package plant was evaluated to meet current permit requirements. A package system such as the Legacy Package System would be installed partially buried at the existing treatment plant site as shown in Figure 5. The package would include a flow equalization basin, sludge holding/digester, anoxic zone, aeration zone, and hopper clarifier with all pertinent equipment such as blower, pumps, and controls.

A rock base would be required. New piping and electrical to and from the package system would also be required. Legacy would provide a performance guarantee on the process to ensure the treatment goals are met. The tanks would be made of steel. This alternative is not pursued further, because the lifespan of steel tanks is less than using concrete basins for the treatment unit.

Figure 5. Activated Sludge System Example (courtesy of Legacy Environmental Process)

5.2.3. Secondary Treatment: Sequential Extended Aeration

Another secondary treatment alternative is using a sequential extended aeration flow through process such as the AeroMod SEQUOX as shown in Figure 6. AeroMod is a plug flow activated sludge plant with no moving parts under the water and a simple control system. The system includes a 60 day aerobic digester to handle solids and minimize the solids that need to be disposed of. A building to house the blowers, controls and alkalinity feed system would be needed.

In addition to the new treatment system, this alternative requires addressing I&I in the collection system. A Grade 3 contract operator is recommended to operate the facility. All these improvements must be completed in the same timeframe, because they are dependent on each other for the project to succeed.

Figure 6. Sequential Extended Aeration (courtesy of Aero-Mod)

5.2.4. Secondary Treatment: Oxidation Ditch

Another secondary treatment alternative is using an oxidation ditch such as the packaged Orbal oxidation ditch plant. The oxidation ditch has simultaneous nitrification/denitrification processes using dedicated zones for specific treatment purposes. These treatment zones operate in series during the treatment process. Denitrification would occur without the need for an internal recycle pump. Other secondary treatment alternatives had lower capital costs. Therefore, this secondary treatment alternative is not considered further.

5.2.5. Secondary Treatment: Sequencing Batch Reactor (SBR)

The SBR is similar to the activated sludge plant except it is a fill-and draw activated sludge system. Wastewater is added to a "batch" reactor, aerated, allowed to settle, and then discharged. There may be one or more reactors for the wastewater to be added to while treatment is being performed. The basins would be constructed out of concrete to improve facility longevity and may be partially buried as shown in the example installation in Figure 7. A building to house the blowers and controls and alkalinity feed system would be needed.

Figure 7. AquaSBR Sequencing Batch Reactor in Concrete Basins (Courtesy of Aqua Aerobics)

The solids generated by the biological process would be aerobically digested to minimize the solids that would need to be disposed of.

In addition to the new treatment system, this alternative requires addressing the I&I in the collection system. A Grade 3 contract operator is recommended to operate the facility. All of these improvements must be completed in the same timeframe, because they are dependent on each other for the project to succeed.

5.2.6. Secondary Treatment: Granular Sludge Reactor

Another secondary treatment alternative is using a granular sludge reactor plant such as Aqua Aerobic's AquaNereda® process. Based on the unique characteristics of granular biomass, the AquaNereda® Aerobic Granular Sludge Technology uses an optimized batch cycle structure. The three main phases of the cycle include Fill/Draw, React, and Settling. Other secondary treatment alternatives had lower capital costs. Therefore, this secondary treatment alternative is not considered further.

5.2.7. Tertiary Treatment: Membrane Bioreactor (MBR)

A MBR plant offers tertiary level treatment in a small footprint as shown in Figure 8. Although the discharge permit does not require tertiary filtration, a MBR would provide the District peace of mind of being able to reliably meet the current permit and future permit requirements. However, the higher level of treatment is not currently practical as there are no nearby uses for recycled water such as a golf course or park. A building to house the blowers and controls and alkalinity feed system would be needed. Additional prescreening is required before the membranes as a requirement to maintain the membrane warranty.

