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Grass Valley Master Sewer Plan

Humboldt County

June 2022

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EXECUTIVE SUMMARY

This Master Sanitary Sewer Plan Report (Master Sewer Plan) has been prepared by Farr West Engineering (Farr West) at the request Humboldt County to provide preliminary recommendations for the design and phasing of a wastewater collection and treatment system proposed to serve Grass Valley.

Grass Valley has a known groundwater quality issue associated with elevated nitrate levels. Developed properties in Grass Valley are dependent on individual septic systems for wastewater disposal. The cumulative disposal of wastewater from the septic systems has been determined to be a direct contributor the elevated nitrate levels. Water quality samples taken from monitoring wells in Grass Valley have indicated multiple exceedances of the maximum contaminant level for nitrates. Furthermore, in the Gold Country Subdivision, Production Wells 1 and 2, that serve drinking water to the subdivision residents, have nitrate issues. Well 1 had a recorded nitrate maximum contaminant level (MCL) exceedance of 10 mg/L in 2011. Production Well 2 water sample results indicated an increase in nitrate levels from 1.7 mg/L in April of 2017 to 9.0 mg/L in July of 2021.

Various studies have been completed over the past decades to consider ways to address the nitrate issue and provide mitigation recommendations. Most recently, Humboldt County retained Farr West Engineering to prepare a Preliminary Engineering Report (PER) that considers a wastewater collection system for the residential subdivisions with higher densities and to compare treatment alternatives. The PER concludes with a recommendation that Humboldt County consider constructing a collection system and mechanical treatment facility in and around the Gold County and Star City subdivisions in Grass Valley.

The purpose of this report is to present a master sewer plan for the preliminary design of the wastewater collection and treatment systems to ensure that pipe and other facilities are properly sized and that treatment systems can be expanded to accommodate areas of existing development and of future in Grass Valley.

The master sewer plan area was split into four phases, the first phase based on the PER project area, and three other phases of equivalent volume based on the number of connections to serve. Phases with lower property densities end up requiring more materials and construction to cover the larger distances. As needed, the master sewer plan phases can be divided into smaller areas to become more affordable to construct. Phase volumes and estimated construction costs are listed below:

Phase (Order of Priority)	Phase Volume*	Cumulative Volume*	Phase Estimate	Running Total
Phase 1 (PER Planning Area)	0.405 MGD	0.405 MGD	$ 27,796,200	$ 27,796,200
Phase 2	0.305 MGD	0.710 MGD	$ 30,354,920	$ 58,151,170
Phase 3	0.305 MGD	1.015 MGD	$ 36,023,700	$ 94,174,870
Phase 4	0.305 MGD	1.32 MGD	$ 29,560,390	$ 123,735,260

*MGD = Million Gallons/Day

The estimates above are based on current monetary conditions and do not include inflationary projections since such projections are unknown at this time, particularly for a project that may take decades to complete. The estimates above also assume that a centralized treatment facility will be constructed requiring miles of pipe to drain north to connect to a treatment facility. Decentralized treatment may reduce the amount of conveyance pipe needed, and hence, reduce costs.

1.0 INTRODUCTION

Grass Valley, located in Pershing and Humboldt Counties is a 30-mile-long valley. The north end of the valley is just a few miles south of Winnemucca and is nestled between two mountain ranges to the east and west. Humboldt County is the oldest county in Nevada, was created in 1856 by the Utah Territorial Legislature, and is named after the Humboldt River. Grass Valley's permanent residents began to be established as ranches and farms developed in the area. Eventually, large parcels of land began to be subdivided as outgrowth from the City of Winnemucca expanded south into Grass Valley.

Gold Country Estates and Star City Subdivision are the most densely populated communities in Grass Valley with lot sizes in the range 0.25 to 1-acre, most lots are a half-acre or smaller. These subdivisions are served by community water systems and dispose of wastewater via individual septic systems. Other subdivisions or parcels in the area consist of larger lot sizes and are served by individual water wells and septic systems.

The industry standard lifespan of a septic system is typically 20-30 years. While most septic systems in Grass Valley are at or more than 20 years old, some systems are estimated to be 35-40 years old. The useful life of a septic system frequently depends on environmental conditions that impact it. The condition of septic systems in Grass Valley are unknown because they are privately owned and maintained. Septic systems that have failed will contribute to increased loading of nitrates and other constituents.

The cumulative disposal of wastewater through septic systems in Grass Valley has impacted groundwater quality increasing nitrates and total dissolved solids to near or above maximum contaminant levels. The increase of nitrates impacting groundwater has been the subject of studies for the Grass Valley area. The reports have concluded that an alternative wastewater management system should be implemented to stop increasing negative impacts to groundwater. Extracts from the previous Preliminary Engineering Reports (PERs) are attached in Appendix B.

Farr West Engineering (Farr West) has prepared a PER that examines the potential installation of a sanitary sewer collection system to replace the septic systems in the highest density area, Gold Country and Star City subdivisions, with additional sewer service to some Airport Industrial Park Parcels, area churches, and the elementary school. If the findings of the PER are implemented, the wastewater collection and treatment systems would be considered Phase 1 of a master sewer plan for Grass Valley.

The purpose of this report is to present a master sewer plan for the design of the wastewater collection and treatment systems to ensure that pipe and other facilities are properly sized and that treatment systems can be expanded to accommodate areas of existing development and of future growth, identified by county staff, mostly adjacent to Grass Valley Road, south into higher density housing areas of Pershing County.

Humboldt County has adopted a county-wide master plan with a Grass Valley specific goal to improve groundwater quality by reducing impacts from high nitrate levels. Another master plan goal specific to Grass Valley is to increase opportunities for development of airport industrial park parcels helping to provide an economic boost for the region as businesses develop. These goals can be achieved in part by installing a wastewater collection and treatment system.

1.1 BACKGROUND INFORMATION

In 1993 a PER was completed to address the feasibility of water and sewer utilities in Grass Valley. The report determined there were localized problems with nitrates and recommended a groundwater monitoring program be initiated. Humboldt County followed the recommendation and in 1995 a domestic well groundwater monitoring program commenced. Observations were completed on a semi-annual basis.

A technical memorandum completed in 1999 concluded that the monitoring system demonstrated an increase in nitrates and total dissolved solids in the groundwater over the course of four years of completed observations. It concluded this was resultant from the density of discharge from individual septic systems.

In 2003, four new monitoring wells were constructed; however, the Nevada Department of Environmental Protection (NDEP) felt the depth of these wells did not provide a representative sample of the water table interface and requested replacement wells to be constructed.

In 2007, the County had three additional monitoring wells constructed at locations agreed upon with the NDEP. The monitoring wells used for the observations mentioned in this report are shown in Figure 1.

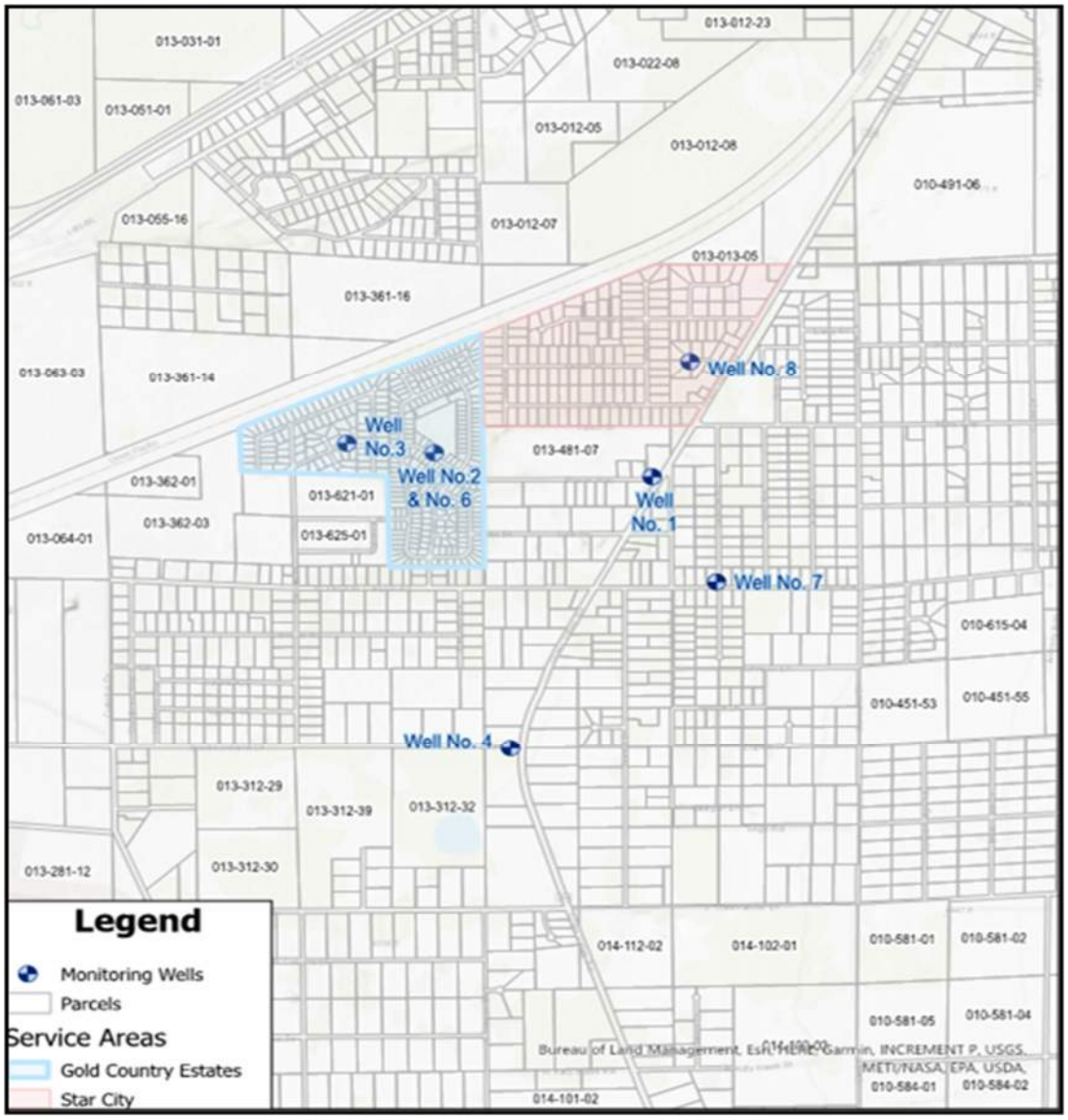

Figure 1: Monitoring Well Locations

Monitoring well sample results gathered from January 2014 to April 2020 are shown in Figure 2. Monitoring Well 3 (MW-3), located in the Gold Country Estates subdivision, shows consistently elevated nitrate levels over the course of monitoring with exception to the result given for the early 2017 sample. MW-7N, approximately one mile southeast of MW-3, indicates two exceedances of the allowable MCL and otherwise upper limit readings also with exception to the result given for the early 2017 sample.

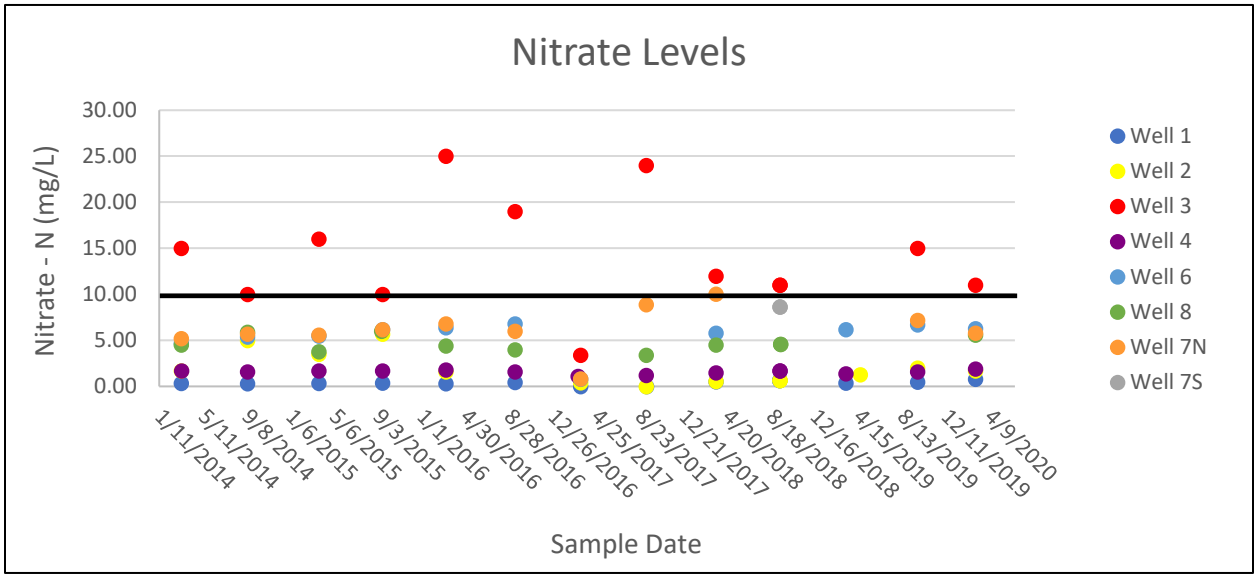

Figure 2: Monitoring Well Sample Data

The maximum contaminant level (MCL) set by the Environmental Protection Agency (EPA) for nitrates found in drinking water is 10 milligrams per liter (mg/L). As shown above, MW-3 and MW-7N have yielded water samples exceeding the allowable MCL for nitrates.

In February of 2022, the *Gold Country Water Company Nitrate Mitigation Assessment PER* was completed by One Water Consulting. The report focused on the water quality of production wells that serve the Gold Country Subdivision with specific documentation given to nitrate concentration levels and methods of mitigation. The PER concluded that nitrate levels in their production wells 1 and 2 have increased over time. Production Well 1 had a recorded nitrate MCL exceedance of 10 mg/L in 2011 and Well 2 recorded an increase in nitrate levels from 1.7 mg/L in April of 2017 to 9.0 mg/L in July of 2021.

High nitrate levels have been linked to a variety of negative side effects, including a lack of oxygen in the blood circulatory system which is most likely to affect infants and pregnant women. The severity and extent of potential side effects is different for each person affected. Nitrate level exceedances are often linked to runoff from fertilizer use, erosion of natural deposits, or leakage from septic tanks. The consistent exceedances combined with the age and density of septic systems operating in the area support the assumption; the cause of elevated nitrate levels is linked to septic systems.

2.0 STUDY AREA

2.1 GENERAL LOCATION

Grass Valley, located in Pershing and Humboldt Counties is a 30-mile-long valley. The north end of the valley is just a few miles south of the City of Winnemucca. Most of the valley is within the Pershing side of the county line; however, most of the population is on the Humboldt side. The area defined as the project planning area in the PER concentrates on the Star City Subdivision, Gold Country Estates, and adjacent residential and commercial areas. The PER planning area is shown in Figure 3.

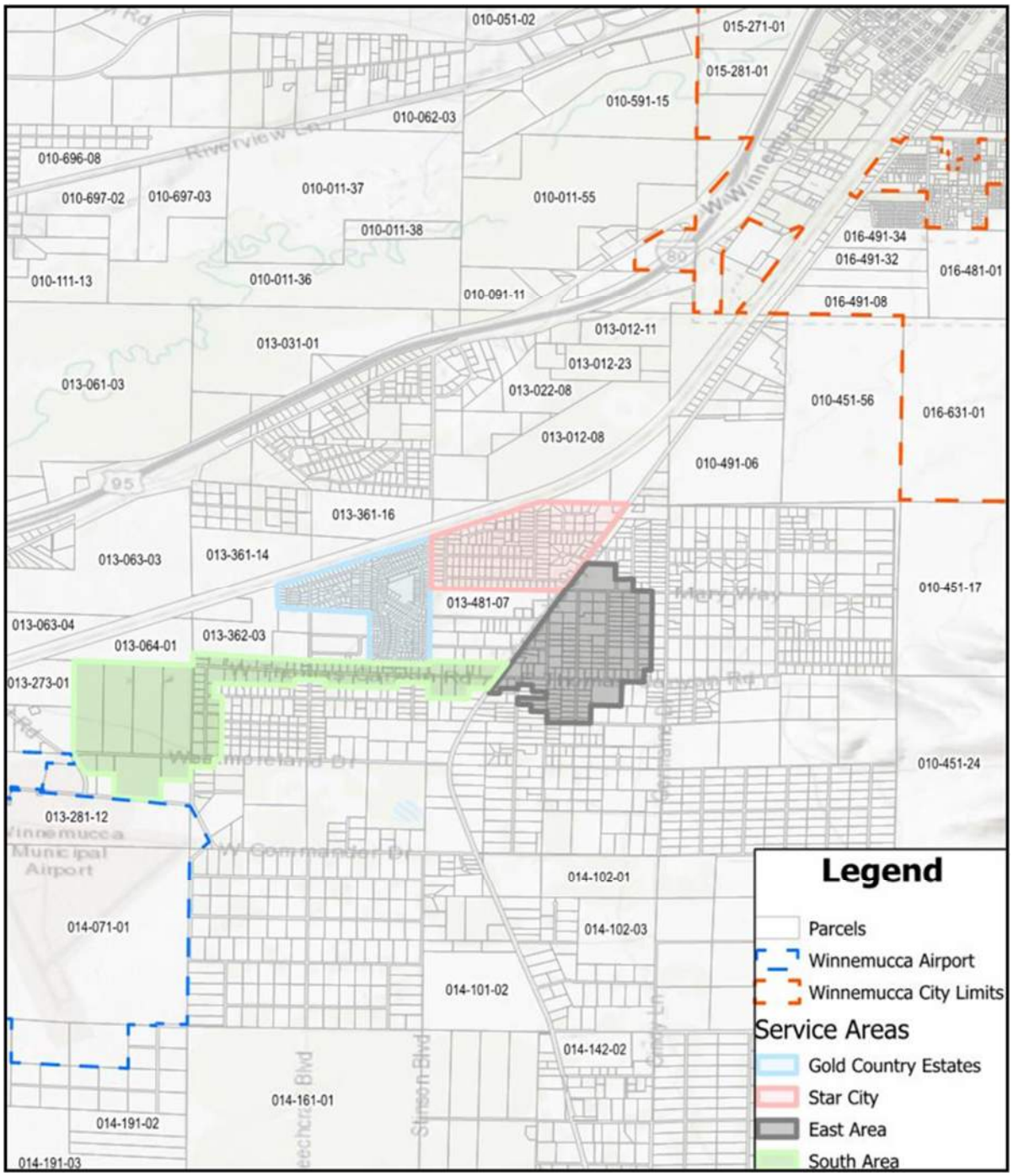

Figure 3: PER Planning Area

As the PER project planning area was reviewed and discussed with county staff, it was concluded that the wastewater collection area would have to continue to expand over time to connect to existing and future development to reduce nitrates discharging into the groundwater aquifer. The Humboldt Development Authority provided information on potential areas of future growth in Grass Valley. Input was also received from Pershing County on areas of future growth. The multi-county approach is thought to enhance opportunities for project funding.

With consideration of potential growth, existing development, and a multi-county approach, the master sewer plan area was defined as shown in Figure 4. The area includes the PER planning area, surrounding residential and commercial areas beginning in the north at Interstate-80 and south 2 miles into Pershing County.

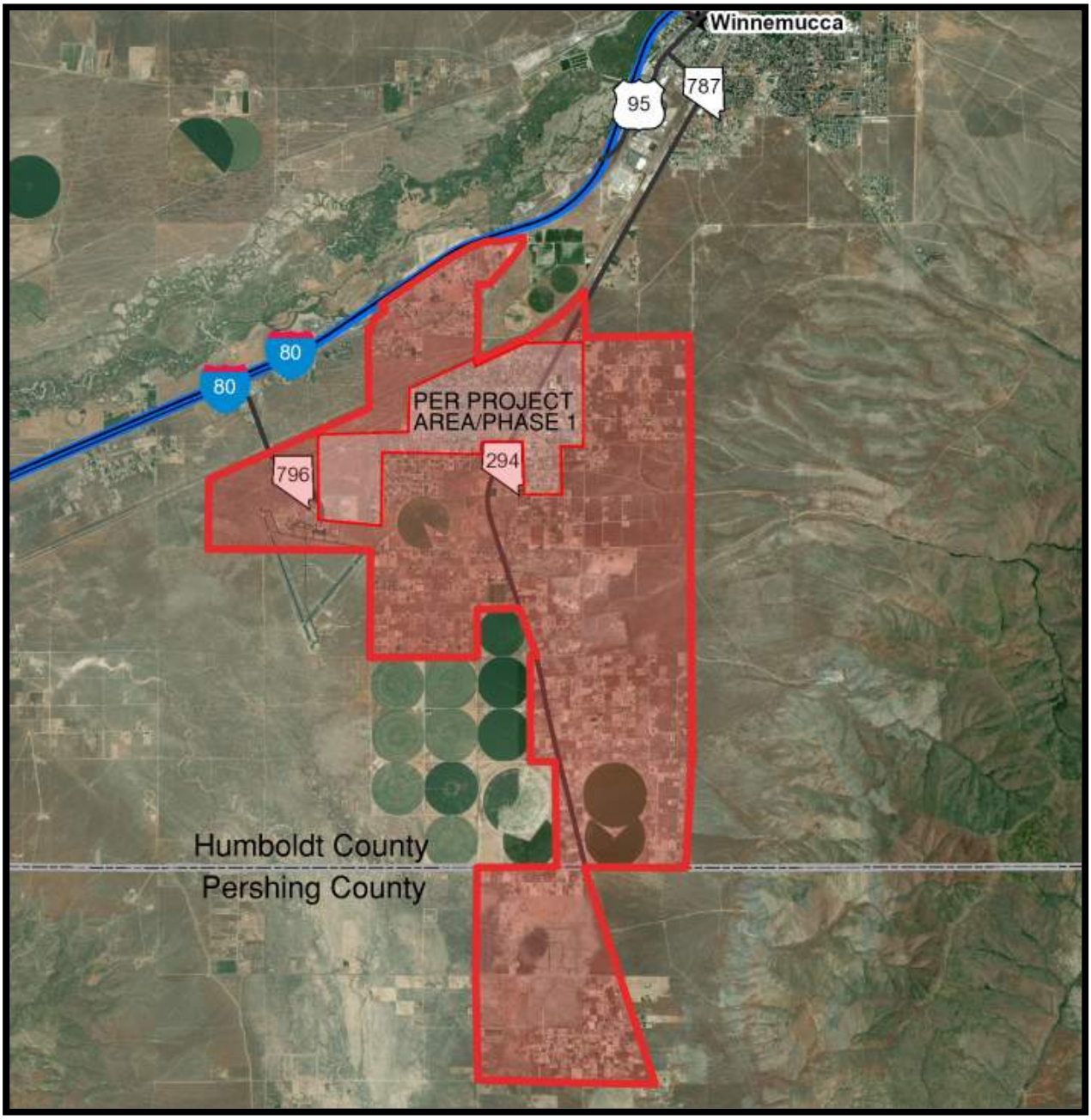

Figure 4: Master Planning Area

The proposed master sewer plan area encompasses approximately 16.8 square miles consisting of 14.1 square miles in Humboldt County north of the Pershing County boundary, mostly along the east and west sides of Grass Valley Road (State Route 294). The area includes the commercial and industrial parcels north of the airport. Most of the agricultural areas southeast of the airport are excluded from the project area. There are 2.7 square miles in Pershing County south of the county boundary and west of Grass Valley Road. The project area within Humboldt County includes, township 35 north (T35N), range 37 east (R37E), with all or part of the sections 01, 02, 10, 11, 12, 13, 14, 15, 16, 23, 24, 25, and within T35N, R38E, sections 07, 18, 19, 30, 31. The project area within Pershing County includes T34N, R37E sections 01 and 12. Additionally, T34N, R38E part of the sections 06 and 07.

