BLUE LAKE RANCHERIA

P.O. Box 428
Blue Lake, CA 95525

Office: (707) 668-5101
Fax: (707) 668-4272

www.bluelakerancheria-nsn.gov

August 16, 2023

Blue Lake Rancheria Waste Water Treatment Facility (WWTF)

Invitation to Bid/RFP

1.1 PROJECT INFORMATION

A. Notice to Bidders: Qualified bidders are invited to submit bids for Project as described in this Document.

B. Project Identification: Blue Lake Rancheria Waste Water Treatment Facility (WWTF).
  1. Project Location: Blue Lake Rancheria, Blue Lake, CA 95525

C. Owner: Blue Lake Rancheria, 428 Chartin Road, Blue Lake, CA 95525
  1. Owner's Representative: Scott Nickerson (707) 825-1489
     snickerson@bluelakerancheria-nsn.gov
  2. Feasibility Study is available at https://bluelakerancheria-nsn.gov/rfp/.

D. Project Description: Design and Construction of an AeroMod Activated Sludge Package Plant and Leach Field in accordance with the Rinehart Engineering Feasibility Study included in this RFP. The project will be completed in two phases. **Phase One** is the Design & Engineering of the Waste Water Treatment Facility. **Phase Two** is the construction of this facility.

E. This project is: Phase One - The Design and Construction of an AeroMod Activated Sludge Package Plant. Activated sludge package plants consist of several interconnected wastewater treatment compartments constructed of non-corrosive material such as concrete or coated steel (Alternative #4 in Feasibility Study). The activated sludge process is an aerobic suspended-growth (bioreactor) process in which air is diffused into the treatment compartments in order to maintain aerobic conditions as well as continuously suspend the micro-organisms to ensure contact with the nutrients in the wastewater. Leach Fields will be installed in Zone 'B', as depicted in the Feasibility Study. Phase Two – The Construction of the Facility designed in Phase One. Please include the cost for phase one AND the estimated cost for Phase Two based on the information provided in the RFP.

F. Bid documents include the Rinehart Engineering Feasibility Study dated 4-23-2023, which dictates the desired location of the WWTF as well as the system requirements and project background.

G. Construction Contract: Bids will be received for the following Work:
  1. General Contractors (all trades) Subcontractors (all trades).

H. BID SUBMITTAL AND OPENING
  1. Proposals may be submitted electronically or hard copy form until the bid time and date.
  2. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by
  3. **Owner and delivered as follows:**

     Bid Due Date: Friday, October 13, 2023
     Bid Time: 3:00 p.m. local time.
     Location: Blue Lake Rancheria, 1 Aiyekwee Loop, Blue Lake, CA 95525
     In care of Scott Nickerson
     Bids will be opened by the BLR Tribal Committee, on Monday October 16, 2023 at 10:00 AM.

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I. TIME OF COMPLETION

1. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time.

J. BIDDERS QUALIFICATIONS

1. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. Insurance in a form acceptable to Owner will be required of the successful bidder.

K. INSTRUCTION TO BIDDERS

1. Contract documents to be provided by Blue Lake Rancheria upon award to the successful bidder.

L. PRE-BID SITE WALKDOWN

1. A Pre-Bid Site Walk down will be conducted as indicated below:

A. Meeting Date: Monday July 10, 2023.
B. Meeting Time: 10:00 a.m., local time
C. Location: Blue Lake Rancheria Tribal Office, 1 Aiyekwee Loop, Blue Lake, CA 95525.

M. Attendance:

1. Prime Bidders: Attendance at Pre-Bid Site Walk down is recommended.
2. Subcontractors: Attendance at Pre-Bid Site Walk down is recommended.

N. PRELIMINARY PROJECT SCHEDULE

A. This document, with its referenced attachments, is part of the Procurement and Contracting Requirements for Project.

O. The Preliminary project schedule is as follows:

1. Bid Documents issued to Bidders:	Wednesday August 16, 2023
2. Pre-Bid Site Walk:	Wednesday September 13, 2023
3. Bids Due:	Friday October 13, 2023
4. Award Contract:	Monday October 16, 2023
5. Design Facility:	Friday December 1, 2023
6. Begin Construction:	Monday June 3, 2024
7. Complete Construction:	Monday June 2, 2025

E CIVIL ENGINEERS 2
S RINEHART O
T ENGINEERING O
D EUREKA, CALIFORNIA 7

BLUE LAKE RANCHERIA

TRIBAL WASTEWATER TREATMENT SYSTEM FEASIBILITY STUDY

BLUE LAKE, CA

April 23, 2023

Prepared for:
Blue Lake Rancheria
Attention: Jason Ramos, M.S., D.C.
PO Box 428
Blue Lake, CA 95525-0428
(707) 668-5300
JRamos@tgc.bluelakerancheria-nsn.gov

Prepared by:
Juliette P. Bohn, Project Manager
Bret Rinehart, PE; Project Engineer
Rinehart Engineering
559 Howard Heights Rd
Eureka, CA 95503
(707) 498-3414
rinehartengineering@gmail.com

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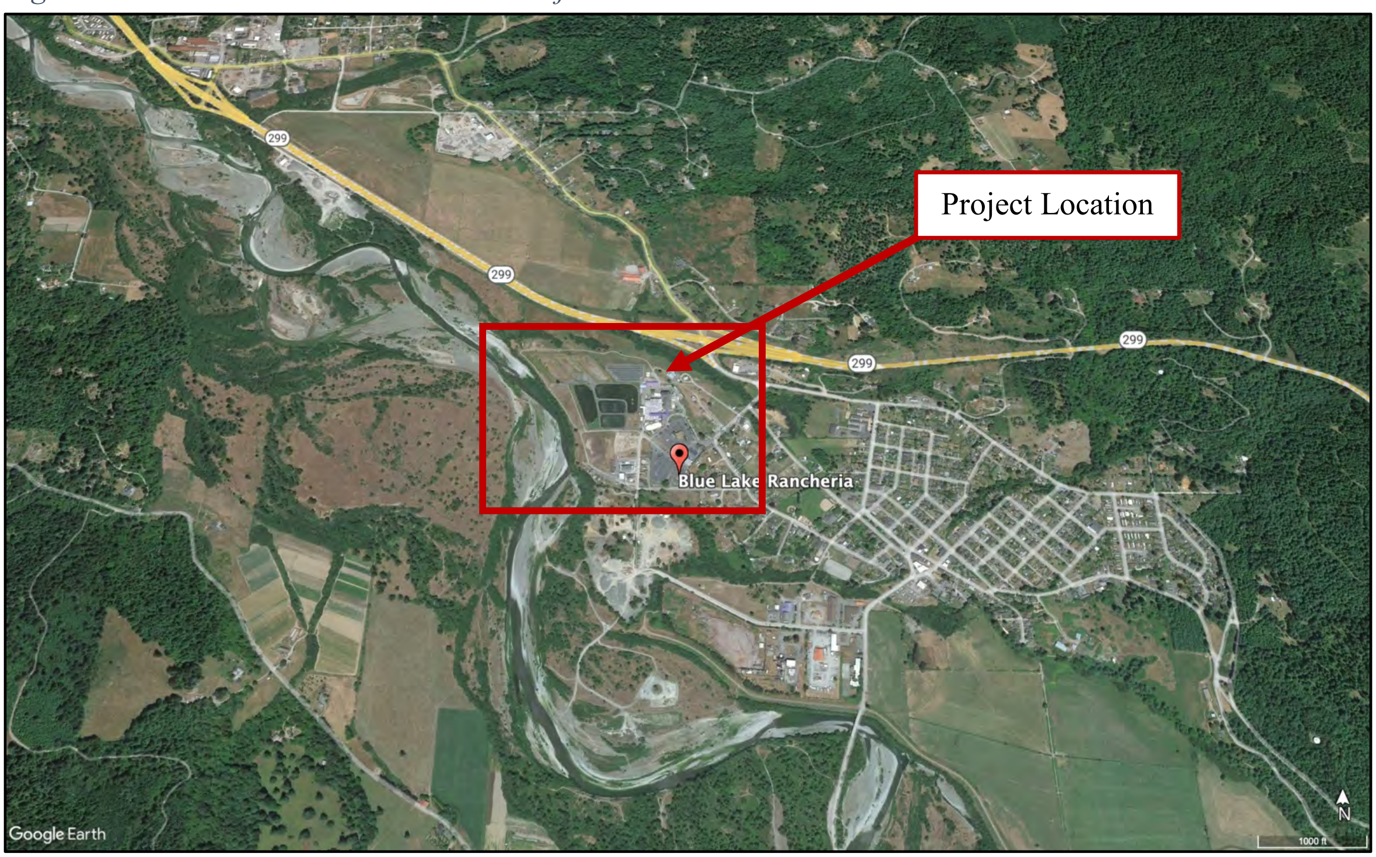
PROJECT OVERVIEW

The Blue Lake Rancheria Tribe was recently awarded a CalEPA Environmental Justice Small Grant to assess the feasibility of developing an onsite wastewater treatment facility, and gather community input. Tribal staff indicate a preference for an alternative to the current wastewater treatment strategy due to concerns over future wastewater treatment capacity and a desire to reduce the potential for pollution entering the watershed. Additionally, Tribal staff are interested in pursuing an onsite wastewater treatment system to reduce the land area required for multiple septic systems / leach fields.

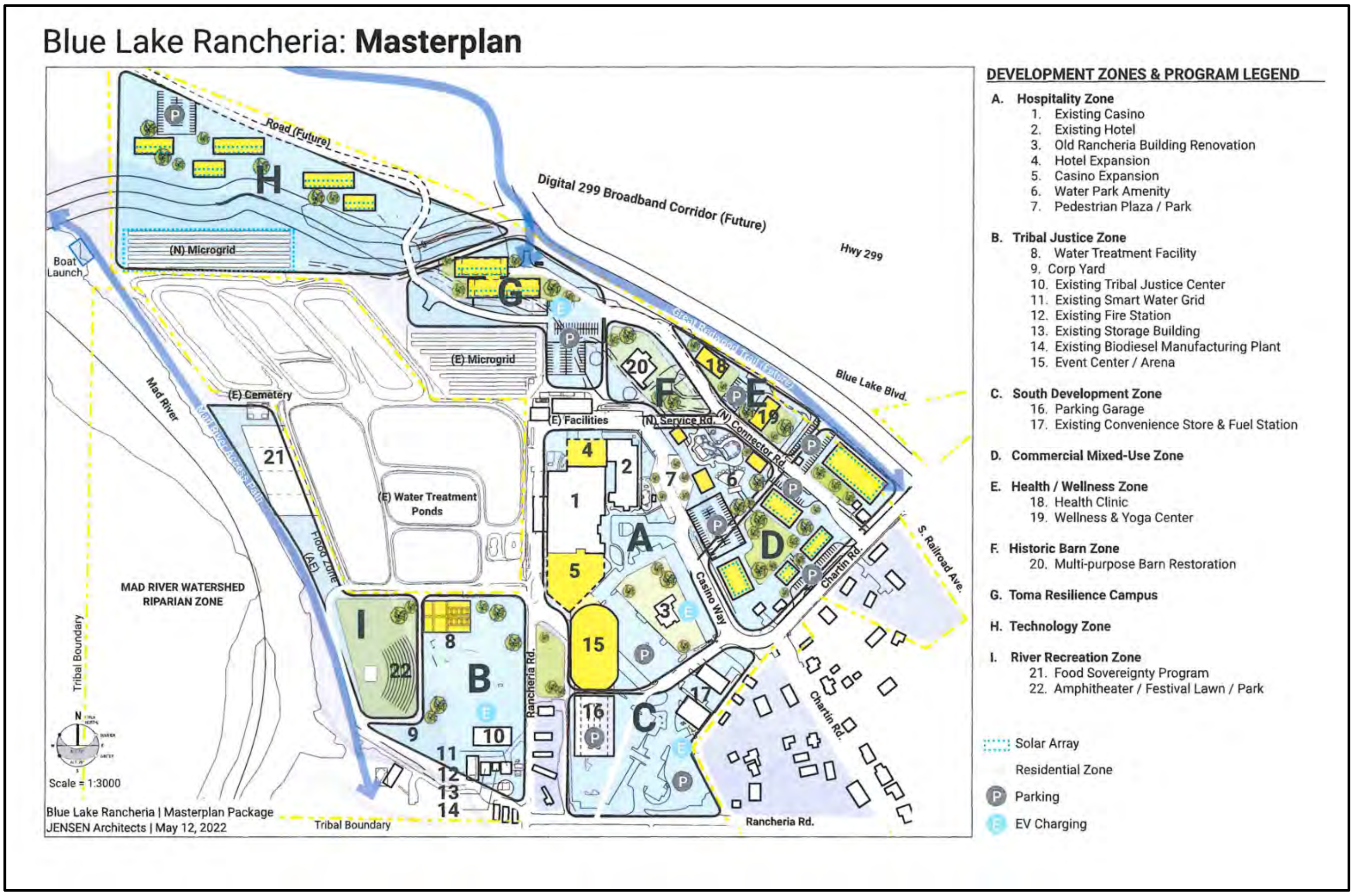
The Tribe contracted with Rinehart Engineering to complete a Feasibility Study to identify a community wastewater treatment facility (WWTF) capable of serving both the current Tribal wastewater treatment needs as well as wastewater flows from future economic and residential development. Existing Tribal wastewater sources include the Casino, Hotel, Tribal Justice Center, Play Station 777 fuel station & convenience store, fire station, and 45 residences. At present, the residential population living on Tribal land is 203 persons (both Tribal members and non-Tribal residents) and, on average, 2,000 people visit Tribal businesses each day. Development of a Blue Lake Rancheria Tribal wastewater treatment facility (the "Project") is part of a larger vision to increase self-sufficiency and Tribal community resilience. The Project is to be located within the Blue Lake Rancheria Tribal boundary which lies between the Mad River and Highway 299 in Humboldt County, CA (see Figure 1 below). Assumptions underlying the feasibility study that follows are included as APPENDIX A.

Figure 1: Blue Lake Rancheria WWTF Project Site



The Blue Lake Rancheria (BLR) Master Plan shows existing Tribal facilities as well as planned facilities and planned expansion of the Casino and Hotel. The Feasibility Study is based on the Master Plan shown in Figure 2 below.

Figure 2: BLR Master Plan



FEASIBILITY STUDY SCOPE OF WORK

The Project scope of work includes the following:

- Identify potential locations on the Rancheria for a wastewater treatment facility.
- Recommend size and type of wastewater treatment system based on BLR needs and engineering feasibility.
- Identify potential for expansion of facility to handle projected growth.
- Provide construction cost estimate and preliminary project schedule.
- Describe operation and maintenance needs and cost estimate.
- Identification of project assumptions and potential issues or concerns.
- Cooperation with Tribal environmental staff to circulate draft feasibility study and incorporate community feedback.
- Final draft Tribal community wastewater treatment feasibility study.

EXISTING WASTEWATER FACILITIES

The Blue Lake Rancheria Hotel and Casino wastewater is treated via an existing wastewater facility operated by the City of Blue Lake Public Works Department. Wastewater from the Old Rancheria Building, Tribal Justice Center, gas station, convenience store, fire house, and most residences is treated via septic tank systems with subsurface disposal to leach fields.

The City of Blue Lake wastewater treatment plant is located directly west of the BLR Casino and Hotel facilities. The facility consists of a primary headworks followed by a 4-cell secondary treatment lagoon system, a chlorine disinfection system, and two effluent disposal percolation ponds. The facility's wastewater treatment capacity is 1 million gallons per day (MGD). The system is designed for average flows of 0.25 MGD and peak flows of 1.54 MGD. The Blue Lake wastewater facility has an average dry weather flow of 0.18 MGD.

City of Blue Lake WWTP Secondary Treatment Lagoons

The City's 2019 Municipal Services Review states that infiltration/inflow of stormwater into the City's wastewater collection system is a significant portion of the annual wastewater flow. Infiltration/inflow is estimated to be as much as six times the average summer flow during major winter storm events. The 2019 Review also speaks to capacity stating that "In 2013, the City of Blue Lake adopted an *Interim Policy Pertaining to the Release of Sewer Capacity*. At this time, it was determined that the City had a remaining unallocated sewer capacity equal to 100 residential equivalent units (REUs); 60 REUs were reserved for residential connections, and 40 REUs were made available for non-residential use." As a significant user of the City of Blue Lake wastewater treatment plant, the Rancheria has a reserved capacity of 150 single-family residential (SFR) units (same unit as REU). The Tribe estimates that it is currently using approximately 10 - 70 SFR units out of the 150 reserved SFR units and therefore has sufficient reserved capacity to increase Tribal wastewater flows into the City's WWTP. From the City's perspective, the remaining wastewater treatment capacity is fully allocated because the Tribe's wastewater strength has periodically been observed to be above the City's Biological Oxygen Demand (BOD) discharge limit. Further, the City has determined that it can only provide 7 additional SFR units to the Rancheria due to concerns over meeting future wastewater capacity needs for the City of Blue Lake itself.

The existing wastewater management system does not serve all Tribal needs and requires significant use of land for individual septic systems / leach fields. Additionally, the Tribal community shoulders the impacts (i.e., odors and corrosion on nearby buildings) associated with the City's existing open pond treatment system located directly adjacent to the Rancheria Casino and Hotel. As a long-term strategy, the Tribe prefers to limit those impacts by managing its own wastewater. Further, the sewer capacity limits specified by the City of Blue Lake directly impact the Tribe's ability to realize the economic development envisioned in the BLR Master Plan. To address these issues, the Tribe is evaluating the feasibility of an on-site wastewater treatment system.

ESTIMATED DAILY WASTEWATER FLOWS

The Blue Lake Rancheria wastewater treatment needs were estimated based on historic wastewater flow measurements for the Casino and Hotel (2020 - 2022 datasets), discussions with Tribal staff, and published estimates for wastewater generation by facility type. A site visit to identify all existing sources of Tribal wastewater flows was conducted on May 20th, 2022. A second meeting was held on November 1st, 2022 to estimate future wastewater flows based on facility type and anticipated daily occupancy. The projected design wastewater flows for existing facilities is summarized in Table 1 below. BLR wastewater flow data for the Casino and Hotel can be seen in APPENDIX B.

Table 1: BLR Existing Facilities Wastewater Flow Estimate

Blue Lake Rancheria Wastewater Treatment System Wastewater Flow Estimate				
Existing Facilities	**Unit (Use Type)**	**Flow / Unit (gallons/unit/day)**	**Number of Units**	**Total Flow (gallons/day)**
Casino	Customer	3	500	1,500
	Employee	13	108	1,404
Hotel	Guest	50	150	7,500
	Employee	10	23	230
Old Rancheria Building	Visitor	3	15	45
	Employee	10	20	200
Convenience Store & Fueling Station	Customer	3	150	450
	Employee	10	10	100
Tribal Justice Center	Employee	5	30	150
RV Camping Sites	Guest	50	12	600
Fire Station	Employee	10	4	40
Residences	House	450	45	20,250
Total BLR Existing Wastewater Flow (GPD)				**32,469**

The Biodiesel Manufacturing Plant is not included in the Project design flows as the manufacturing by-product is collected in 55-gallon drums. The wash water and Glycerin by-product collected contains Methanol and as such is considered a hazardous waste and is generally[1] not suitable for processing in a community wastewater treatment facility.