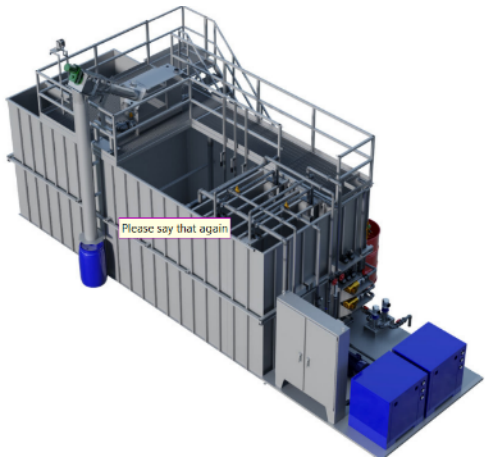

Figure 8. Packaged Membrane Bioreactor (Courtesy of Cloacina, LLC)

MBRs also require more chemicals and periodic membrane replacement (approx. 7-10 years) plus necessary spare parts to continue operating compared to the secondary alternatives described above. Some MBR manufacturers will provide a lease to own agreement for their equipment.

However, at a $40,000 per month rental fee, renting the equipment is not feasible with the current rate schedule.

In addition to the new treatment system, this alternative requires addressing the I&I in the collection system and adding an alkalinity feed system. A Grade 3 contract operator is recommended to operate the facility. All of these improvements must be completed in the same timeframe, because they are dependent on each other for the project to succeed.

5.3. Alternative 3 - Implement Individual Septic System

5.3.1. Individual Septic and Disposal System

Per discussions with Santa Cruz County Environmental Health there is a minimum 1 acre lot size to build a septic system with leach field on each parcel in the Bear Creek Estates area (Santa Cruz County code Section 7.38.045). The lot sizes are all smaller than 1 acre. Therefore, individual septic tanks may be constructed at each parcel, but disposal may not occur at a parcel level. Using individual septic tanks with their own disposal system is not considered further, because it is not feasible.

5.3.2. Individual Septic and Community Treatment Disposal

Individual septic tanks may be placed on each parcel and pumped into a liquid only sewer system such as the Orenco System's Delos system as shown in Figure 9. The tank with a pump is approximately $15,000 per parcel. A pressurized sewer system with small diameter piping (e.g. 2" or 3") to the existing WWTP would be an additional cost. An advantage of installing a new collection system is it would address the I&I issues. A disadvantage is each homeowner would be responsible for maintaining the individual septic tank unless the District took ownership of maintaining each tank. The tanks could be monitored remotely by the District for how much water is being conveyed to the tank and the status of each tank. Monitoring the flow into each tank would be useful in reducing the total amount of wastewater, because illegal drain connections would become evident. With the recent Public Safety Power Shutoffs (PSPS), a backup power source would be needed at each tank to be able to maintain sewer service.

Figure 9. Delos System

(From Orenco Systems)

Treatment with nitrogen removal would still be necessary at a central treatment plant, as described in the above alternatives. Treatment under this alternative would be challenging because much of the food necessary for the microorganisms for nitrogen removal would have been removed at septic tanks. The treatment plant alternatives are the same as discussed in Alternative 2. Due to the high cost and impact to landowners, this alternative is not considered further in this study.

5.3.3. Individual Septic and Hauling

Wastewater may be pumped from each individual septic tank to a centralized location and hauled daily to a wastewater treatment facility. The disposal cost includes both the cost to haul the wastewater as well as the cost the facility charges to process the wastewater as discussed below.

Storage: Large storage tanks would be required to store wastewater between trips. If the existing treatment plant tanks are used, then the collection system would need to be repaired to minimize I&I. A contingency plan would also be required for when Bear Creek Road closes due to damage from winter storms.

Hauling: The District pays approximately $625 to haul 3,500 gallons. Therefore, it would be more cost-effective for the District to acquire their own truck under this alternative. A 5,500 gallon septage hauling truck would be approximately $185,000 per a quote provided by Robinson Vacuum Tanks.

Staffing: The wages of the staff person to collect and transport the wastewater to the wastewater treatment plant for disposal need to be accounted for.

Disposal: Initial discussions with the City of Santa Cruz Wastewater Treatment Plant indicated that they would be willing to take the waste at a disposal cost of approximately $100 per 1,000 gallons. Therefore, 10,000 gallons would be $1,000/day for just the treatment plant charges.

The cost to haul water is attractive in the short-term but far exceeds the cost of constructing a new treatment facility or retrofitting the existing facility. Therefore, this alternative is not considered further in the study.