2.2 ENVIRONMENTAL RESOURCES PRESENT

The environmental resources present in Phase 1 of this master sewer plan area are thoroughly discussed in the environmental assessment (EA) prepared in conjunction with the PER. The PER provides a high-level overview of the EA's findings. To summarize, there are no major negative environmental impacts expected with the construction of the wastewater system in Phase 1, the PER Planning Area. It is anticipated that similar EA results will be discovered as future assessments are prepared with the phasing of the system. The most important environmental impact will be the reduction of nitrates in the groundwater aquifer.

2.3 GROWTH AREAS AND POPULATION TRENDS

2.3.1 Base Population

The U.S. Census Bureau and the Nevada State Demographer provide demographic information for the whole of Humboldt County and the City of Winnemucca, but do not provide information or data specific to Grass Valley. Information provided for the county and Winnemucca was used to make assumptions and combined with observational data gathered from aerial imagery to determine basic population data for the Grass Valley project area. According to the state demographer, there are 17,064 residents in Humboldt County with an average household size of 2.56 persons. Within the master planning area there are approximately 1,792 developed lots which at the average household size computes to 4,588 residents or 27 percent of the county's population. There are an estimated 1,087 undeveloped lots in the planning area that would increase the population by approximately 2,783 residents. The undeveloped lot count and population estimate is subject to change if the current lot zoning is altered to either increase or decrease the number of lots per area.

2.3.2 Projected Growth

Based on available aerial imagery information, the PER planning area experienced an approximate development of 40 lots over a period of nine years, from 2006 to 2015, resulting in an average development rate of 4.5 lots per year. Growth at 4.5 lots per year over the next 20 years means that approximately 90 lots may be developed. This is considered a low-end, slow growth average.

The earliest aerial imagery with a clear visual of the PER project area subdivisions is from 1994, which shows approximately 272 lots were developed at that time. The next clear aerial imagery is from 2006 and shows that approximately 171 additional lots were developed during that 12-year period, an average of 14.25 lots per year.

Although aerial imagery is not available for earlier than 1994, it may be possible that most of the development took place within a few years and coincided with the increase in gold mining activity of the late 1980's and early 1990's. If the 272 lots were developed in a period of 5 years, then the development rate could be as high as 54 lots per year.

The pending development of lithium mining in northern Humboldt County may have a similar effect on demand for residential housing. The large undeveloped parcels in Grass Valley are expected to be subdivided into smaller residential lots, specifically areas adjacent to Star City Subdivision and Gold Country Estates.

3.0 EXISTING WASTEWATER FACILITIES

Grass Valley residential and commercial establishments are dependent on the use of septic systems for wastewater management, the nearest treatment facility is located in Winnemucca. Connecting to the city's collection system was considered as an alternative to treat Grass Valley's wastewater, but it was determined not to be a preferred alternative due to the limited capacity available to the county.

The exact age of septic systems operating Grass Valley is not readily available; however, based on aerial imagery the oldest systems are potentially more than 40 years old, assuming they have not been replaced. A typical industry standard for septic system operation is 25 to 30 years before replacement, dependent on the degree of maintenance performed. Some of the aging septic systems may have unknown operating deficiencies contributing to the elevated nitrate levels.

3.1 OTHER WATER UTILITY SERVICES

There is a privately owned water system serving Gold Country Estates and a county owned water system operating in Star City Subdivision, the remaining residential and commercial lots are provided water through individual or community well systems.

In 2018, records indicate the Star City Water System served 120 single family lots, a 25-unit mobile home park, and a convenience store. Originally operated as a non-profit water system by subdivision residents, it became impossible to find willing volunteers to take over management of the system. In 2019, Humboldt County determined it would take ownership of the water system and the county's public works department would be responsible for the management and operations of the system.

The water service in Gold Country Estates is operated by SPB Utility Services, Inc., a water utility provider that offers services throughout Nevada. There are 353 service connections in Gold Country Estates, all of which are single family residential connections. Humboldt County is reviewing the possibility of acquiring the Gold Country water system and operating it in conjunction with the Star City Water System.

4.0 PROJECT DESIGN PARAMETERS

4.1 UNIT TOTALS

With the guidance of the Humboldt Development Authority, areas of future growth in Grass Valley were identified to create the master sewer plan area. In Humboldt County, the plan area is estimated to serve approximately 1,556 existing and 823 future equivalent residential units (ERU) respectively. The plan area would also include service to 500 total existing and future properties in Pershing County.

4.2 WASTEWATER CHARACTERISTICS

Wastewater characterization data is not readily available for the Grass Valley sewer system since a representative sample would have to be collected from numerous private septic systems. However, typical characterization data from wastewater systems in the United States is assumed to be applicable and listed in Table 1. The five-day biochemical oxygen demand (BOD_5) determines the amount of oxygen consumed to break-down biodegradable organic materials and provides an effective gauge of treatment efficiency. Nitrate levels are the primary driver of this report and temperature is required to estimate nitrogen removal; therefore, total nitrogen and temperature assumptions were made.

Table 1: Influent Characterization Assumptions

Design Parameters	Influent Characterization
Total Nitrogen	40 mg/L
BOD_5	240 mg/L
Temperature	60 °F

The wastewater characterization listed in the above table would be considered normal or average strength wastewater. Grass Valley is assumed to have normal strength wastewater because most homes are several years old and would not be equipped with low water use fixtures. Treatment system sizing will be based in part on the wastewater strength. As new developments are constructed in the area it is anticipated that modern low water use fixtures will be installed in the homes resulting in a less diluted wastewater. Adjustments in design parameters will be necessary to accommodate significant amounts of high solids concentration wastewater.

4.3 WASTEWATER VOLUME

The volume of the wastewater generated in the master sewer plan area is estimated using lot counts multiplied by design volumes that are extrapolated from various wastewater utility sources. The number of developed lots in the planning area was estimated based on aerial imagery. Zoning descriptions for the included lots were gathered from the Humboldt County Assessor's data. The design volumes used for this report are shown in Table 2, categorized by zoning descriptions.

Table 2: Average Day Design Volumes

Zoning Description	Design Volume	Unit of Measure
Residential Unit	300	gpd (gallons per day)
Public Facility	2600	gpd/acre
Neighborhood Commurcial/Rural District	2600	gpd/acre
General Commerical	780	gpd/acre
Airport/Industrial District	457	gpd/acre

The average volumes listed in Table 2 are factored by 1.5 for maximum-day flow and 2.5 for peak-hour flow. Factored flows are utilized to size conveyance and treatment facilities.

4.4 PLAN PHASING

The PER planning area (Phase 1) in Figure 3 became the basis for determining potential phases of the master sewer plan for Grass Valley. The first phase location was determined by the considerations established in the PER, mostly centered around eliminating septic systems in the highest density housing areas at the Gold Country and Star City subdivisions. Phase 1 is comprised of 638 existing residential units and 27 ERU which consist of the existing elementary school, churches, commercial, and industrial properties. These existing non-residential properties do not include the full property area in the volume calculations since most of the properties consist of parking, landscaping, laydown areas, and so forth which do not contribute to wastewater flows. Moreover, non-residential properties will generate peak wastewater flows at opposite times of residential properties. These factors were combined to reduce the calculated amount of volume contributed to the treatment facility. In addition to the existing development, Phase 1 has area for growth estimated at 234 ERU or 26 percent of the Phase 1 treatment capacity. The estimated wastewater to be generated in the Phase 1 area is 0.405 MGD.

With the design parameters established for the Phase 1, PER area, and with consideration of existing and future service connections, it was determined the ultimate treatment facility buildout would need capacity for 1.32 million gallons per day (MGD). The volume assigned to each phase and the cumulative wastewater treatment facility (WWTF) capacity are shown in Table 3.

Table 3: WWTF Capacity

Phase Description	Phase Volume (GPD)	WWTF Capacity (GPD)		
Phase 1 (PER Planning Area)	405,000	405,000		
Phase 2	305,000	710,000		
Phase 3	305,000	1,015,000		
Phase 4	305,000	1,320,000		
Total Avg. Day Volume Capacity			0.88	MGD
Total Max Day Volume Capacity			1.32	MGD
Estimated Peak Hour Flow			461	GPM

After Phase 1, the remaining phases would each have an allotted volume of 0.305 MGD for a total of 0.915 MGD. It is not feasible at this time to determine the exact geographical boundaries for the remaining phases; however, phase boundaries were delineated based on the geographical locations in relation to the treatment facility. It is assumed those areas closer to the facility would receive services before areas further away. The phasing boundaries also considered providing sewer to entire neighborhoods rather than having gaps in the service area.

Phase four, the final phase, would encompass the remaining areas on the Humboldt County side of the planning area and provide an allotted capacity of 150,000 GPD, the equivalent of five hundred residential units, to Pershing County. The breakdown of capacity by type of service connection for each phase is given in Table 4, the percentage of lots developed in each phase is also provided. The proposed phasing boundaries are shown in Figure 5.

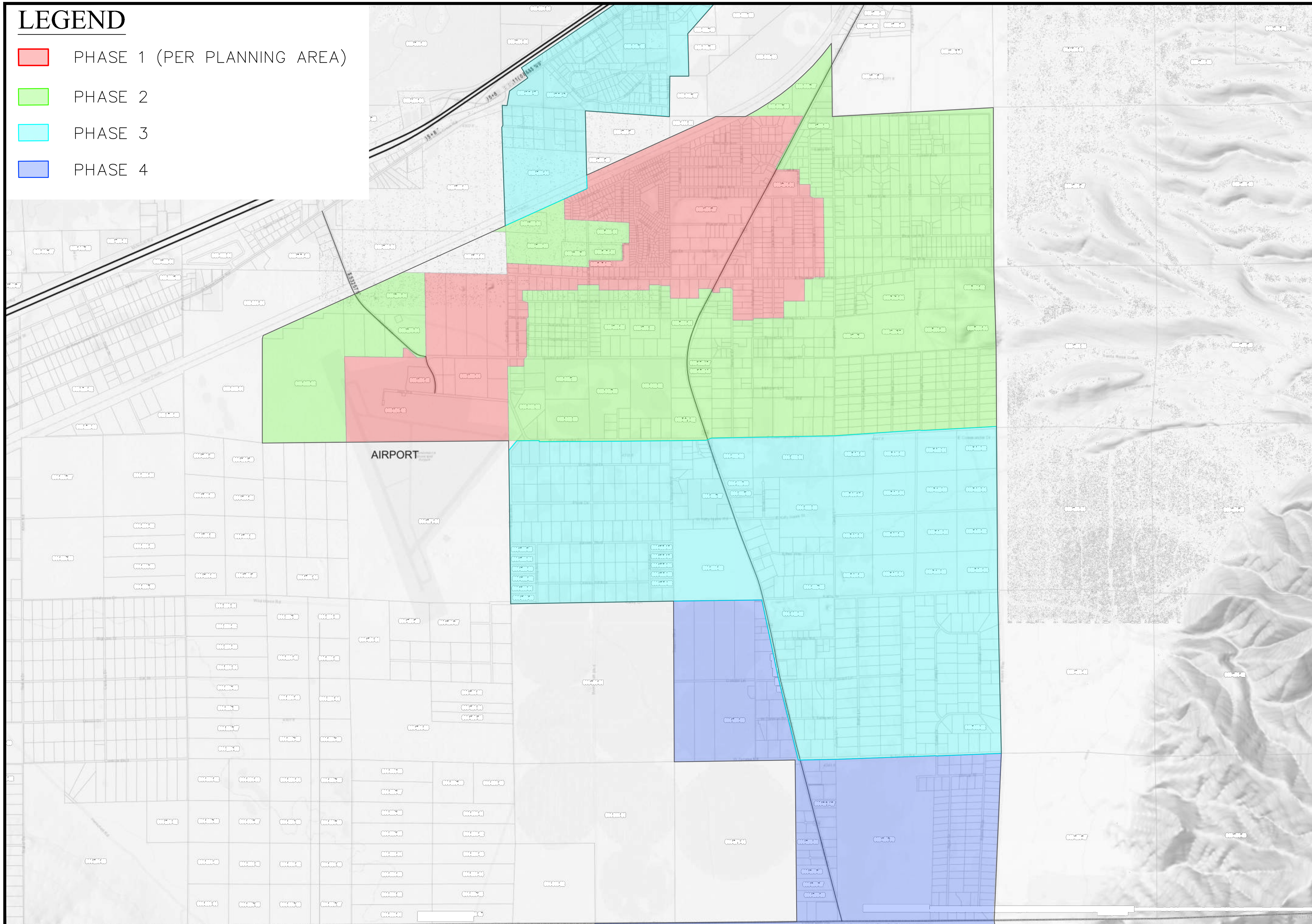

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Table 4: Phase Capacity Breakout

Phase	No. of Units		Vol / Unit		Avg. Flow (GPD)
Phase 1 (PER Planning Area)					
Residential Units	638	ERU	300	gpd	191,400
General Commercial District	0.24	Acre	780	gpd/acre	187
Public Facility	2.03	Acre	2600	gpd/acre	5,278
Neighborhood Commercial/Rural District	0.18	Acre	2600	gpd/acre	468
Airport/Industrial District*	5.18	Acre	457	gpd/acre	2,367
Additional Capacity	234	ERU	300	gpd	70,200
				Estimated Avg. Day Volume	269,900 GPD
				Estimated Max. Day Volume	404,851 GPD
				Estimated Peak Hour Flow	469 GPM
Phase 2 (45% Developed)					
Residential Units	630	ERU	300	gpd	189,000
Neighborhood Commercial/Rural District	1.88	Acre	2600	gpd/acre	4,888
Airport/Industrial District*	21	Acre	457	gpd/acre	9,597
				Estimated Avg. Day Volume	203,485 GPD
				Estimated Max. Day Volume	305,228 GPD
				Estimated Peak Hour Flow	353 GPM
Phase 3 (75% Developed)					
Residential Units	660	ERU	300	gpd	198,000
Airport/Industrial District*	10	Acre	457	gpd/acre	4,570
				Estimated Avg. Day Volume	202,570 GPD
				Estimated Max. Day Volume	303,855 GPD
				Estimated Peak Hour Flow	352 GPM
Phase 4 (35% Developed)					
Residential Units	161	ERU	300	gpd	48,300
Airport/Industrial District*	10	Acre	457	gpd/acre	4,570
Pershing County Capacity	500	ERU	300	gpd	150,000
				Estimated Avg. Day Volume	202,870 GPD
				Estimated Max. Day Volume	304,305 GPD
				Estimated Peak Hour Flow	352 GPM

*The available land in the airport/industrial district was divided between phases under the assumption it would be developed over periods of time. Phase 2 was given the majority of acreage under the assumption it would experience the most development.

4.5 TREATMENT EVALUATION OVERVIEW

An evaluation of wastewater treatment alternatives was conducted to determine the preferred type of treatment for the Grass Valley system. Evaluated criteria included the ease and reliability of operation, the expected treatment performance and quality, constructability, sustainability, expandability, and cost. The alternatives considered activated-sludge processes including an extended aeration package plant and an oxidation ditch. Appendix C contains manufacturer's information for three extended aeration systems and one oxidation ditch system. This section provides a summation of the comparison of the treatment alternatives and a recommendation for a treatment process.

4.5.1 Extended Aeration Package Plant

Extended aeration package plants are typically very stable, reliable, and known to consistently meet effluent permit limitations with proper operations and maintenance procedures. Some systems can be operated with sequential reactions to minimize the mixing requirements and perform nitrification and denitrification in the aeration basins. Dissolved oxygen levels may be monitored coupled with a control system to provide the minimum air necessary for proper treatment. Aeration and mixing are used to achieve the lowest biologically attainable nitrogen levels. The system clarifier regulates the effluent flow and contains sludge to waste. A small portion of the sludge is returned to the beginning of the treatment sequence.

The advantages of an extended aeration package plant include:

- Successful operational history
- Established and understood treatment process
- Operator friendly, simple mechanical process
- Superior effluent quality
- Does not require highly efficient screening
- Easily constructable
- Conducive to phased expansion
- Ability to reduce energy consumption
- Overall smaller footprint

The disadvantages of an extended aeration package plant include:

- Solids separation requires additional, separate facilities
- Activated sludge requires close monitoring
- Tertiary treatment requires separate processes

4.5.2 Oxidation Ditch

Oxidation ditch treatment systems are also typically very stable, reliable, and consistently meet effluent permit limitations, with proper operations and maintenance procedures. Aeration equipment typically includes brush aerators, but jet aeration can be incorporated into the system. Dissolved oxygen probes continuously monitor and report oxygen levels to control whether the system is functioning in an on or off aeration mode. On/off operation helps eliminate costly over-aeration by meeting the minimum oxygen demand to maintain process stability. Separation of liquids and solids typically occurs via gravity in a secondary clarifier. A time-based operational strategy provides the ability to effectively vary process volumes to accommodate a range of influent flow and characteristics.

The advantages of an oxidation ditch include:

- Successful operational history
- Established and understood treatment process
- Does not require highly efficient screening
- Characteristically low energy demands

- Ability to incorporate phase expansion

The disadvantages of an oxidation ditch include:

- Solids separation requires additional, separate facilities
- System footprint requires large area
- Activated sludge requires close monitoring
- Tertiary treatment requires separate processes

4.5.3 Treatment Recommendation

Based on the information provided above and from the manufacturer, it was determined that an extended aeration treatment system would be the optimal option for the proposed Grass Valley treatment facility. Extended aeration systems require a smaller footprint and are easily customizable and expandable for varying conditions and phase expansions.

4.6 PROJECT COST AND FUNDING

The cost information provided for Phase 1 of the project was determined during the development of the PER. A detailed breakdown of those cost estimates for the collection system, treatment facility, and annual operations and maintenance are included in Appendix A Table 1, 2, and 3, respectively. Cost information for the remaining phases was determined based on similar parameters for Phase 1. All cost estimates provided are based on pricing for the 1st quarter of 2022. Depending on the rate of inflation, which is currently very high, the cost estimates provided in this section will need to be adjusted at the design of each phase.

The pipe length and manhole count provided for Phases 2 through 4 are approximations founded on the preliminary design of Phase 1 from the PER. Based on an aerial view of Grass Valley, it was estimated that Phase 2 will cover approximately twice the area of Phase 1, and therefore, will require twice the amount of pipe length and number of manholes to construct the collection system. Considering the density of Phase 2 compared to Phase 1, it was estimated that 85 percent of the Phase 2 collection system would be 8-inch pipe, 10 percent would be 10-inch pipe, and 5 percent would be 12-inch pipe. A similar process was followed for Phases 3 and 4. The number of manholes estimated in Phases 2 through 4 are based on an assumed spacing of approximately 325 feet along the total pipe length. The approximated pipe lengths and associated costs for Phases 2 through 4 for the “collection systems” are shown in Table 5 below. Detailed information for Phase 1 pipe is provided in Table 1 in Appendix A.

Table 5: Phase 2-4 Collection System Cost Estimations

Phase	Component	Quantity		Cost/Unit	Total Cost
Phase 2	8” PVC SDR-35 Pipe	104,409	LF	$ 125	$ 13,051,100
	10” PVC SDR-35 Pipe	12,283	LF	$ 175	$ 2,149,500
	12” PVC SDR-35 Pipe	6,142	LF	$ 195	$ 1,197,690
	Type 1-A 48” Manhole	376	EA	$ 9,500	$ 3,572,000
				Subtotal	**$ 19,970,290**
Phase 3	8” PVC SDR-35 Pipe	142,794	LF	$ 125	$ 17,849,250
	10” PVC SDR-35 Pipe	7,677	LF	$ 175	$ 1,343,470
	12” PVC SDR-35 Pipe	3,071	LF	$ 195	$ 598,850
	Type 1-A 48” Manhole	470	EA	$ 9,500	$ 4,465,000
				Subtotal	**$ 24,256,570**
Phase 4	8” PVC SDR-35 Pipe	116,692	LF	$ 125	$ 14,586,500
	10” PVC SDR-35 Pipe	6,142	LF	$ 175	$ 1,074,850
	Type 1-A 48” Manhole	376	EA	$ 9,500	$ 3,572,000
				Subtotal	**$ 19,233,350**

Cost estimations, including the expansion of the treatment facility for each phase, are provided in Table 6. The estimates for Phases 2 through 4 assume the construction of an additional RIB equal to the half the cost of the RIB construction in Phase 1 will be required. The WWTF expansion estimate also includes the cost of an additional components for Phases 2 through 4. The cost estimates provided are based on current pricing and will need to be adjusted to match economic conditions at the time of design. Topographic and property mapping of Grass Valley will enable a more accurate design and will likely result in the identification of additional items such as lift stations or easements that will be necessary to have a fully functional system.