As part of the wastewater treatment facility feasibility study, design flow projections have been evaluated for future development of Tribal facilities included in the 2022 Blue Lake Rancheria Master Plan. The projected design wastewater flows and potential new facilities are summarized in Table 2 below.

[1] Communications with AeroMod (wastewater treatment system technology provider) indicate that the current level of biodiesel manufacturing by-product can be disposed in the AeroMod system provided it is fed into the plant slowly (e.g., dripped into the headworks channel over time).

Table 2: Flow Estimates for BLR Planed Facilities, New Housing, and Expansions of Existing Buildings

Blue Lake Rancheria Wastewater Treatment System Wastewater Flow Rate Estimate				
Future Expansion	**Unit (Use Type)**	**Flow / Unit (gallons/unit/day)**	**Number of Units**	**Total Flow (gallons/day)**
Event Center / Arena	Guest	3	500	1,500
	Employee	13	20	260
Old Rancheria Building Renovation	Visitor	3	15	45
	Employee	10	20	200
Hotel Expansion	Guest	50	150	7,500
	Employee	10	30	300
Casino Expansion	Customer	3	500	1,500
	Employee	13	30	390
Water Park	Customer	10	100	1,000
	Employee	10	10	100
Wastewater Treatment Facility	Employee	13	5	65
Bathrooms for Events in Zone B	Person	3	500	1,500
Corp Yard	Employee	13	15	195
Commercial Mixed-Use Zone	Customer	3	200	600
	Employee	10	20	200
Health Clinic	Visitor	3	50	150
	Employee	10	5	50
Wellness & Yoga Center	Guest	25	100	2,500
	Employee	10	10	100
Multi-purpose Barn Restoration	Visitor	3	50	150
	Employee	10	5	50
Toma Resilience Campus	Visitor	15	100	1,500
	Employee	10	10	100
New Residences	House	450	20	9,000
Residences on Chartin Rd.	House	450	3	1,350
Potential Retirement Facility	Resident	90	60	5,400
	Employee	10	6	60
Total BLR Future Wastewater Flow (GPD)				**35,765**

DESIGN WASTEWATER FLOW

The design capacity for the BLR WWTF is based on wastewater flows from all existing and planned Tribal sources, as well as a peak use factor of 1.5. This peak use factor is based on measured monthly peak use compared to monthly average daily use from the 2020 - 2022 BLR wastewater flow data. The resulting design flow for the WWTF is 100,000 gallons per day (GPD). Table 3 below summarizes the basis of this design capacity.

Table 3: BLR Wastewater Treatment Facility Design Capacity

Design WWTF Flow Projections		
Wastewater Flows	**Daily Average Design Flow (GPD)**	**Peak Daily Design Flow (GPD)**
Existing facilities	32,469	49,328
Future facilities	35,765	54,335
Design Wastewater Flow Projections	**68,234**	**103,663**

DESIGN WASTEWATER TREATMENT PARAMETERS

The design wastewater treatment parameters are based on wastewater samples collected from the BLR Hotel and Casino. Tribal Utilities staff monitor wastewater characteristics such as: pH, Temperature, Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Phosphate, and oil/grease. Table 4 below provides a summary of BLR wastewater data collected during 7-day sampling that occurred over busy weekends Memorial Day 2021 - New Year's weekend 2022 (April data omitted due to assumed sampling error), and 2022 monthly sampling data. Blue lake Rancheria BOD and TSS raw data are included in APPENDIX C.

Table 4: BLR Wastewater Characteristics

Range of Values	Blue Lake Rancheria Wastewater Characteristics					
	pH	**Temperature (°C)**	**BOD (mg/L)**	**TSS (mg/L)**	**Phosphate (mg/L)**	**Oil & Grease (mg/L)**
Low	6	9.6	170	61	6.4	13
High	8	25.9	580	320	13	95
Average	7	17.7	324	99	9.5	32

The data show that the wastewater strength is higher at times than the typical domestic wastewater strength (200 - 290 mg/L BOD & TSS). New and expanded Tribal facilities as well as the addition of residences is expected to result in a wastewater strength similar to that which is currently observed. **For design purposes, the assumed BLR wastewater strength is 350 BOD and 180 TSS.**

PERMIT REQUIREMENTS

The key permit requirements for a WWTF installed on the Rancheria are summarized below. These permits can be applied for concurrently.

1. Tribal Building Permit - This permit is issued by the Tribal Facilities department.
2. Tribal Environmental Assessment - This assessment mirrors the Federal National Environmental Policy Act (NEPA) process and is administered by the Tribal Environmental Director. The Environmental Assessment consists of a template that is completed by the Project Lead with assistance from the Environmental Director as needed.

OTHER REQUIREMENTS

Although the Project is to take place on Tribal land, and is not subject to State or Regional permit requirements, the U.S. Environmental Protection Agency (EPA) has three key noticing requirements for all new wastewater treatment plants that could affect the water quality of surface and ground waters. Links to required forms and contact information for the EPA Region 9 staff that administer the following programs are included in APPENDIX D.

The EPA requirements for WWTFs are summarized below:

1. The U.S. EPA Region 9 maintains an inventory of subsurface disposal from all on-site wastewater treatment systems through the Underground Injection Control (UIC) program. The EPA UIC inventory includes both existing and non-operable injection wells (40 CFR part 114.26) to ensure that effluent disposal does not endanger drinking water or the public (40 CFR part 144.12). An onsite wastewater treatment system discharging to a subsurface disposal system, such as a leach field, is classified as a Class V injection well when the system has capacity to serve 20 or more persons per day. Shallow Class V wells (such as a leach field) are "Authorized by Rule" and the owner/operator is only required to submit the inventory information. The EPA then makes a determination if any additional information is required to prove that the well (leach field) does not pose a threat to drinking water or the public. The EPA has indicated that no permits are needed for facilities that are properly sited, and where monthly water quality monitoring is maintained. The inventory form is streamlined to include basic WWTF information only, and has no further requirements unless major changes are made to the WWTF.
2. The U.S. EPA also requires that all operators of New Treatment Works Treating Domestic Sewage complete NPDES Application Forms 1 (general facility information), 2A (required from all new publicly owned treatment works) and 2S (biosolids disposal). These informational forms are used by the EPA to maintain an inventory of all WWTFs and track the disposal of biosolids in order to protect surface and ground water quality. While the Tribe is not required to obtain a permit under the NPDES program, the disposal of biosolids off Tribal lands (i.e., a landfill) triggers the requirement to complete form 2S.
3. Construction General Permit for Stormwater Discharges from Construction Activities. Operators of construction sites where more than one acre of land will be disturbed are required file a Notice of Intent (NOI) and obtain the Construction General Permit. This is also an informational form, with automatic approval in most cases, and must be filled out at least 14 days before commencing construction activities.

WATER QUALITY / DISCHARGE STANDARDS

As a sovereign nation, the Blue Lake Rancheria will be responsible for establishing its own water quality / wastewater discharge standards. In order to protect surface and groundwater resources to the highest level, Rancheria staff expressed interest in developing a WWTF capable of producing an effluent water quality that meets or exceeds regional and state standards. The water quality standards and design criteria described in this section provide a basis from which to establish Rancheria-specific discharge standards, as well as identify the best-fit technology to meet the treatment goals of the Tribe. A summary of existing standards is provided below.

State & Regional Standards

Water quality and discharge standards in California are underpinned by regional Basin Plans. Humboldt County is located in the North Coast Region, or Hydrologic Region Number 1. The North Coast Hydrologic Region encompasses 19,000 square miles and is home to 690,000 people and many Tribal lands. The Basin Plan for the North Coast Region was completed in May 2011 and updated in 2018.

In general, Basin Plans contain the following key elements:

- Provide the basis for protecting water quality in California.
- Identify "beneficial uses" of water resources that are to be protected.
- Establish water quality objectives to protect surface and groundwater for all beneficial uses.
- Implementation programs (standards) designed to achieve water quality objectives.
    - Water quality standards specific to treated wastewater disposal.

The Project site is located in the Mad River Hydrologic Unit (HU 109.00) which is part of the larger North Coast Basin. The Department of Water Resources (DWR) has identified two groundwater basins in the Mad River Hydrologic Unit: Mad River Valley - Mad River Lowland (1-008.1), and Mad River Valley - Dow's Prairie School Area (1-008.2). The Project site is located above the Mad River Lowland groundwater basin. Groundwater from this basin is used for both agricultural and urban purposes.

Chapter 2 of the North Coast Basin Plan contains an assessment of the beneficial uses which are to be protected. Water quality protection is afforded to both the existing and potential beneficial uses, and beneficial uses generally apply to all tributaries of listed waterbodies. The listed beneficial uses for the Mad River Hydrologic Area are presented in Table 5 below.

Table 5: Beneficial Uses of Waters of the North Coast Region

Beneficial Uses of Waters of the North Coast Region	
Beneficial Use	**Mad River Hydrologic Unit 109.00 / Blue Lake Hydrologic Area 109.10**
Municipal and Domestic Supply (MUN)	Existing
Agricultural Supply (AGR)	Existing
Industrial Service Supply (IND)	Existing
Industrial Process Supply (PRO)	Existing
Groundwater Recharge (GWR)	Existing
Freshwater Replenishment (FRSH)	Existing
Navigation (NAV)	Existing
Hydropower Generation (POW)	Potential
Water Contact Recreation (REC-1)	Existing
Non-Contact Water Recreation (REC-2)	Existing
Commercial and Sport Fishing (COMM)	Existing
Cold Freshwater Habitat (COLD)	Existing
Wildlife Habitat (WILD)	Existing
Rare, Threatened, or Endangered Species (RARE)	Existing
Marine Habitat (MAR)	Potential
Migration of Aquatic Organisms (MIGR)	Existing
Spawning, Reproduction, and/or Early Development (SPWN)	Existing
Estuarine Habitat (EST)	Existing
Aquaculture (AQUA)	Existing
Native American Culture (CUL)	Existing

Chapter 3 of the Basin Plan contains numeric and narrative water quality objectives designed to ensure that all designated beneficial uses in the region are maintained and protected. The water quality objectives that apply to the Project are the water quality objectives for groundwaters. Water quality objectives for groundwaters are summarized in Table 6 below.

Table 6: North Coast Basin Plan Water Quality Objectives for Groundwater

Water Quality Parameter	Water Quality Objective for Groundwaters
Bacteria	In groundwaters used for domestic or municipal supply (MUN), the median of the most probable number of coliform organisms over any 7-day period shall be less than 1.1 MPN/100 ml, less than 1 colony/100 ml, or absent (State Department of Health Services).
Chemical Constituents	Groundwaters shall not contain concentrations of chemical constituents in amounts that cause nuisance or adversely affect beneficial uses In no case shall groundwaters designated for use as MUN contain concentrations of chemical constituents in excess of the provisions specified in Title 22 of the California Code of Regulations (CCR).
Radioactivity	Groundwaters shall not contain concentrations of radionuclides in concentrations that cause nuisance or adversely affect beneficial uses. In no case shall waters designated for use as MUN contain concentrations of chemicals in excess of the numeric taste and odor limits established in Title 22 CCR.
Tastes and Odors	In no case shall waters designated for use as MUN contain concentrations of chemicals in excess of the numeric taste and odor limits established in Title 22 CCR.
Toxicity	Groundwaters shall not contain toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in, humans or that adversely affects beneficial uses.

Table 3-1 in the North Coast Basin Plan identifies waterbody-specific water quality objectives; the water quality objectives specific to the Mad River Hydrologic Unit are summarized in Table 7 below.

Table 7: Water Quality Objectives for the Mad River Hydrologic Unit

Specific Water Quality Objectives for the North Coast Region: Mad River Hydrologic Unit (Basin Plan Ch. 3, Table 3-1)	
Water Quality Parameter	**Water Quality Objective Applicable at Project Location**
Specific Conductance (micromhos) @ 77°F	90% Upper Limit = 320 50% Upper Limit = 150
Total Dissolved Solids (mg/L)	90% Upper Limit = 160 50% Upper Limit = 90
Hydrogen Ion (pH)	Max = 8.5 Min = 6.5
Dissolved Oxygen (mg/L)	Daily Minimum Objective = 6.0 7-Day Moving Average Objective = 8.0

Chapter 4 of the North Coast Basin Plan contains "implementation plans" that establish standards designed to meet water quality objectives. Standards specific to wastewater treatment plants are included as a stand-alone document within the Basin Plan titled: *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems* (OWTS Policy). The OWTS Policy provides criteria and guidelines to protect water quality, and prevent health hazards and nuisance conditions arising from the subsurface discharge of treated wastewater.

OWTS Policy recommendations include the following:

- Prohibition of point-source discharges into the Mad River and its tributaries during the "dry season" from May 15th through September 30th, and during all other periods when the waste discharge flow is greater than 1% of the receiving stream's flow.
- On-site waste treatment and disposal systems shall be located, designed, constructed, and operated in a manner to ensure that effluent does not surface at any time.
- On-site wastewater treatment systems shall not cause the groundwater nitrate concentration to exceed 10 mg/L at any source of drinking water on the property, nor at any off-site potential drinking water source.
- No dispersal systems shall be covered by an impermeable surface, such as paving, building foundation slabs, plastic sheeting, or any other material that prevents oxygen transfer to the soil.
- Percolation rates for subsurface disposal shall be between 1 minute per inch (MPI) and 120 MPI
- Horizontal Setbacks:
  - 5' from property lines and structures
  - 100' from water wells and monitoring wells
  - 100' from any unstable land mass
  - 100' from springs and flowing surface waterbodies
  - 200' from wetlands
  - 150' from a public water well
- All leach fields shall have at least 12" soil cover
- Leach fields shall be designed using not more than 4 square-feet of infiltrative area per linear foot of trench as the infiltrative surface, and with trench width no wider than 3 feet.
- Dispersal systems shall not exceed a maximum depth of 10 feet as measured from the ground surface to the bottom of the trench.
- Leach fields shall be constructed in accordance with the percolation rate of the soil. Recommended minimum depth to groundwater relevant to the measured BLR percolation rates (4 - 20 Minutes per Inch) are shown in the table below.

Table 8: Minimum Depths to Groundwater Relevant to BLR Percolation Rates

Minimum Depths to Groundwater from Bottom of Dispersal System	
Percolation Rate (Minutes per Inch)	**Minimum Depth to Groundwater**
1 MPI< Percolation Rate ≤ 5 MPI	Twenty (20) feet
5 MPI< Percolation Rate ≤ 30 MPI	Eight (8) feet

The OWTS Policy identifies stringent discharge standards for impaired waterbodies throughout the Basin, but does not address discharge standards for non-impaired waterbodies. The Mad River is not listed as an impaired waterbody, and as such standards for discharges that could affect this waterbody are guided by the State Water Quality Control Board *General Waste Discharge Requirements for Small Domestic Wastewater Treatment Systems* (100,000 GPD or less).

Limits on wastewater effluent Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) are shown in the table below:

Table 9: Effluent Limits Based on Wastewater Treatment Technologies Evaluated in Feasibility Study

Effluent Limitations based on Technology performance (Activated Sludge, MBR, or Similar)		
Constituent	**Units**	**Limit**
BOD	mg/L	30 (monthly average), 45 (7-day average)
TSS	mg/L	30 (monthly average), 45 (7-day average)

Attachment 1 of this document describes standards for nitrogen removal in wastewater effluent. The recommended approach to determine the level of nitrogen treatment required from a wastewater treatment facility is to compare wastewater effluent quality to groundwater quality, and assess the potential for the wastewater discharge to cause a condition of pollution or nuisance. Typical levels of Total Nitrogen (TN) in domestic wastewater are 35 - 100 mg/L.

Relevant nitrogen removal standards include:

- In low-threat situations, 50% nitrogen removal (in effluent prior to discharge) is appropriate. Low-threat situations are those where additional nitrogen removal will occur in the dispersal area or where adequate attenuation exists based on other conditions such as depth to groundwater.
- In high-threat situations, a 10 mg/L effluent limit is appropriate. High-threat situations are those where limited nitrogen removal will occur in the dispersal area (e.g., shallow depth to groundwater, fractured aquifer, potential for groundwater to migrate to surface water bodies etc.).

No limits for Total Phosphorus were found in the existing water quality standards consulted for this study. The General Waste Discharge Requirements document cites typical levels of phosphorus in domestic wastewater at 6-12 mg/L. In order to protect groundwater resources, the phosphorus reduction levels achieved by wastewater treatment technology alternatives should be considered.

POTENTIAL LOCATIONS

A site visit was conducted on May 20th, 2022 to identify a preferred site for a wastewater treatment facility (WWTF). This site visit included a meeting with Rancheria staff to discuss WWTF site alternatives. The 2022 BLR Master Plan identifies a WWTF site located in the Tribal Justice Zone (B) directly south of the existing City of Blue Lake wastewater treatment lagoons. Other potential sites include the Technology Zone (H) or in a field directly adjacent to Zone B.