5.4. Alternative 4 - Consolidation

The Local Agency Formation Commission (LAFCO) of Santa Cruz County prepared a draft Comprehensive Sanitation Service and Sphere Review (LAFCO report) in October 2019. The report stated that several sanitation districts, including the Bear Creek Estates Wastewater System, have expressed interest in transferring sewer responsibilities to another agency due to funding issues, limited long-term planning, or lack of economies of scale. Establishment of a countywide memorandum of understanding or a joint powers authority may unify the already-established collaboration set by the sanitation providers in the county. Such agreements may also lay the foundation for future changes of organization, including but not limited to annexations, consolidations, or mergers.

Improvements to the collection system and treatment plant would still be required. Currently, there are no immediate plans for consolidation and this alternative is not considered further.

5.5. Alternative Comparison

The similarities and differences between the treatment methods are discussed in this section.

5.5.1. Treatment Facility Site Layout

The western side of the existing treatment facility area has a flat area that most of the treatment systems described above would fit in without affecting the existing treatment as shown in Figure 10. The fence may need to be relocated slightly to give a larger area for pretreatment processes. The large tanks required for the packed bed filter would likely require removing some of the existing treatment system to facilitate constructing the new facilities.

Figure 10. Treatment Facility Site Layout

5.5.2. Treatment Alternative Similarities

Pretreatment: The existing septic tank may be used to settle out solids and other items like rags that may be problematic for the treatment process. Per the District, the existing treatment facility has not had a problem with ragging or disposable wipes and therefore, only a bar screen would be recommended to remove large solids.

Biological Nutrient Removal Process: The treatment alternatives are all using microorganisms in a biological process to remove nitrogen. Therefore, all the treatment systems are susceptible to upset and lack of performance if illegal dumping occurs in the sewer. For example, other plants have lost their treatment biomass when someone dumped weed killer or large amounts of bleach into the sewer. In the proposed alternatives, only one treatment train is provided to minimize cost, so there is no redundancy if the treatment train has an upset. Monitoring of the influent at the first tank could be added to potentially discover problems before the microorganisms are killed. Monitoring could include pH or oxidation reduction potential (ORP).

Alkalinity Addition: For the biological processes to occur, the pH needs to be within a certain range. The nitrification process decreases the pH of the water if the water does not have a good buffering capacity.

The influent wastewater has an alkalinity of 140 mg/L to 150 mg/L per the 2016 Memorandum 2. Therefore, there is not much buffering capacity and chemical addition would likely be necessary to maintain the pH within reasonable bounds. The alkalinity typically needs to be 7.14 times the influent ammonia to be able to remove ammonia. Assuming an average influent ammonia concentration of 35 mg/L per the 2016 report, then an alkalinity of around 250 mg/L is recommended. As recommended in the 2016 memorandum, a soda ash feed system may be added to add alkalinity to the influent wastewater.

Performance Guarantee: Some manufacturers offer a performance guarantee that their package system complies with permit requirements.

District Ownership: The alternative chosen by the District needs be something that they take ownership of to make it succeed because all alternatives will require on-going maintenance. Some systems could be provided with remote monitoring capability if internet was available at the WWTF to be able to receive assistance from the manufacturer or remote contract operators.

Operations and Maintenance (O&M): An operator is recommended to operate the plant whether it is the existing plant or a new plant since they have the knowledge and training to keep the plant within compliance over varying conditions. Contract operations companies, if used, often have backup staffing in case the lead operator is unavailable. To minimize operational costs, the contract operator may physically come to the site every other week with day-to-day monitoring performed by District staff.

Solids Disposal: All alternatives require periodic solids removal and disposal from the primary settling tank and solids generated from the biological process. The solids will be disposed of as they currently are by using a septage hauler to pump out the tanks and dispose of the solids at the Santa Cruz Wastewater Treatment Plant. Per the District, it is approximately $625 per 3,500 gallons for hauling and disposal.

Collection System Improvements: All alternatives require the collection system to be improved to reduce the I&I. The collection system improvements need to occur in the same timeframe as the treatment improvements for the treatment improvements to succeed.

Monitoring Requirements: Influent and effluent monitoring requirements will likely stay the same as required in WDR 00-043 and listed in Table 2. An operator would need to take grab samples at least twice a month for the WWTF influent and effluent. Other samples will be required for the septic tanks, leach field, Bear Creek and groundwater.