Table 6: Phase Costs

Phase 1			
WWTF Construction	5,603,900	LS	$ 5,603,900
RIB Construction	250,000	LS	$ 250,000
Collection System	14,062,710	LS	$ 14,062,710
Service Connection w/ Cleanout ($3,500/EA)	645	EA	$ 2,257,500
		Subtotal	$ 22,174,110
Construction Management, Engineering, Legal			$ 2,673,300
Construction Contingency			$ 2,543,800
Cultural Resources Inventory/ Additional Environmental Studies			$ 30,000
Land, Easements, Permits			$ 375,000
	Phase Total		**$ 27,796,200**
Phase 2			
WWTF Expansion	2,361,000	LS	$ 2,361,000
RIB Expansion	125,000	LS	$ 125,000
Collection System Expansion	19,970,290	LS	$ 19,970,290
Service Connection w/ Cleanout ($3,500/EA)	635	EA	$ 2,222,500
		Subtotal	$ 24,678,790
Construction Management, Engineering, Legal			$ 2,714,670
Construction Contingency			$ 2,961,460
	Phase Total		**$ 30,354,920**
Phase 3			
WWTF Expansion	2,361,000	LS	$ 2,361,000
RIB Expansion	125,000	LS	$ 125,000
Collection System Expansion	24,256,570	LS	$ 24,256,570
Lift Station	1	LS	$ 235,000
Service Connection w/ Cleanout ($3,500/EA)	660	EA	$ 2,310,000
		Subtotal	$ 29,287,570
Construction Management, Engineering, Legal			$ 3,221,630
Construction Contingency			$ 3,514,500
	Phase Total		**$ 36,023,700**
Phase 4			
WWTF Expansion	2,361,000	LS	$ 2,361,000
RIB Expansion	125,000	LS	$ 125,000
Collection System Expansion	19,233,350	LS	$ 19,233,350
Service Connection w/ Cleanout ($3,500/EA)	661	EA	$ 2,313,500
		Subtotal	$ 24,032,850
Construction Management, Engineering, Legal			$ 2,643,600
Construction Contingency			$ 2,888,940
	Phase Total		**$ 29,560,390**

Approximately $17.8 million of the cost estimated for Phase 4 can be attributed to Pershing County related expenses, this does not include costs associated with construction management, engineering, legal, or construction contingencies. Providing sewer mains that convey wastewater north to treatment from the south near the Pershing County and Humboldt County boundary may not be cost effective for either county. A more cost-effective option may be to construct a small treatment facility to service that area.

The cost for the treatment facility construction and each phase of expansion was determined from budgetary proposal information provided by facility manufacturers, information is attached in Appendix C. Although three manufacturers provided budgetary quote information for extended aeration systems, the quote provided by Aero-Mod, Inc. (Aero-Mod) was the most complete of the received quotes. For this reason, the Aero-Mod quote was used as the basis for determining WWTF costs. This does not imply the selection of a WWTF manufacturer to provide treatment equipment for Grass Valley.

The county intends to secure grants and low interest or principal forgiveness loans from the Nevada Clean Water State Revolving Loan Fund (SRF) to finance the project. The PER qualified for funding assistance through SRF with a Class A designation and the 7th highest priority. Class A projects are those that benefit the public health and/or the environment. The goal of constructing a collection system and treatment facility is to protect the public's health and alleviate the negative groundwater impacts from elevated nitrate levels. Phase 1 is the highest priority area planned for a wastewater system and is the only phase currently being pursued to determine what funding is available and the financial impacts that may result.

4.7 CONSTRUCTION ISSUES

Connecting existing residential and commercial sewer laterals and constructing sewer mains is anticipated to have difficulties due to obstructions in the path of the sewer lines such as other utilities, surface infrastructure, trees, etc. Environmental concerns or cultural resources are not anticipated to be significant impacts for construction.

4.8 PROJECT PERMITTING

Various permits will be required prior to the construction of each phase. The following is a brief summary of identified permit requirements:

- NDEP's BWPC Plan Approval – Complete plans and specifications must be submitted and approved by the BWPC. The approval evaluates whether the proposed project is compliant with NAC 445A, and other design guidance adopted in the code.
- Humboldt County Building Permit – This permit is issued by Humboldt County to ensure the project follows adopted building codes that apply to components of the treatment plant construction. This permit will require plan review, approval, and milestone building inspections to be completed by certified inspectors to ensure the construction meets building code requirements.
- Encroachment Permits – The collection system will cross or be within NDOT and Union Pacific Railroad right-of-way in a few cases, thus requiring permits to encroach and complete work within the right-of-way.
- During construction NDEP-BWPC will require a storm water discharge permit since more than one acre will be disturbed by construction. Best Management Practices will be installed to mitigate runoff and the release of sediment into water courses.
- It is likely that more than 5 acres will be disturbed at any one time, so a surface area disturbance permit should be obtained from the NDEP Bureau of Air Pollution Control (BAPC) by the construction contractor.
- Discharge Permit – This permit is issued by the BWPC to ensure the RIBs will meet or exceed the standards for design, construction, operation, and maintenance.

In addition to the above permits, the project must also be reviewed by any funding agencies to ensure that the plans and specifications follow applicable funding requirements.

At this preliminary stage it is assumed that Phase 1 will have at least private one lot that will need to serve as a sewer crossing to maintain a gravity driven design. It is possible additional easements may be required for other lots as well, during design accurate survey data will determine the final layout of the collection system. Otherwise, the majority of the work should be completed in street and utility right-of-way.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented in this report the following conclusions and recommendations for Humboldt County to consider benefitting the health and well-being of the public and to reduce the harmful impact to the Grass Valley groundwater aquifer:

- Nitrates are increasing in the aquifer impacting drinking water quality due to the cumulative discharge of wastewater through septic systems. If left unimpeded, nitrates are expected to be found consistently exceeding maximum contaminate levels in water quality samples.
- Continue to educate the public of the current and potential health risks of doing nothing.
- Grass Valley is an area that can accommodate both residential and commercial growth if wastewater infiltration from septic systems can be eliminated by implementing a new wastewater collection and treatment system.
- There are no major negative environmental impacts expected with the construction of a new wastewater system.
- Pursue the Phase 1 project as outlined in the Grass Valley PER. Communication with NDEP and pre-application to funding agencies should be completed as the proposed project will need advanced planning.
- Topographic and property mapping of Grass Valley will enable a more accurate design and will likely result in the identification of additional items such as lift stations or easements that will be necessary to have a fully functional system.
- The wastewater system phases can be refined into multiple smaller projects that may be more easily funded.
- Install the wastewater collection and treatment system as soon as possible for the benefit and protection of the public's health and to reduce significant degradation to the groundwater aquifer.

APPENDIX A – COST BREAKDOWN

Table 1: Engineer's Opinion of Collection System Cost

Line	Description	Quantity	Unit	Cost/Unit	Total Cost
1	Mobilization/Demobilization	1	LS	$ 700,000	$ 700,000
2	Temporary Traffic Control	1	LS	$ 350,000	$ 350,000
3	Best Management Practices	1	LS	$ 60,000	$ 60,000
4	8” PVC SDR-35 Pipe	45,092	LF	$ 125	$ 5,636,500
5	10” PVC SDR-35 Pipe	6,026	LF	$ 175	$ 1,054,550
6	12” PVC SDR-35 Pipe	5,552	LF	$ 195	$ 1,082,640
7	15” PVC SDR-35 Pipe	2,344	LF	$ 205	$ 480,520
8	18” PVC SDR-35 Pipe	2,403	LF	$ 215	$ 516,645
9	Pressure Force Main	6,264	LF	$ 160	$ 1,002,240
10	Type 1-A 48” Sewer Manhole	184	EA	$ 9.500	$ 1,748,000
11	Type III (Drop) 48” and 60” Sewer Manhole	4	EA	$ 13.500	$ 54,000
12	WW Lift Station	3	EA	$ 235,000	$ 705,000
13	Sewer Service Connection with Cleanout	645	EA	$ 3,500	$ 2,257,500
14	3” AC Patch Paving	56,670	SF	$ 4.50	$ 255,015
15	NDOT Jack and Bore	3	LS	$ 139,200	$ 417,600
16				**Total**	**$ 16,320,210**
17					
	Non-Construction Items:				
18	12 % Construction Contingency				$ 1,958,425
19	Cultural Resources Inventory/Additional Environmental Studies				$ 30,000
20	Legal, Engineering, Construction Program Management, Funds Administration				$ 1,795,223
21	Land, Easements, Permits				$ 375,000
22				**Total**	**$ 4,158,648**
23					
24				**Total Project Cost**	**$ 20,478,858**

Table 2: Engineer's Opinion of WWTF Cost

Line	Description	Quantity	Unit	Cost/Unit	Total Cost
1	Mobilization/Demobilization	1	LS	$ 290,000	$ 290,000
2	Rough Grading & Earthwork – RIBs	1	LS	$ 250,000	$ 250,000
3	Plant Site Work	1	LS	$ 27,000	$ 27,000
4	Concrete	1	LS	$ 65,000	$ 65,000
5	Auger in Vault	1	LS	$ 240,825	$ 240,825
6	Supply and Install 350,000-gallon WWTF with clarifier	1	LS	$ 2,795,000	$ 2,795,000
7	Supply and Install Chlorine Containment Unit 150-gallon Double Walled Storage Tank, Peristaltic Pumps, Chemical Tubing, Injectors, Saddle, Pipe, etc.	1	LS	$ 61,100	$ 61,100
8	Supply and Install Sludge Pump and Vault	1	LS	$ 90,025	$ 90,025
9	Building, Building Pad, Slab, Mechanical, Plumbing, Electrical	1	LS	$ 295,500	$ 295,500
10	Supply and Install Sludge Press and Polymer Pump	1	LS	$ 436,150	$ 436,150
11	Supply and Install Generator and ATS	1	LS	$ 133,900	$ 133,900
12	48” Type III Manhole, 48” Type 1-B Manhole (2), and Lift Pumps	1	LS	$ 235,000	$ 235,000
13	Stainless Steel Slide Gate	1	EA	$ 10,758	$ 10,758
14	8” Magnetic Meter	1	EA	$ 10,563	$ 10,563
15	2” Steel Ceramic Epoxy Lined Pipe	20	LF	$ 267	$ 5,330
16	Flow Control Valve Assembly	1	LS	$ 16,478	$ 16,478
17	Site Electrical	1	LS	$ 412,325	$ 412,325
18	NV Energy Service Extension	1	LS	$ 120,000	$ 120,000
19	Project SCADA	1	LS	$ 203,125	$ 203,125
20	Computer/Server/Software Allowance	1	LS	$ 36,400	$ 36,400
21	¾” Yard Hydrant	3	EA	$ 2,828	$ 8,483
22	Standard Cleanout	2	EA	$ 991	$ 1,983
23	Wells	1	EA	$ 71,500	$ 71,500
24	Best Management Practices	1	LS	$ 19,000	$ 19,000
25	3” Plantmix Bituminous Patch/Driveway Apron	3200	SF	$ 6	$ 18,462
26				**Construction Subtotal**	**$ 5,853,907**
27	**Non-Construction Items:**				
28	10 % Construction Contingency				$ 585,391
29	Legal, Engineering, Construction Program Management, Funds Administration				$ 878,086
30				**Non-Construction Subtotal**	$ 1,463,477
31					
32				**Total Project Cost**	**$ 7,317,384**

Table 3:Annual Operating and Maintenance Costs

Operational Item	Cost
Salaries and Benefits	$ 142,000
Supplies and Chemicals	$ 38,000
Short Lived Asset Maintenance/Replacement	$ 10,400
Administrative and Support Services	$ 26,400
Energy Cost	$ 69,000
Sludge Hauling Equipment	$ 36,000
Sludge Disposal Fee	$ 30,000
Annual Discharge Permit Fee	$ 1,900
Total Annual Cost	**$ 353,700**

APPENDIX B – PER EXTRACTS

COPY

GRASS VALLEY

WATER AND SEWER FEASIBILITY REPORT

PREPARED FOR
HUMBOLDT COUNTY

DECEMBER, 1993

waterresource
consulting engineers, inc.
RENO, NEVADA

1993 PER Extracts Include: Section 1 Pages 1-4, Section 3 Pages 6-7

SECTION 1.0
SUMMARY

1.1 INTRODUCTION

This Project Feasibility Report was prepared to give the reader a brief but thorough understanding of the water and sewer infrastructure requirements to provide these utilities in Grass Valley and their probable economic impact. It is not intended to be used as a detailed facilities planning study which presents detailed information and cost estimates, but rather as a preliminary guide and planning tool for the development of future projects.

1.2 PLANNING AREA AND GROWTH (Section 2.0)

Due to the large size of the Valley (Figure 2.1, Page 2-2), which is over 520 square miles and lies in Humboldt and Pershing Counties, a smaller planning area was developed (Figure 2.2, Page 2-3). This planning area encompasses the more densely populated areas such as Gold Country Estates and Star City. The last few years have shown a tremendous growth increase in Grass Valley averaging approximately 12.5 percent per year. Currently, the population within the planning area is estimated at 1,766 which is estimated to increase to 3,563 by the year 2012. The average persons per household is estimated to be 3.04. It is estimated that the present average day water demand in the planning area is 581,000 gallons per day and the wastewater produced is in the order of 349,000 gallons per day.

1.3 GROUNDWATER SOURCE OF SUPPLY (Section 3.0)

The planning area encompasses two hydrographic basins known as the Winnemucca Segment and Grass Valley. All of the groundwater in the planning area however, is either in the Grass Valley Basin or is directly from the Grass Valley Hydrographic Basin (Figure 3.1, Page 3-2). A significant portion of the groundwater in Grass Valley is derived from infiltration of tributary stream flows from the Sonoma Range and the East Range which are derived primarily from snowpack.

Existing water rights (Certificated and Permitted) in Grass Valley (42,600 acre-feet) far exceed the present estimated pumpage (10,000 acre-feet) and estimated safe yield of the aquifer (13,000 acre-feet). The majority of the groundwater is utilized for irrigation. The State of Nevada Division of Water Resources (DWR) is extremely concerned with the continued increase of individual domestic wells. They prefer the Community Water System concept which provides them the ability to more accurately account for groundwater pumpage, lessens the risk of groundwater contamination caused by the proliferation of individual domestic wells and provides the public with a relatively safe and reliable source of water.

The current water quality in the large municipal wells at Gold Country and Star City is very good and meets all of the current Federal Drinking Water Standards. It is estimated that there are 775 private domestic wells in Grass Valley. The State of Nevada Bureau of Health Protection Services conducted an informal study of 249 of these individual domestic wells. The results of the study indicated that although there are some localized problems with Nitrates, Total Dissolved Solids and Chlorides, the majority of the wells sampled were of good quality water with respect to the previously referenced constituents.

The State of Nevada Division of Environmental Protection (DEP) is very concerned with individual sewage disposal systems and the potential of groundwater contamination resulting from these systems. The Division of Environmental Protection is not approving any subdivision maps for Grass Valley until a groundwater study is performed. All of Grass Valley is presently served by individual sewage disposal systems. This report recommends that a groundwater monitoring program must be initiated.

1.4 WATER SYSTEM ALTERNATIVES (Section 4.0)

Two alternatives were investigated for providing water service to the Grass Valley planning area. The major difference between the alternatives was whether Grass Valley would provide the source of water (Alternative A) or the City of Winnemucca would provide the source (Alternative B). Table 1.1 (page 1-4) presents the cost comparison of the water

alternatives. Both alternatives appear equally feasible and ultimately will cost in the order of $2.0 million to construct a core system with an additional $1.6 million initially to serve the outlying areas of the planning area.

1.5 SEWER SYSTEM ALTERNATIVES (Section 5.0)

As with the water alternatives, two sewer system alternatives were investigated for providing wastewater conveyance and disposal for the planning area. The primary difference between the alternatives was whether Grass Valley would construct and maintain their own treatment plant (Alternative C), or whether the wastewater effluent would be pumped to the City of Winnemucca to be disposed of at their treatment facility (Alternative D). Selection of an alternative for the sewer system is difficult at best because of the unknowns which surround acquiring land for a treatment facility for Alternative C and the uncertainty of the City of Winnemucca's ability or desire to accept Grass Valley sewage. Table 1.1 (page 1-4) presents a summary of the costs for the sewer alternatives. At best the initial capital cost to serve the core area is estimated to be in the order of $3.8 - $4.3 million. To serve all of the existing developments in the outlying areas of the planning area an additional $2.6 million cost is estimated.

1.6 FUNDING (Section 6.0)

Several sources of potential funding may exist, including a Community Development Block Grant, State Water Grant, Economic Development Agency, State Revolving Loan Fund, Farmers Home Administration Loan and Private Financing. Because of the large magnitude of the projects required, the funding will most likely require a combination of all feasible sources.

TABLE 1.1
COST SUMMARY

ALTERNATIVE		TOTAL COST $
Water	A, Phase I	1,970,810
	A, Phase II	1,626,250
	B, Phase I, Option I*	2,501,450
	B, Phase I, Option II	1,970,810
	B, Phase II	1,626,250
Sewer	C, Phase I **	3,791,700
	C, Phase II	2,566,000
	D, Phase I***	4,321,500
	D, Phase II	2,566,000

* Does not include cost for City of Winnemucca to deliver water
** Does not include cost for acquiring land for treatment facility
*** Does not include cost for City of Winnemucca to accept wastewater

The total per unit cost to deliver water is estimated to be $22.40 per month, per residential service for operation and maintenance plus $16.52 per month, per residential service to repay the loan to construct the capital improvements.

The cost per unit to convey the wastewater is approximately $16.90 per month, per unit for operation and maintenance plus $35.80 per month, per residential unit for loan repayment required to construct the capital improvements.

The loan repayment schedule assumed that the entire project was funded through a loan and no grant monies were included.

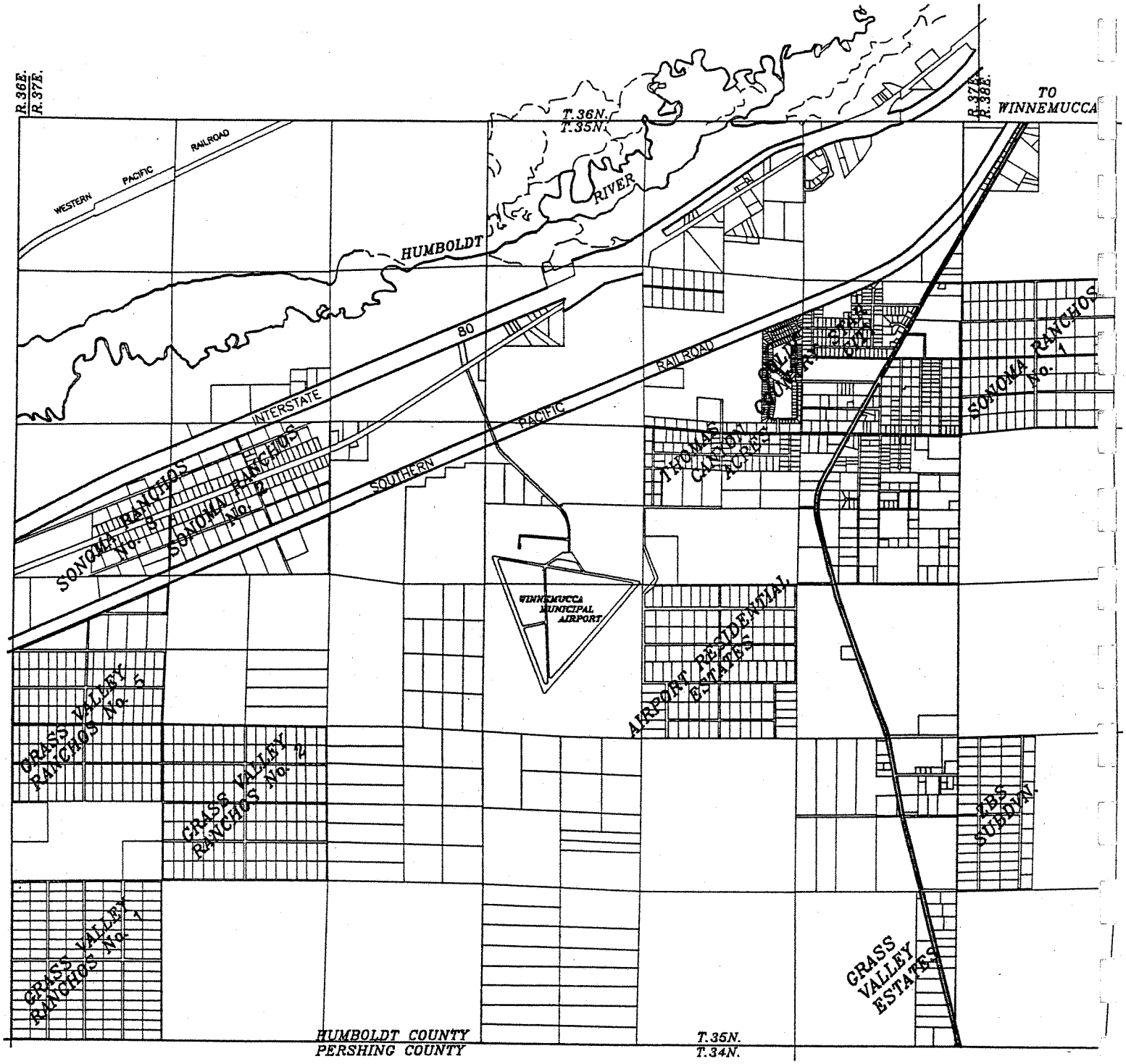

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FIGURE 2.1 – GRASS VALLEY

TABLE 3.2
SUMMARY GRASS VALLEY
DRINKING WATER AWARENESS PROJECT

Total Wells Sampled	249
Samples Exceeding 10 mg/l Nitrate	11
Samples Exceeding 1000 mg/l TDS	13
Samples Exceeding 500 mg/l TDS but less than 1000 mg/l	38
Samples Exceeding 400 mg/l Chloride	4
Samples Exceeding 250 mg/l Chloride But Less Than 400 mg/l	8
Number of Samples Exceeding TDS, Chloride and Nitrate	8

It appears from the results of the study that the majority of the domestic wells sampled in Grass Valley are producing excellent quality water with respect to TDS, Chlorides and Nitrates.

There are many unknown factors however when sampling from individual domestic wells such as well depth, presence or absence of a surface seal and location of the well with respect to septic system or other potential contamination sources. Because of these factors the Grass Valley Water Awareness Project is probably not an indicator of the overall quality of the groundwater; however, it does provide an initial concern for the groundwater quality and its relationship to individual sewage disposal systems.

Another indicator is the water quality of the larger domestic wells in Gold Country and Star City Subdivisions. These wells were presumably constructed to State standards since they are wells serving a public water system. In addition, they are relatively deep (greater than 300 ft) and because of the relatively large amount of water they continuously pump, undoubtedly provide representative samples of the groundwater. The water quality

from the wells in both Star City and Gold Country meet all the Drinking Water Standards and are of good quality. Appendix B.3 contains the water quality results reported by the State of Nevada for the Gold Country and Star City wells.