The figures that follow show the BLR WWTF site alternatives:

Figure 3: Wastewater Treatment Facility Site Alternatives

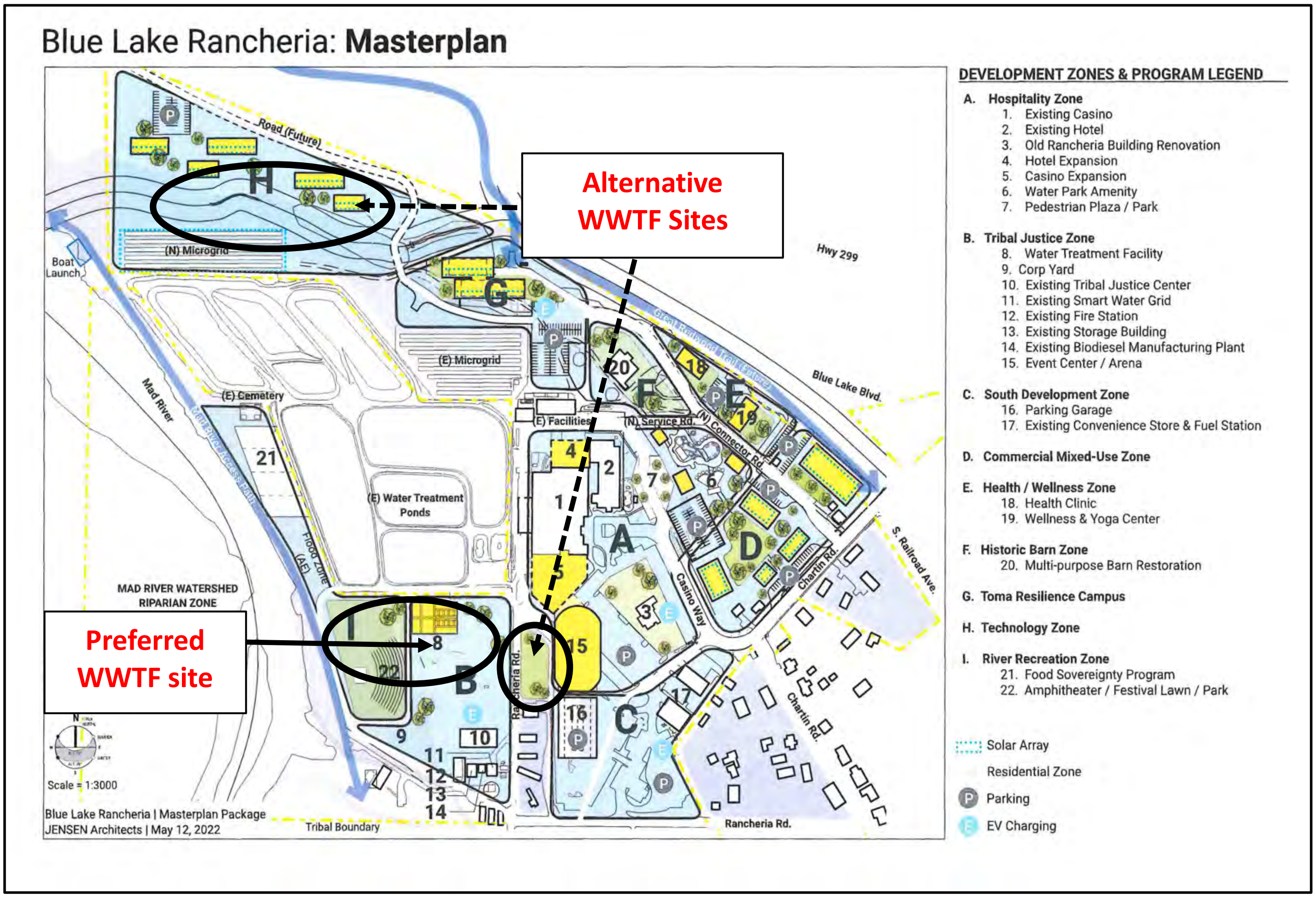
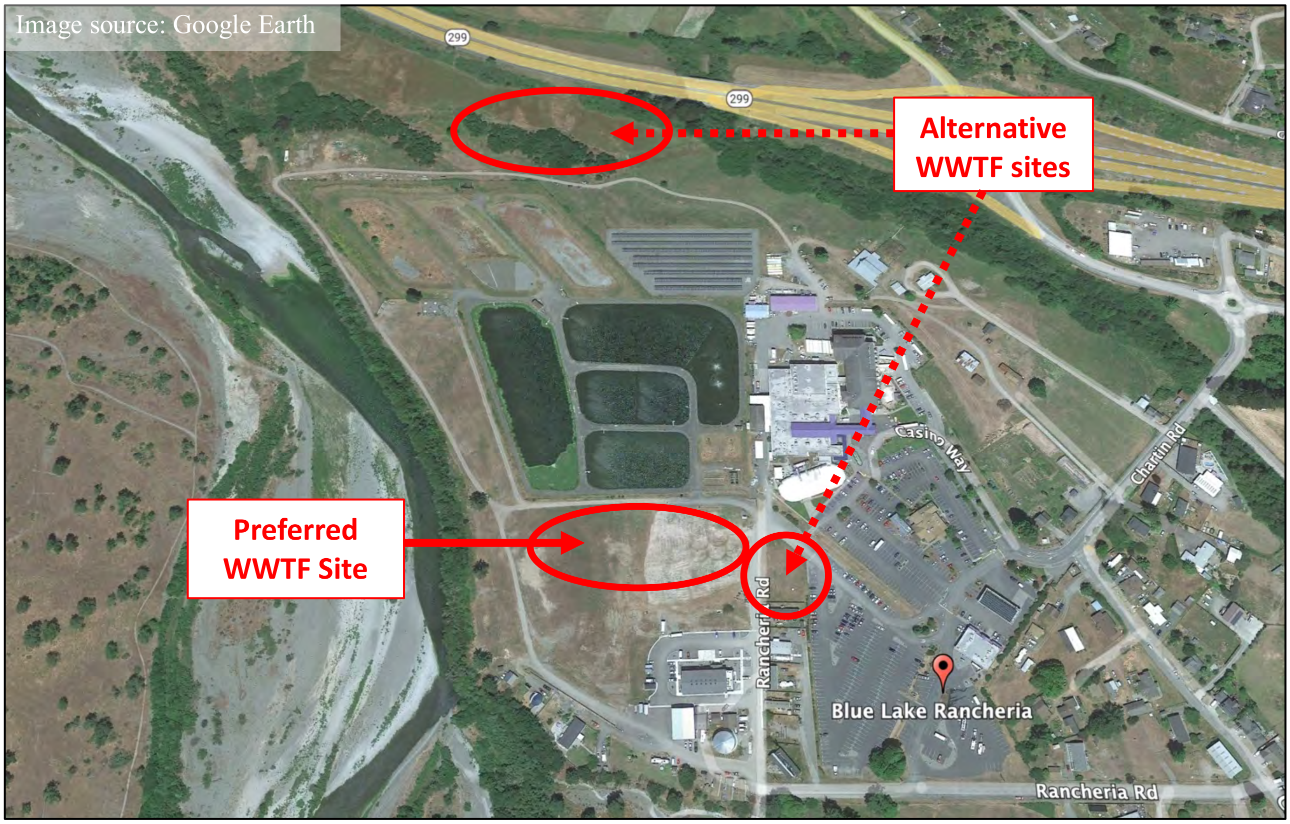


Figure 4: Satellite View of Wastewater Treatment Facility Site Alternatives July 2022



Preferred Location: Zone B

Tribal Justice Zone (B) was determined to be the preferred WWTF site. This site has the following advantages:

1. Odor management - the site is adjacent to existing wastewater treatment activities, as well as located within a large, empty field that serves as a green space buffer on three sides.
    a. The buffer allows ample area to site a leach field while retaining the green space.
2. WWTF location near the largest sources of wastewater - Casino, Hotel, fuel station & convenience store, Event Center, and Old Rancheria Building.
    a. Wastewater collection pipe run distances are minimized and therefore implementation costs and maintenance requirements are reduced.
3. Zone B lies atop an old river bottom that has a soil structure that is good for percolation.
4. There is no current paving, and no future paving planned for the area.
5. Typically, BLR holds concert series in the large field on Zone B that would also be used for the WWTF leach fields. Planned continued use for festivals in this field would not be affected by the subsurface presence of leach fields, and therefore there would be no loss of current use on Zone B.
6. Zone B is tucked away on the Rancheria property; this area could be fenced in to block views from other facilities.
7. Locating the WWTF on Zone B ensures that key utility operations are proximate to Utilities staff and maintenance equipment as the planned location of the future Corps Yard is on the southern edge of Zone B.

Zone B Site Constraints:

The only constraint present at this site is the proximity of the Mad River. However, even when the recommended 100' setback from the riparian dripline is taken into consideration, there is more than enough area to site a WWTF and leach field.

Alternative Location 1: Zone H

The Technology Zone (Zone H) is located at the farthest northwest corner of the Rancheria between Highway 299 and the Mad River. According to the 2022 BLR Master Plan, the Technology Zone is envisioned to be a green space that hosts a new microgrid as well as several solar electric arrays. The future Great Redwood Trail is envisioned to cross through the entire length of the Technology Zone from west to east. Zone H has the following advantages:

1. Zone H sits on a large shelf could be used for leach fields.
2. Zone H ties into plans to install a gravity sewer main to serve new development on the NW bank.

Zone H Site Constraints:

1. Space limitation: setback from Great Redwood Trail planned to cross through Zone H is 20'
2. Zone H also has a creek running through it presenting an additional setback and space limitation.
3. Pumping from main facilities is farther to Zone H.
    a. Pipe runs would have to pass under or around the existing micro-grid as well as avoid other utilities located along Rancheria Rd. (i.e., fiber lines, high pressure gas lines, and a water main).
4. The Tribe may pave portions of Zone H in future.
5. Co-locating the WWTF on this site would present a potentially incompatible use related to the Great Redwood Trail.

Alternatives Considered but Ruled Out

The small field next to Zone B was initially considered as a site for the WWTF, and would have included a leach field located in the adjacent Zone B. However, the Tribe has plans to shift the future Events Center / Arena (building #15 in Master Plan) to the small field; therefore, this site has a different preferred use. Additionally, the site's proximity to existing Tribal housing was determined to be sub-optimal.

PREFERRED SITE PHOTOGRAPHS

PHOTO #1: NE corner of preferred WWTF site looking West towards the Mad River; view from Aiyekwee Loop.


PHOTO #2: SE corner of preferred WWTF site looking West towards the Mad River. Parking lot for Tribal Justice Center shown in top left corner.

PHOTO #3: Preferred WWTF site from NW corner of Aiyekwee Loop looking East towards the Sapphire Palace and Casino.

PHOTO #4: View of preferred site looking South from Aiyekwee Loop on northern edge of Zone B.

PHOTO #5: View of preferred WWTF site looking North towards existing treatment ponds from Aiyekwee Loop on southern edge of Zone B.

TREATMENT SYSTEM ALTERNATIVES

All alternatives evaluated in this study are based on collection of wastewater from all Rancheria uses, existing and planned. Collected wastewater will be conveyed into a common lift station that pumps into a facility headworks. Wastewater is conveyed from the headworks to the primary and secondary treatment systems to remove organic wastes and nutrients from wastewater in advance of final disposal or reuse.

The wastewater treatment alternatives evaluated in this study include:

1. Remain on the City of Blue Lake's wastewater treatment system
2. Low-tech recirculated packed-bed filtration system
3. Advanced treatment membrane bioreactor micro-filtration system
4. Advanced treatment activated sludge / de-nitrification package plant

All on-site wastewater treatment systems compared are suitable for small communities with wastewater flows below 0.1 MGD (100,000 GPD). All on-site wastewater treatment alternatives include collection of all Rancheria wastewater into a wet well. The wastewater is then pumped into a treatment system headworks with a bar / grit screen to remove large objects. All onsite treatment alternatives described below also include sub-surface effluent disposal through a leach field. The selection of this disposal method is discussed in the Discharge Alternatives section. All onsite systems described below will also require ancillary equipment including: a control panel, flow meters, and valving.

Operation and maintenance costs vary depending on the level of trained personnel required and wastewater treatment system complexity. Key wastewater treatment system operation and maintenance costs generally include the following:

- Operating personnel
- Electrical Power - collection system pumps and treatment system processes
- Chemicals (as needed) - alkalinity adjustment, phosphorus removal, solids settling
- Water quality testing and record keeping
- Repair and replacement of components
- Residual solids disposal

Wastewater treatment system alternatives evaluated for the Blue Lake Rancheria Tribe are described below.

ALTERNATIVE 1: City of Blue Lake Wastewater Treatment System

Alternative 1 would require obtaining additional wastewater treatment capacity at the City of Blue Lake's wastewater treatment plant. Alternative 1 would also require planning for facilities and residences that are not able to be connected to the sewer main, or for which no treatment capacity is available. Connecting the existing unserved Tribal facilities (Tribal Justice Center and Fire Station), residences, and planned facilities to the existing wastewater facility would require approximately 0.03 - 0.06 million gallons per day (MGD) of treatment capacity. The total treatment capacity required for full build-out of the Rancheria's Master Plan is estimated to be 0.1 MGD treatment capacity in order to handle periods of peak water use. This peak use would account for over half (55%) of the City's wastewater treatment plant dry weather design flow of 0.18MGD. This level of reserved wastewater treatment capacity exceeds the quantity of remaining unallocated capacity at the City's WWTP.

Given the documented challenges associated with infiltration/inflow during storm events, as well as the wastewater capacity reserved for future growth within City's service area, it is not feasible for Rancheria to rely on the City's wastewater treatment system to meet all Tribal wastewater treatment needs. This conclusion is supported by the historic Memorandums of Understanding (MOUs) and email correspondences between the Tribe and the City in regards to wastewater treatment capacity.

A summary of agreements between the Rancheria and the City of Blue Lake is provided below:

- Original MOU signed November 1, 2000:
  - Tribe and City agree to cooperate in furnishing sewer services to the Tribe.
  - Agreement includes 108 equivalent single-family residential (SFR) units of capacity reserved for sole use of the Tribe for casino and gaming facilities only
  - Tribe agrees to be bound by the City of Blue Lake sanitary code (Sewer Ordinance # 357)
  - Agreement stipulates "No Hotels" are to be constructed
- First Amendment to MOU (2004):
  - Tribe proposes building 12,600ft2 pavilion for hosting events
  - City agrees to provide wastewater treatment services for the effluent from the pavilion
  - The number of SFR units of reserved wastewater treatment capacity was increased from 108 to 118.
- Second Amendment (2006):
  - Tribe and City agree to strike the "No Hotels" prohibition in the original MOU.
- Third Amendment (2008):
  - Tribe proposes to add a 104-room hotel to its gaming facilities
  - The number of SFR units of reserved wastewater treatment capacity was increased from 118 to 150.
  - City commits to establish BOD and TSS wastewater strength limits
- Draft Fourth Amendment (2020):
  - This agreement would add the Tribal Justice Center to the City's wastewater services
  - The number of SFR units of reserved capacity would increase from 150 to 157.
  - The City's Draft language states "Following the addition of the seven (7) SFRs for the Justice Center, no new SFRs will be permitted and the Tribe agrees to a moratorium as the waste water treatment plant is expected to reach capacity based on other projected development in the City."
  - The Draft requires that the Tribe hire an engineer to investigate and advise on possible Tribal wastewater discharge exceedances of the City's established standards.

As of the date of this study, the Tribe and the City have not reached agreement on the terms of the Fourth Amendment to the MOU. Subsequent email communications have made clear that the City of Blue Lake is not prepared to include additional Rancheria facilities in a MOU at this time.

Advantages and Disadvantages of ALTERNATIVE 1	
Advantages	**Disadvantages**

• Lowest Capital Investment
  ○ Main cost is installation of additional lateral piping to connect to water main
• Retains Tribal land for other uses
• BLR historic investments in the City's wastewater treatment facility continue to serve the Tribe's largest facilities - the Casino and Hotel
	• Under the current MOUs with the City, the wastewater treatment capacity available to the Rancheria is insufficient to meet the demand for planned facilities and housing
	  ○ The facilities not able to be added to the City's treatment system would require additional land set aside for new septic systems / leach fields, limiting opportunities for economic development.
	• Limited sewer main access - connection to areas not close to the sewer main will require extensive trenching below existing roads and structures
	• Alternative does not contribute to self-reliance goals
	• Tribe accepts pricing uncertainty for future wastewater treatment services
	• Tribe continues to expend resources to negotiate with City regarding required wastewater influent standards and quantity of reserved wastewater treatment capacity (SFRs) available to Tribe

ALTERNATIVE 2: Orenco Recirculating Packed Bed Filter System

A recirculating "packed-bed" filtration system incorporates natural media such as sand, gravel, or an engineered textile media for the purpose of providing treatment of small to medium wastewater flows. Recirculating filters consist of an enclosed container with uniform media placed over an underdrain system. The wastewater is dispersed over the bed of media and allowed to percolate through to the under-drain system which collects the treated effluent for either 1.) disposal through a leach field, or 2.) recirculation to the top of the packed media filter for further treatment. A recirculating packed-bed filtration system is considered an aerobic, fixed-film "bioreactor" in which soluble pollutants in wastewater are consumed by micro-organisms that grow on the packed-bed and absorb the waste materials as the wastewater percolates through.


Image Source: R.C. Worst Co.

The Orenco recirculating textile filter that could be sized to process the BLR wastewater flows is known as the AdvanTex AX-MAX treatment System. This system includes pre-packaged modular treatment units capable of treating 5,000 - 15,000 GPD. The modular units can be installed in multi-unit arrays to meet larger design flows and/or more stringent effluent treatment requirements. The modular design would allow the BLR wastewater treatment system to be expanded as flows increase over time.

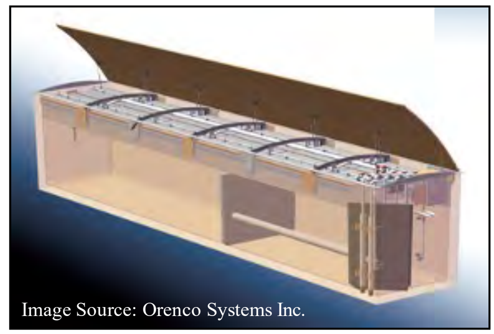


Image Source: Orenco Systems Inc.

As shown in the Orenco system flow diagram (Figure 5), a complete wastewater treatment system using the Orenco packed bed filter system would include the following components:

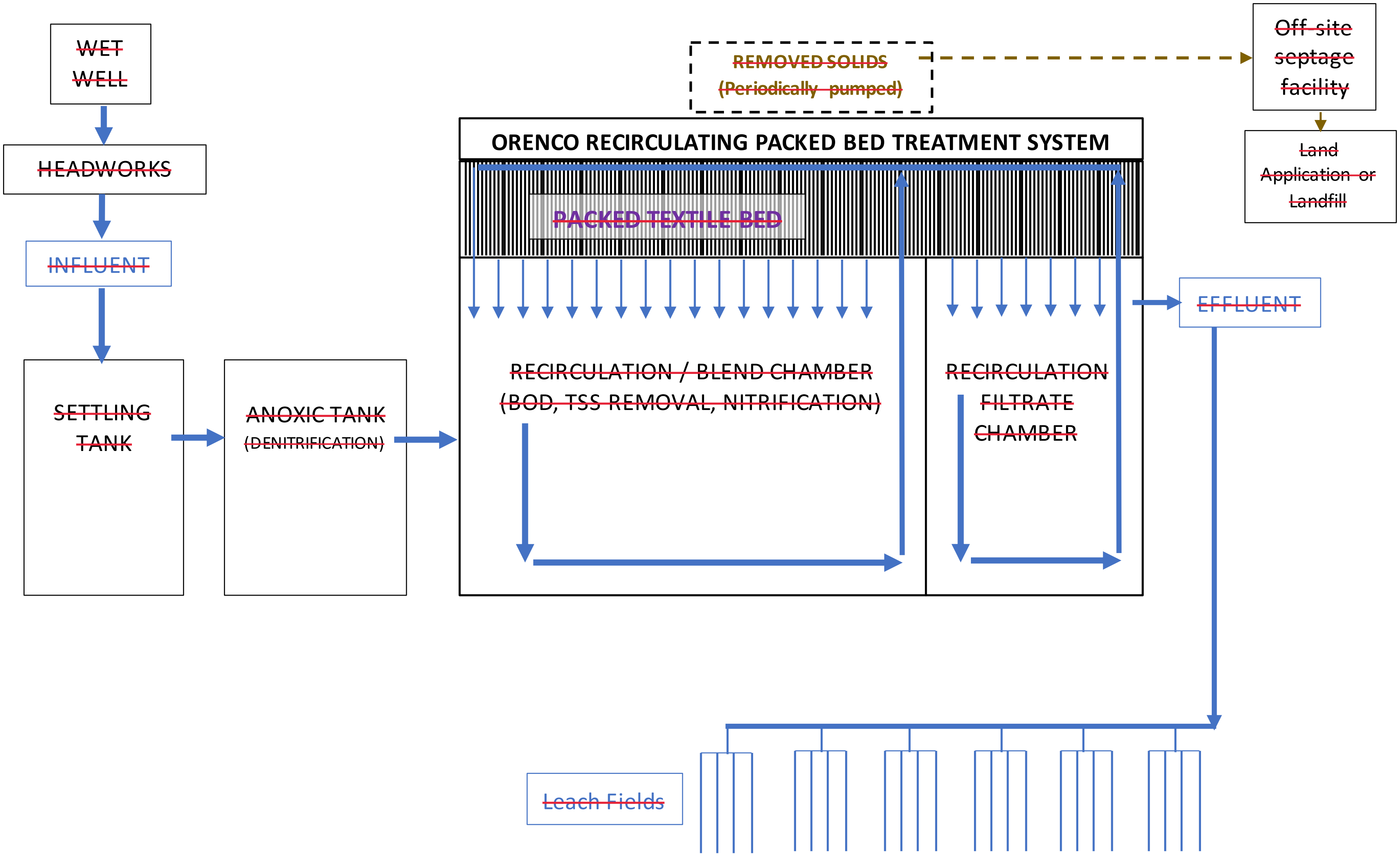
- Primary treatment – screening and primary settling tanks
- Pre-secondary treatment – pre-anoxic, pre-aeration, and clarification tanks
- Secondary treatment – Orenco recirculating textile filter treatment units
- Additional nitrogen and phosphorus treatment units as needed based on effluent discharge limits.