Table 2. Influent and Effluent Grab Sample Monitoring Requirements

Constituent	Influent Frequency	Effluent Frequency
BOD	Monthly	Monthly
pH	Monthly	Monthly
Organic Nitrogen	Twice per Month	
Nitrate	Twice per Month	Twice per Month
Nitrite	Twice per Month	Twice per Month
Ammonia	Twice per Month	Twice per Month
Total Dissolved Solids	Quarterly	Quarterly
Total Suspended Solids	Quarterly	Quarterly
Sodium	-	Quarterly
Chloride	-	Quarterly

A comparison of the alternatives is listed in Table 3.

Table 3. Alternative Comparison

	Modify Existing WWTF	Liquid Only Sewer System and Packed Bed Filter	Packed Bed Filter	Activated Sludge Plant	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)
Description	Modify existing trickling filters	Delos system and recirculating packed-bed filter using cloth textile	Recirculating packed-bed filter using cloth textile	Continuous activated sludge. Clarifiers separate liquid and floc	Batch use of activated sludge. Clarifiers separate liquid and floc	Continuous activated sludge. Membranes separate liquid from floc
Level of Treatment (1)	Undisinfected Enhanced Primary	Undisinfected Enhanced Primary	Undisinfected Enhanced Primary	Undisinfected Secondary	Undisinfected Secondary	Undisinfected Tertiary
Average Flow	12,000 gpd	32,500 gpd	32,500 gpd	12,000 gpd	12,000 gpd	12,000 gpd
Peak Flow (2)	32,500 gpd	32,500 gpd	32,500 gpd	32,500 gpd	32,500 gpd	32,500 gpd
Operator License Requirements	No need for licensed operator	Anyone can be certified by Orenco distributor	Anyone can be certified by Orenco distributor	Need Grade 3 licensed operator	Need Grade 3 licensed operator	Need Grade 3 licensed operator
Ease of Operations/ Operational Flexibility	Can adjust alkalinity, recirculation rate, and timing of blowers	Can adjust alkalinity	Can adjust alkalinity	Can adjust alkalinity, solids wasting rate, recirculation rate	Can adjust alkalinity, solids wasting rate, recirculation rate	Can adjust alkalinity, solids wasting rate, recirculation rate
Ease of Troubleshooting	-	With internet, remote connection	With internet, remote connection	With internet, remote connection	With internet, remote connection	With internet, remote connection
Solids production	Solids would need to be hauled off	Fixed biofilm, minimal solids production	Fixed biofilm, minimal solids production	Solids aerobically digested with some haul off	Solids aerobically digested with some haul off	Solids would need to be hauled off
Footprint	-	Two 10.5' x 35' tanks, one 10.5 x 28' tank (both in-ground) and one 10'x12' building	Two 10.5' x 35' tanks, one 10.5 x 28' tank (both in-ground) and one 10'x12' building	18.5' x 23' tank (in-ground) plus 10' x 12' building	8' x 5' tank, 12' x 16' tank (both in-ground) plus 10' x 12' building	21.5' x 10' packaged system on slab plus 10' x 12' building
Construction Costs:						
Treatment Equipment Cost Incl. Basins	$50,000	$469,000	$516,296	$461,000	$410,000	$505,000
Collection System Cost (3)	-	$1,398,000	-	-	-	-
Building Cost ($200/sf)	-	$24,000	$24,000	$24,000	$24,000	$24,000
Ancillary Equipment (5% of Equip.)	-	$23,500	$25,800	$23,100	$20,500	$25,300
Site Work	-	$20,000	$20,000	$20,000	$20,000	$10,000
Construction Labor (50% of Materials)	-	$256,300	$281,000	$252,100	$225,300	$270,200
Construction Hard Cost Subtotal	***$50,000***	***$2,190,800***	***$867,096***	***$780,200***	***$699,800***	***$834,500***
Design Contingency (30%)	$0	$657,240	$260,129	$234,060	$209,940	$250,350
Subtotal	***$50,000***	***$2,848,040***	***$1,127,225***	***$1,014,260***	***$909,740***	***$1,084,850***
Contractor General, Mob, Overhead & Profit (15%)	$7,500	$427,206	$169,084	$152,139	$136,461	$162,728
Gen. Cond, Bonds, Insurance & Taxes (4%)	$2,000	$113,922	$45,089	$40,570	$36,390	$43,394
Probable Construction Cost	***$59,500***	***$3,389,168***	***$1,341,398***	***$1,206,969***	***$1,082,591***	***$1,290,972***
Construction Contingency (10%)	$0	$338,917	$134,140	$120,697	$108,259	$129,097
Design & SDC Cost (12% of Construction)	$7,100	$406,700	$161,000	$144,800	$129,900	$154,900
Project Total Cost (2020 USD) (5)	**$67,000**	**$4,135,000**	**$1,637,000**	**$1,472,000**	**$1,321,000**	**$1,575,000**
Project Cost per Unit (Total/ 56 units)	$1,000	$74,000	$29,000	$26,000	$24,000	$28,000