Unfortunately, because the Gold Country and Star City wells are at the very end of the Grass Valley Hydrographic Basin, they would be the last to show contamination occurring upgradient in the aquifer. It is strongly recommended that a monitoring program be implemented throughout the Grass Valley Hydrographic Basin. A system of monitoring wells beginning at the southernmost portion of Grass Valley and proceeding northwestward towards the Humboldt River Valley Basin should be developed. Since Grass valley encompasses two counties, Humboldt and Pershing, it is recommended that both governmental entities cooperate in a shared groundwater monitoring program. It Is essential that development occurring in Pershing County be monitored closely because potential groundwater contamination occurring in Pershing County will eventually travel into Humboldt County. Existing suitable wells, in strategic locations, may be utilized as monitoring wells in Grass Valley thus saving the expense of drilling new monitoring wells. The wells should not only be monitored for water quality (Total Dissolved Solids, Chlorides, Nitrates, Arsenic) but also static water levels. A series of 10 to 20 monitoring wells should be developed and tested quarterly and semi-annually dependent on their locations. This would provide data throughout the groundwater aquifer for assessing the potential of contamination and water level declines and would be the initial step in developing a groundwater study for Grass Valley.

The above normal presence of TDS, Chlorides and Nitrates can be an indication that individual sewage disposal systems (ISDS), primarily septic tanks with leach fields, are producing a negative impact on the groundwater. All of Grass Valley is served by ISDS including Star City and Gold Country Estates. Current estimates indicate that there are approximately 851 septic systems within that portion of Grass Valley in Humboldt County including a large system at the Grass Valley School. It is further estimated that there are 253 septic tanks in the Pershing County portion of Grass Valley. This equates to a total of approximately 660,000 gallons per day of wastewater effluent disposed in the Grass Valley Hydrographic Basin aquifer.

TECHNICAL MEMORANDUM

GRASS VALLEY PHASE I SEWER SYSTEM

PHASE I – REGIONAL SYSTEM CONCEPT REVIEW

PREPARED FOR

HUMBOLDT COUNTY

November 30, 1999

1999 PER Extracts Include: Pages 1-11

wateresource
consulting engineers, inc.

GEORGE W. BALL JR., P.E.
PRESIDENT

730 TAHOE STREET • RENO, NEVADA 89509 • (702) 322-9443 • FAX (702) 322-9507

TECHNICAL MEMORANDUM

DATE: November 30, 1999

TO: HUMBOLDT COUNTY

ATTN: John Milton, Chairman

FROM: George W. Ball, Jr., P.E.

RE: Grass Valley Phase I Sewer System
Phase I – Regional System Concept Review

JOB NO.: 9304.30

SECTION 1.0 – INTRODUCTION

The objective of Phase I of WATERESOURCE's March 3, 1999 proposal (see Appendix A) was to form a review committee consisting of Humboldt County, City of Winnemucca, Winnemucca Farms, Vista Ridge Development, Nevada Division of Environmental Protection and WATERESOURCE, as technical advisor, and review the various Grass Valley sewer system alternatives proposed in WATERESOURCE's January 1998 Report concerning the Phase I Sewer System Concept (see Figure 1, page 6). The goal of the committee's efforts was to ascertain if there is any future feasibility for integration of the four entities into a regional sewer system since it does not appear feasible to have four separate treatment facilities in the Winnemucca/Grass Valley area.

The Grass Valley wastewater effluent is a valuable water resource, as well as a potential water right for Humboldt County. Therefore, the Phase I Sewer System Concept is to treat the effluent that is presently going untreated into the groundwater aquifer and beneficially using it, thereby conserving other water resources such as the groundwater aquifer for higher uses, i.e. drinking water. The **PRIMARY** objective of sewering Grass Valley is to protect the drinking water resources of Grass Valley, as well as portions of the City of Winnemucca.

WATERESOURCE did not perform Task 2.0 of our March 3, 1999 proposal (see Appendix A), regarding a conference with the funding agencies. WATERESOURCE, together with the County, had two conferences with the City, Winnemucca Farms and the Vista Ridge Development parties to ascertain various issues related to the project feasibility. The principal issues that were discussed by all partles were: (1) is the Vista Ridge project viable; (2) does a regional wastewater facility have the potential to be adequately funded; and (3) will the construction of a joint wastewater treatment and disposal facility be in the best interests of Humboldt County? The result of the conferences, together with the declining Humboldt County mining activities, has suggested that entering into a Grass Valley Regional Sewer System project at this time is not in the best interest of Humboldt County.

One of the critical and very important aspects of this project, with regards to funding, is establishing the revenue base. Individual homeowners may need a County mandate to convince them to convert from an operational septic system to a regional sewer collection system requiring monthly operation and maintenance charges and possibly a connection fee. Hopefully, the deciding factor will be the potential effect of the septic system's discharge to the groundwater reservoir effecting the potability of domestic wells.

The Grass Valley project is listed on the Nevada State Revolving Loan Fund Project Priority List for fiscal year 2001, for a total of $10.650 million. This project priority list indicates a loan award date of April of 2001. WATERESOURCE recommends that Humboldt County continue to submit a project priority listing request for this project in the future.

SECTION 2.0 – SUMMARY

2.1 Background

2.1.1 Need for the Wastewater System

The requirement for a wastewater treatment and disposal system in Grass Valley is primarily driven by the density of development, particularly in Gold Country Estates and the adjacent Star City Development. In addition, as the Grass Valley groundwater monltoring program has demonstrated, the groundwater is experiencing a nitrate and total dissolved solids increase. It is the conclusion, at this point in time, that this results from the discharge of the individual septic disposal systems into the groundwater system. Therefore, the primary goal, as noted previously, is to protect the water resource for this area.

2.1.2 Wastewater System Concept

The collection system concept involves a septic tank effluent pumping (STEP) system to collect and convey the effluent from the Grass Valley area to the treatment/disposal facility. This concept was presented in the January 1997 Addendum to the December 1993 Water and Sewer Feasibility Report prepared for Humboldt County. The 1993 Feasibility Report presented a conventional gravity sewer collection system with pumping stations as required. The treatment alternatives that have been evaluated include:

a. Connection to the Winnemucca Farms' system,
b. Connection to the City of Winnemucca system,
c. A joint venture treatment facility with other entities, and
d. A stand-alone, County-only system.

2.1.3 Projected Wastewater Flows

a. 2000 = 0.40 mgd
b. 2005 = 0.50 mgd
c. 2010 = 0.55 mgd

2.1.4 Estimated Cost

a. Facility plan, including an environmental assessment - $70,000.00.
b. Collection system, including engineering and construction management - $7,930,000.00.
c. Treatment, including engineering and construction administration - $2,650,000.00.

Total = $10,650,000.00

2.2 Regional Wastewater System

2.2.1 Interested Entities

The entities involved in the discussions concerning a regional system in Grass Valley are: (a) Vista Ridge Development, (b) City of Winnemucca, (c) Winnemucca Farms, and (d) Humboldt County.

2.2.2 Future Interest in Grass Valley Wastewater Treatment and Disposal Facility

a. City of Winnemucca – They have no immediate interest in a regional wastewater system simply because their existing treatment facility is sized to accommodate their expansion into the near future and is

appropriately permitted with an NDPES permit. However, at some future time, they would entertaln the potential of sewering the east side of the collection system by gravity to a proposed future Grass Valley wastewater treatment and disposal facility. This would accomplish two things for the City of Winnemucca: (1) eliminate the need to treat that portion of thelr existing demand In the existing City Wastewater Treatment Facillty, and (2) extend the life of the existing treatment facility.

b. Winnemucca Farms – Winnemucca Farms presently is managing their treatment and disposal needs with their new facility. However, in the future, they may have an Interest in conveying some of their treated effluent to a joint regional treatment facility for further treatment and disposal. Presently, Winnemucca Farms disposes their effluent through land application; however, winter conditions sometimes make this very difficult.

c. Vista Ridge has expressed an interest in pursuing a joint regional wastewater treatment and disposal facility with Humboldt County, as evidenced by the May 24, 1999 letter from First Federal Development, LLC (see Appendix B). The Vista Ridge Development's proposal is to construct a wastewater facility that will be sized, not only to manage their total development, but also incorporate the sewage collection system from the County's Grass Valley area. Disposal would include golf course irrigation in the summer and winter storage in holding ponds and rapid Infiltration basin.

SECTION 3.0 – BACKGROUND

3.1 Need for Wastewater Treatment and Disposal

Figure 1, page 6, presents the densest developed area to be sewered initially. The driving force for a sewer collection, treatment and disposal system in Grass Valley results from growth and the groundwater monitoring program, initiated by Humboldt County over four years ago. This monitoring program has continually sampled 17 sites for between 3 to 4 years. The results from these tests indicate increasing trends of nitrate in 14 of the 17 monitoring sites. The program strongly suggests that the increase in nitrates, as well as total dissolved solids in the groundwater system, results from the discharge of untreated septlc tank effluent to the groundwater system. Since this is the only water resource for the Grass Valley/ Winnemucca area, its protection and maintenance of an acceptable water quality is paramount. The Nevada Division of Environmental Protection also supports the

development of a sewer collection, treatment and disposal system for the Grass Valley area, primarily because of the density of development in the northern portion of the valley in Humboldt County.

In addition, the County Is desirous of removing septage dlsposal from their landfill and disposing of it in a wastewater treatment facllity. The City of Winnemucca will not accept septage at their facility at this time.

3.2 County Commitment

Since the initiation and development of the December 1993 Grass Valley Water and Sewer Feasibility Report, prepared by WATERESOURCE for Humboldt County, the County has been steadfast in maintaining thelr support for developing a wastewater collectlon, treatment and disposal system in the Grass Valley area. It is presently estimated that the discharge from septlc tank effluent into the groundwater system in the area delineated in Figure 1, page 6, is in the order of 350,000 – 380,000 gallons per day.

3.2.1 Collection System Concept

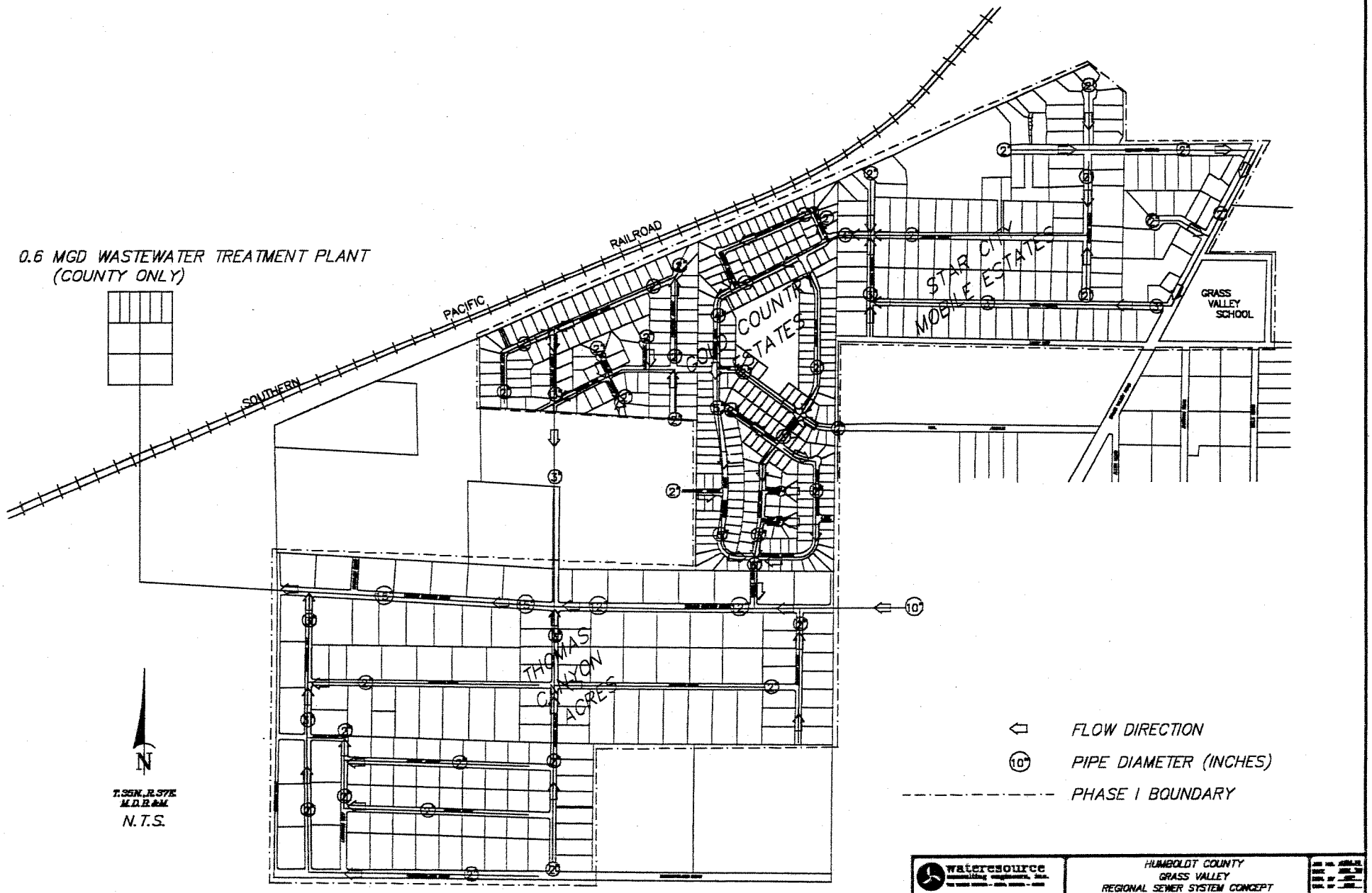
Figure 1, page 6, presents the collection system, utilizing the septic tank effluent pump (STEP) concept. This concept envisions each septic tank at individual residence and other facilities, havlng a small pump that discharges effluent from the septic tank through a pressurized service line to a small diameter pressure main that conveys the wastewater, along with other pumped septic tank effluent, to a central collection treatment and disposal facility.

3.2.2 Treatment Alternatives

The treatment alternatives that were evaluated include:

a. Connection to Winnemucca Farms and utilization of their existing treatment facility. Since Winnemucca Farms' treatment requirements is approaching their plant capacity, they will not have sufficient capacity to Integrate Grass Valley Into their system. In addition, the discharge of Grass Valley domestic wastewater into the Winnemucca Farms' treatment facility would change the characteristics of the wastewater they are presently treating by adding pathogens and viruses, as well as requiring a higher level of treatment, including dislnfection and a higher level of operator certification.

b. Connection to the City of Winnemucca. This alternative appears to have some feasibility; however, the Grass Valley system is removed


0.6 MGD WASTEWATER TREATMENT PLANT
(COUNTY ONLY)
SOUTHERN PACIFIC RAILROAD
COUNTRY ESTATES
STAR CITY MOBILE ESTATES
GRASS VALLEY SCHOOL
THOMAS CANYON ACRES
N
T.25N., R.5E., M.D.B.&M.
N.T.S.
FLOW DIRECTION
PIPE DIAMETER (INCHES)
PHASE I BOUNDARY
waterresource
HUMBOLDT COUNTY
GRASS VALLEY
REGIONAL SEWER SYSTEM CONCEPT
FIGURE 1
PHASE 1 SEWER SYSTEM CONCEPT

from the City of Winnemucca's collection system by approximately three miles. In addition, the existing collection system in the City of Winnemucca appears inadequate to convey the projected Grass Valley wastewater to the City's treatment facility. Therefore, this alternative would require expensive collection system reconstruction, including a new river and freeway crossing. In addition, adding the Grass Valley wastewater to the City's system would significantly reduce their available capacity for growth, requiring them to look at a future plant expansion at a much sooner planning horizon.

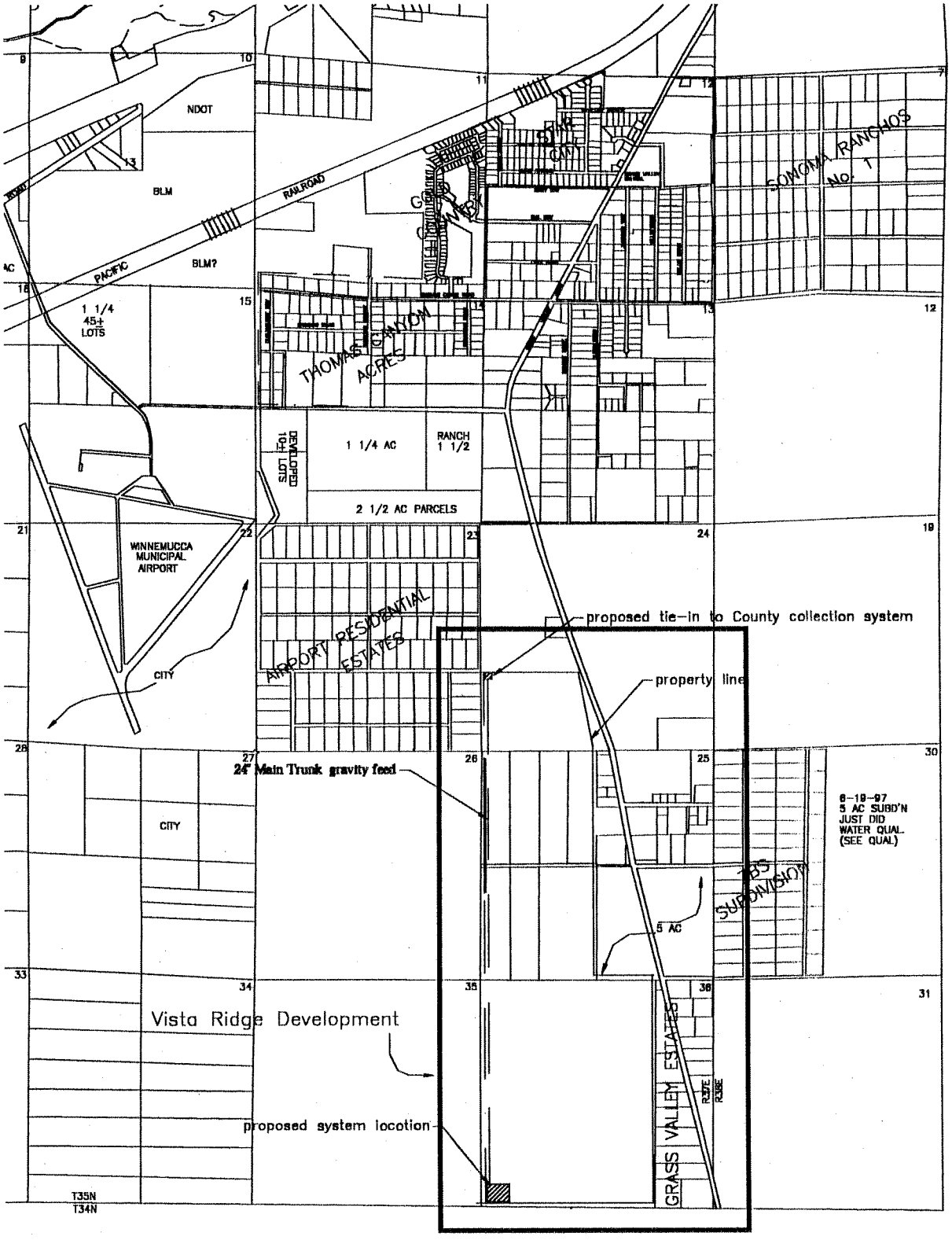
c. The Vista Ridge proposed development is presented in Figure 2, page 8. Their Interest in pursuing a Joint Wastewater Treatment Facility with the County is reflected in their letter to WATERESOURCE (Appendix B). However, subsequent discussions with them, by WATERESOURCE, suggested that the County is the key player, I.e. they would proceed with a regional facility if the County would participate. The issue involved in an inter-local agreement between Vista Ridge and the County have not been defined. In addition, WATERESOURCE has not heard of any interest from the developers in this project since June 1999. This, together with the decline in mining activity in the Winnemucca area, suggests the development is not feasible at this time.

d. The fourth alternative, County stand-along treatment facility for Grass Valley, was evaluated in the 1993 Feasibility Report which presented a conventional gravity collection system, and the January 1997 Addendum which evaluated a STEP system collection. The obvious disadvantage of a stand-alone facility is the capital cost outlay borne totally by the County, as well as a necessity for developing a rate base to support the system. In addition, the County would have to set up for the Grass Valley treatment system a total integrated wastewater collection treatment and disposal facility organization, along with the administrative and maintenance staff to administer and manage such a utility.

3.3 Previous Studies

3.3.1 Grass Valley Water and Sewer Feasibility Report, December 1993

This feasibility report was prepared to give Humboldt County an understanding of the water and sewer Infrastructure requirements to provide these utilities in Grass Valley and their probable economic impact. It served as a preliminary guide and planning tool for development of future projects.



NOT TO SCALE

wateresource consulting engineers, inc.	HUMBOLDT COUNTY GRASS VALLEY REGIONAL SEWER SYSTEM CONCEPT	JOB NO. 8324.02 DATE 10/24/97 DRN. BY RDP CHK. BY GWP
DATE / REVISIONS / BY	FIGURE 2 VISTA RIDGE DEVELOPMENT	

3.3.2 Grass Valley Water and Sewer Feasibility Report Addendum, January 1997

This report was prepared as an alternative sewer collection system based on emerging technology relating to a septic tank effluent pumping (STEP) system in comparison to a community gravity sewer collection system as presented in the 1993 Report. One of the main purposes of the report was to compare the cost of the gravity collection system and the STEP system.

3.3.3 Sewer Collection/Treatment System Phase I Concept and Funding Investigation/Evaluation, January 1998

The primary objective of this investigation was to evaluate the various funding avenues available to Humboldt County for purpose of constructing a sewer collection and treatment system in Grass Valley. In addition, the investigation further delineated the area for the initial phase of the sewer collection system.

SECTION 4.0 – REGIONAL WASTEWATER SYSTEM ISSUES

4.1 Interested Entities

4.1.1 Vista Ridge Development

In a conference (4/1/99) with the Vista Ridge Development, they presented a conceptual design for a 1.5 mgd treatment facility with an estimated cost of $2.7 million. The effluent from the treatment facility would be used for golf course irrigation and storage in the winter in 50 - 60 million gallon storage lagoons. They would also dispose of the effluent in the winter time in rapid infiltration basins. Their treatment concept envisioned filtration with disinfection with the effluent nitrate in the order of 0.5 mg/l and utilization of ultra-violet (UV) disinfection. The Vista Ridge Development indicated they will enter Into an agreement with the County to construct the treatment facility with sharing of the capital and O & M costs.