Image Source: Orenco Systems Inc.

Operation and maintenance requirements:

Annual maintenance consisting of power washing the packed bed filters is recommended. Annual maintenance also includes effluent testing, inspecting effluent for odor and clarity, pump filter cleaning, and flushing the distribution piping if needed. Periodically solids will need to be removed from the primary settling tank that precedes the packed bed filter. This low-tech wastewater treatment system does not require specially-trained operators; however, it is recommended that operations personnel have training and experience similar to a Grade II wastewater operator.

Figure 5: Orenco Recirculating Packed Bed Wastewater Treatment System Flow Diagram



Advantages and Disadvantages of ALTERNATIVE 2	
Advantages	**Disadvantages**
• Lowest capital cost for onsite treatment • Low maintenance / minimal equipment • Low energy demand for operations • Effective at removing BOD, TSS, TN, and fecal coliforms • High reliability - system can handle highly variable wastewater strengths and flows • Pre-packaged units easy to install, and have a short start-up time • System provides adequate storage during power outages • Media can be periodically "recovered" • System can be expanded over time.	• Large dedicated land area requirement • Does not allow for reuse of treated effluent • Requires primary treatment that includes solids settling as well as additional secondary treatments such as pre-aeration and pre-anoxic processes • Requires additional treatment capacity and/or chemical treatment to reach <10mg/L Total Nitrogen levels • Requires additional treatment capacity and/or chemical treatment for Phosphorus removal.

ALTERNATIVE 3: Membrane Biological Reactor (MBR) System

Alternative 3 utilizes a package Membrane Biological Reactor (MBR) treatment process. MBRs consist of a bioreactor with suspended solids removal (i.e., aerated tanks) in combination with microfiltration membranes. Like alternative #2, the first stage of this treatment process relies on microorganisms that convert biodegradable organic matter into new populations of microorganisms (cell mass). Membranes are used to separate the treated effluent from the removed solids (microorganisms). MBRs have two primary configurations: 1) integrated MBR with membranes immersed in the bioreactor and 2) a recirculated MBR with a membrane module located outside the bioreactor in a separate unit.


Image source: Smith & Loveless Inc.

Membranes are constructed of cellulose or polymer material with a maximum pore size that is set during the manufacturing process. The two types of micro-filters most often used are hollow fibers grouped in bundles or formed into flat plates. MBR treatment systems rely on fine influent screening, blowers for aeration in the bioreactor, and pumps to push or pull the wastewater through the filtration system. All MBR systems also rely on techniques for continuously cleaning the membranes in order to maintain functional life for as long as possible.


Image source: ECOLOGIX TECHNOLOGY

Flat Plate Membrane Filter


Image source: EVOQUA WATER TECHNOLOGIES

Hollow Fiber Membrane Filter

There are several package MBR systems available on the market. Package MBR modular units come in a number of sizes and can be configured into a larger system with multiple treatment units to meet design flow and/or treatment requirements. This modular configuration allows for a wastewater treatment system to be expanded over time wastewater flows increase.

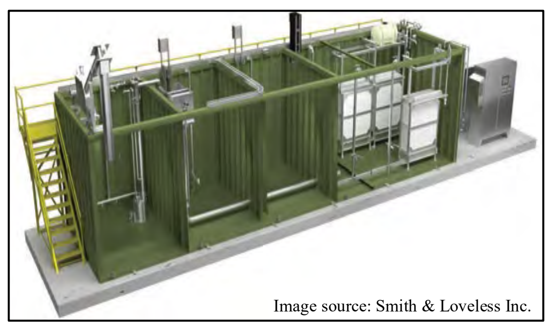


Image source: Smith & Loveless Inc.

Titan MBR Package Plant

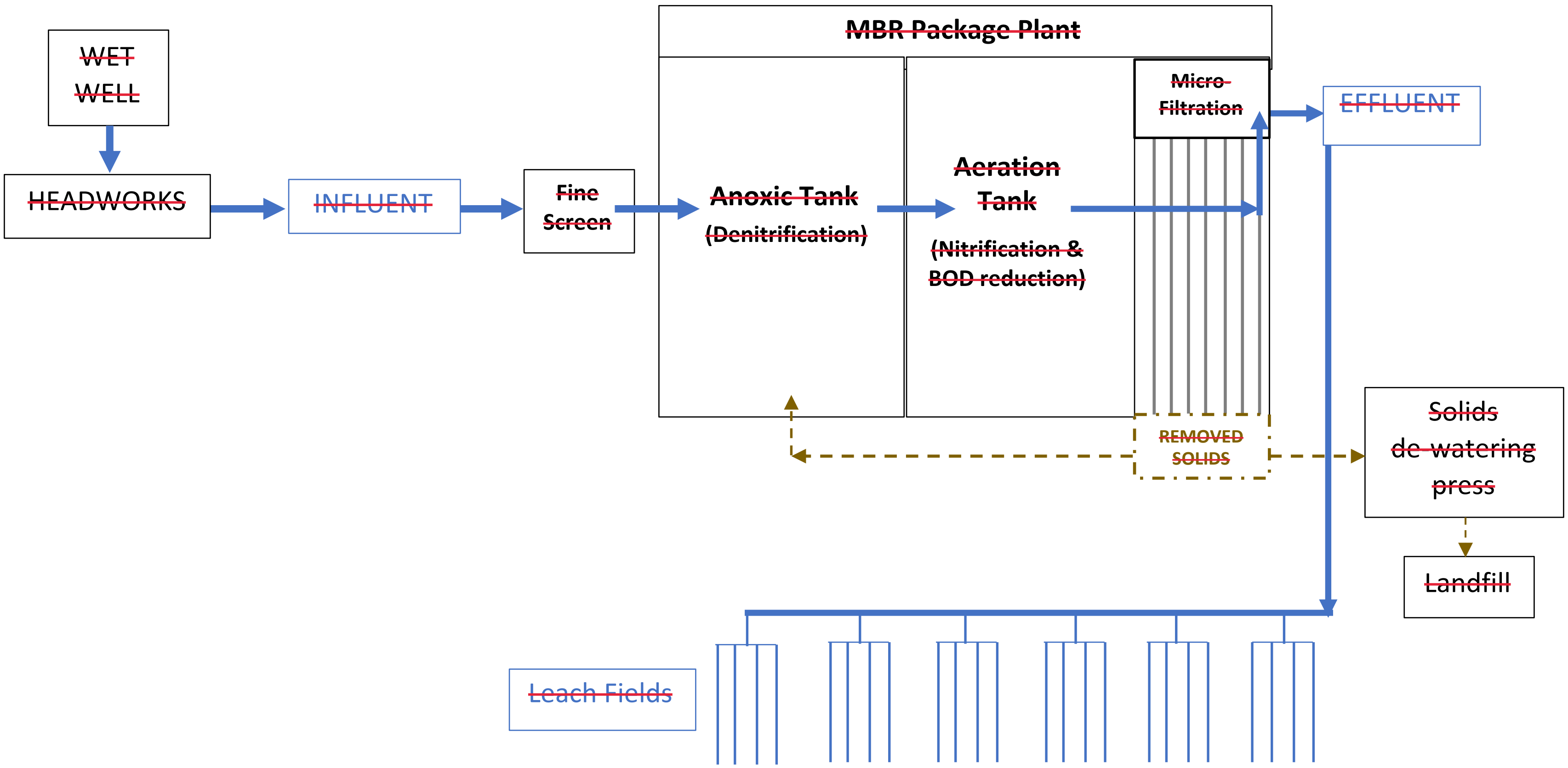
Operation and maintenance requirements:

Operating costs for MBR systems are typically higher than comparable treatment systems due to the higher energy demand required for air scouring used to prevent fouling by reducing bacterial growth on the membranes. Air scouring consists of blowing air around the membranes and out the manifolds. Some systems also use a back-pulsing technique, in which treated effluent is occasionally pumped back through the membranes to keep pore spaces clear. Pumps and blowers will require annual maintenance. Membranes require periodic replacement at a frequency that depends on the level of pre-screening and regular cleaning. In addition, solids in the bioreactor will need periodic removal, dewatering, and disposal. MBR systems utilize advanced treatment processes that require training and experience equivalent to a Grade III wastewater treatment operator.


Image source: EVOQUA WATER TECHNOLOGIES

Xpress MBR Package Plant

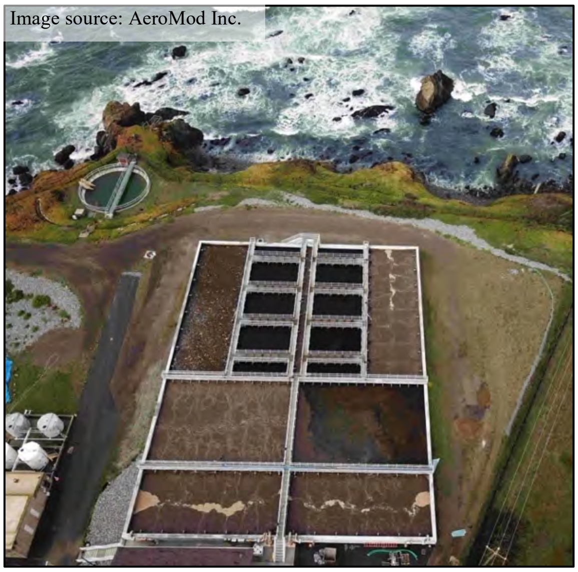
Figure 6: MBR Package Plant System Flow Diagram



Advantages and Disadvantages of ALTERNATIVE 3	
Advantages	**Disadvantages**
• High quality effluent increases disposal and reuse options ○ High level of removal for BOD, TSS, Nitrogen, and Phosphorus ○ High quality effluent facilitates subsequent disinfection processes if desirable for re-use in future • Modular - additional MBR treatment units can be added as flows increase • Modular package plants allow for quick installation. • MBR systems can be operated with long solids residence times to reduce volume of solids requiring disposal • Membrane filtration eliminates need for clarifiers reducing required footprint of treatment plant	• Higher initial capital cost as compared to conventional secondary treatment systems • Higher operating costs compared to conventional activated sludge treatment systems (with same throughput) due to: ○ Energy required for membrane cleaning (air scrubbing) ○ Cost of periodic membrane replacement • Throughput dictated by membrane properties limiting peak flow capacity to • 1.5 - 2 times average design flows • Membranes must be kept wet during operations limiting flexibility for highly variable wastewater flows • Requires fine screening (1-3mm) at headworks to protect membranes • Additional equalization tank required for larger peak flows • Sludge may require additional chemicals for ability to settle for removal / disposal • Requires additional equalization tank to manage periodic peaks in BOD levels

ALTERNATIVE 4: AeroMod Activated Sludge Package Plant

Activated sludge package plants consist of several interconnected wastewater treatment compartments constructed of non-corrosive material such as concrete or coated steel. The activated sludge process is an aerobic suspended-growth (bioreactor) process in which air is diffused into the treatment compartments in order to maintain aerobic conditions as well as continuously suspend the micro-organisms to ensure contact with the nutrients in the wastewater. Like the preceding two onsite treatment alternatives, the activated sludge process is a bioreactor that relies on micro-organisms to consume biodegradable organic matter in order to reproduce.



AeroMod WWTF in Ft. Bragg, CA

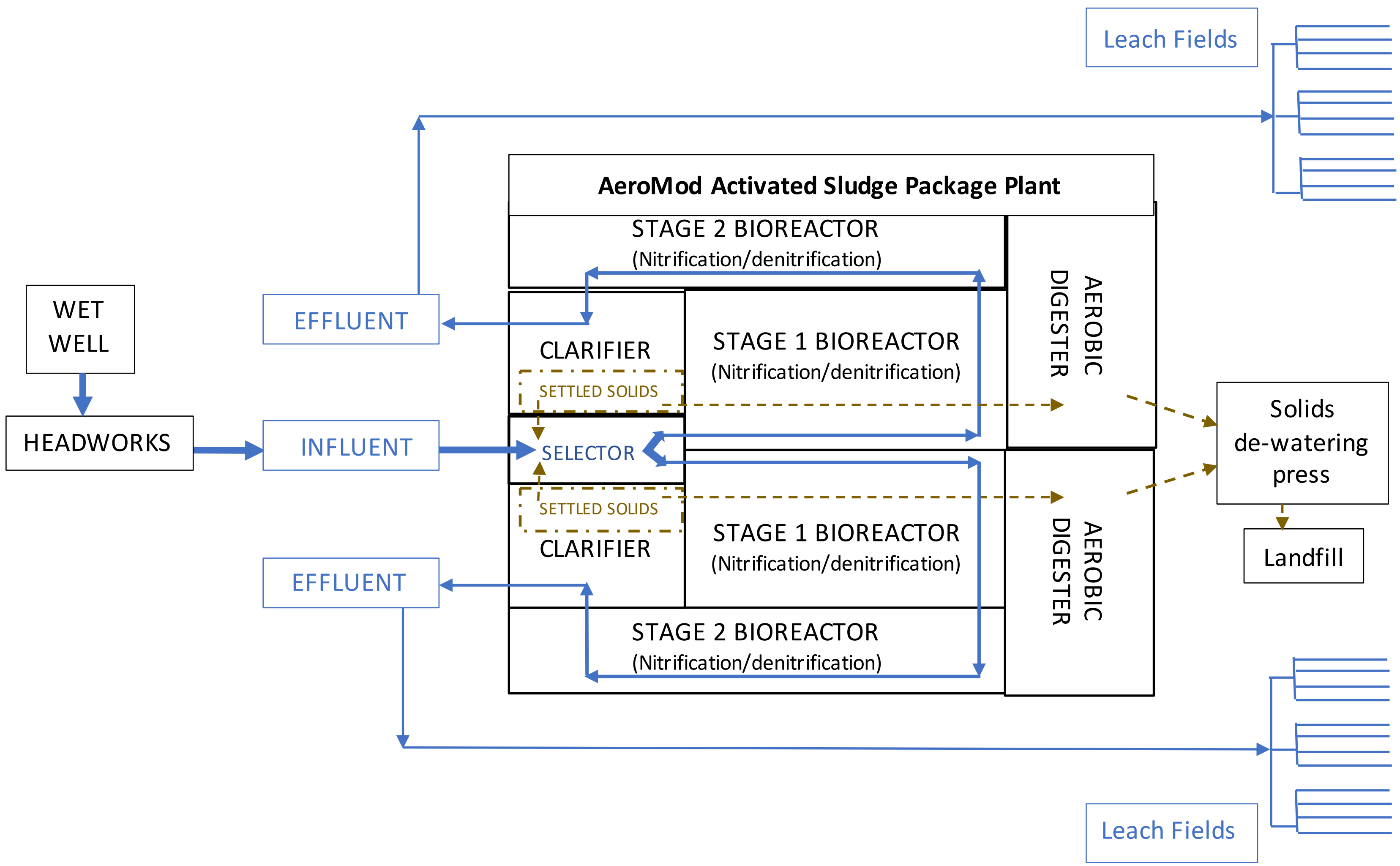
The AeroMod activated sludge treatment plant includes suspended growth bioreactors (aeration tanks), solids separation equipment (clarifiers), and solids wasting systems (aerobic digestion) as a package unit. The treatment system employs the "Sequox-Plus" process developed by AeroMod in which individual bioreactors are aerated and unaerated in a repeated sequence in order to provide conditions required to achieve both aerobic and anoxic biological wastewater treatment. The aeration sequence can be adjusted to achieve desired nutrient (BOD, nitrogen & phosphorus) removal levels in the bioreactor chambers. The Sequox Plus process produces a high level of BOD and nitrogen removal.

As shown in the flow diagram below (Figure 7), the wastewater flows enter into the AeroMod system through a "Selector Tank" where the raw sewage is combined with returned activated sludge from the clarifiers. The Selector tank can be aerated or anoxic to provide additional biological treatment. The mixture if wastewater and sludge then flow into the First Stage Bioreactors where the aeration diffusers are operated on a 2-hour cycle. After multiple cycles, the flow continues into the Second Stage Bioreactor where the sequencing of aeration (and non-aeration) is opposite to the First Stage bioreactor. The flow then continues to the clarifier where microbial solids settle out (sludge). Treated effluent from the clarifiers can be pumped directly to leach fields for discharge or can be treated through additional disinfection processes for re-use. Sludge removed from the clarifier is recycled back into the Selector Tank or, as needed, pumped to the aerobic digester for further processing and eventual de-watering in preparation for final disposal in a landfill.

Operation and maintenance requirements:

Maintenance requirements for an AeroMod activated sludge package plant include regularly checking dissolved oxygen levels in the system as well as checking the motors, pumps, gears and blowers to ensure proper lubrication and operation. Routine inspection of the clarifier, and sludge levels in the aerobic digester are also recommended. Solids in the aerobic digester will require monthly removal and disposal. The AeroMod activated sludge wastewater treatment system requires operators that have training and experience equivalent to a Grade III wastewater treatment operator.

Figure 7: AeroMod Activated Sludge System Flow Diagram



Advantages and Disadvantages of ALTERNATIVE 4	
Advantages	**Disadvantages**

• Highly stable at variable loading rates
  o System can handle peak flows up to 4 X average daily design flow
  o System can be operated as low as 25% capacity
• Modest land use requirement
• High BOD / TSS / TN / TP removal rates
• Low daily operations requirements
  o Primarily blower and compressor maintenance
• Treatment system is odor free
• Long solids retention time in aerobic digester allows for low sludge volume and long sludge storage duration
• System does not require media - reducing maintenance costs
• System does not have moving parts below the waterline
• Multi-chamber design allows for dilution of periodic peaks in BOD in wastewater
	• High initial capital cost
	  o Full facility built-out required
	  o Not designed to be modular
	• Moderate operational energy demand - higher than packed bed filtration system, but lower than MBR system
	  o Energy required for pumping and aeration in treatment chambers
	• Surface discharge or re-use would require additional filtration and disinfection

COMPARISON OF WASTEWATER TREATMENT SYSTEM ENVIRONMENTAL PERFORMANCE

The environmental performance characteristics of the alternative treatment systems compared in this study are summarized in the Table below.