	Modify Existing WWTF	Liquid Only Sewer System and Packed Bed Filter	Packed Bed Filter	Activated Sludge Plant	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)
Interest	-	6%	6%	6%	6%	6%
Loan Term, years	-	20	20	20	20	20
Monthly Loan Payment	-	$29,620	$11,730	$10,550	$9,460	$11,280
Monthly Loan Payment per Unit	-	$529	$209	$188	$169	$201
Annual Cost	$231,800	$575,800	$361,200	$349,800	$336,700	$373,100
Monthly Cost per Unit	**$345**	**$857**	**$538**	**$521**	**$501**	**$555**
Treatment Plant Net Present Value for 20 Years of Operation (6)	$2,955,700	$11,310,700	$6,138,400	$5,831,300	$5,517,000	$6,224,700
Grant Funding Scenario:						
Assumed Grant % for Design and Construction	n/a	100%	100%	100%	100%	100%
Monthly Loan Cost per Unit w/Grant Funding	n/a	$0	$0	$0	$0	$0
Monthly Cost per Unit w/Grant	**n/a**	**$328**	**$328**	**$332**	**$332**	**$354**
Prevalence	One-of-kind design	Common at individual house level	Common at individual house level	Many different packages being used throughout California	Not common. Frequently being replaced by MBRs.	Common at many facilities such as golf courses and state parks
Example Manufacturers	-	Orenco AdvanTex	Orenco AdvanTex	AeroMod	Parkson, Aqua-Aerobic	Suez, Cloacina

Notes:

1. All treatment options assume disposal to the existing leach field. No improvements to the leachfield are included.
2. Assumes collection system will be repaired to limit incoming flow to these values prior to building new treatment.
3. Assumes 6,200 feet of pipe at $90/LF and 1 Delos unit ($15,000) per house. Does not include permitting or easements. Other alternatives will need collection system improvements, but not estimated in this report.
4. Assumes $2,500/month for 12 months.
5. Assumes project is built in 2020. Costs should be increased 3% to 5% per year for inflation of the project construction occurs in 2021 or later.
6. Assumes discount rate of 5%. Collection system will be extra cost for every option except liquid only sewer.

5.5.3. Summary

A summary of each treatment alternative is listed below and in Table 4. The new treatment plant alternatives are similar in capital cost but have varying operation and maintenance costs depending on the process.

Table 4. Summary of Necessary Improvements by Alternative

Alternative	Modify Existing WWTF	Packed Bed Filter	Activated Sludge Plant	Sequencing Batch Reactor (SBR)	Membrane Bioreactor (MBR)
Collection System Repair to Correct I&I	Necessary	Necessary	Necessary	Necessary	Necessary
Add Alkalinity Feed System	Necessary	Necessary	Necessary	Necessary	Necessary
Modify Existing WWTF	Necessary	-	-	-	-
Add New Package Plant	-	Necessary	Necessary	Necessary	Necessary
Contract Operations Assistance	Necessary	Necessary	Necessary	Necessary	Necessary

Existing Plant: Modifying the existing facility is the least expensive alternative but carries a risk of not reliably meeting nitrogen removal requirements for all influent conditions. These modifications may be pursued while seeking funding for design and construction of a new treatment plant to show the Board that progress is being made towards compliance to limit the risks of incurring fines.

Liquid Only System with Packed Bed Filter: Using a liquid only sewer system with a packed bed filter is cost prohibitive compared to other alternatives.

Packed Bed Filter: A packed bed filter provides treatment using a smaller amount of power and does not generate additional solids like the other alternatives. The recirculation system will keep the filters wet to maintain the biological growth (biofilm). However, the biological growth would be limited at lower influent flows when less nutrients are available for the microorganisms due to the large filter surface area that was sized to treat the overall peak flow rate. The filter area needed for meeting peak flow is necessary to make this alternative comparable to the other alternatives. The biofilm would increase as the nutrients increased in the influent. There are not many options for the operator to modify the process to ensure that the nitrogen is being removed for all influent conditions. However, the system is simpler to operate than secondary and tertiary treatment. A licensed wastewater treatment operator would not be required. A process guarantee is not available from the manufacturer for this alternative.