Both the City and the County were interested in the Vista Ridge Development proposal since it would provide both water and wastewater service to the airport properties which would allow potential development of the airport's industrial development property. As noted previously herein, the project economic feasibility, at this point in time, does not appear to exist.

4.1.2 City of Winnemucca

Steve West, City Manager, has Indicated they have no requirements from the Division of Environmental Protection to upgrade their treatment technology or move their treatment facility. The City is very pleased with their aerated lagoons system because of its ease of operation. They are at 44% of their present deslgn capacity; however, they have limited land for disposal. West is concerned that adding Grass Valley will bring thelr treatment requirements up to near capacity. He also expressed concern that the river crossing may not be big enough to convey the total City of Winnemucca and Grass Valley flows to the treatment facility.

The City dld express an interest of sewering, in the future, the southeastern portion of the City to a future regional facility in Grass Valley. They felt that that in the future there would be a distinct advantage since they could gravity from the higher portions of the City to the Grass Valley treatment facility. NDEP indicated an interest in this alternative since it would unload the existing City's treatment facility and reduce the amount of water going to the rapid infiltration basins. The City indicated that if their sewage load started to Increase dramatically or their monitoring wells indicated some problems from their treatment process that this would accelerate the conversion of the southeastern portion of the City of Winnemucca to a Grass Valley system, if it existed.

4.1.3 Wlnnemucca Farms

Winnemucca Farms indicated that their plant Is operating efficiently. They would have some concern Integrating Grass Valley's wastewater into their facility, particularly with the change in characteristics of the wastewater. Presently, they are treating 350,000 to 400,000 gallons per day with a BOD ten times the municipal wastewater strength. Winnemucca Farms believes their plant would need expansion wlth the Grass Valley system integratlon into their plant. They also feel that taking their effluent to a regional facility would not have any great benefit to Wlnnemucca Farms. Winnemucca Farm's present plant and capacity Is sufficient for their needs for ten years into the future.

SECTION 5.0 – CONCLUSION

The need and participants to create a Regional Wastewater Treatment and Dlsposal Facility in the Grass Valley area exists; however, the timing does not appear to be feasible, primarily due to the overall economy of Humboldt County at this time. Development of funding resources appears feasible particularly in a joint venture scenario

The need for a Grass Valley treatment and disposal facility is highlighted by the groundwater quality impact from septic tank effluent. Therefore, a wastewater treatment and disposal facility will be required in the future to manage the Grass Valley Wastewater and protect the groundwater resource.

cc: Janet Kubichek, Vice Chairman
Bob Cassinelli, Commissioner
Buster Dufurrena, Commissioner
Chuck Giordino, Commissioner
Bill Diest, County Administrator

APPENDIX C – WWTF MANUFACTURERS INFORMATION

AERO MOD®
Wastewater Process Solutions

Sequox® ClarAtor® SR Diffuser Access System

DO optimizer™

Grass Valley, NV

WWTP Proposal

for

Farr West Engineering

March 9, 2022

Specializing in Custom Designed Wastewater Treatment Facilities

Aero-Mod, Inc.
7927 U.S. Highway 24
Manhattan, KS 66502 USA
Ph: (785) 537-4995
www.aeromod.com

Phase 1 - 0.405 MGD

Aero-Mod, Inc.

EQUIPMENT AND SERVICES COST ESTIMATE

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English

EQUIPMENT SUPPLIED

AERATION EQUIPMENT

2	Aeration pd blower/sound enclosure package, 100 HP - 460 V, 3 ph	
4	SEQUOX aeration control butterfly valve, pneumatically-actuated	
2	SEQUOX aeration throttling butterfly valve, gear-operated	
2	SEQUOX aeration control butterfly valve, electrically-actuated	
2	Aeration flow conditioner/flow sensor/SS flanged pipe spool	
24	Wall mounted aeration assembly, Model WA-PF6-2	- First Stage Aeration Basins
16	Wall mounted aeration assembly, Model WA-PS4-2	- Second Stage Aeration Basins

BIO-P EQUIPMENT

1	Aeration control butterfly valve, pneumatically-actuated
2	Aeration throttling butterfly valve, gear-operated
4	Wall mounted aeration assembly, Model WAD-PS2-2

CLARIFIER & RAS EQUIPMENT

2	Aero-Mod Split-ClarAtor Clarifier System - 640 sf/each

DIGESTION, SLUDGE HOLDING & WAS EQUIPMENT

2	WAS airlift pump, Model AL-600
2	Aeration control butterfly valve, pneumatically-actuated
2	Aeration control butterfly valve, electrically-actuated
2	Aeration flow conditioner/flow sensor/SS flanged pipe spool
8	Wall mounted aeration assembly, Model WAD-PS2-2

ELECTRICAL & CONTROLS EQUIPMENT

1	SEQUOX Process Control Panel w/ Allen Bradley PLC, Model SQC-100 Series - 115 V
2	Blower control panel w/ Allen Bradley 6-pulse VFD - 460 V, 3 ph
2	Air compressor, 3.0 HP with 80 gallon tank & auto-drain - 460 V, 3 ph
1	Air compressor alternation panel - 460 V
1	Regenerative desiccant dryer mounted on 60 gal dry storage tank - 115 V wall outlet
1	D.O. Control System - probe analyzer & sunshield w/ rail-mounted sensor probes

ANCILLARY EQUIPMENT

280	Wall mounted walkway & handrail, LF
2	Wall mounted stop plates & frames
	2 SS wall-mounted frames 2 Aluminum stop plates
LS	Spare Parts
LS	Interior tank installation materials - SS brackets, SS bolts, PVC wall inserts, pneumatic tubing, misc.

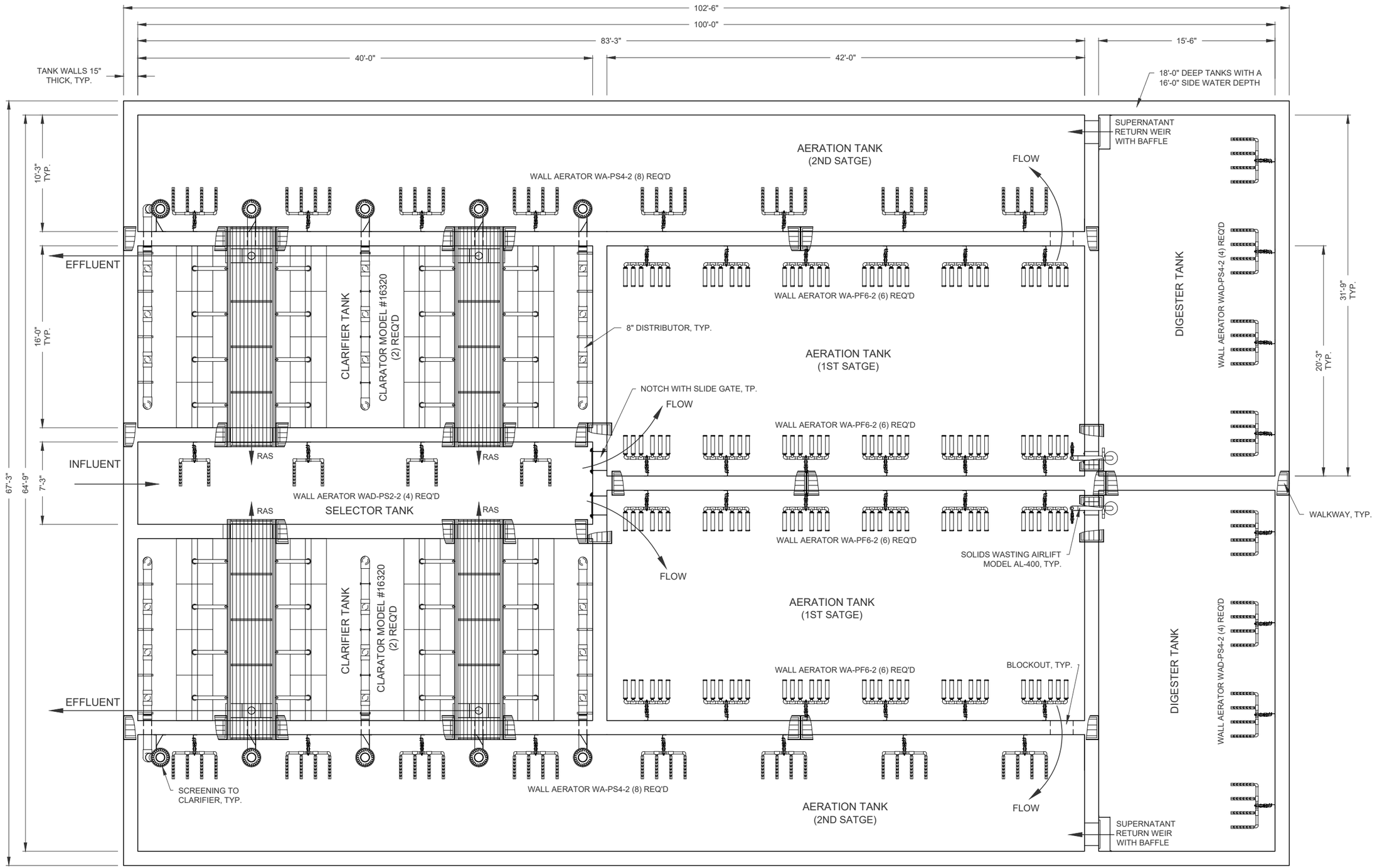
SERVICES

LS	Freight to jobsite
LS	Aero-Mod equipment dry inspection/equipment start-up & training, two (2) days
LS	Aero-Mod PLC startup & training, two (2) days
LS	Aero-Mod biological training, two (2) days
LS	Operator training school - 2 days at Aero-Mod facilities in Manhattan, KS

TOTAL EQUIPMENT COST	**$979,850**
EST'D INSTALLATION of Aero-Mod EQUIPMENT by Contractor *(Includes Interior Tank PVC Piping)*	$235,000
ESTIMATED CONCRETE TANK COST by Contractor	$941,000
Concrete for Tank Walls, cy: 626	
Installed Concrete Cost, $/cy: $900	
Concrete for Tank Slab, cy: 402	
Installed Concrete Cost, $/cy: $800	
Grout for Clarifier Bottom, cy: 81	
Installed Concrete Cost, $/cy: $700	
ESTIMATED COST	**$2,155,850**

PLEASE NOTE THE FOLLOWING

1. Buildings, site work, and auxiliary equipment are not included within this estimate.
2. No RAS pump station and associated electrical requirements are required.
3. Yard piping is not required between each Aero-Mod tank.
4. All associated walkways & handrail for the clarifier and tankage are included in the above estimate.
5. This estimate is valid for 90 days from the above date.



Drawn by: JB
Chk by:
Scale: NTS
Date: 03/09/22

Title:
GRASS VALLEY
PHASE 1 - 0.405 MGD
WASTE WATER TREATMENT PLANT

Aero - Mod, Inc.

7927 U.S. Highway 24
Manhattan, Kansas 66502
PHONE: (785) 537-4995

Aero-Mod, Inc.

ACTIVATED SLUDGE DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Act. Sludge Process: SEQUOX BNR

DESIGN CONDITIONS & PARAMETERS

	Influent	Clarifier Effluent
Flow (Q), MGD	**0.405**	
BOD_5, mg/l	**240**	**15.0**
BOD_5, lbs/day	811	50.7
BOD_L, mg/l	351	
TSS, mg/l	**240**	**15.0**
TSS, lbs/day	811	50.7
Ammonia-N, mg/l	**40**	**3.0**
Ammonia-N, lbs/day	135.1	10.1
TN, mg/l (assumes rDON < 1.0 mg/l)		**10.0**
TN, lbs/day		33.8
Phosphorus-P, mg/l	**8.0**	**4.9**
Phosphorus-P, lbs/day	27.0	16.5
Net Alkalinity Loss, mg/l as $CaCO_3$		**(206)**

Aeration Basin	
Retention Time, hours	**24.0**
Aeration Tank Volume, Mgal	0.405
MCRT, days	**20.0**
Wastewater Temperature, °C	16
Aerobic Digester	
Volume, % of Aeration Tank	30.0
Maximum Solids Conc., mg/l	12,000
Maximum Solids Conc., %	1.20%
Digester Temperature, °C	16
Sludge Holding Tank	
Volume, % of Aeration Tank	0.0
Maximum Solids Conc., mg/l	25,000
Maximum Solids Conc., %	2.50%

PROJECTED OPERATING CONDITIONS - AERATION BASIN

Mixed Liquor Suspended Solids, mg/l		**3,277**
Excess MLSS due to Phos-P Uptake/Removal, mg/l	0	
Mixed Liquor Volatile Suspended Solids, %		72%
F/M Ratio, lbs BOD_5/lb MLVSS		0.10
F/M Ratio, lbs BOD_5/lb MLSS		0.07
Organic Loading, lbs BOD_5/1000 cf of tank/day		15.0
Oxygen Requirements (Carbonaceous), mg/l/hr		9.48
Oxygen Requirements (Nitrogenous), mg/l/hr		7.09
Solids Production, lbs/day		553
WAS - Solids Wasted per Day, lbs/day		503
WAS - Solids Wasted per Day, gal/day @	0.33%	18,396

PROJECTED OPERATING CONDITIONS - AEROBIC DIGESTER

Volatile Solids Loading in Digester, lbs VSS/1,000 cf of tank/day	22
Volatile Solids Reduction in Digester, %	29%
Solids Wasted from Digester, lbs/day	400
Mass Solids Yield in Process & Digester per Mass Influent BOD_5, %	56%
Volume Wasted from Digester, gallons/day	3,993
Digester Sludge Age, days	**30**
Air Required for Stabilization, scfm	149
Air Required for Mixing @ 30 cfm/1000 cf	487

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Tubular EPDM Fine Bubble

	Design	Peak		Design	Peak
Q, MGD	0.405	N/A	TKN_o, mg/l	50.0	N/A
BOD_o, mg/l	240	N/A	$TKN_{assimilation}$, mg/l	9.1	N/A
BOD_{rem}, mg/l	240	N/A	TKN_{rem}, mg/l	50.0	N/A
BOD_{rem}, lb/day	811	N/A	TKN_{rem}, lb/day	168.9	N/A
O_2 Requirement, lb O_2/lb BOD_{rem}	1.500		O_2 Requirement, lb O_2/lb TKN_{rem}	4.60	

AERATION REQUIREMENTS - FIRST STAGE

	Design	Peak
Removal in First Stage	70%	70.0%
BOD_{oxy} - Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	35.5	N/A
TKN_{oxy} - Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	22.7	N/A
Actual Oxygenation Rate (AOR), lbs O_2/hr	**58.1**	**N/A**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**164.7**	**N/A**

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

$C_{s,T,H}$	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	0.60	Θ	Theta - Oxygen Transfer Coeff	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**4,390**
P_H	Atmospheric Pressure at Site Elevation, psi	12.51	Ω	Omega (P_H/P_s)	0.851

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm **581** **N/A**

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**15.0**
Transfer Efficiency per Foot of Submergence, %	**1.80%**		

Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm 91 N/A

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

Total Aeration Required in Aeration Basin, scfm **490** **N/A**

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)]

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	12.31	

Minimum Air Required for Mixing in First Stage Aeration Basin, cfm	272	Side Roll
Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	273	Side Roll
Minimum Air Required for Operating Full Plant, cfm (mixing requirement for 24 hrs)	814	

	Design	Peak	Design	Peak
Aeration Pressure, in. H_2O			228	228
psi, std (does not include blower inlet/outlet)			**8.2**	**8.2**

		scfm	scfm	icfm	icfm
Aeration Basin - Fine Bubble		490	0	665	0
Aeration Basin - Coarse Bubble		386	0	524	0
Aerobic Digester Tank	(sequenced aeration)	244	0	244	0
Bio-P / Selector Tank		46	0	46	0
Post Aeration Tank		0	0	0	0
Clarifier RAS Airlift Pumps & Skimmers		60	0	60	0
	Total Air Required	1,227		1,539	
	Total Air Available			**1,783**	

POWER REQUIREMENTS

	Unit	Power	Power
Operating Power for Aeration Basin, HP	Blower	72.4	
Operating Power for Digester, HP	Blower	14.8	
Operating Power for Selector Tank, HP	Blower	2.8	
Operating Power for Post Aeration Tank, HP	Blower	0.0	
Operating Power for Clarifier, HP	Blower	3.7	
Operating Power for Pneumatic System, HP	Air Compr.	0.4	
Operating Power Required at Full Loading, HP		**94.1**	
Minimum Power Required to Operate Full Plant , HP		**48.1**	

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Stainless Steel Coarse Bubble

AERATION REQUIREMENTS - SECOND & THIRD STAGE	**Design**	**Peak**
Removal in Second Stage	30%	30.0%
Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	15.2	N/A
Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	9.7	N/A
Actual Oxygenation Rate (AOR), lbs O_2/hr	**24.9**	**N/A**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**56.5**	**N/A**

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 Coeffi	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**4,390**
P_H	Atmospheric Pressure at Site Elevation, psi/FASL	12.51	Ω	Omega (P_H/P_s)	0.851

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm **434** **N/A**

Where:

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**15.5**
Transfer Efficiency per Foot of Submergence, %	**0.80%**		

Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm 47 N/A

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

Total Aeration Required in Aeration Basin, scfm **386** **N/A**

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	12.31	

Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	273	Side Roll
Aeration Pressure, in. H_2O	213	213
psi, std (does not include blower inlet/outlet)	**7.7**	**7.7**

	Design scfm	**Peak** scfm	**Design** icfm	**Peak** icfm
Aeration Basin - Coarse Bubble	386	0	524	0

Aero-Mod, Inc.

O&M COST CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Tubular EPDM Fine Bubble ***Aeration Blower:*** Kaeser FB791C-100HP
Stainless Steel Coarse Bubble

AERATION REQUIREMENTS

		Full Loading
Aeration Basin - Fine Bubble		665
Aeration Basin - Coarse Bubble		524
Aerobic Digester Tank		244
Clarifier RAS Airlift Pumps & Skimmers		106
	Total Air Required, icfm	1,539
	Total Air Capacity, icfm	1,783

POWER REQUIREMENTS

		Full Loading
	Total Operating Blower Power, HP	93.7
	Nameplate HP	kW
Operating Power for Aeration Basin	2 @ 100	54.0
Operating Power for Digester		11.1
Operating Power for Clarifier		4.8
Operating Power for Pneumatic System	2 @ 3.0	0.3
Operating Power for Air Compressor Auto-Drains		0.05
Operating Power for Regenerative Desiccant Dryer		0.07
Operating Power for Positioning Actuators		0.07
Operating Power for Blower VFD Control Panels		2.00
Operating Power for PLC-based Process & D.O. Control		0.20
	Total Operating Power, kW	72.6
	Total Daily Power, kWh	1,742
	Yearly Power @ $0.08/kWh	**$50,868**

LABOR REQUIREMENTS

Labor is assumed at what is actually required, and only for the plant proper. The labor rate includes base labor and overhead. Regional policy, existing contracts, and related duties may alter this figure significantly. The person-hours required per week is calculated for only the Aero-Mod equipment.

Time per Week, hrs	**15**
Rate per Hour, $	**$25.00**
	$19,500

REPLACEMENT PARTS & CONSUMABLES

	Quan.
Blower Belts	2
Blower Inlet Filter Element	2
Blower Oil (Twice)	2
Compressor Oil (Twice)	2
Filters for Regenerative Dryer	1
Desiccant for Regenerative Dryer (once every 3 years)	1
Misc. Parts	1
	$1,600

CHEMICAL COST FOR PHOSPHORUS REMOVAL

Chemical Assumed to be Used	**N/A**
Estimated Amount of Chemical Added per Day, gal.	
Estimated Amount of Chemical Added per Year, gal.	
Estimated Cost per Gallon of Chemical (assumes bulk delivery)	
	N/A

CHEMICAL COST FOR NITROGEN REMOVAL

Chemical Assumed to be Used	**N/A**
Estimated Amount of Chemical Added per Day, gal.	
Estimated Amount of Chemical Added per Year, gal.	
Estimated Cost per Gallon of Chemical (assumes bulk delivery)	
	N/A

Aero-Mod, Inc.

CLARIFIER DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Clarifier Type Used: Split-ClarAtor

FLOW CONDITIONS

Design Flow, MGD		0.405	
Peaking Factor, hourly	1,125 gpm	4.00	1.620 MGD
Duration, min		60	
Peaking Factor, sustained		3.00	1.215 MGD
Aeration Tank Volume, Mgal		0.405	
MLSS, mg/l		3,277	
Avg. RAS Recycle Rate, %		150%	

EQUIPMENT SIZING & SELECTION

Number of Clarifiers	**2**	Surface Area per Clarifier, sf	640
Clarifier Unit Model	**16320**	Total Surface Area, sf	**1,280**
Bridge Length, ft	16	Total Weir Length, ft	116
Clarifier Unit Width, ft	20	Tank Wall Depth, ft	18.0
Number of Units per Clarifier	2	Tank Water Depth, ft	16.0

SURFACE OVERFLOW RATE

	Design	
Design Flow, gpd/sf	**316**	
Peak Day Flow, gpd/sf	949	
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	**3,491**
Peak Flow, gpd/lin. ft	11,034

SOLIDS LOADING RATE

Design Flow, lbs/day/sf	**21.6**
Peak Flow, lbs/day/sf	40.3

RETENTION TIME - including RAS

Design Flow, hr	**3.6**
Peak Flow, hr	1.9

PEAK FLOW HANDLING - IN-BASIN SURGE STORAGE

Hourly Peak Flow, MGD	1.620	Vol. of In-Basin Surge Storage, gal	15,514
Max. Flow Through Clarifier, MGD	1.280	Capacity of Surge Storage, hr.	1.1
Stored Peak Flow, gpm	236		

PEAK FLOW HANDLING - SIDE-LINE SURGE TANK

Hourly Peak Flow, MGD	1.620	Volume of Surge Tank	0
Max. Flow Through Clarifier, MGD	1.280	Capacity of Surge Tank, hr.	0.0
Diverted Peak Flow, gpm	236		
		Peak Hour Capacity, hr.	1.1

Aero-Mod, Inc.