Table 10: Environmental Performance of Wastewater Treatment System Alternatives

Wastewater Treatment System Environmental Performance					
Treatment System	**Effluent BOD level (mg/L)**	**Effluent TSS level (mg/L)**	**Effluent TN (mg/L)**	**Effluent Phosphorus (mg/L)**	**Energy consumption**
~~**Orenco Textile Filter**~~	~~5 to 10~~	~~10~~	~~10~~	~~Requires additional treatment~~	~~Low - pumping / recirculating wastewater~~
~~**Membrane Bioreactor**~~	~~2 to 5~~	~~1 to 5~~	~~3 to 10~~	~~<1~~	~~High - aeration, pumping wastewater through membranes, air scouring~~
Aero-Mod Activated Sludge	3	1 to 5	2 to 5	<1	Medium - aeration and pumping wastewater between chambers

COMPARISON OF WASTEWATER TREATMENT SYSTEM COSTS

Construction cost estimates for the three on-site wastewater treatment system alternatives are included in the table below.

The estimates include the following:

1. Design
2. Contract administration
3. Site construction
4. Concrete
5. Metals
6. Wastewater treatment system equipment (provided by vendor)
7. Mechanical piping
8. Electrical equipment
9. Instrumentation and controls

The cost estimates do not include a Supervisory Control & Data (SCADA) system or off-site lift stations for future infrastructure.

Table 11: Construction Cost Estimate for AeroMod Wastewater Treatment Facility

BLR Wastewater Treatment Alternatives	**100,000 GPD Wastewater Treatment Facility Construction Cost Estimate (Million $)**
Alternative 1: City of Blue Lake Wastewater Treatment System	N/A: 100,000 GPD capacity not feasible
Alternative 2: Orenco Recirculating Packed Bed Filter System	$5.5M - $6.5M
Alternative 3: Membrane Biological Reactor (MBR) System	$7.5M - $8.5M
Alternative 4: AeroMod Activated Sludge Package Plant	$7.5M - $8.5M

EFFLUENT DISCHARGE ALTERNATIVES

SURFACE DISCHARGE

As per the North Coast Basin Plan, discharging wastewater treatment facility effluent into surface waters requires a higher level of treatment to protect water quality for all beneficial uses. Additional wastewater treatment equipment and/or chemicals are required to achieve higher levels of water quality, increasing both capital and operating costs. The Basin Plan also prohibits all regulated (non-Tribal) wastewater treatment plants from discharging into surface waters during the "dry season" spanning May 15th through September 30th. This requirement is designed to protect water quality during times of low surface water flows. In addition, discharging treated wastewater into surface waters triggers the involvement of the U.S. EPA through the National Pollutant Discharge Elimination System (NPDES) permit program**.**

Given the increased system complexity and cost associated with attaining a higher level of effluent quality, as well as the recognition that established seasonal surface water discharge restrictions protect local rivers, disposal into the nearest surface water, the Mad River, was eliminated as a discharge alternative for this project.

SUBSURFACE DISCHARGE

Subsurface discharge of treated wastewater through leach fields offers additional water quality treatment as the effluent percolates through the soil. As such, subsurface treated effluent disposal has less stringent water quality requirements as compared to surface water discharge. Further, sub-surface discharge does not trigger any further involvement by the EPA so long as there is no hydrologic connection to any nearby surface waters.

Subsurface discharge systems must be sized and designed based on soil properties, depth to groundwater, percolation rates, ground slope, and setback distances to wells as described in detail in the preceding Water Quality / Discharge Standards section. Subsurface disposal through a leach field is the preferred method of final disposal for the Blue Lake Rancheria wastewater treatment facility as it allows for unconstrained year-round discharging, and the highest level of protection of both ground and surface water resources.

<u>BLR Leach field design</u>

Soil types, percolation rates, and groundwater level data were obtained from the 2019 BLR Geotechnical Exploration Report for a proposed Tribal office building. The data were collected via five (5) borings around the area where the Tribal Justice Center now stands, and an additional four (4) borings in the adjacent empty field - which is the southernmost edge of the preferred Project site. All boring holes in the open field had identical soil characteristics. For the purpose of this study, the data in the Geotechnical Report are assumed to be representative of the soil characteristics throughout the preferred Project site. These data indicate the presence of a sandy/loam soil and percolation rates (4 - 20 Minutes per Inch) suitable for subsurface disposal. Additional percolation testing will be required as part of the subsequent design/build phase of the Project.

Table 4.3 of the EPA Onsite Treatment Systems Manual recommends hydraulic loading rates for treated effluent based on soil type, and an effluent strength (BOD) of either 30mg/L or 150mg/L. Additional percolation area is required for wastewater effluent BOD levels above 30mg/L. The following table summarizes the soil characteristics from the borings taken at the preferred Project site, as well as the EPA suggested leach field hydraulic loading rate based on an effluent strength at or below 30mg/L BOD.

Table 12: EPA Suggested Hydraulic Loading Rate Based on Effluent Level

Boring Locations	Soil Type / Soil Classification	Soil Depth	Soil Zone	EPA Suggested Hydraulic Loading Rate BOD = 30mg/L
I-1, P-1, P-2, P-3	Grey Sandy GRAVELS with Silt, loose, moist, coarse grain, to 3", rounded / (GW) well graded	1-5 ft	2	1.0 gallons / ft^2 - day

According to the geotechnical report, the groundwater level in all boring holes was 18' below the surface. This data is validated by the BLR groundwater monitoring data collected from 10/29/2010 through 10/20/2020 which show an average groundwater level of 18' below the surface.

It is generally recommended that land be reserved for a 100% leach field replacement in the future. The area available in the preferred location does not have sufficient space for a 100% replacement of the BLR leach field sized for the full build-out of the Master Plan. This is not deemed to be an issue however due to the water quality levels achieved by the preferred treatment technology. Additionally, the leach field area required for discharging the Rancheria's treated effluent will require multiple individual zones in order to ensure even distribution for optimal percolation. This design allows for portions of the leach field system to be takin off-line for maintenance, as well as the expansion of the leach field system as-needed, eliminating the need to immediately build to full capacity or have a large land area reserved for redundancy.

RE-USE

Although treated effluent re-use is not planned for the initial phase of the BLR WWTF, information about treated wastewater re-use is included in this study for consideration as the Tribe moves forward with the construction of new facilities and facility expansions. Disinfected tertiary recycled water can be used for flushing toilets and urinals; this should be considered for the future phases of the Project as use of dual plumbing to convey properly treated recycled water to toilets and urinals would reduce the potable water demand. Potable water demand reductions of approximately 20% or more may be possible for buildings that incorporate dual plumbing and treated wastewater re-use. Recycled water can also be used for other applications such as: construction water, backfill consolidation, soil compaction, as well as landscape irrigation and water features. There may also be a demand for recycled water from nearby agricultural water users during the dry season.

The California Department of Public Health (CDPH) is statutorily required to establish uniform statewide recycling criteria for the various uses of recycled water to assure protection of public health where recycled water use is involved (CWC section 13521). CPDH criteria include specified approved uses of recycled water, numerical limitations and requirements, treatment method requirements, and performance standards. These treated wastewater reuse criteria are included in APPENDIX E.

RECOMMENDED APPROACH

The recommended wastewater management alternative for the Blue Lake Rancheria is an onsite facility located in Zone B that utilizes a 100,000 GPD AeroMod activated sludge package plant with subsurface disposal through leach fields. The 100,000 GPD plant capacity represents the highest anticipated peak wastewater flows[2] at full build-out of the BLR Master Plan. An AeroMod package plant with 100,000 GPD peak capacity will allow the Tribe to meet both existing and planned wastewater treatment needs. This is possible due to the multi-chamber, redundant design of the AeroMod treatment system which can be operated at flows as low as 25% of total capacity or as high as four times the average daily design flow. The existing Blue Lake Rancheria wastewater flows are approximately 30% of the design treatment plant capacity. The life expectancy of the AeroMod treatment system is 30 years. Figure 8 below shows the approximate layout of the Rancheria WWTF on the preferred location in Zone B.

It is recommended that the treated effluent be disposed through a multi-zone leach field with a full build-out capacity of 100,000 GPD. A multi-zone leach field design consisting of six (6) 16,667 GPD leach fields in parallel configuration can be installed in phases. The first three zones consisting of at least half of the leach field capacity (50,000 GPD) should be installed with the construction of the AeroMod treatment plant. The remaining zones can be installed as needed over time. The multi-zone approach allows the Tribe to take portions of the leach field off-line for maintenance without interrupting treatment system operations. The soil type and percolation test data for the leach field area on Zone B correspond to an EPA recommended 1 gallon /ft2/day design area. Therefore, a minimum of 100,000ft2 will be required for the leach field area at full build-out.

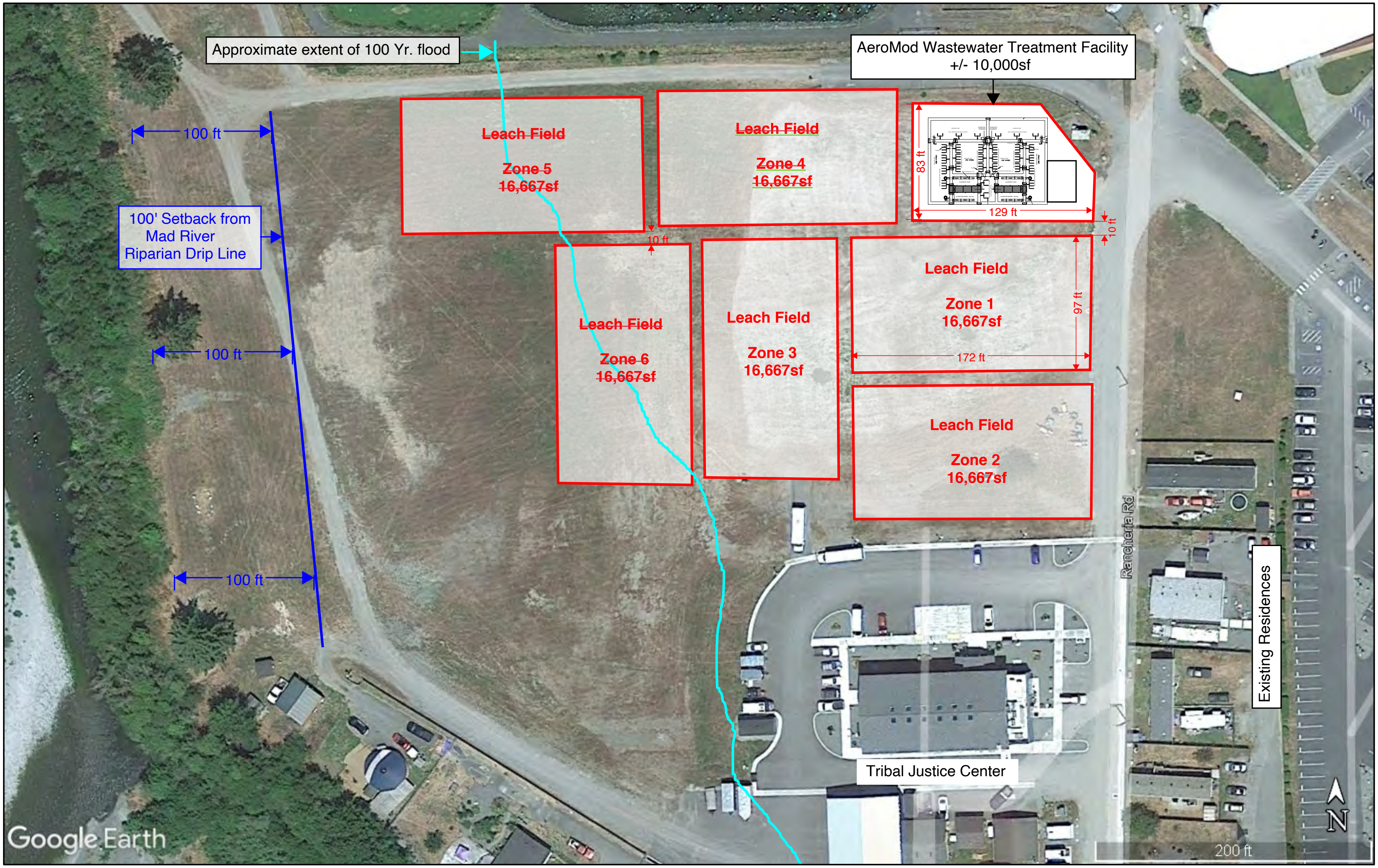
All onsite wastewater treatment plant design standards call for leach field redundancy consisting of setting aside land equal to the full leach field area for future replacement. The Rancheria does not have sufficient land in Zone B for a 100% leach field replacement at full BLR Master Plan build-out (min. 200,000ft2). The lack of space for 100% leach field replacement is not expected to be a problem for the Rancheria as the AeroMod system effluent has very little remaining organic and inorganic material and is not expected to cause buildup or failure in the leach field system (see table below). Additionally, individual leach field zones can be taken off-line for maintenance as needed. Typical leach field life expectancy is 30 - 50 years.

Table 13: BLR AeroMod WWTF Wastewater Treatment Levels

BLR AeroMod WWTF Wastewater Treatment Levels		
Treatment Component	**Influent mg/L**	**Effluent mg/L**
BOD	350	10
TSS	180	10
Ammonia-N	50	1
Phosphorus	8	2

[2] The average daily wastewater flows for existing Rancheria uses is estimated to be 32,000 GPD, and the anticipated average daily flow at full build-out of the BLR Master Plan is estimated to be 68,000 GPD. The 100,000 GPD design flow reflects peak wastewater flows of 1.5 times the daily average design flows. This peak flow factor is based on the average monthly peak flow factors from the BLR wastewater flow data for the years 2021 - 2022.

Figure 8: Blue Lake Rancheria WWTF Layout on the Preferred Site in Zone B



The recommended approach provides the following benefits to the Tribe:

- The Rancheria will have guaranteed capacity to expand housing and facilities as it chooses.
  - This solution also eliminates uncertainly related to future wastewater treatment pricing and BOD discharge limits.
- The WWTF will consolidate the wastewater currently served by individual septic systems into one location and reduce maintenance issues and/or threats to groundwater from failing systems.
- The recommended alternative provides unmatched peak flow flexibility that will be useful during music festivals or other periodic, high-attendance events at the Casino and Hotel. This is possible due to the AeroMod system design which can handle periodic peak wastewater flows up to four (4) times the average daily design flow.
- By operating and maintaining an advanced onsite treatment system that produces a high-quality effluent, the Tribe can be assured that it is protecting both groundwater and the Mad River from untreated solids and nutrients harmful to aquatic life and other beneficial uses.
- The recommended solution relies on moderate energy use to produce a high-quality effluent. In an effort to increase energy efficiency, the AeroMod system has optimized the energy used for aeration with the DO_2 optimizer that adjusts air diffusion rates based on continuously measured dissolved oxygen levels.
  - The level of dissolved oxygen directly corresponds to BOD levels in wastewater; therefore, the system can ramp up or down to process fluctuations in BOD loading rates. This is a significant advantage to the Tribe as it eliminates concerns over surges in concentrated wastewater flows (e.g., periodic high BOD levels).
- AeroMod supplies de-watering equipment specifically designed to work with the wastewater treatment system. This is an advantage to the Tribe as this arrangement allows for a single point of contact for support and parts for the entire WWTF. Other systems rely on third party supplied de-watering systems.

ANCILLARY SITE CONSIDERATIONS

1. **Flood Zone** - The preferred Project site is partially within the 100-year flood zone as shown in APPENDIX F. Any WWTF components not rated for submersion and all electrical components should be placed outside of the 100-year flood zone. Leach fields can be located in the 100-yr flood zone; however, operational capacity will be reduced when inundated.
2. **Energy Use** - Annual energy use is estimated to be 92,000kWh/year - 201,000kWh/year (this reflects 50,000GPD - 100,000GPD wastewater flows respectively). BLR may want to expand on-site solar electricity generation to reduce overall energy costs, as well as additional costs associated with "Demand Charges" that are based solely on peak use.
3. **Emergency Power** - provide source of back-up power for the wastewater lift station, treatment system, and leach field dosing pump to provide service in the event of a power outage and prevent sewer overflows.
4. **Percolation Testing** - Conduct site-specific percolation testing for leach fields during wet season prior to April 1st so that leach field design and construction can commence.
5. **Wells** - It is recommended that leach fields be set back 150' from all drinking water wells; therefore, Tribal well locations should be identified before final leach field siting.
6. **Recreational Vehicle (RV) Guests** - Consider asking RV campsite guests to refrain from using chemical products in holding tanks while hooked up to the Rancheria wastewater system. Some products used to control RV holding tank odors contain harmful chemicals that can kill the bacteria in the wastewater treatment system.

~~CONSTRUCTION COST AND TIMELINE~~

~~As shown in Table 11 above, the construction cost for a complete WWTF that includes the AeroMod activated sludge package plant is estimated to be between $7.5 - $8.5 million. This cost estimate includes the de-watering and electrical controls building as well as the belt-filter press equipment. The electrical controls included in the cost estimate are stand-alone; however, if order to bring these independent operations together and to allow for remote monitoring, a SCADA system is strongly recommended. A SCADA system would cost an additional $250,000 - $350,000.~~

~~AeroMod has provided a proposal for the Blue Lake Rancheria wastewater treatment system which is included in Appendix G. The estimated timeline for constructing the Blue Lake Rancheria WWTF is six (6) months for design, and 18 months for construction.~~

~~The AeroMod proposal includes the following:~~

- ~~Aeration equipment~~
- ~~Bio-P (phosphorus removal) equipment~~
- ~~Clarifier & return activated sludge equipment~~
- ~~Aerobic digesters, sludge holding tank, and waste activated sludge equipment~~
- ~~Electrical controls~~
- ~~Ancillary equipment such as handrails etc.~~
- ~~Freight delivery to job site~~
- ~~Inspection, start-up, & operator training~~

OPERATION & MAINTENANCE COSTS

Maintenance requirements for an AeroMod activated sludge package plant include regularly checking dissolved oxygen levels in the system as well as checking the motors, pumps, gears and blowers to ensure proper lubrication and operation. Routine inspection of the clarifier, and sludge levels in the aerobic digester are also recommended. Solids in the aerobic digester will require monthly removal and disposal. Note that costs below reflect the operations required for a 100,000 GPD system. The anticipated cost of operating power is significantly lower for the current level of wastewater treatment required (~$22,000). This component of the operating cost can be further reduced through on-site power generation.