Activated Sludge. An activated sludge system is a “tried and true” treatment process that provides more options to adjust the process to ensure nitrogen is removed over the flow range and would require a licensed treatment plant operator. The extra solids generated by the biological process would be digested to limit the of solids disposal. A process guarantee is available from several manufacturers for this alternative.

SBR. The SBR has the same advantages of the activated sludge system. However, at this size of a treatment plant there are not many SBRs being installed compared to package activated sludge plants. A process guarantee is available from several manufacturers for this alternative.

MBR. The MBR has the same advantages of the activated sludge system. However, the cost of membrane replacement, spare parts, chemical use, and power usage make this alternative expensive to operate compared to other available alternatives. A process guarantee is available from several manufacturers for this alternative.

5.5.4. Annual Cost

The projected annual cost for the Bear Creek Estates wastewater collection system and treatment facility are listed in Table 5 by treatment alternative. The cost includes current District costs that will carry forward even with a new treatment facility and new treatment facility costs.

Table 5. Operation and Maintenance Cost

	Modify Existing WWTF	Liquid Only Sewer System and Packed Bed Filter	Packed Bed	Aeromod	Sequencing Batch Reactor	Membrane Bioreactor	Notes
Add'l Treatment Electrical/ Spare Parts (a)	$6,000	$6,000	$6,000	$7,000	$7,000	$21,500	Cost from treatment equipment manufacturer
Alkalinity Addition (a)	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	Cost for pH adjustment chemicals
Additional Sludge Hauling (a)	$500	$500	$500	$2,300	$2,300	$2,300	Gallons of wasted sludge multiplied by hauling cost provided by District
District Misc. Expenses (b)	$4,800	$4,800	$4,800	$4,800	$4,800	$4,800	Allocations for PROF, OP EX, MAINT., FACILITIES, GEN ADMIN. Postage
District Hourly Operator (b)	$10,000	$48,600	$48,600	$48,600	$48,600	$48,600	District hourly operator assistance
Outside Water Analysis (b)	$17,900	$17,900	$17,900	$17,900	$17,900	$17,900	Laboratory cost to do required sampling
Operating Supplies (b)	$6,900	$6,900	$6,900	$6,900	$6,900	$6,900	Supplies for collection and treatment systems
Permit Fees (b)	$8,500	$8,500	$8,500	$8,500	$8,500	$8,500	Electronic data submission fee required by permit
Utilities (b)	$3,900	$3,900	$3,900	$3,900	$3,900	$3,900	Power for collection system and treatment plant
Telephone (b)	$4,700	$4,700	$4,700	$4,700	$4,700	$4,700	Telephone for treatment facility
Professional Services (b)	$11,100	$11,100	$11,100	$11,100	$11,100	$11,100	Sludge hauling, alarm company, bank, and engineering consultants
WWTF Financing	$0	$355,440	$140,760	$126,600	$113,520	$135,360	Based on monthly payment for 20 years of project cost and 6% interest.
WWTF Capital Reserve	$42,000	$42,000	$42,000	$42,000	$42,000	$42,000	Assume reserves stays the same for all alternatives
Contract Operations (c)	$100,000	$50,000	$50,000	$50,000	$50,000	$50,000	Two contract operator visits a month and using remote monitoring
Debt/ Collection System and Leachfield Depreciation (c)	$14,000	$14,000	$14,000	$14,000	$14,000	$14,000	Pay off existing debt in 10 yrs., then will go towards collection system and leachfield depreciation
Annual Total Operations Cost	**$231,800**	**$575,800**	**$361,200**	**$349,800**	**$336,700**	**$373,100**	Sum of individual costs
Monthly O&M Cost Per Unit	**$345**	**$857**	**$538**	**$521**	**$501**	**$555**	Annual cost divided by 56 Units
Comparison to 2021 Monthly Rates	$88	$600	$281	$264	$244	$298	2021 monthly rate is $257.47
Comparison to 2021 Annual Rates	$58,780	$402,780	$188,180	$176,780	$163,680	$200,080	2021 collected rates will be $173,020

(a) Based on new treatment facility. Assumes collection system infiltration and inflow issue has been fixed.
(b) Based on 7/2018-6/2019 District budget value.
(c) Required with or without new treatment facility

5.6. Recommended Alternative

All of the secondary and tertiary treatment alternatives have a process guarantee to ensure they will remove nitrogen and meet permit requirements. The capital costs for the new treatment system will likely be financed through a combination of a loan and/or grant. However, the homeowners need to be able to afford to operate the new treatment system using the collected rates. Therefore, a secondary treatment system is recommended since it is a lower cost to operate. Specifically, the Aeromod system would offer secondary treatment that could be remotely monitored.