TANKAGE DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Tank Construction: Cast-in-Place Concrete

BIO-P / SELECTOR TANK

Anaerobic Selector	Volume Required, gal	**33,750**		
Number of Tanks	1	Tank Length, ft		40.0
Tank Wall Height, ft	18.0	Tank Width, ft		7.25
Tank Water Depth, ft	16.0	Total Volume, gallons		**34,707**
Freeboard, ft	2.0	Retention Time (Forward Flow) min.		123

AERATION TANK Volume Selected, gal **405,000**

Tank Wall Height, ft	18.0	Number of Trains	2
Tank Water Depth, ft	16.0	Number of Stages	2

Stage 1		*Stage 2*	
Number of Tanks	2	Number of Tanks	2
Tank Length, ft	42.0	Tank Length, ft	83.250
Tank Width, ft	20.250	Tank Width, ft	10.25
Area of Each Tank, sf	851	Area of Each Tank, sf	853
Total Volume, gallons	**203,576**	Total Volume, gallons	**204,249**

Total volume provided, gal **407,825**

CLARIFIER TANK

Number of Tanks	2	Tank Width, ft	16.0
Tank Wall Height, ft	18.0	Tank Length, ft	40.0
Tank Water Depth, ft	16.0	Total Volume, gallons	**153,190**

AEROBIC DIGESTER TANK Volume Selected, gal **121,500**

Number of Tanks	2	Tank Length, ft	15.5
Tank Wall Height, ft	18.0	Tank Width, ft	31.750
Tank Water Depth, ft	16.5	Total Volume, gallons	**121,476**

OVERALL TANKAGE DIMENSIONS

Total Length, ft	102.5	Wall Thickness, in	15.0
Total Width, ft	67.25	Floor Thickness, in	18.0
Total Area, sf	6,893	Total Concrete for Walls, cy	**626**
Total Wall Length, LF	751	Total Concrete for Slab, cy	**402**
		Total Grout for Clarifier, cy	**81**

Phase 2 - 0.305 MGD

Aero-Mod, Inc.

EQUIPMENT AND SERVICES COST ESTIMATE

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English

EQUIPMENT SUPPLIED

AERATION EQUIPMENT

2	Aeration pd blower/sound enclosure package, 75 HP - 460 V, 3 ph	
4	SEQUOX aeration control butterfly valve, pneumatically-actuated	
2	SEQUOX aeration throttling butterfly valve, gear-operated	
2	SEQUOX aeration control butterfly valve, electrically-actuated	
2	Aeration flow conditioner/flow sensor/SS flanged pipe spool	
20	Wall mounted aeration assembly, Model WA-PF6-2	- First Stage Aeration Basins
16	Wall mounted aeration assembly, Model WA-PS4-2	- Second Stage Aeration Basins

BIO-P EQUIPMENT

1	Aeration control butterfly valve, pneumatically-actuated
2	Aeration throttling butterfly valve, gear-operated
4	Wall mounted aeration assembly, Model WAD-HS2-2

CLARIFIER & RAS EQUIPMENT

2	Aero-Mod Split-ClarAtor Clarifier System - 480 sf/each

DIGESTION, SLUDGE HOLDING & WAS EQUIPMENT

2	WAS airlift pump, Model AL-400
2	Aeration control butterfly valve, pneumatically-actuated
2	Aeration control butterfly valve, electrically-actuated
2	Aeration flow conditioner/flow sensor/SS flanged pipe spool
6	Wall mounted aeration assembly, Model WAD-PS4-2

ELECTRICAL & CONTROLS EQUIPMENT

1	SEQUOX Process Control Panel w/ Allen Bradley PLC, Model SQC-100 Series - 115 V
2	Blower control panel w/ Allen Bradley 6-pulse VFD - 460 V, 3 ph
2	Air compressor, 3.0 HP with 80 gallon tank & auto-drain - 460 V, 3 ph
1	Air compressor alternation panel - 460 V
1	Regenerative desiccant dryer mounted on 60 gal dry storage tank - 115 V wall outlet
1	D.O. Control System - probe analyzer & sunshield w/ rail-mounted sensor probes

ANCILLARY EQUIPMENT

270	Wall mounted walkway & handrail, LF
2	Wall mounted stop plates & frames
	2 SS wall-mounted frames 2 Aluminum stop plates
LS	Spare Parts
LS	Interior tank installation materials - SS brackets, SS bolts, PVC wall inserts, pneumatic tubing, misc.

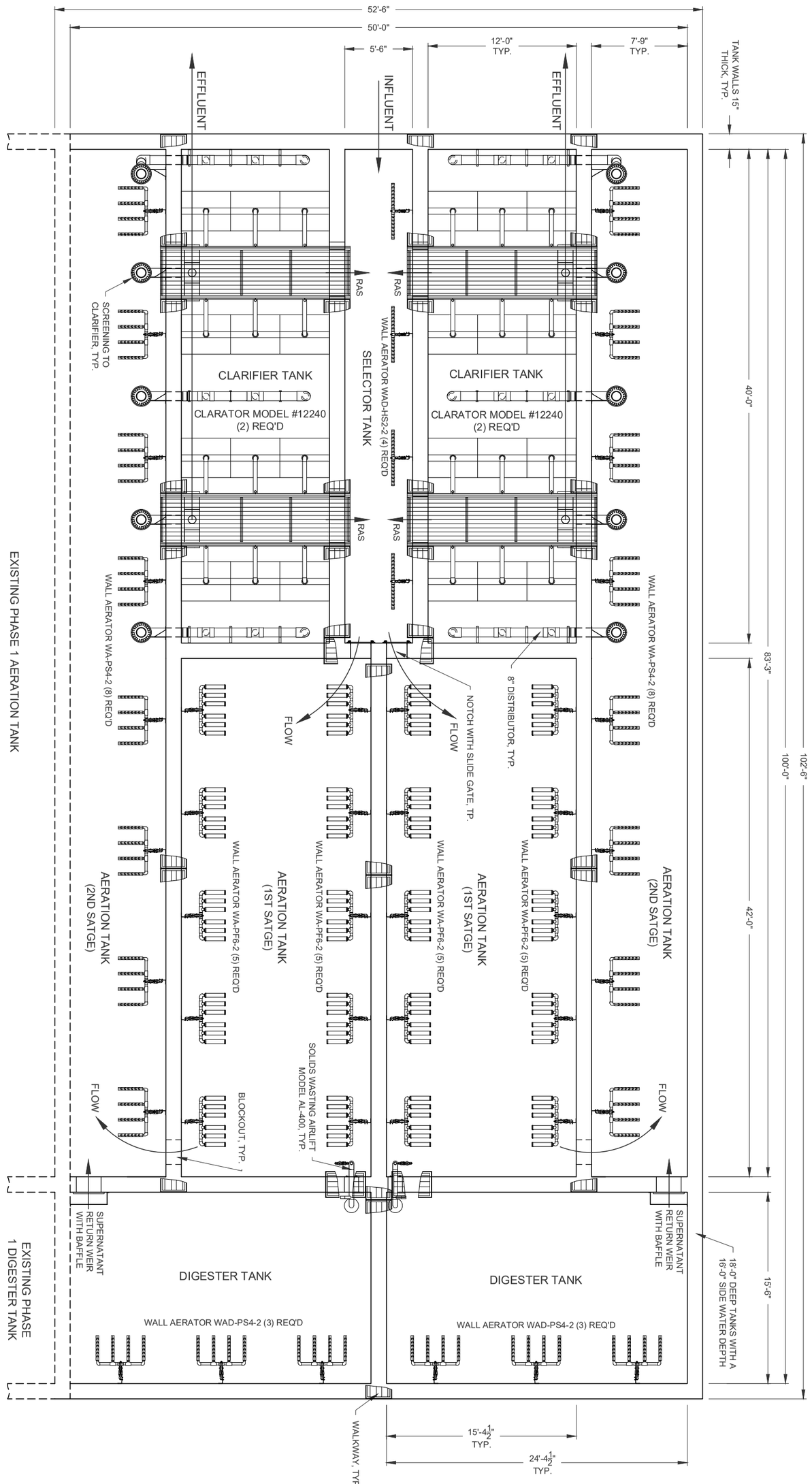
SERVICES

LS	Freight to jobsite
LS	Aero-Mod equipment dry inspection/equipment start-up & training, two (2) days
LS	Aero-Mod PLC startup & training, two (2) days
LS	Aero-Mod biological training, two (2) days
LS	Operator training school - 2 days at Aero-Mod facilities in Manhattan, KS

TOTAL EQUIPMENT COST	**$889,500**
EST'D INSTALLATION of Aero-Mod EQUIPMENT by Contractor *(Includes Interior Tank PVC Piping)*	$185,000
ESTIMATED CONCRETE TANK COST by Contractor	$741,500
Concrete for Tank Walls, cy: 496	
Installed Concrete Cost, $/cy: $900	
Concrete for Tank Slab, cy: 316	
Installed Concrete Cost, $/cy: $800	
Grout for Clarifier Bottom, cy: 60	
Installed Concrete Cost, $/cy: $700	
ESTIMATED COST	**$1,816,000**

PLEASE NOTE THE FOLLOWING

1. Buildings, site work, and auxiliary equipment are not included within this estimate.
2. No RAS pump station and associated electrical requirements are required.
3. Yard piping is not required between each Aero-Mod tank.
4. All associated walkways & handrail for the clarifier and tankage are included in the above estimate.
5. This estimate is valid for 90 days from the above date.



Aero - Mod, Inc.
7927 U.S. Highway 24
Manhattan, Kansas 66502
PHONE: (785) 537-4995

Drawn by:	Chk by:	Scale:	Date:
JB		NTS	03/09/22

Title:

GRASS VALLEY
PHASE 2 - 0.305 MGD
WASTE WATER TREATMENT PLANT

Aero-Mod, Inc.

ACTIVATED SLUDGE DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Act. Sludge Process: SEQUOX BNR

DESIGN CONDITIONS & PARAMETERS

	Influent	Clarifier Effluent
Flow (Q), MGD	**0.305**	
BOD_5, mg/l	**240**	**15.0**
BOD_5, lbs/day	610	38.2
BOD_L, mg/l	351	
TSS, mg/l	**240**	**15.0**
TSS, lbs/day	610	38.2
Ammonia-N, mg/l	**40**	**3.0**
Ammonia-N, lbs/day	101.7	7.6
TN, mg/l (assumes rDON < 1.0 mg/l)		**10.0**
TN, lbs/day		25.4
Phosphorus-P, mg/l	**8.0**	**4.9**
Phosphorus-P, lbs/day	20.3	12.5
Net Alkalinity Loss, mg/l as $CaCO_3$		**(206)**

Aeration Basin	
Retention Time, hours	**24.0**
Aeration Tank Volume, Mgal	0.305
MCRT, days	**20.0**
Wastewater Temperature, °C	16
Aerobic Digester	
Volume, % of Aeration Tank	30.0
Maximum Solids Conc., mg/l	12,000
Maximum Solids Conc., %	1.20%
Digester Temperature, °C	16
Sludge Holding Tank	
Volume, % of Aeration Tank	0.0
Maximum Solids Conc., mg/l	25,000
Maximum Solids Conc., %	2.50%

PROJECTED OPERATING CONDITIONS - AERATION BASIN

Mixed Liquor Suspended Solids, mg/l		**3,277**
Excess MLSS due to Phos-P Uptake/Removal, mg/l	0	
Mixed Liquor Volatile Suspended Solids, %		72%
F/M Ratio, lbs BOD_5/lb MLVSS		0.10
F/M Ratio, lbs BOD_5/lb MLSS		0.07
Organic Loading, lbs BOD_5/1000 cf of tank/day		15.0
Oxygen Requirements (Carbonaceous), mg/l/hr		9.48
Oxygen Requirements (Nitrogenous), mg/l/hr		7.09
Solids Production, lbs/day		417
WAS - Solids Wasted per Day, lbs/day		379
WAS - Solids Wasted per Day, gal/day @	0.33%	13,854

PROJECTED OPERATING CONDITIONS - AEROBIC DIGESTER

Volatile Solids Loading in Digester, lbs VSS/1,000 cf of tank/day	22
Volatile Solids Reduction in Digester, %	29%
Solids Wasted from Digester, lbs/day	301
Mass Solids Yield in Process & Digester per Mass Influent BOD_5, %	56%
Volume Wasted from Digester, gallons/day	3,007
Digester Sludge Age, days	**30**
Air Required for Stabilization, scfm	112
Air Required for Mixing @ 30 cfm/1000 cf	367

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Tubular EPDM Fine Bubble

	Design	Peak		Design	Peak
Q, MGD	0.305	N/A	TKN_o, mg/l	50.0	N/A
BOD_o, mg/l	240	N/A	$TKN_{assimilation}$, mg/l	9.1	N/A
BOD_{rem}, mg/l	240	N/A	TKN_{rem}, mg/l	50.0	N/A
BOD_{rem}, lb/day	610	N/A	TKN_{rem}, lb/day	127.2	N/A
O_2 Requirement, lb O_2/lb BOD_{rem}	1.500		O_2 Requirement, lb O_2/lb TKN_{rem}	4.60	

AERATION REQUIREMENTS - FIRST STAGE

	Design	Peak
Removal in First Stage	70%	70.0%
BOD_{oxy} - Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	26.7	N/A
TKN_{oxy} - Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	17.1	N/A
Actual Oxygenation Rate (AOR), lbs O_2/hr	**43.8**	**N/A**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**124.0**	**N/A**

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

$C_{s,T,H}$	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	0.60	Θ	Theta - Oxygen Transfer Coeff	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**4,390**
P_H	Atmospheric Pressure at Site Elevation, psi	12.51	Ω	Omega (P_H/P_s)	0.851

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm **437** **N/A**

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**15.0**
Transfer Efficiency per Foot of Submergence, %	**1.80%**		

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

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

Total Aeration Required in Aeration Basin, scfm **369** **N/A**

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)]

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	12.31	

Minimum Air Required for Mixing in First Stage Aeration Basin, cfm	207	Side Roll
Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	206	Side Roll
Minimum Air Required for Operating Full Plant, cfm (mixing requirement for 24 hrs)	628	

	Design	Peak	Design	Peak
Aeration Pressure, in. H_2O			228	228
psi, std (does not include blower inlet/outlet)			**8.2**	**8.2**

		scfm	scfm	icfm	icfm
Aeration Basin - Fine Bubble		369	0	501	0
Aeration Basin - Coarse Bubble		291	0	395	0
Aerobic Digester Tank	(sequenced aeration)	183	0	183	0
Bio-P / Selector Tank		35	0	35	0
Post Aeration Tank		0	0	0	0
Clarifier RAS Airlift Pumps & Skimmers		57	0	57	0
	Total Air Required	936		1,171	
	Total Air Available			**1,355**	

POWER REQUIREMENTS

	Unit	Power	Power
Operating Power for Aeration Basin, HP	Blower	54.7	
Operating Power for Digester, HP	Blower	11.2	
Operating Power for Selector Tank, HP	Blower	2.1	
Operating Power for Post Aeration Tank, HP	Blower	0.0	
Operating Power for Clarifier, HP	Blower	3.5	
Operating Power for Pneumatic System, HP	Air Compr.	0.4	
Operating Power Required at Full Loading, HP		**71.9**	
Minimum Power Required to Operate Full Plant , HP		**37.3**	

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Stainless Steel Coarse Bubble

AERATION REQUIREMENTS - SECOND & THIRD STAGE	**Design**	**Peak**
Removal in Second Stage	30%	30.0%
Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	11.4	N/A
Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	7.3	N/A
Actual Oxygenation Rate (AOR), lbs O_2/hr	**18.8**	**N/A**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**42.5**	**N/A**

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 Coeffi	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**4,390**
P_H	Atmospheric Pressure at Site Elevation, psi/FASL	12.51	Ω	Omega (P_H/P_s)	0.851

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm **327** **N/A**

Where:				
Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**15.5**
Transfer Efficiency per Foot of Submergence, %	**0.80%**		

Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm 36 N/A

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

Total Aeration Required in Aeration Basin, scfm **291** **N/A**

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	12.31

Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	206	Side Roll
Aeration Pressure, in. H_2O	213	213
psi, std (does not include blower inlet/outlet)	**7.7**	**7.7**

	Design scfm	**Peak** scfm	**Design** icfm	**Peak** icfm
Aeration Basin - Coarse Bubble	291	0	395	0

Aero-Mod, Inc.

O&M COST CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Diffuser Type Used: Tubular EPDM Fine Bubble ***Aeration Blower:*** Kaeser FB621C-75HP
Stainless Steel Coarse Bubble

AERATION REQUIREMENTS

		Full Loading
Aeration Basin - Fine Bubble		501
Aeration Basin - Coarse Bubble		395
Aerobic Digester Tank		183
Clarifier RAS Airlift Pumps & Skimmers		92
	Total Air Required, icfm	1,171
	Total Air Capacity, icfm	1,355

POWER REQUIREMENTS

		Full Loading
	Total Operating Blower Power, HP	71.5
	Nameplate HP	kW
Operating Power for Aeration Basin	2 @ 75	40.8
Operating Power for Digester		8.3
Operating Power for Clarifier		4.2
Operating Power for Pneumatic System	2 @ 3.0	0.3
Operating Power for Air Compressor Auto-Drains		0.05
Operating Power for Regenerative Desiccant Dryer		0.07
Operating Power for Positioning Actuators		0.07
Operating Power for Blower VFD Control Panels		2.00
Operating Power for PLC-based Process & D.O. Control		0.20
	Total Operating Power, kW	56.0
	Total Daily Power, kWh	1,345
	Yearly Power @ $0.08/kWh	**$39,262**

LABOR REQUIREMENTS

Labor is assumed at what is actually required, and only for the plant proper. The labor rate includes base labor and overhead. Regional policy, existing contracts, and related duties may alter this figure significantly. The person-hours required per week is calculated for only the Aero-Mod equipment.

Time per Week, hrs	**15**
Rate per Hour, $	**$25.00**
	$19,500

REPLACEMENT PARTS & CONSUMABLES

	Quan.
Blower Belts	2
Blower Inlet Filter Element	2
Blower Oil (Twice)	2
Compressor Oil (Twice)	2
Filters for Regenerative Dryer	1
Desiccant for Regenerative Dryer (once every 3 years)	1
Misc. Parts	1
	$1,600

CHEMICAL COST FOR PHOSPHORUS REMOVAL

Chemical Assumed to be Used	**N/A**
Estimated Amount of Chemical Added per Day, gal.	
Estimated Amount of Chemical Added per Year, gal.	
Estimated Cost per Gallon of Chemical (assumes bulk delivery)	
	N/A

CHEMICAL COST FOR NITROGEN REMOVAL

Chemical Assumed to be Used	**N/A**
Estimated Amount of Chemical Added per Day, gal.	
Estimated Amount of Chemical Added per Year, gal.	
Estimated Cost per Gallon of Chemical (assumes bulk delivery)	
	N/A

Aero-Mod, Inc.

CLARIFIER DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Clarifier Type Used: Split-ClarAtor

FLOW CONDITIONS

Design Flow, MGD		0.305		
Peaking Factor, hourly	847 gpm	4.00	1.220	MGD
Duration, min		60		
Peaking Factor, sustained		3.10	0.946	MGD
Aeration Tank Volume, Mgal		0.305		
MLSS, mg/l		3,277		
Avg. RAS Recycle Rate, %		150%		

EQUIPMENT SIZING & SELECTION

Number of Clarifiers	**2**	Surface Area per Clarifier, sf	480
Clarifier Unit Model	**12240**	Total Surface Area, sf	**960**
Bridge Length, ft	12	Total Weir Length, ft	84
Clarifier Unit Width, ft	20	Tank Wall Depth, ft	18.0
Number of Units per Clarifier	2	Tank Water Depth, ft	16.0

SURFACE OVERFLOW RATE

	Design	
Design Flow, gpd/sf	**318**	
Peak Day Flow, gpd/sf	985	
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	**3,631**
Peak Flow, gpd/lin. ft	11,429

SOLIDS LOADING RATE

Design Flow, lbs/day/sf	**21.7**
Peak Flow, lbs/day/sf	40.4

RETENTION TIME - including RAS

Design Flow, hr	**3.6**
Peak Flow, hr	1.9

PEAK FLOW HANDLING - IN-BASIN SURGE STORAGE

Hourly Peak Flow, MGD	1.220	Vol. of In-Basin Surge Storage, gal	11,725
Max. Flow Through Clarifier, MGD	0.960	Capacity of Surge Storage, hr.	1.1
Stored Peak Flow, gpm	181		

PEAK FLOW HANDLING - SIDE-LINE SURGE TANK

Hourly Peak Flow, MGD	1.220	Volume of Surge Tank	0
Max. Flow Through Clarifier, MGD	0.960	Capacity of Surge Tank, hr.	0.0
Diverted Peak Flow, gpm	181		
		Peak Hour Capacity, hr.	1.1

Aero-Mod, Inc.