Operation and Maintenance costs include the following:

Operation & Maintenance Costs for 100,000 GPD AeroMod Wastewater Treatment System	
Operational Element	**Annual cost ($)**
Grade III Operator	$75,000
Maintenance Worker (wages only)	$50,000
Polymer for de-watering	$2,500
Landfill Disposal Cost	$5,000
Misc. Parts, Oil Fluids Etc.	$2,500
Annual replacement parts & repairs	$5,000
System operating power ($0.25/kWh)	$50,000
Total	**$190,000**

RESOURCES CONSULTED

1. AeroMod Inc.; *Cost-Effective Biological Nitrogen Removal: Aero-Mod Sequox-Plus*
2. AeroMod Inc. (12/20/2022); *Blue Lake Rancheria, CA WWTP Proposal.*
3. Blue Lake Rancheria wastewater flow and effluent water quality data 2020 - 2022.
4. Blue Lake Rancheria 7-day water quality sampling data 2021 - 2022.
5. Blue Lake Rancheria Master Plan May 12, 2022.
6. Blue Lake Rancheria Tribe and City of Blue Lake Memorandum of Understanding; Draft Fourth Amendment June 20, 2020.
7. Blue Lake Rancheria Tribe and City of Blue Lake Memorandum of Understanding; First Amendment December 14, 2004.
8. Blue Lake Rancheria Tribe and City of Blue Lake Memorandum of Understanding; Original MOU November 1, 2000.
9. Blue Lake Rancheria Tribe and City of Blue Lake Memorandum of Understanding; Second Amendment January 24, 2006.
10. Blue Lake Rancheria Tribe and City of Blue Lake Memorandum of Understanding; Third Amendment October 28, 2008.
11. California State and Regional Water Quality Control Boards (2012); *OWTS Policy Water Quality Control Policy for Siting, Design, Operation and Maintenance of Onsite Wastewater Treatment Systems.*
12. California State Water Resources Control Board Order WQ 2014-0153-DWQ (2014); *General Waste Discharge Requirements for Small Domestic Wastewater Treatment Systems*.
13. Ecologix; Package MBR Plant brochure.
14. Evoqua Water Technologies; Xpress Membrane Bioreactor brochure.
15. Federal Emergency Management Agency Flood Map (12/17/2022); https://www.fema.gov/flood-maps/national-flood-hazard-layer.
16. Humboldt LAFCO (2019); *City of Blue Lake Municipal Service Review.*
17. KC Engineering Company (2019); *Geotechnical Exploration Report on Proposed Blue Lake Tribal Office Building Project.*
18. Metcalf & Eddy, Inc. 2004*; Wastewater Engineering Treatment and Reuse, Fourth Edition.*
19. Newterra; Membrane Bioreactor System brochure.
20. North Coast Regional Water Quality Control Board; personal communication with Kelsey Cody, Senior Environmental Scientist.
21. North Coast Regional Water Quality Control Board; *Water Quality Control Plan for the North Coast Region.*
22. Orenco Water; AdvanTex AX-MAX O&M Manual.
23. Orenco Water; Environmental Profile AdvanTex Wastewater Treatment Systems.
24. Pacific Gas & Electric Company (7/08/2021); *Electric Schedule A-10, Medium General Demand Metered Service. https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_SCHEDS_A-10.pdf.*
25. Redwood Coast Energy Authority (1/25/2023); *Commercial, Industrial, and Agricultural Generation Rates. https://redwoodenergy.org/wp-content/uploads/2023/01/JAN-2023-Rates-for-Website_Non_RES.pdf.*
26. U.S. Environmental Protection Agency (2004); *Onsite Wastewater Treatment Systems Manual.*
27. U.S. Environmental Protection Agency; personal communication with Abagail Farrell UIC program Environmental Engineer.
28. Smith & Loveless Inc.; Titan MBR brochure.

APPENDIX A
Feasibility Study Assumptions

1. There is no wastewater from the following Rancheria facilities: Pedestrian Plaza, Storage Building, Biodiesel Manufacturing building.
2. RV camping sites - assumes two persons per site (6 sites). Assumes RVs are hooked up to the Rancheria water and wastewater effectively making these units like a hotel room; so therefore, hotel room water use of 50gallons / person / day is assumed.
3. The data in the Geotechnical Report are assumed to be representative of the soil characteristics throughout the preferred Project site.
4. REU units of wastewater capacity at the City of Blue Lake WWTP (as listed in the 2019 Municipal Services Review) are equal to SFR units of wastewater capacity as stated in MOU documents between the Tribe and the City.
5. Number of bathrooms anticipated in Zone B = 2.
6. Number of bathrooms anticipated for the Multi-purpose Barn = 2.
7. Retirement Facility assumed to have 1 person / room.
8. Toma Resilience Campus assumed to have a kitchen and 2 bathrooms.
9. Multi-purpose Barn assumed to have 2 bathrooms.
10. Yoga and Wellness Center assumed to have a large gym, showers and bathrooms with 6 showers, 8 toilets.
11. Health clinic assumed to have 2 bathrooms.
12. Corp Yard assumed to have 2 bathrooms.
13. The Old Rancheria Building, Hotel, and Casino are all assumed to double in both guests and employees with planned expansion.
14. Assumed BLR household occupancy calculated from current Rancheria residential population (203) divided by the total # houses (45) as per BLR data.
15. It is assumed that the BOD sampling error began in April 2022 and ended mid-September 2022. BOD data from 2021 7-day sampling, as well as data from 2022 January - March and Mid- September - December sampling are assumed to be a valid representation of the Rancheria wastewater strength.
16. WWTF site layout assumes an additional building will be required for de-watering equipment (belt-filter press) and an electrical room.
17. A 20' maintenance access space is included on all sides of the wastewater treatment facility.
18. Operational power costs are based on a $0.25/kWh electricity rate; actual rates may vary.
19. It is assumed that the Tribal Justice Center septic system and leach field will be abandoned. The Tribal Justice Center wastewater will be processed through the BLR WWTF, and the existing leachfield area will be re-purposed as part of the new WWTF.
20. Wastewater flow estimates are based on the sources as shown in the following tables.

BLR wastewater flow estimates are based on the following sources:

Blue Lake Rancheria Tribal Wastewater System Feasibility Study			
Wastewater Flow Rate Estimate - Existing Facilities			
Existing Facilities	**Unit**	**Flow (gallons/unit/ day)**	**Source**
Casino	Customer	3	EPA OWTS Manual Table 3-6 (Theater)
	Employee	13	EPA OWTS Manual Table 3-4 (Office)
Hotel	Guest	50	EPA OWTS Manual Table 3-4 (Hotel)
	Employee	10	EPA OWTS Manual Table 3-6 (Resort)
Old Rancheria Building	Visitor	3	EPA OWTS Manual Table 3-3 (Toilet)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Convenience Store & Fueling Station	Customer	3	EPA OWTS Manual Table 3-4 (Public lavatory)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Tribal Justice Center	Employee	5	BLR water use measurements from well
RV Camping Sites	Guest	50	EPA OWTS Manual Table 3-4 (Hotel)
Fire Station	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Residences	Houses	450	Metcalf & Eddy 2004 (100gpd/capita)

Blue Lake Rancheria Tribal Wastewater System Feasibility Study			
Wastewater Flow Rate Estimate - Future Facilities			
New Facility Development & Expansion	**Unit**	**Flow (gallons/ unit/day)**	**Source**
Event Center / Arena	Guest	3	EPA OWTS Manual Table 3-5 (Assembly Hall)
	Employee	13	EPA OWTS Manual Table 3-4 (Office)
Old Rancheria Building Renovation	Visitor	3	EPA OWTS Manual Table 3-3 (Toilet)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Hotel Expansion	Guest	50	EPA OWTS Manual Table 3-4 (Hotel)
	Employee	10	EPA OWTS Manual Table 3-4 (Hotel)
Casino Expansion	Customer	3	EPA OWTS Manual Table 3-6 (Theater)
	Employee	13	EPA OWTS Manual Table 3-4 (Office)
Water Park	Customer	10	EPA OWTS Manual Table 3-6 (Swimming pool)
	Employee	10	EPA OWTS Manual Table 3-6 (Swimming pool)
Wastewater Treatment Facility	Employee	13	EPA OWTS Manual Table 3-4 (Industrial building)
Bathrooms for events in Zone B near WWTF	Person	3	EPA OWTS Manual Table 3-4 (Public lavatory)
Corp Yard	Employee	13	EPA OWTS Manual Table 3-4 (Industrial building)
Commercial Mixed-Use Zone	Customer	3	EPA OWTS Manual Table 3-6 (Store)
	Employee	10	EPA OWTS Manual Table 3-6 (Store)
Health Clinic	Visitor	3	EPA OWTS Manual Table 3-3 (Toilet)
	Employee	10	EPA OWTS Manual Table 3-5 (Hospital)
Wellness & Yoga Center	Guest	25	EPA OWTS Table 3-5 (Day school: cafeteria, GYM, Showers)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Multi-purpose Barn Restoration	Visitor	3	EPA OWTS Manual Table 3-3 (Toilet)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
Toma Resilience Campus	Visitor	15	EPA OWTS Table 3-5 (Day school, cafeteria only)
	Employee	10	EPA OWTS Manual Table 3-4 (Office)
New BLR residences	Houses	450	Metcalf & Eddy 2004 (100gpd/capita)
Chartin Rd. Residences	Houses	450	Metcalf & Eddy 2004 (100gpd/capita)
Potential Retirement Facility	Resident	90	EPA OWTS Manual Table 3-5 (Rest home)
	Employee	10	EPA OWTS Manual Table 3-5 (Rest home)

APPENDIX B

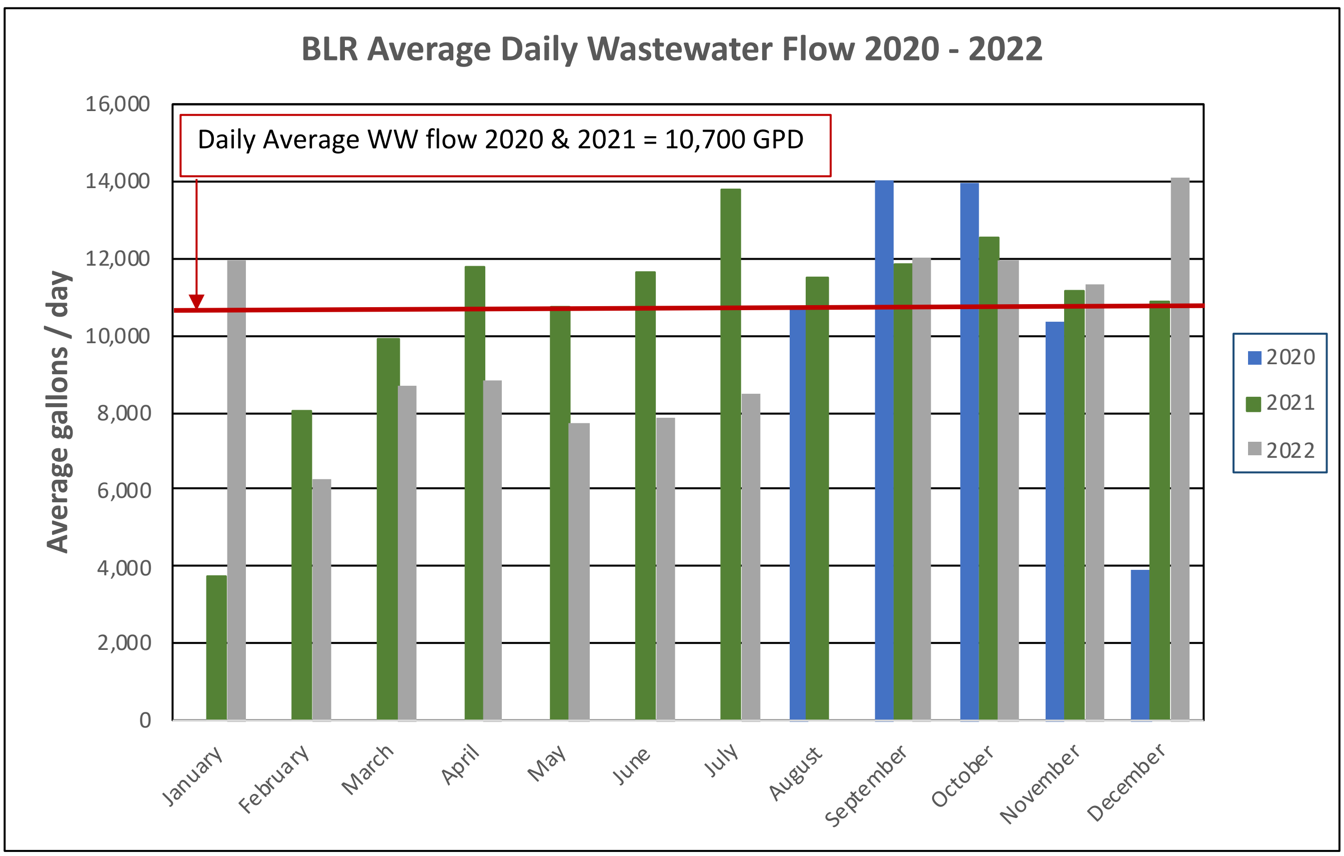
Blue Lake Rancheria Wastewater Flow Data for Casino and Hotel

BLR Average Daily Wastewater Flow (gallons/day)			
Month	**2020**	**2021**	**2022**
	Avg. Gallons / day	**Avg. Gallons / day**	**Avg. Gallons / day**
January	-	3,770	11,987
February	-	8,049	6,297
March	-	9,912	8,734
April	-	11,776	8,856
May	-	10,716	7,698
June	-	11,644	7,880
July	-	13,789	8,467
August	10,805	11,483	-
September	14,065	11,873	12,023
October	13,946	12,564	11,987
November	10,372	11,137	11,309
December	3,929	10,857	14,098

2020 Average GPD	**10,656**	*Not full yr.
2021 Average GPD	**10,659**	full year
2022 Average GPD	**9,316**	*Not full yr.

Highest daily peak use (GPD)	**20,527**	Oct. 2021

Average Peak Use Factor 2020-2022	**1.5**	See data below

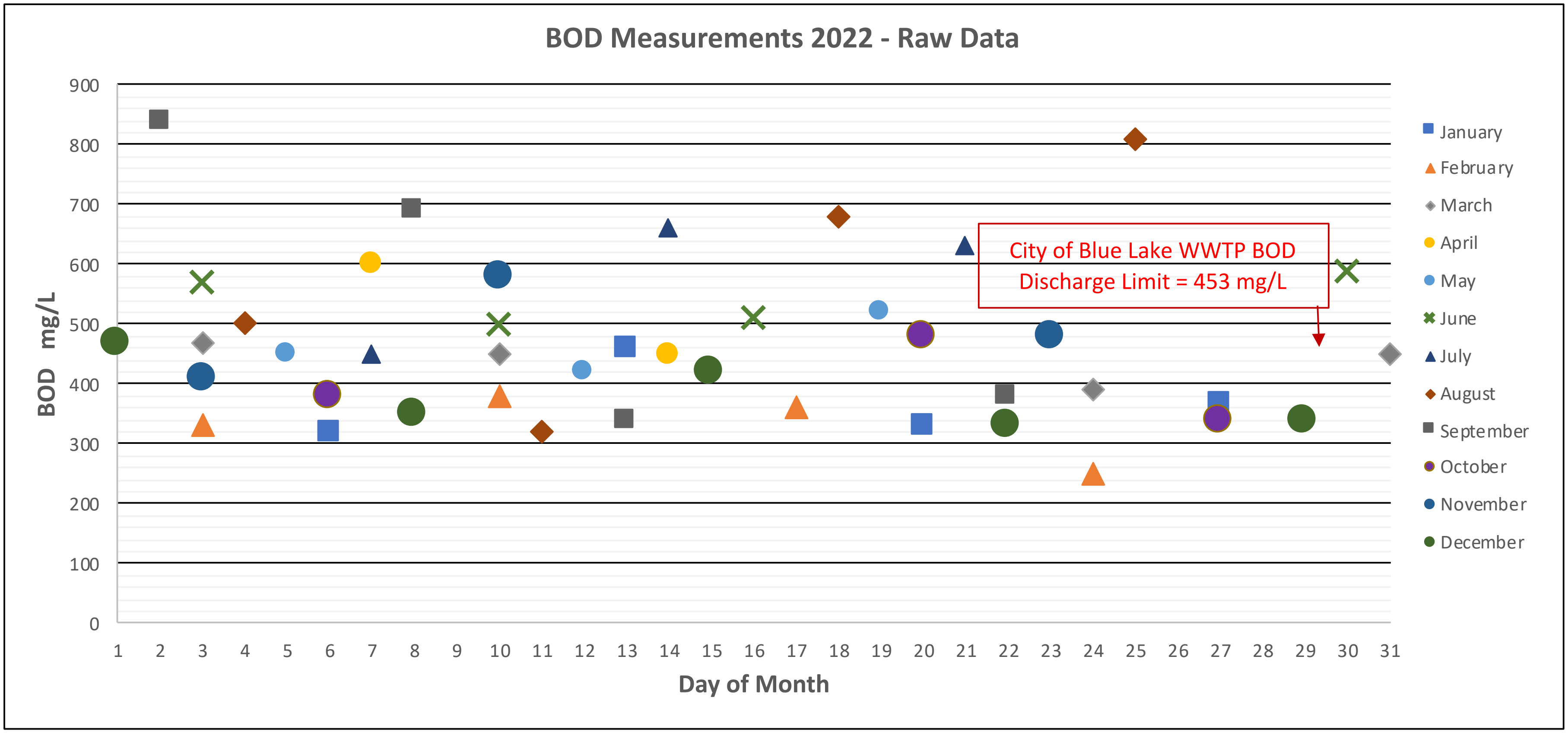


Wastewater treatment plants must be designed to handle periods of peak use. A peak use factor is used to estimate the maximum design flow. Peak use factor = monthly peak use / average daily use. A peak use factor for BLR was calculated based on the monthly peak use factors from the 2020 - 2022 flow data. The BLR Peak Use Factors are summarized below:

Monthly Peak Use Factors			
	2020	**2021**	**2022**
January	-	3.4	2.2
February	-	1.2	1.8
March	-	1.2	1.6
April	-	1.3	1.7
May	-	1.1	1.2
June	-	1.3	1.6
July	-	1.3	1.5
August	1.2	1.3	-
September	1.4	1.3	1.3
October	1.3	1.6	1.3
November	1.6	1.1	1.5
December	2.2	1.5	1.3