6. Next Steps and Schedule

Below are the recommended steps to start on the repair of the collection system and replacement of the treatment facility.

1. The first step is to fix the collection system so the WWTF influent is consistent in quality to facilitate future treatment facility design. To determine what needs to be fixed in the collection system we recommend implementing the collection system I&I improvements recommended in 2016 IEC Technical Memorandum 1 as follows:
    a. Perform video (CCTV) inspection between manholes 13 and 14.
    b. If there appears to be no sags in the existing pipeline between manholes 13 and 14, then replace the hundred 95 linear feet using cure in place (CIPP) technology. If there appear to be sags, then replace the pipe using open trench methods.
    c. A video (CCTV) inspection of the remainder of the collection system is recommended to identify sewers in need of rehabilitation.
    d. If further repairs are needed to the collection system
        i. Chemically grout manholes and install chimney seals.
        ii. Prepare a proposed project list based on CCTV data.
        iii. Identify funding if project list is extensive
2. While a longer-term solution is implemented for the treatment facility, we recommend implementing the recommendations in the following IEC Technical Memorandums to try to improve nitrogen removal.

    <u>2016 Memorandum 2 Recommendations</u>
    a. <u>Testing</u>: Conduct rigorous sampling to determine trickling filter performance. Obtain grab samples at several points in the process for key constituents.
    b. <u>Improve Process Control</u>: Verify blowers adequately sized for the height of water and sludge level above the diffusers. Maintain consistent dissolved oxygen levels. Obtain a new dissolved oxygen meter.
    c. <u>Alkalinity Addition</u>: Procure and install alkalinity feed system. Trickling filter performance should be independently verified prior to implementing feed system.

    <u>2018 Memorandum Recommendations</u>
    d. Improve the microbiological population in the second stage trickling filter
    e. District could seed the second stage filter with wastewater from Tank 1. The District could slug feed wastewater from Tank 1 to trickling filter 3 while keeping adequate dissolved oxygen.
    f. Improve the mass of food or BOD in the second stage trickling filter.
3. Continue discussions with the County to determine what they need before they would take over operating the treatment facility and collection system.
4. To implement a longer-term solution for the treatment facility, we recommend hiring a consultant to assist with procuring outside funding for the design and construction of a new WWTF to replace the existing WWTF. A description of the steps required to replace the treatment facility and potential timeline for these steps are listed in Table 6.

Table 6. Steps to Replace Treatment Facility

Step	Description	Timeline
1	• Identify potential funding sources for treatment plant replacement including design and construction	6 months
2	• Prepare preliminary design for selected WWTF alternative including detailed capital and O&M cost estimates for use in funding application(s) • Complete a rate study to assess what monthly rates are needed so they are sufficient to cover operating the system, paying off existing debt, and paying towards future collection system and treatment replacement needs • Complete and submit funding application, including Technical, Managerial and Financial (TMF) requirements	6 months
3	• Review of financial application by funding entity	1 year
4	• Establish new sewer rates as soon as funding is approved	-
5	• Prepare construction documents for WWTF • Coordinate with Regional Board for requirements to update Waste Discharge Requirements (e.g. preparation of Report of Waste Discharge)	8 months
6	• Construct new WWTF	1 year

7. References

IEC, "*Technical Memorandum No.1 – Collection Systems Inflow and Infiltration Assessment*", July 29, 2016.

IEC, "*Technical Memorandum No.2 – Wastewater Treatment Plant Process Assessment*", July 29, 2016.

IEC, "*2018 Bear Creek Wastewater Treatment Plant Wastewater Collection and Treatment System Improvements Report*", October 2018.

Local Agency Formation Commission of Santa Cruz County, "*Comprehensive Sanitation Service and Sphere Review, Administrative Draft"*, October 2, 2019.