TANKAGE DESIGN CALCULATIONS

Project: Grass Valley, NV Ph. 2-4 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Tank Construction: Cast-in-Place Concrete

BIO-P / SELECTOR TANK

Anaerobic Selector	Volume Required, gal	**25,417**		
Number of Tanks	1	Tank Length, ft		40.0
Tank Wall Height, ft	18.0	Tank Width, ft		5.50
Tank Water Depth, ft	16.0	Total Volume, gallons		**26,330**
Freeboard, ft	2.0	Retention Time (Forward Flow) min.		124

AERATION TANK Volume Selected, gal **305,000**

Tank Wall Height, ft	18.0	Number of Trains	2
Tank Water Depth, ft	16.0	Number of Stages	2

Stage 1		*Stage 2*	
Number of Tanks	2	Number of Tanks	2
Tank Length, ft	42.00	Tank Length, ft	83.250
Tank Width, ft	15.375	Tank Width, ft	7.75
Area of Each Tank, sf	646	Area of Each Tank, sf	645
Total Volume, gallons	**154,567**	Total Volume, gallons	**154,432**

Total volume provided, gal **308,999**

CLARIFIER TANK

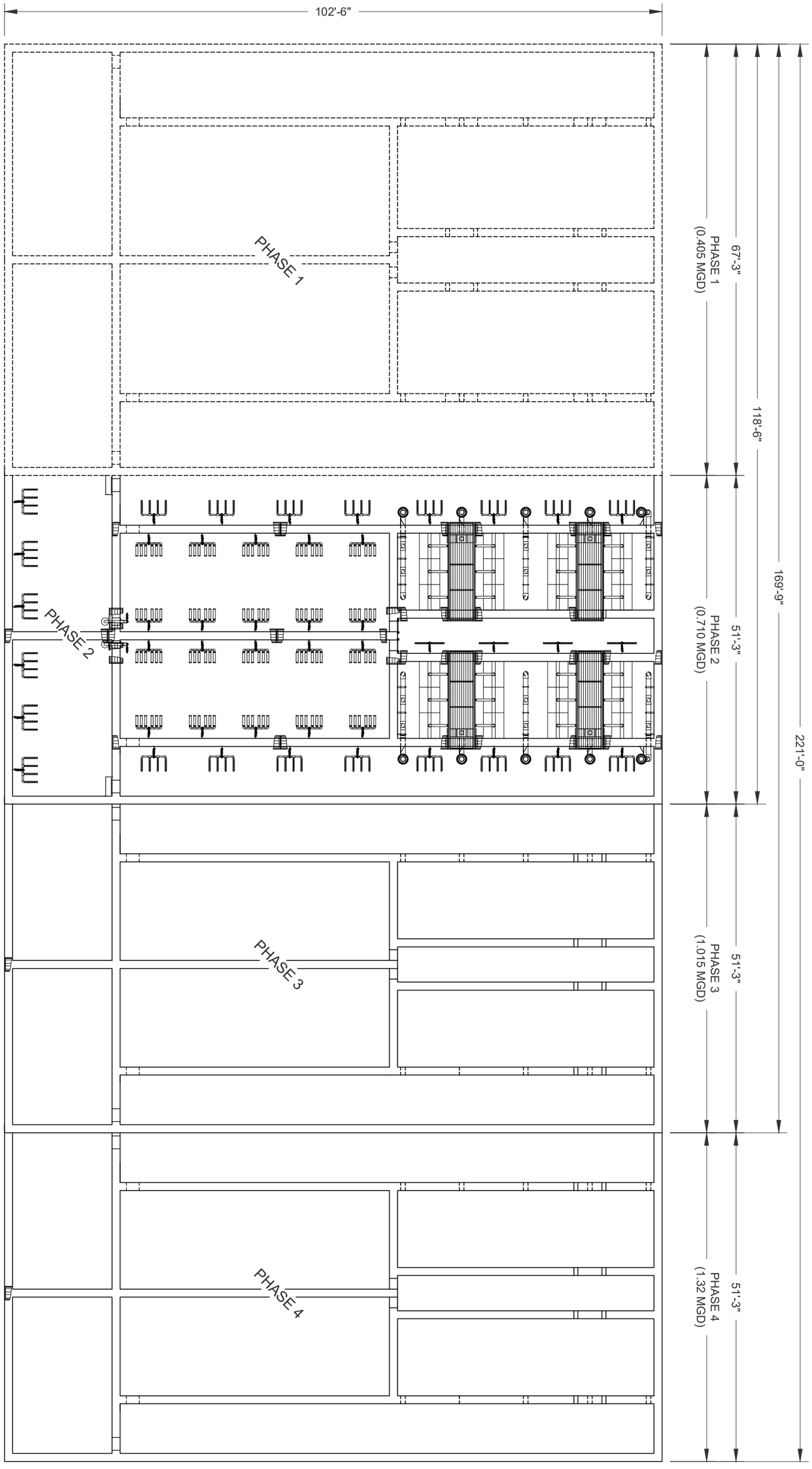
Number of Tanks	2	Tank Width, ft	12.0
Tank Wall Height, ft	18.0	Tank Length, ft	40.0
Tank Water Depth, ft	16.0	Total Volume, gallons	**114,893**

AEROBIC DIGESTER TANK Volume Selected, gal **91,500**

Number of Tanks	2	Tank Length, ft	15.50
Tank Wall Height, ft	18.0	Tank Width, ft	24.375
Tank Water Depth, ft	16.5	Total Volume, gallons	**93,259**

OVERALL TANKAGE DIMENSIONS

Total Length, ft	102.50	Wall Thickness, in	15.0
Total Width, ft	52.50	Floor Thickness, in	18.0
Total Area, sf	5,381	Total Concrete for Walls, cy	**496**
Total Wall Length, LF	595	Total Concrete for Slab, cy	**316**
		Total Grout for Clarifier, cy	**60**



Aero - Mod, Inc.

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PHONE: (785) 537-4995

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JB		NTS	03/09/22

Title:

GRASS VALLEY
PHASE 1 - 0.405 MGD THROUGH PHASE 4 - 1.320 MGD
WASTE WATER TREATMENT PLANT

AERO MOD
Wastewater Process Solutions

SEQUOX® Biological Nutrient Removal

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

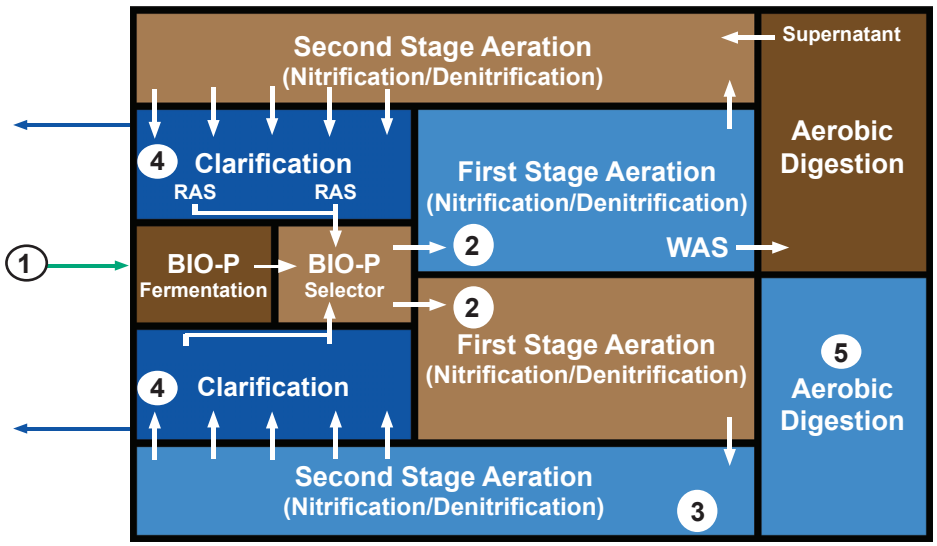
Holton, KS 0.528 MGD

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

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.



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

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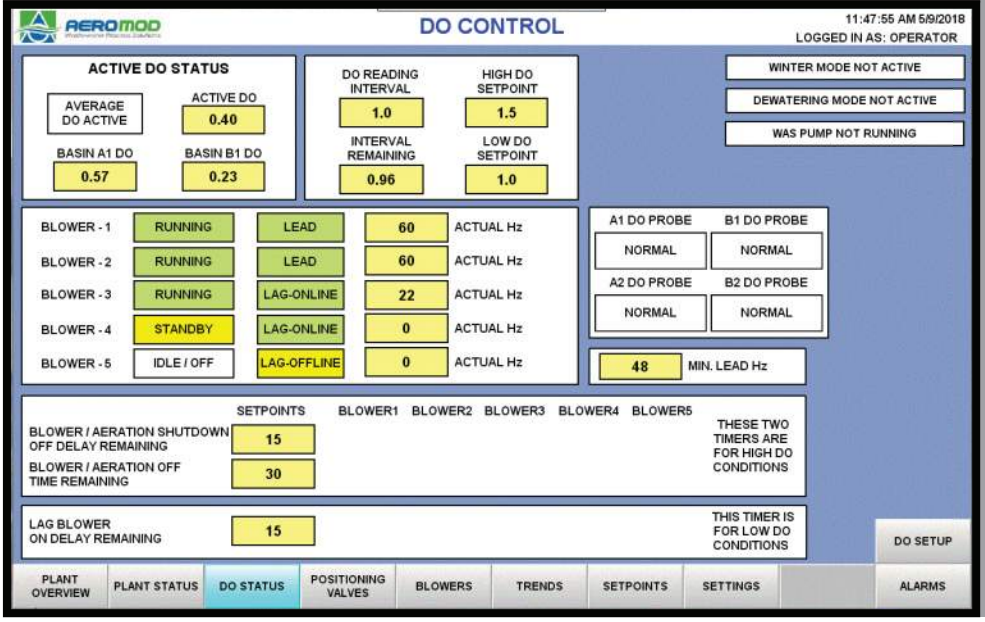
DO$_2$ptimizer™ Process Control

Use the SEQUOX® Process and DO$_2$ptimizer™ 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$_2$ptimizer™ 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$_2$ptimizer 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

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AERO MOD
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.

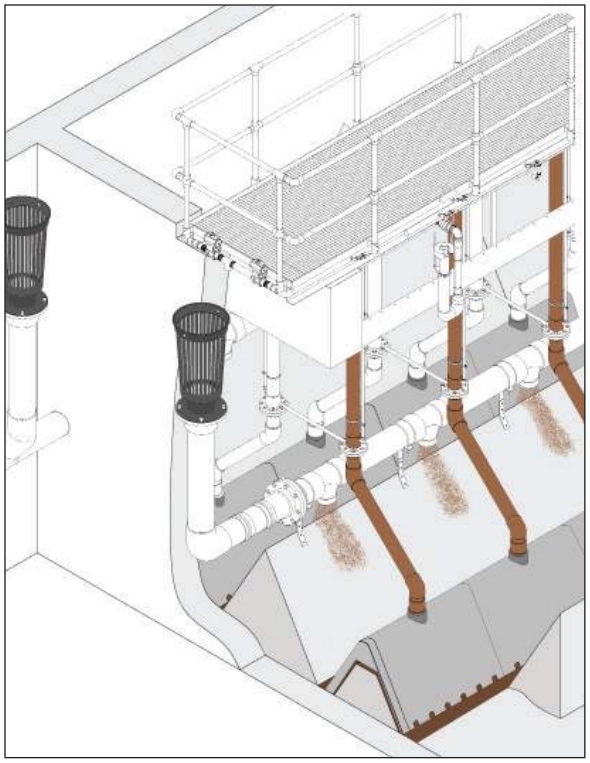
ClarAtor® Clarifier

- 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

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.



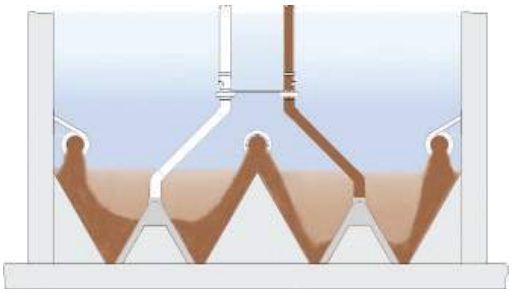
Distribution and removal system creates the optimal settling environment for wastewater treatment plant clarification. Futhermore, the ClarAtor's unique effluent regulation system allows more flow to enter the plant than is exiting, creating in-basin surge storage.

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

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AERO MOD
Wastewater Process Solutions

SR Diffuser Access System

An Innovative Solution to the Challenge of Diffuser Inspection and Maintenance

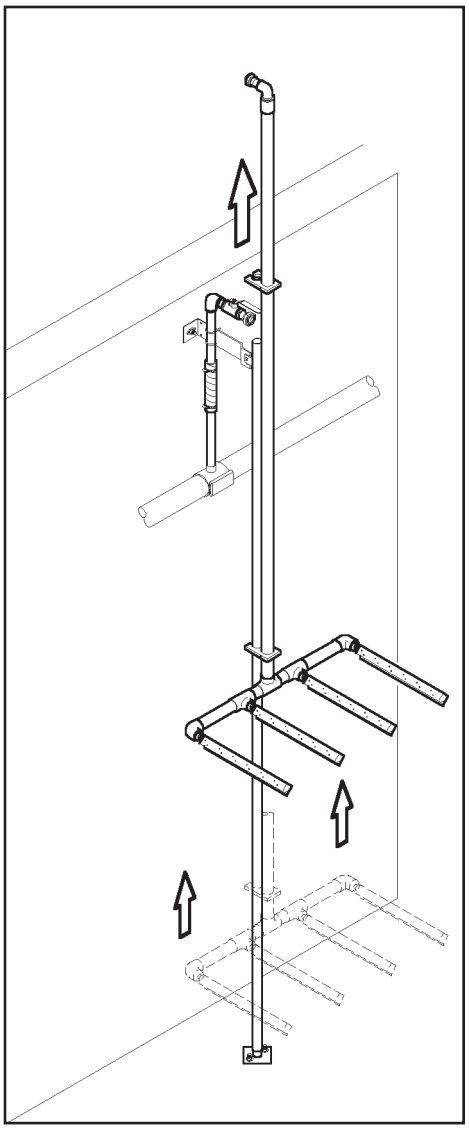
The SR (Slide Rail) Diffuser Access System provides simple removal of the aeration diffusers within a tank without turning off the blowers or draining the tank(s). Applications for the system are typically for aeration or digester basins.

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: Grass Valley, NV Ph. 1 ***Date:*** 9-Mar-22
Engineer: Farr West Engineering ***Units:*** English
Belt Filter Press Model Used: Tritan series 1500

NOTE: Actual operating conditions dependent upon loading of treatment plant.
This proposal assumes a population equivalent of about 4,000 people.

SLUDGE CONDITIONS

Volume of sludge per day (fully loaded), gallons *(avg over month)*		**3,993**
Solids concentration of sludge, mg/l		12,000
Solids concentration of sludge, %		1.20%
Solids to dewater, dry lbs/day *(avg over month)*		**400**
Polymer requirement, lbs/dry ton sludge		20
Dewatered solids concentration, %	Varies 13-16%	15.0%
Volume of dewatered sludge, ft^3		42.7

EQUIPMENT SIZING & SELECTION

Number of Belt Filter Presses Used	**1**
Polymer Feed Pump Used	**Diaphragm**
Sludge Feed Pump Used	**Prog. Cavity**
Pumping Capacity, gpm	137
BFP Solids Loading Rate, lbs/hr	825
Belt Filter Press Effective Belt Width, m	1.5
BFP Solids Loading Rate, lbs/hr/m	550
Projected Operational Time Period, hrs/day	6.0
Projected Operational Days Required/month	**2.4**
Sludge Cake Pump Used	**Prog. Cavity**

OPERATIONAL REQUIREMENTS

Total polymer requirement, lbs/month				120
Active polymer	50%	Polymer density, lb/gal	8.6	
Total polymer requirement, gal/month				28
Electrical usage per press, kWh		7.9		
Total electrical usage, kW/month				121
Total weight of dewatered sludge @		15.0% , tons/month		40

WASHWATER USE (per press)

Washwater use for normal operation, gpm	31.5
Washwater use for washdown cycle, gpm (≈30 min)	43.0
Recommended washwater supply, gpm	55.0

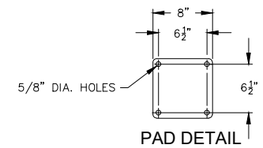
* Note: minimum water pressure (psi) of 50

BUDGET PRICE QUOTE FOR EQUIPMENT **$421,125**

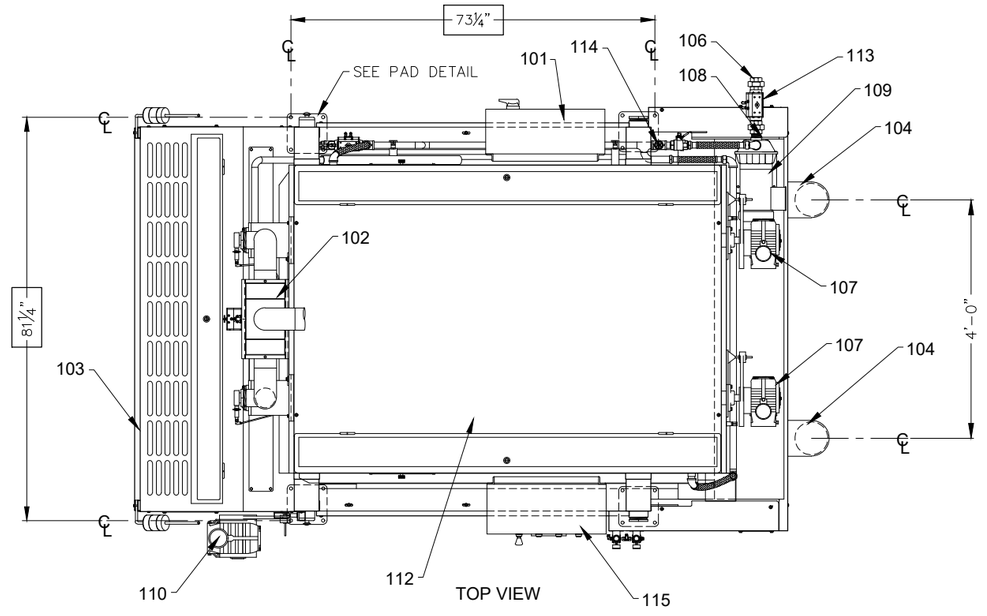
Includes:
(1) Tritan Belt Filter Press, model 1500
(1) PLC Master Control Panel w/ Touchscreen
(1) Sludge Feed Pump/VFD Controls/Static Mixer on Stand
(1) Polymer Feed System/Controls on Stand
(1) Sludge Cake Pump/Sludge Hopper/VFD Controls
(1) Day(s) of Operator Training & Equipment Startup
LS Freight to Job-site

No.	Qty.	Item	hp	Connection
101	1	Main Power Panel (NEMA 4x)	N/A	P.O.C. by Others (230/460 V, 3 phase)
102	1	Sludge Inlet	N/A	P.O.C. by Others
103	1	Dry Cake Outlet	N/A	P.O.C. by Others (Conveying System and/or Storage Container)
104	2	Filtrate Outlets	N/A	P.O.C. by Others (6" Flex Connections)
105	1	Compressed Air Inlet (Instrument Quality)	N/A	P.O.C. by Others (90 to 100 p.s.i. @ 5.5 c.f.m.) 3/8" Compression
106	1	Water Inlet	N/A	P.O.C. by Others (1 1/2" N.P.T., 70 g.p.m. @ 50 p.s.i.)
107	2	Rotary Drum Thickener Motor	1.0hp	Power Supplied from 101
108	1	Centrifugal Water Washing Pump	N/A	N/A
109	1	Centrifugal Water Washing Pump Motor	3.0hp	Power Supplied from 101
110	1	Press Cylinder Motor	.5hp	Power Supplied from 101
111	1	Fork Lifting Supports	N/A	N/A
112	1	Rotary Drum Thickener	N/A	N/A
113	1	Automatic Water Shut-off Valve	N/A	Controlled from 115
114	1	Low Washwater Pressure Switch	N/A	Power Supplied from 115
115	1	PLC Control Panel (NEMA 4x)	N/A	Power Supplied from 101

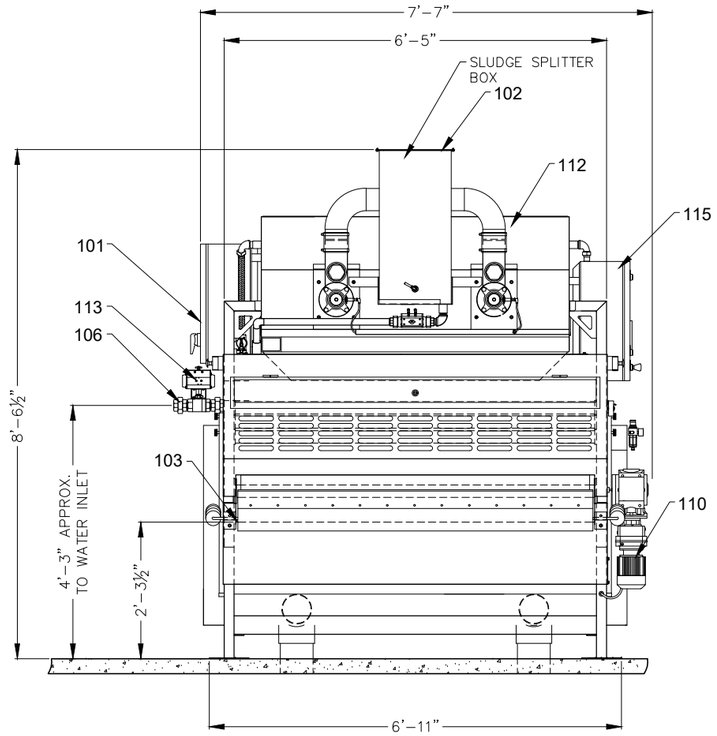
P.O.C. = Point of Connection
Minimum distance of 6' 0" required on each side of the TRITAN
Minimum distance of 3' 6" required in front and back of the TRITAN
APPROX. WT. = 5000 LBS. LOADED = 5600 LBS.



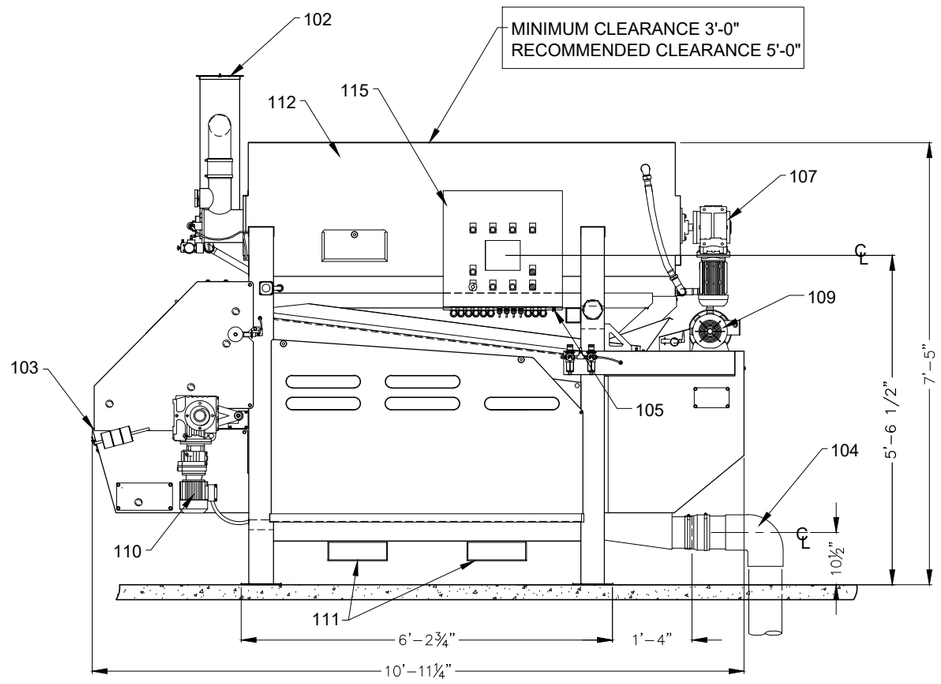
PAD DETAIL



TOP VIEW



END VIEW



SIDE VIEW

Date: 2-10-17
Scale: NTS
Chk by:
Drawn by:
Title: TRITAN FILTER PRESS MODEL 1500 SERIES

Aero - Mod, Inc.

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AEROMOD
Wastewater Process Solutions

TRITAN™ Belt Filter Press Solids Dewatering Technology

The Tritan™ dewatering belt press provides three belt performance with single belt tracking.