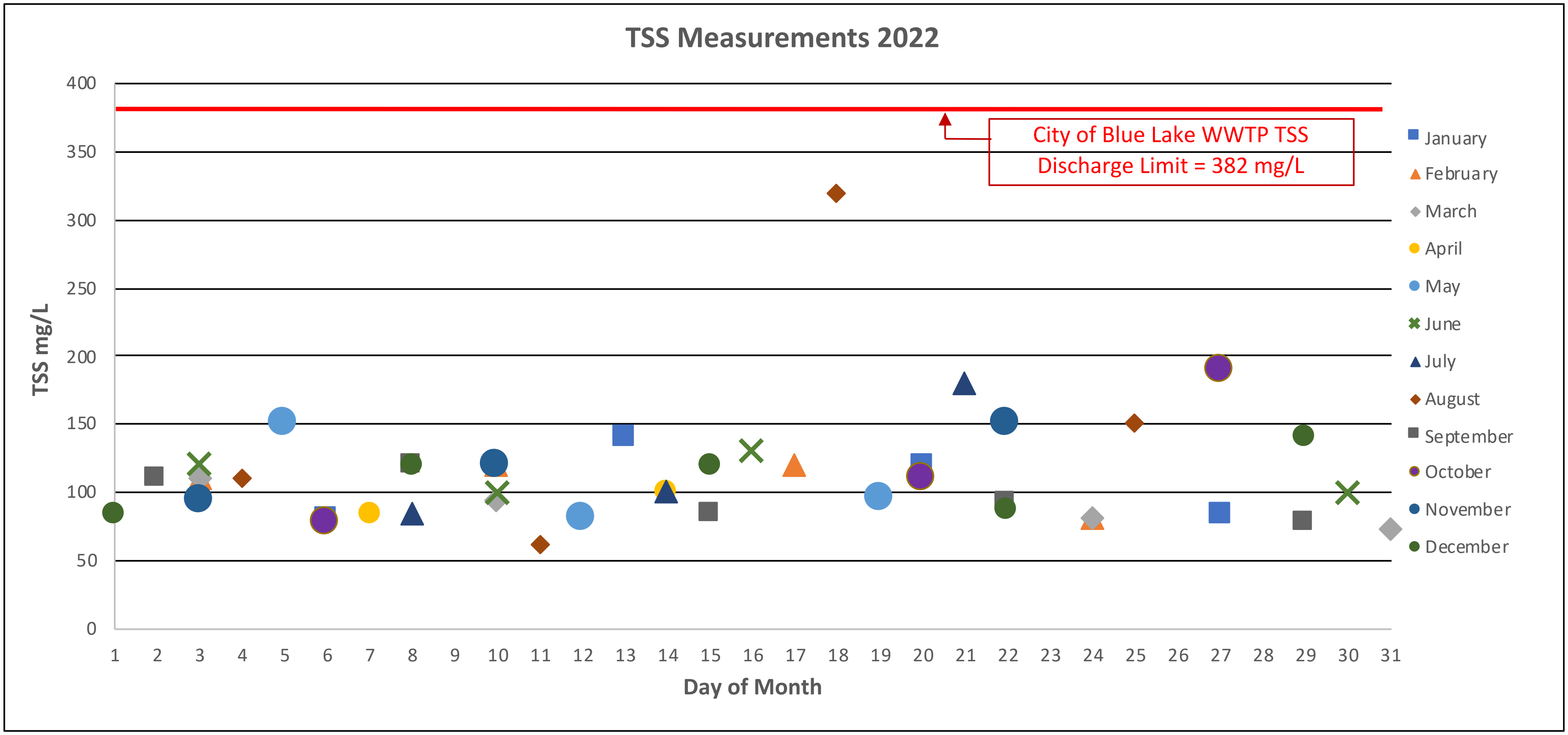
APPENDIX C
Blue Lake Rancheria Wastewater Strength Data

BOD data for 2022 are shown below. BLR staff noted a sampling error that is assumed to have occurred between April - mid-September 2022. For the purposes of this study, the BOD data recorded during the period of sampling error was omitted from the design calculations. The wastewater strength used for the preliminary WWTF design is based on the 2022 data collected between January 1 through the end of March 2022, and mid-September through the end of December 2022. These data were used in combination with the BOD data from periodic 7-day sampling that occurred between Memorial Day 2021 and the New Year's Holiday weekend in 2022.



Biological Oxygen Demand Measurements 2022 - Raw Data (mg/L BOD)												
Day / Month	January	February	March	April	May	June	July	August	September	October	November	December
1												470
2									840			
3		330	470			570					410	
4								500				
5					450							
6	320									380		
7				600			450					
8									690			350
9												
10		380	450			500					580	
11								320				
12					420							
13	460								340			
14				450			660					
15												420
16						510						
17		360										
18								680				
19					520							
20	330									480		
21							630					
22									380			330
23											480	
24		250	390									
25								810				
26												
27	370									340		
28												
29												340
30						590						
31			450									

BLR Total Suspended Solids (TSS) data for 2022 are shown below.



Total Suspended Solids Measurements 2022 - Raw Data (mg/L TSS)												
Day / Month	January	February	March	April	May	June	July	August	September	October	November	December
1												84
2									110			
3		110	110			120					93	
4								110				
5					150							
6	80									78		
7				84								
8							84		120			120
9												
10		120	94			100					120	
11								61				
12					80							
13	140											
14				100			100					
15									84			120
16						130						
17		120										
18								320				
19					96							
20	120									110		
21							180					
22									92		150	87
23												
24		80	80									
25								150				
26												
27	84									190		
28												
29									78			140
30						100						
31			72									

BOD & TSS 7-day sampling 2021 - 2022				
7-day Sampling Period / Design level	**PARAMETERS**			
	pH	**Temperature (°C)**	**BOD**	**TSS**
Memorial Day				
Low	7.34	21	170	38
High	7.86	22.6	260	59
Average	7.61	21.8	207	48
4th of July				
Low	7.04	20.7	170	59
High	8.04	25.9	250	180
Average	7.66	23.7	204	80
Labor Day				
Low	6.53	20.6	230	70
High	7.42	24	330	130
Average	7.16	23	276	100
Thanksgiving				
Low	7.35	17.9	280	94
High	7.84	20.5	340	170
Average	7.57	19.1	310	126
New Years				
Low	7.1	14.2	300	88
High	7.84	20	460	130
Average	7.5	18	383	105
April*				
Low	6.35	14.8	360	65
High	6.72	17.1	480	100
Average	6.52	15.9	424	79

*The data collected during the month of April were not used in the design wastewater strength calculation as this is the assumed first month of the BOD sampling error.

APPENDIX D
Links and Contact Information for U.S. EPA UIC and NPDES Programs

1. Underground Injection Control (UIC) inventory form:

   Form #7520 asks for basic wastewater treatment facility and leach field information.

   https://www.epa.gov/uic/forms/underground-injection-well-registration-epas-pacific-southwest-region-9#form

   EPA Region 9 contact for this program:

   Abby Farrell, PE
   USEPA Region 9 (WTR-4-2)
   75 Hawthorne Street
   San Francisco, CA 94105
   415 972-3937

2. Biosolids disposal informational forms:

   Link to NPDES Form 1 (general info) and Form 2A (publicly owned treatment works) and 2S (biosolids). While part of the NPDES program, the use of these forms does not require the applicant to apply for a full NPDES permit.

   https://www.epa.gov/npdes/npdes-applications-and-forms-epa-applications

   EPA Region 9 contact for this program:

   Lauren Fondahl
   Biosolids Coordinator, WTR-2-3
   US EPA Region 9
   415-972-3514
   Fondahl.lauren@epa.gov

3. Construction General Permit:

   While this is technically a permit, the approval process is automatic in most cases.

   https://www.epa.gov/npdes/2022-construction-general-permit-cgp

   EPA Region 9 contact for this program:

   Eugene Bromley
   NPDES Permits Section (WTR-2-3)
   EPA Region 9
   75 Hawthorne Street
   San Francisco, CA 94105
   bromley.eugene@epa.gov
   (415) 972-3510

APPENDIX E
Treated Wastewater Re-Use Criteria

The State of California promotes the use of recycled water to the maximum extent in order to supplement existing surface and ground water supplies to help meet water needs (California Water Code (CWC) sections 13510-13512).

There are three primary classes of disinfected recycled water, which include the following:

1. Disinfected secondary 2.2 – Recycled water that been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a most probable number (MPN) of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30-day period.

2. Disinfected secondary 23 – Recycled water that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed a most probable number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed, and the number of total coliform bacteria does not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30-day period.

3. Disinfected tertiary recycled water – A filtered and subsequently disinfected wastewater that meets the following criteria:

   a. The filtered wastewater has been disinfected by either:

      i. A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or

      ii. A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999 percent of the plaque forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for purposes of the demonstration.

   b. The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100 milliliters in more than one sample in any 30-day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100 milliliters.

Allowable recycled water uses include the following:

1. Use of recycled water for irrigation:

   a. Disinfected tertiary recycled water:

      i. Food crops, including all edible root crops, where the recycled water comes into contact with the edible portion of the crop,

      ii. Parks and playgrounds,

      iii. School yards,

      iv. Residential landscaping,

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project:	Blue Lake Rancheria	***Date:***	20-Dec-22
Engineer:	Rinehart Engineering	***Units:***	English
Diffuser Type Used:	Stainless Steel Coarse Bubble		

	Design	**Peak**		**Design**	**Peak**
Q, MGD	0.100	0.150	TKN_o, mg/l	62.5	56.3
BOD_o, mg/l	350	315	$TKN_{assimilation}$, mg/l	11.3	6.8
BOD_{rem}, mg/l	350	315	TKN_{rem}, mg/l	62.5	56.3
BOD_{rem}, lb/day	292	394	TKN_{rem}, lb/day	52.1	70.4
O_2 Requirement, lb O_2/lb BOD_{rem}	1.500		O_2 Requirement, lb O_2/lb TKN_{rem}	4.60	

AERATION REQUIREMENTS

	Design	**Peak**
BOD_{oxy} - Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	18.2	24.6
TKN_{oxy} - Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	10.0	13.5
Actual Oxygenation Rate (AOR), lbs O_2/hr	**28.2**	**38.1**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**51.9**	**70.1**

SOR = [(AOR * $C_{s,20}$) / (α * $\Theta^{(T-20)}$ * (Tau * Ω * β * $C_{s,20}$ - C_L))]

Where:

$C_{s,T,H}$	Actual Value of D.O. Saturation, mg/l	**9.08**	**C_L**	Residual D.O. Conc., mg/l	**2.0**
$C_{s,20}$	Steady State Value of D.O. Saturation, mg/l	9.08	**T**	Temperature of Water, °C	**20**
Tau	Oxygen Saturation Value ($C_{s,T,H}$/$C_{s,20}$)	1.000	**F**		
α	Alpha - Oxygen Transfer Correction Factor for Waste	0.75	Θ	Theta - Oxygen Transfer Coeff	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**131**
P_H	Atmospheric Pressure at Site Elevation, psi	14.63	Ω	Omega (P_H/P_s)	0.995

	Design	**Peak**
Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm	**458**	**618**

Where:

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**13.5**
Transfer Efficiency per Foot of Submergence, %	**0.80%**		

	Design	**Peak**
Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm	68	96

Where: TN_e = TKN_o / 2 (assumed when D.O. control is not used)

	Design	**Peak**
Total Aeration Required in Aeration Basin, scfm	**390**	**522**

Air Correction

icfm = scfm / [((T_{std} + 460) / (T_{air} + 460)) * ((P_H - (RH% * SVP_{Tair})) / (14.7 - (RH%$_{std}$ * SVP_{std}))) * ((P_A / P_H)]

Where:

T_{std}, °F	68	T_{air}	Maximum Air Temperature, °F	**104**
RH%$_{std}$	36%	RH%	Maximum Relative Humidity, %	**80%**
SVP_{std}, psi	0.34	SVP_{Tair}	Saturated Vapor Pressure of Air @ T_{air}, psi	1.058
		P_A	Actual Atmospheric Pressure after Blower Inlet, psi	14.43

Minimum Air Required for Mixing in First Stage Aeration Basin, cfm	68	Side Roll
Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	71	Side Roll
Minimum Air Required for Operating Full Plant, cfm (mixing requirement for 24 hrs)	248	

	Design	**Peak**	**Design**	**Peak**
Aeration Pressure, in. H_2O			189	189
psi, std (does not include blower inlet/outlet)			**6.8**	**6.8**

		scfm	scfm	icfm	icfm
Aeration Basin		390	522	447	598
Aerobic Digester Tank	(sequenced aeration)	103	103	103	103
Bio-P / Selector Tank		12	12	12	12
Clarifier RAS Airlift Pumps & Skimmers		29	29	29	29
	Total Air Required	533	665	**590**	741
	Total Air Available				**844**

POWER REQUIREMENTS

	Unit	Power	Power
Operating Power for Aeration Basin, HP	Blower	20.6	31.1
Operating Power for Digester, HP	Blower	4.8	5.4
Operating Power for Selector Tank, HP	Blower	0.5	0.6
Operating Power for Post Aeration Tank, HP	Blower	0.0	0.0
Operating Power for Clarifier, HP	Blower	1.3	1.5
Operating Power for Pneumatic System, HP	Air Compr.	0.4	0.4
Operating Power Required at Full Loading, HP		**27.6**	**39.0**
Minimum Power Required to Operate Full Plant , HP		**13.7**	

Aero-Mod, Inc.

CLARIFIER DESIGN CALCULATIONS

Project:	Blue Lake Rancheria	***Date:***	20-Dec-22
Engineer:	Rinehart Engineering	***Units:***	English
Clarifier Type Used:	Split-ClarAtor		

FLOW CONDITIONS

Design Flow, MGD	0.100	
Peaking Factor, hourly	3.90	0.390 MGD
Duration, min	60	
Peaking Factor, sustained	2.85	0.285 MGD
Aeration Tank Volume, Mgal	0.104	
MLSS, mg/l	3,755	
Avg. RAS Recycle Rate, %	150%	

EQUIPMENT SIZING & SELECTION

Number of Clarifiers	**2**	Surface Area per Clarifier, sf	144
Clarifier Unit Model	**12144**	Total Surface Area, sf	**288**
Bridge Length, ft	12	Total Weir Length, ft	42
Clarifier Unit Width, ft	12	Tank Wall Depth, ft	16.0
Number of Units per Clarifier	1	Tank Water Depth, ft	14.0

SURFACE OVERFLOW RATE

Design Flow, gpd/sf	**347**	
Peak Day Flow, gpd/sf	990	
Peak Hour Flow, gpd/sf	1,000	* Max allowed to leave clarifier
Max. Flow Allowed Through Clarifier Orifice, gpd/sf	1,000	* Max allowed to leave clarifier

WEIR OVERFLOW RATE

Design Flow, gpd/lin. ft	**2,381**
Peak Flow, gpd/lin. ft	6,857

SOLIDS LOADING RATE

Design Flow, lbs/day/sf	**27.2**
Peak Flow, lbs/day/sf	47.6

RETENTION TIME - including RAS

Design Flow, hr	**2.9**
Peak Flow, hr	1.7

Aero-Mod, Inc.

TANKAGE DESIGN CALCULATIONS

Project:	Blue Lake Rancheria	***Date:***	20-Dec-22
Engineer:	Rinehart Engineering	***Units:***	English
Tank Construction:	Cast-in-Place Concrete		

BIO-P / SELECTOR TANK

Anaerobic Selector Volume Required, gal **8,333**

Number of Tanks	1	Tank Length, ft	12.0
Tank Wall Height, ft	16.0	Tank Width, ft	7.0
Tank Water Depth, ft	14.0	Total Volume, gallons	**8,796**
Freeboard, ft	2.0	Retention Time (Forward Flow) min.	127

AERATION TANK

Volume Selected, gal **103,908**

Tank Wall Height, ft	16.0	Number of Trains	2
Tank Water Depth, ft	14.0	Number of Stages	2

Stage 1		*Stage 2*	
Number of Tanks	2	Number of Tanks	2
Tank Length, ft	15.00	Tank Length, ft	28.250
Tank Width, ft	16.125	Tank Width, ft	9.00
Area of Each Tank, sf	242	Area of Each Tank, sf	254
Total Volume, gallons	**50,658**	Total Volume, gallons	**53,250**

Total volume provided, gal **103,908**

CLARIFIER TANK

Number of Tanks	2	Tank Width, ft	12.0
Tank Wall Height, ft	16.0	Tank Length, ft	12.0
Tank Water Depth, ft	14.0	Total Volume, gallons	**30,159**

AEROBIC DIGESTER TANK

Volume Selected, gal **51,491**

Number of Tanks	2	Tank Length, ft	9.00
Tank Wall Height, ft	16.0	Tank Width, ft	26.375
Tank Water Depth, ft	14.5	Total Volume, gallons	**51,491**

OVERALL TANKAGE DIMENSIONS

Total Length, ft	41.000	Wall Thickness, in	15.0
Total Width, ft	56.50	Floor Thickness, in	15.0
Total Area, sf	2,317	Total Concrete for Walls, cy	**288**
Total Wall Length, LF	388	Total Concrete for Slab, cy	**116**
		Total Grout for Clarifier, cy	**9**

SEQUOX® Biological Nutrient Removal

Activated Sludge Process Provides Nutrient Removal with High Quality Treatment and Energy Savings

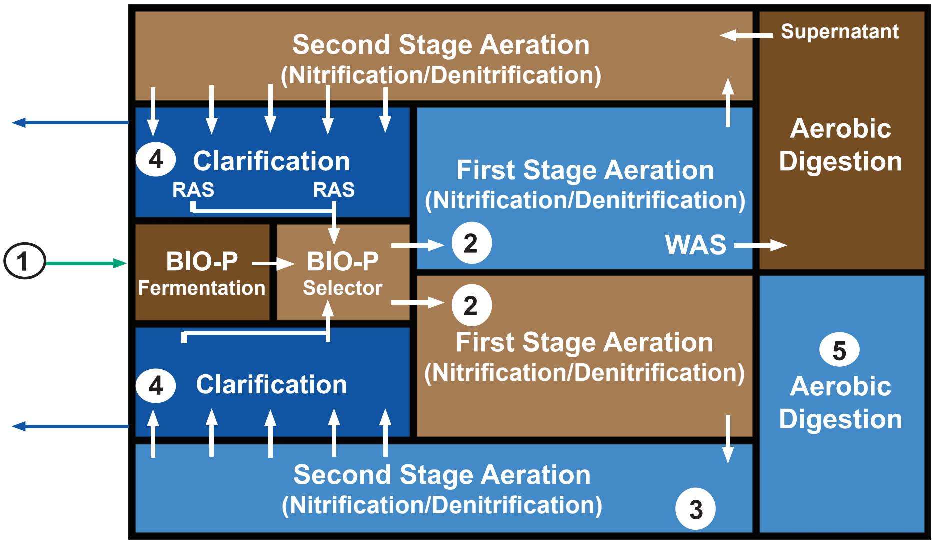
Holton, KS 0.528 MGD

Aero-Mod believes nutrient removal requires energy efficiencies. The SEQUOX® Biological Nutrient Removal Process along with the DOptimizer control meets this requirement. It is the latest innovation for biological nutrient removal from Aero-Mod. SEQUOX (SEQUential OXidation) offers the benefits of sequencing aeration with plug flow kinetics and the reliability of continuous clarification. Consistent superior effluent quality is achieved with total nitrogen levels as low as 3 mg/L. Phosphorus removal can be achieved by incorporating a fermentor/anaerobic selector and/or chemical addition. The process is energy efficient and has a small footprint. Furthermore, it requires no recycle pumps or mixers.

The SEQUOX® process often incorporates the ClarAtor® clarifier technology which is low-maintenance and operator friendly. Featuring stainless steel and fiberglass components with no moving parts below the water, its unique flow regulation system provides in-basin surge storage. The DOptimizer control system maximizes energy efficiency by balancing organic demand with mixing energy requirements.

FEATURES

- Biological Nutient Removal
- Plug flow kinetics
- Continuous clarification with sequencing aeration
- Sequential reactions without turning blowers on/off
- Superior energy control
- Operator friendly and low maintenance
- Automatic back-up controls should PLC fail
- Selector tank promotes better settling characteristics
- No moving parts below the water surface



SEQUOX® Biological Nutrient Removal

1 – Flow enters into an **Anoxic- Selector Tank** or **BIO-P Fermentor/Anaerobic Selector Tank,** where the raw sewage is combined with returned activated sludge (RAS) from the clarifiers.

2 – This mixture then flows into the **First Stage Aeration Basins** where the air is sequenced on/off on a 2 hour cycle. During peak organic loadings the DOptimizer controls the alternation of air and can activate both 1st Stage Aeration Basins.

3 – Flow continues into the **Second Stage Aeration Tanks**. The aeration is sequenced on/off on a 2 hour cycle between these two basins. The sequencing of this on/off air is opposite to the 1st Stage Aeration Basins. The end result of the plug flow process with sequential reactions is excellent nitrification/denitrification without having blowers turned on and off nor have dedicated internal recycle pumps and associated mixers in separate anoxic tanks.

The combination of cyclical aeration in the four (4) basins creates excellent aerobic conditions for BOD and ammonia removal when aerating. When the air is off, the nitrate laden MLSS settles and becomes oxygen deprived, creating anoxic conditions for the nitrates to become the oxygen source and allow for denitrification to occur. The plug flow process repeats this cyclical on/off aeration several times as the liquid mass progresses through the SEQUOX® process and on to the clarifier.

4 – The flow then enters the **ClarAtor Clarifier** where the biomass is settled and returned to the Selector Tank. The clarified effluent is withdrawn and discharged.

5 – At regular intervals solids are automatically or manually wasted to an **Aerobic Digester/Aerated Sludge Holding Tank.** Supernatant is simultaneously decanted back to the aeration process over a fixed level weir.

The SEQUOX® process with our innovative DOptimizer control strategy offers optimal energy efficiencies. It has more turn down for under loaded plants than ever before. The control philosophy allows the plant to mimic the actual organic loading coming to it. A plant is driven either in an organically "ACTIVE" mode; or, it is in a mixing "SEMI-ACTIVE" mode; or, it is virtually under no organic load and can "REST". Energy savings is the result of operating the minimum required basins and reducing blower usage for minimum mixing energy, or, no energy as the blowers are turned off in the "REST" mode.

LOAD TUNE YOUR PLANT WITH THE DOptimizer™ CONTROL STRATEGY

ClarAtor® Clarifier

Combining the SEQUOX process with the ClarAtor clarifier technology offers cost effective compact solution. Other ClarAtor advantages include:

- No moving parts below the water
- Unique ability to regulate effluent flow rate for in-basin surge storage
- Uniform influent distribution and collection
- Stainless steel and fiberglass fabrication
- Rapid and positive sludge withdrawal
- Minimal maintenance

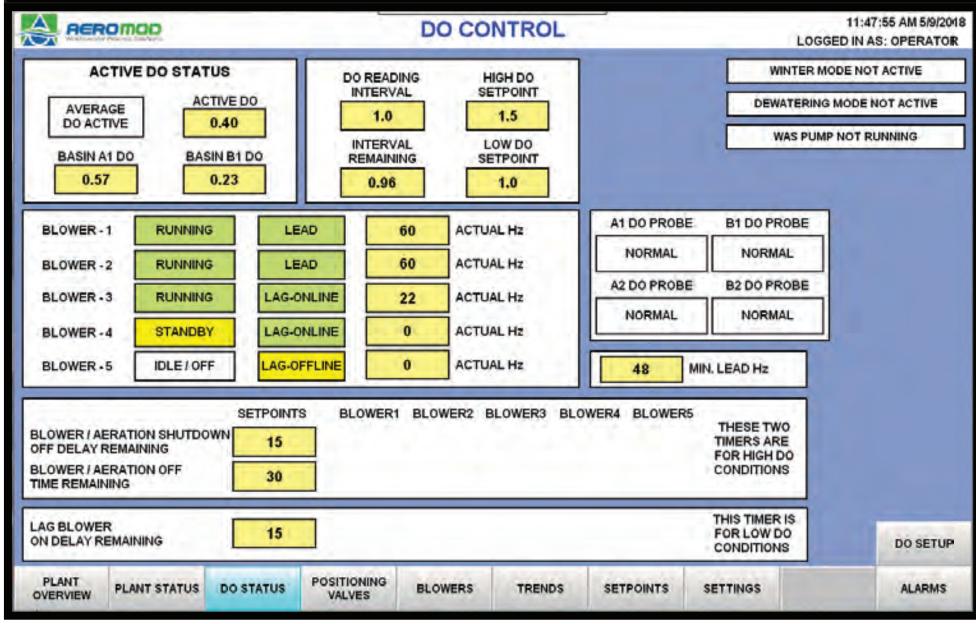
Aero-Mod, Inc. • 7927 U.S. Highway 24, Manhattan, KS 66502 • Phone: 785.537.4995 • Fax: 785.537.0813
www.aeromod.com • aeromod@aeromod.com

DO_2ptimizer™ Process Control

Use the SEQUOX® Process and DO_2ptimizer™ D.O. Control to "Load-Tune" Your Process

Aero-Mod's SEQUOX® process has a continuous, plug-flow pattern with sequential reactions. Sequential reactions means the aeration basins are aerated intermittently to minimize the mixing requirements to half of the tankage. Sequential reactions also means that with the alternating conditions of aerobic and anoxic, nitrification and denitrification will occur in the aeration basins. Denitrification will reclaim a portion of the oxygen used in nitrification. Use of the DO_2ptimizer™ D.O. Control System provides control of the air supplied to the aeration system in the tankage to provide the minimum air necessary for proper treatment and operation. At all times the Dissolved Oxygen (D.O.) level in the aeration basins is monitored, and the proper blower operation is correspondingly controlled. During periods of high loading (organic driven), the blower speed and quantity are adjusted to maintain the D.O. level within a set range. During periods of low loading (mixing driven), the blower speed and quantity are adjusted to maintain mixing intensity while limiting the D.O. to a maximum level. During periods of minimal or no loading (rest), the blowers are turned off to allow the process to "rest". The combination of the SEQUOX Process and the DO_2ptimizer D.O. Control System provide a cost-effective way of maintaining the most power-efficient operation of the wastewater treatment plant while achieving Total Nitrogen removal to the lowest levels attainable biologically.

Operator-friendly settings give the operator full control of the process.



- TN levels to lowest achieved biologically
- Mimics/matches actual demand to achieve energy efficiency
- Able to reduce energy consumption over conventional D.O. control
- Operates with energy efficiency even on plants well below design capacity

AEROMOD Wastewater Process Solutions

7927 E. US Highway 24, Manhattan, KS 66502
Phone: (785) 537-4995
www.aeromod.com

AEROMOD
Wastewater Process Solutions

ClarAtor® Clarifier Technology

Headache Free Clarifier With No Moving Parts

The ClarAtor clarifier equipment is installed into concrete tankage, utilizing common-wall aeration basin construction, helping to lower capital and construction costs.

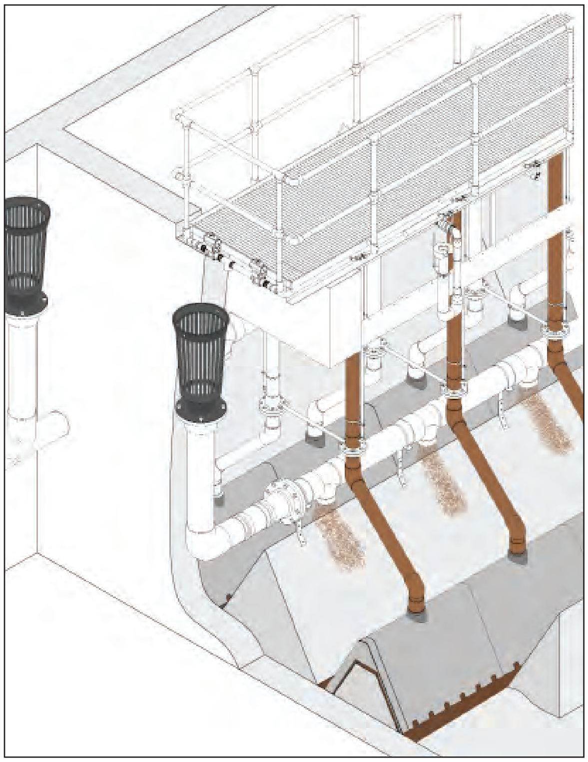
Aero-Mod's proven ClarAtor® clarifier technology puts the operator in the best position to succeed. It features no moving parts below the water, a uniform distribution of the influent, and a uniform collection of the effluent. It also offers the unique ability to regulate the effluent flow rate. It is applicable to municipal and industrial biological wastewater treatment plants.

This secondary clarifier technology can be used for a wide range of flows (including infiltration and inflow problems) and can be applicable for retrofitting rectangular clarifiers.

The clarifier equipment is typically installed in conjunction with the SEQUOX nutrient removal process. It is installed into concrete tankage that is common wall to the activated sludge process. The equipment is fabricated of stainless steel, fiberglass and associated PVC piping with a bridge that includes grating and aluminum handrails. Typical operator attention required is periodic cleaning of the walkways, skimmers, and effluent discharge weirs. Because no mechanical equipment is below water, maintenance is virtually eliminated.

ClarAtor® Clarifier

- No moving parts below the water surface
- No motors, gears or electrical components
- Stainless steel and fiberglass fabrication
- No field welding or painting
- Uniform influent distribution
- Unique ability to regulate effluent flow rate provides in-basin surge storage
- Rapid and positive sludge withdrawal
- Minimal maintenance
- Applicable over a wide range of flows



Distribution and removal system creates the optimal settling environment for wastewater treatment plant clarification. Futhermore, the ClarAtor's unique effluent regulation system allows more flow to enter the plant than is exiting, creating in-basin surge storage.

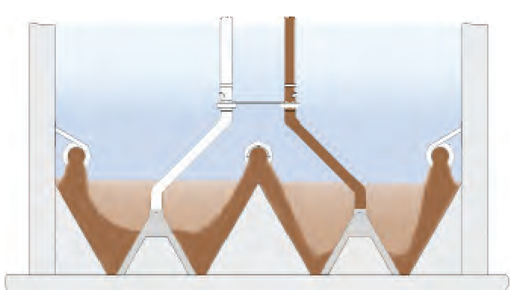
within the basins or in a sideline surge tank. This flow control system limits the upward velocity in the clarifier, producing a better quality effluent with a more regulated flow rate to downstream tertiary treatment or disinfection systems.

With no moving parts under the water and common-wall construction of the process tanks; a complete treatment plant fits in a rectangular configuration. This greatly reduces yard piping, electrical requirements, transfer pump stations and treatment footprint. The end result can be significant savings in capital and maintenance costs.

Settling occurs under ideal conditions because there is not a moving sludge scraper. Settled solids are rapidly removed from the bottom of the clarifier through stationary hydraulic suction hoods evenly spaced across the floor of the clarifier. Airlifts attached to the top of these suction hoods provide the pumping mechanism. The return activated sludge (RAS) rate is controlled by a timer which controls the airlifts in a "minutes on/minutes off" mode. The return activated sludge is discharged back to the selector/aeration tank through the RAS trough on the bridge.

Effluent is evenly withdrawn across the clarifier through submerged launders and discharges through a flow regulation system. This unique system with the ClarAtor technology creates a clarifier able to regulate the effluent flow rate on the downstream end and absorb the excess flow

The hydraulic suction hood assemblies have ports along the bottom of the clarifier to allow solids removal via airlifts evenly spaced along the length of the suctions hoods.



SEQUOX® Process

Combining the ClarAtor Clarifier with the SEQUOX process offers a compact low maintenance plant. Other SEQUOX advantages include:

- Biological nutrient removal
- Continuous clarification with sequencing aeration
- Operator friendly, low mechanical process
- Reduced energy requirements
- Superior effluent quality

SR Diffuser Access System

An Innovative Solution to the Challenge of Diffuser Inspection and Maintenance

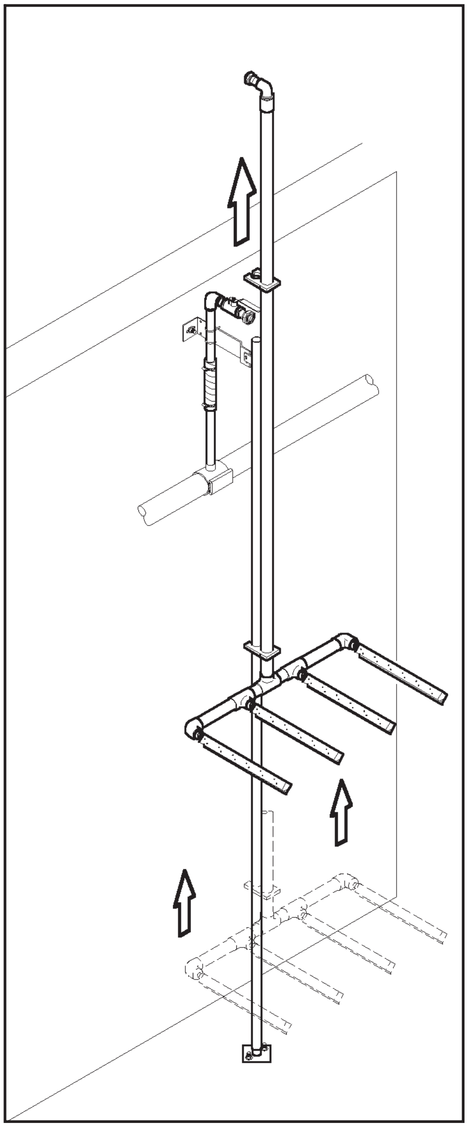
The SR (Slide Rail) Diffuser Access System provides simple removal of the aeration diffusers within a tank without turning off the blowers or draining the tank(s). Applications for the system are typically for aeration or digester basins.

Isolation and air control are provided by a ball valve on each assembly. Removal is achieved by loosening a stainless steel union and lifting up the PVC assembly on guides. Rigidity is provided by a permanently mounted stainless steel slide rail firmly bolted to the tank wall and floor. The result is a low maintenance, operator friendly system for diffuser upkeep.

SR Diffuser Access System

- Lightweight diffuser system
- Provides access to diffusers without turning off the blowers or draining tanks
- Individual isolation and control
- Constructed from long lasting, non-corrodible materials - SS and PVC
- Excellent for retrofits of existing aeration basins
- Eliminates the need for hoist or winching systems
- Provides access to an individual drop pipe without affecting the entire system

Diffuser inspection is easily accomplished without draining the tanks, turning off the blowers, or using a hoist. Diffuser cleaning and maintenance can be performed without affecting the operation of the treatment plant or shutting off other diffuser assemblies.



Typical installations include the tubular type of coarse or fine bubble diffusers. Two to six diffuser assemblies are usually mounted to a common slide rail system.

Installation of the SR Diffuser Access System can include new construction or retrofits to existing mixing or aeration basins. Systems can be designed for "wet installation" in retrofit applications with all hardware mounted above the water.

PVC Drop Pipe

Typically, a two inch schedule 40 PVC pipe is used to transfer air to the diffusers below the surface of the water in the tank. Supports are mounted to the drop pipe that direct the assembly along the guide rail for inspection and maintenance. At the top, a stainless steel union is installed on the pipe that can be easily disconnected for removal of the assembly. Additionally, a stainless steel shut-off throttling ball valve is located at the top of the assembly to isolate the assembly from the air line.

Guide Rail Mounting System

The rigidity needed for operation of the SR Diffuser Access System is provided by the 1.5" stainless steel guide rail. The guide rail is attached to the side of the tank near the top by a stainless steel wall bracket and then secured to the bottom of the tank by a stainless steel floor mounted support.

Diffusers

The SR Diffuser Access System can be used with stainless steel coarse or tubular membrane diffusers. The arrangement of the diffusers per drop pipe is usually two, four or six diffusers in either 12" or 24" diffuser lengths. The number of diffusers and the total number of slide rail assemblies are contingent on the air requirements. This flexible system readily accepts most types of diffusers in varying amounts.

Aero-Mod Treatment

The SR Diffuser Access System is an innovative component of an Aero-Mod wastewater treatment solution. Every Aero-Mod system is custom designed to your exact specifications and features.

- 304 Stainless steel fabrication for long term reliability and reduced maintenance.
- Simple, operator friendly processes and equipment for operational consistency.
- Common-wall, cast-in-place concrete tank construction for easy expansion.

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Aero-Mod, Inc.

SLUDGE DEWATERING DESIGN CALCULATIONS

Project:	Blue Lake Rancheria	***Date:***	20-Dec-22
Engineer:	Rinehart Engineering	***Units:***	English
Belt Filter Press Model Used:	Tritan series 1000		

NOTE: Actual operating conditions dependent upon loading of treatment plant.
This proposal assumes a population equivalent of about 1,100 people.

SLUDGE CONDITIONS

Volume of sludge per day (fully loaded), gallons *(avg over month)*	**1,095**
Solids concentration of sludge, mg/l	12,000
Solids concentration of sludge, %	1.20%
Solids to dewater, dry lbs/day *(avg over month)*	**110**
Polymer requirement, lbs/dry ton sludge	20
Dewatered solids concentration, %	14.0%
Volume of dewatered sludge, ft^3	12.5

EQUIPMENT SIZING & SELECTION

Number of Belt Filter Presses Used	**1**
Polymer Feed Pump Used	**Diaphragm**
Sludge Feed Pump Used	**Prog. Cavity**
Pumping Capacity, gpm	92
BFP Solids Loading Rate, lbs/hr	550
Belt Filter Press Effective Belt Width, m	1.0
BFP Solids Loading Rate, lbs/hr/m	550
Projected Operational Time Period, hrs/day	6.0
Projected Operational Days Required/month	**1.0**
Sludge Cake Pump Used	**Prog. Cavity**

OPERATIONAL REQUIREMENTS

Total polymer requirement, lbs/month 33

Active polymer 50% Polymer density, lb/gal 8.6

Total polymer requirement, gal/month 8

Electrical usage per press, kWh 5.8

Total electrical usage, kW/month 36

Total weight of dewatered sludge @ 14.0% , tons/month 12

WASHWATER USE (per press)

Washwater use for normal operation, gpm	18.0
Washwater use for washdown cycle, gpm (≈30 min)	26.5
Recommended washwater supply, gpm	40.0

* Note: minimum water pressure (psi) of 40

BUDGET PRICE QUOTE FOR EQUIPMENT **$388,790**

Includes:
(1) Tritan Belt Filter Press, model 1000
(1) PLC Master Control Panel w/ Touchscreen
(1) Sludge Feed Pump/VFD Controls/Static Mixer on Stand
(1) Polymer Feed System/Controls on Stand
(1) Sludge Cake Pump/Sludge Hopper/VFD Controls
(1) Day(s) of Operator Training & Equipment Startup
LS Freight to Job-site