Simplicity is the Tritan™ BFP. The Tritan™ is a cost effective solution combining a rotary drum pre-thickener with a belt press in one unit. This streamline design of the pre-thickener above the belt press reduces the equipment footprint. The belt press offers three belt performance while providing excellent dewatering and a dry cake comparable to traditional equipment. Stainless steel fabrication, two drive motors, five rollers, and a seamless moving belt make this press reliable, operator friendly and low maintenance.

Initial thickening occurs with the first belt on the rotary drum pre-thickener, increasing sludge solids concentration to 4 - 8%. Following pre-thickening, the belt press section of the Tritan™ further removes water from the sludge by uniformly spreading it onto the seamless belt via a series of baffles to promote further gravity dewatering. Final dewatering occurs as the sludge is pressed between the seamless belt and a hollow perforated cylinder covered with the third belt. During this final step in the dewatering process, the discharged sludge cake can reach solids concentrations of 14 to 18%. Dewatering percentages vary depending upon sludge characteristics. A doctor blade scrapes the sludge from the seamless belt. The seamless belt is then washed prior to returning to the gravity zone area.

The alignment and tension of the seamless belt are automatically controlled using pneumatic actuators. Sensors monitor the operation of the system and send signals to halt operation in the event of a malfunction.

The main control panel provides automatic operation of the sludge pump, polymer dosing subsystems, and often times the sludge cake conveying system. The result is an integrated solution with Ethernet IP communication between the feed pump, polymer system, belt press and cake conveying system.

Three models with different belt widths are offered:

500 Series - .50 meters
1000 Model - 1.0 meters
1500 Model - 1.50 meters

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TRITAN Advantages

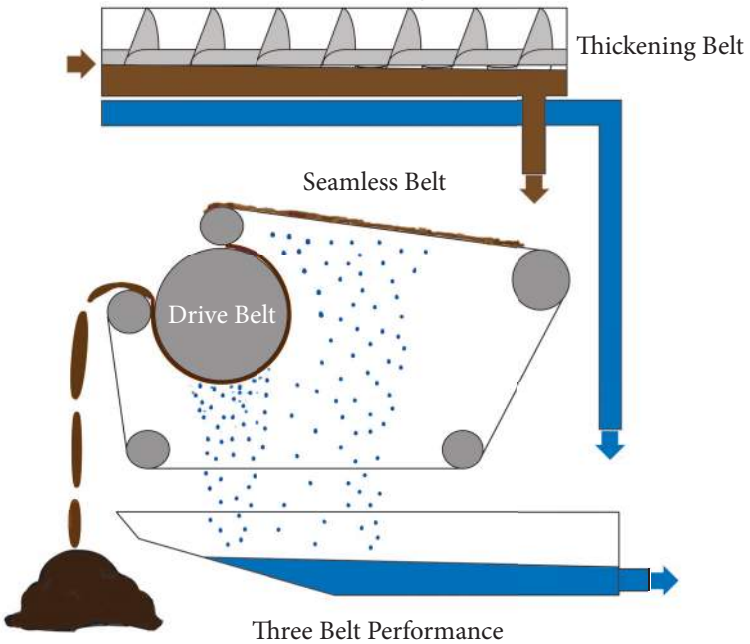
- Simple design reduces maintenance
- Provides economical dewatering
- Seamless belt design reduces risk of breakage (and accompanying downtime)
- Compact design reduces footprint
- Pre-thickening
- Three belt performance

The Tritan discharges a biosolids cake with a solid concentration of 15-20%.

TRITAN Features

- Five Rollers
- Two Drives
- Three belt performance with single belt tracking
- Common collection to a single drain filtrate
- Long life seamless belt
- Stainless Steel fabrication

Flow Diagram



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March 15, 2022

To: All Bidding Contractors

Project: Grass Valley
Humboldt County, Nevada

Quote No.: 2022-2500

Legacy Environmental Process, LLC
45 Kelly Creek Drive
Odenville, Alabama
35120

In USA 1-205-640-1035
Fax: 1-205-640-1039

www.legacyenvpro.com

BUDGETARY PROPOSAL

We are pleased to propose two (2) Legacy Environmental Process model LEP-135M24-SHMCUV prefabricated steel extended aeration/complete mix activated sludge wastewater treatment system as manufactured by Legacy Environmental Process, LLC, Odenville, Alabama. This proposal has been prepared based on preliminary design parameters and request for quotation dated March 2022, the wastewater treatment system will have a design flow of up to 270,000 gallons per day of domestic wastewater and will include all necessary vessels, internal piping, weirs, baffles, and items of equipment as indicated below:

Basis of Design Phase I

Average Daily Flow Rate:	269,900 (GPD)
Peak Daily Flow Rate:	405,000 (GPD)

Parameters	Unit	Influent	Daily Average Discharge Limit
BOD_5:	(mg/L)	240	≤ 25 mg/L
TSS:	(mg/L)	200	≤ 30 mg/L
TKN:	(mg/L)	40	≤ 10 mg/L
Phosphorus-P	(mg/L)	8	N/A
Ammonia-N:	(mg/L)	25	≤ 3 mg/L
pH:		6.0 - 9.0	

Scope of Supply

Primary Screening Devices

One (1) 304 stainless steel influent manual bar screen complete with inclined with drying rack, integral with the aeration chamber #1 & 2
One (1) Manual bar screen rakes

Sludge Holding Chamber / Aerobic Digester

Two (2) 22,500 gallon sludge chamber, aerated with air from the main blowers
Two (2) 3 inch diameter supernatant decant airlift assembly
Two (2) Schedule 40 Galvanized fine bubble diffused aeration system designed for 90 scfm

Aeration Chamber

Two (2) 135,000 gallon aeration chamber
Four (4) Main Aeration blower motor units, model BM-680-6M-5.2, each with the capacity of 680 SCFM @ 5.2 psig, dual splash lubrication, 50 hp, 1800 rpm, 460 volt, 3 phase, 60 Hz. TEFC, Nema premium efficiency, V-Belt drive enclosed OSHA style drive guard, motor slide base, elevated steel table base, 5" inlet filter silencer with paper element, 5" inlet silencer, packed with mounts, 5" discharge silencer packed with mounts, two spool type flexible connectors, 3" weight loaded pressure relief valve with weights and instrument spool, 5" check valve with cast iron body, aluminum & EPDM internals, discharge pressure gauge, inlet filter differential pressure gauge with tubing, initial fill of lubricants, finish paint applicable components with Excelsior standard enamel paint system, Sound enclosure Aluminum exterior with acoustical foam, perforated steel liner, and exhaust fan, louvers as required.
Two (2) Schedule 40 Galvanized Coarse bubble diffused aeration system designed for 541 scfm

Mechanical Clarifier

Two (2)	10 inch diameter inlet piping
Two (2)	24'-0" diameter circular mechanical clarifier
Two (2)	60 inch diameter inlet stilling well with 10 inch inlet feed pipe
Two (2)	Structural steel support bridge
Two (2)	Clarifier drive unit, consisting of a helical gear speed reducer coupled to 1/2 hp, 480 volt, 60 Hz, 3 phase motor
Two (2)	4 inch diameter schedule 80 torque tube, to mount scum skimmer arm and rake arms
Two (2)	scum trough and (2) Scum skimmer arms
Four (4)	Rake arm assemblies, with neoprene squeegee blades
Two (2)	4 inch diameter airlift sludge return pump and piping
Two (2)	3 inch diameter airlift scum return pump and piping
Two (2)	Scum baffles
Two (2)	Clarifier outlet trough, equipped with adjustable S.S. v-notched weir plates
Two (2)	6 inch diameter 150# outlet flange

Disinfection Equipment

One (1)	Complete UV system consisting of two banks in series supplied with 304 stainless steel channel, module support rack, level control weir, transition boxes, monitoring system, spare parts package, operators kit and maintenance rack.
One (1)	Lot of twenty (20) type 316 stainless steel modules supplied, containing 4 UV lamps each module-Total 80 UV lamps, each module weighs 38 lbs. and easily handles by one person, each module has a standard 120 volt plug and 10 ft. (3.0 m) weatherproof cable for connection to GFI receptacles, each lamp consumes 88 watts-Total system power requirements of 7 Kilowatts, lamp on/off status indicated on each module using LED indicators
Ten (10)	Outdoor rated GFI power distribution receptacles supplied (one (1) for two (2) modules
One (1)	Monitoring system provided for local indication of UV intensity, lamp age and alarms, remote indication of UV intensity and low UV intensity alarm available, monitoring system requires 120 volt, 1 phase, 2 wires plus ground, 5 amp power supply

Corrosion Prevention

One (1)	Interior surface sandblast SSSP-SP10, near white
One (1)	Exterior surface sandblast SSSP-SP6, commercial blast
Two (2)	Coats of interior surface protection, Tnemec series N-69 Hi-Build Epoxy, 12-14 mils TDFT
Two (2)	Coats of exterior surface protection, Tnemec series N-69 Hi-Build Epoxy, 12-14 mils TDFT

Service Walkway

Two (2) Lot of grating to cover 3' walkway down the length of the tank and service areas, 1-1/2" FRP (fiberglass reinforced plastic), non-skid, approximately 809 ft^2.
Two (2) Lot of painted steel schedule 40 pipe handrail 2 rail with kick-plate, to enclose grating, approximately 310 linear ft.
Two (2) 45 degree access stairway with FRP stair treads, and painted steel handrail

Treatment Plant Control Panel

Two (2) Treatment Plant Control Panel, NEMA 4X Stainless Steel (36x30x12) w/3-Point latching handle, 12" Stainless Steel leg kit, 480 Volt, 3 Phase, 60Hz., Two (2) 50 HP Main Blowers, Main power circuit breaker, with interlocking door handle, Individual circuit breakers, inner door operable, Soft Starters with at speed contactors, ATS22, 120 Volt control transformer, circuit breaker protected, 2KVA, 120 volt circuit breakers for remote GFI & site lighting, Blower running indicating lights, inner door mounted, Hand-Off-Auto selector switches, inner door mounted, Elapsed time meters, inner door mounted, Volt/ammeters, inner door mounted, Overtemp sensors wired in series with starter coil, Smart Alternator relay, 24-Hour Time clock, Terminals for field connections, UL 508A Listed,

Notes, Clarifications & Exceptions

1. All Items below are EXCLUDED from this proposal and are the responsibility of the CUSTOMER. These are to be completed by others or specifically agreed to in writing by LEGACY and included in the pricing section of the final version of the proposal.

2. Price Validity and Steel Cost: Due to the current volatility in the steel market, material escalation (if any) will be based on AMM (American Metal Markets) published price index for hot rolled carbon steel and on the North American Stainless published price index stainless steel. Pricing included in this proposal is based on today's published index. Any increase in steel cost between date of proposal and material procurement above this benchmark will be customer's account. (Example: if steel increases $0.03/per pound, this would increase the cost of a 30,000 lb. tank as follows: 30,000 X $0.03 = $900.00). (Note: Steel is typically procured 2 weeks after submittal drawings are returned as "Approved as Noted").

The following equipment and services are not provided as part of this proposal

1. Excavation (if required), crane off-loading, touch-up paint, plumbing to the plant, field welding, installation of grating, handrail and component equipment, electrical wiring, and filling of the tank for testing are to be done by the general contractor.

2. All field wiring is to be done by the installing contractor.

3. There is no provision included in this quoted price, unless noted, for field erection supervision, tests, inspections or adjustments of equipment. If factory representative is

required for any of these services, please refer to "Service Terms" enclosed. The equipment offered by Legacy Environmental Process, LLC is our standard design, materials and manufacture. In the event that these items of equipment are subject to any alteration in design or materials or manufacture by the contractor, owner, owner's agent or engineer, such alterations shall be subject to change in the contract price and/or delivery schedule.

4. Detail civil engineering, mechanical and electrical design are excluded from the above proposal.

5. All piping outside of the reactor basins is to be done by the installing contractor.

6. Cost of performance testing and analytical work associated with start-up, commissioning and testing are excluded from the above proposal.

7. The equipment offered by Legacy Environmental Process, LLC is our standard design, materials and manufacture. In the event that these items of equipment are subject to any alteration in design or materials or manufacture by the contractor, owner, owner's agent or engineer, such alterations shall be subject to change in the contract price and/or delivery schedule.

8. Power Requirements: 230/480 volt, 3 phase, 60 Hz.

9. Dimensions and Weights (Approximate):
   - Length x Width x Height: 107'-9" x 24'-0" x 12'-0" Aeration Tanks, which will require approximately 400 linear ft. of field welding for reconnection (by others).
   - Empty Weight (shipping): 96,000 lbs. shipped in four (4) major sections
   - Length x Width x Height: 24'-0" x 24'-0" x 12'-0" Mechanical Clarifier
   - Empty Weight (shipping): 24,000 lbs. shipped in two (2) major sections, which will require approximately 115 linear ft. of field welding for reconnection (by others).

Pricing:

Budgetary Price, F.O.B. factory, with freight allowed to project site, Nevada, off-loading to be by others	**$2,209,256.00 USD**

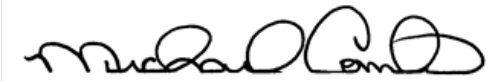
March 15, 2022

Customer Acceptance Page

If you have any questions or need any additional information, please do not hesitate to call your local representative.

James Goldhardt
The Coombs-Hopkins Co.
8706 S. 700 E., Suite 201
Sandy, Utah 84070
Office: (801) 305-4231
Cell: (801) 674-2177
email: james@chcwater.com
www.chcwater.com

Sincerely,



Michael Combs
Vice President
Legacy Environmental Process, LLC

Attachments: Drawing, operations cost

March 22, 2022

David Pulley, PE
Farr West Engineering
421 Court St.
Elko, NV 89801

Grass Valley – Winnemucca, NV

Proposal Number: ASI-009808-2022-03-22

Dear David,

Fluence USA is pleased to provide you with a proposal for one (1) above grade AG-270-EQSHAXCC-C prefabricated A-36 grade steel extended aeration packaged wastewater treatment systems as manufactured by Fluence USA in Minneapolis, Minnesota, USA. This proposal has been prepared based on the request for proposal per parameters provided on March 9, 2022. The Fluence TIPTON Series packaged wastewater treatment plant will have an average design flow of 270,000 gallons per day of domestic wastewater, and will include all vessels, internal piping, weirs, baffles, and items of equipment as indicated in this proposal.

Feel free to contact us with any questions you may have.

Thank you and have a nice day!

Dina Palumbo
Product Sales Manager, USA

Value from Water

fluencecorp.com
Direct +1 763.746.9271
Main +1 800.879.3677
7135 Madison Avenue West
Minneapolis, MN 55427

Table of Contents

1. Technical Data

Parameters	Unit	Influent	Projected Effluent
Average Daily Flow Rate	**(GPD)**	**269,900**	**X**
Peak Hourly (2-hour) Flow Rate	(GPD)	674,750	X
BOD_5:	(mg/L)	240	25
TSS:	(mg/L)	240	30
TKN:	(mg/L)	40	10
Ammonia as N	(mg/l)		3
Alkalinity	(mg/l)	200	X
Typical Ambient Temperature	(F)	60	

Wastewater characterization is an important element in the evaluation and construction of facilities for optimizing performance and available treatment capacity. Without comprehensive wastewater characterization, facilities may either be under-or overdesigned, resulting in inadequate or inefficient treatment.

2. Scope of Supply

2.1 Flow Equalization Chamber

One (1)	56,230-gallon flow equalization chamber constructed as integral to the main system structure
One (1)	Manual Bar Screen
One (1)	Flow proportioning chamber with cover
Two (2)	Submersible flow equalization pumps, ¾ HP, 460 volts, 3 Phase, 60 Hz.
Four (4)	Liquid level sensors for flow equalization pump control
One (1)	Lot of CYCLONE Coarse Bubble Diffusers (304SS)
One (1)	Blower motor unit, 281 SCFM @ 5 psi, 10 HP, 460 volts, 3 Phase, 60 Hz. mounted within a fiberglass enclosure
One (1)	Electrical control console CP-2 for flow equalization pumps and blower unit with the necessary motor starters, timers, circuit breakers, etc. housed within an enclosure.

2.2 Sludge Holding Chamber

One (1)	27,000-gallon aerated sludge holding chamber with air supplied from the main blower motor units

One (1)	Supernatant decant assembly
One (1)	Lot of CYCLONE Coarse Bubble Diffusers (304SS)

2.3 Anoxic Chamber

One (1)	45,000 gallon pre-anoxic chamber
Four (4)	Slow mixer with controls, 3/4 hp; 460 volts, 3 Phase, 60 Hz.

2.4 Aeration Chamber

One (1)	Aeration chamber with a volume of 270,000 gallons
Four (4)	Blower motor units each with a capacity of 551 SCFM at 5.0 PSI, equipped with 20 HP, 460 volts, 3 Phase, 60 Hz. motor mounted in 4 fiberglass enclosures
One (1)	Air manifold with diffuser drop assemblies
One (1)	Lot of 24” CYCLONE coarse bubble air diffusers
One (1)	Lot piping painted steel, schedule 40
One (1)	Pre-wired electrical control system Model CP-1 complete with enclosure with the necessary Motor starters, circuit breakers, programmable 24/7 timers, selector switches all designed to operate on 460 volts, 3 Phase, 60 Hz.
Two (2)	MLSS recycle pump 1 hp; 460 volts, 3 Phase, 60 Hz

2.5 Clarifier Chamber

One (1)	Gravity hopper type clarifier with a volume of 44,938 gallons
Eight (8)	4" sludge return assemblies, airlift type
Eight (8)	2" skimmer return assemblies, airlift type

2.6 Disinfection

One (1)	Chlorine Contact Chamber with a volume of 5,623 gallons
One (1)	Chemical feed hypochlorinator
One (1)	Effluent V-notch with staff gauge.

2.7 Service Walkway

One (1)	Lot of non-skid galvanized grating over the service area only
One (1)	Lot of handrail, around the perimeter of the service area only
One (1)	Access Stairway

2.8 Corrosion Prevention (Above Grade Plants)

One (1)	Interior surface sandblast SSPC-SP10

One (1)	Exterior surface sandblast SSPC-SP6
One (1)	Interior surface protection, Tnemec N69 epoxy, 2 coats, 12-16 TDFT
One (1)	Exterior surface protection, Tnemec N69 epoxy, 2 coats, 12-16 TDFT

2.9 Manufacturer's Service

One (1)	Trip for system startup and operator training, consisting of a maximum of 2 days onsite.

2.10 Notes, Clarifications & Exceptions

A. The following equipment and services are NOT provided as part of this proposal:

- Monitoring system
- Installation of ancillary components including but not limited to blowers, control panels, pumps, grating, handrails, access stairs, platforms, ladders, etc.
- Startup and Operator Training (Available upon request at additional charge)
- Stamped Drawings
- Installation and Field Erection Supervision
- Structural calculation and loads
- Seismic calculations
- Main electrical power connection to plant and field wiring to the control panels.
- All interconnecting piping outside plant walls including:
    - Piping to inlet of plant
    - Blower piping from the blower units to the tank structure (field piping)
    - Effluent piping
- All field welding and conduit.
- All plant lighting.
- Supply and installation of clarifier grout.
- The package wastewater treatment system proposed is for the purpose of treating the domestic wastewater from the site facilities. This is not to be used as a food disposal. No provisions have been included to treat an excessive amount of food waste.
- Performance and Payment Bonds

B. Dimensions and Weights (Approximate):
Advanced Treatment System (12 total truck loads):

- 70'-4"W x 116'-6"L x 11'-0"H Approximate overall dimensions
- Empty Weight (shipping) of heaviest section: 35,000LBS
- Total Tank Weight 375,000LBS

C. Foundation Pad, Crane off-loading at destination, touch-up paint, plumbing to the plant, installation of grating, handrail and component equipment, electrical wiring, and filling of the tank for testing are to be done by the general contractor.

D. The equipment offered by Fluence is our standard design, materials and manufacture. If this equipment is subject to any alteration in design or materials of manufacture by the contractor, owner, owner's agent or engineer, such alterations shall be subject to change in the contract price and/or delivery schedule.

E. Detail civil engineering, mechanical and electrical design are excluded from this proposal.

F. Cost of performance testing and analytical work associated with start-up, commissioning and testing is excluded from the above proposal. Performance testing is in scope of OTHERS.

G. Power Requirements: 480 volts, 3 Phase, 60 Hz.

H. Performance and payment bonds are by OTHERS.

3. Commercial Section

3.1 Selling pricing

Selling Pricing, FOB Factory, Freight allowed to Project Site in Winnemucca, NV, not offloaded. Offloading and installation is by OTHERS

ITEM	Selling Price (USD, $)
Base Price for Wastewater Treatment Plant: **One (1) Tipton Series Model AG-270-EQSHAXCC-C prefabricated A-36 grade steel advanced extended aeration packaged wastewater treatment system**	**$2,888,500.00**

3.2 Submittal Drawings

Submittal drawings on the preceding equipment will be submitted within four (4) to six (6) weeks after receipt of a firm purchase order. Drawing timeline may increase or decrease with volume production at the time of receipt of approved order.

3.3 Manufacturing of Equipment

Manufacturing of equipment listed above will be twelve (12) to fourteen (14) weeks after receipt of approved submittals, down payment and progress payment. Please lead times are subject to change based on availability of materials due to a world wide supply chain shortage.

3.4 Proposal Acceptance

This proposal is offered for acceptance within sixty (60) days from date of this quotation or date of bid opening, whichever is the later date. Prices are subject to review thereafter. Prices are firm, based upon receipt of a Letter of Intent or Purchase Order and notice to proceed within this sixty (60) day period and the review and for return of submittal drawings to Fluence within sixty (60) days. Delays caused by slow return of submittals or other manufacturing delays caused by the contractor, owner, owner's agent or engineer may result in additional charges of 1% per month for such delays or part thereof.

3.5 Fluence Standard Terms and Conditions

1. Applicable Terms. Aeromix Systems Inc. dba Fluence USA. ("**Fluence**") provides the following Standard Terms and Conditions of Sale ("**T&Cs**"), which apply to all quotations and sales of Fluence's products and services (collectively, the "**Systems**"), whether these terms are explicitly included in Fluence's quotation, proposal, acknowledgment, invoice or any other document (collectively "**Fluence's Documentation**") or not. For the avoidance of doubt, all purchases are expressly limited and conditioned upon acceptance of these T&Cs, and no provision contained in any order, acceptance, confirmation or acknowledgement which is inconsistent with, different from, or in addition to these T&Cs is accepted by Fluence unless specifically agreed to in writing. All quotations are valid for a period of thirty (30) days, unless otherwise specified.

2. Delivery. Delivery terms are Ex-Works Fluence warehouse unless Fluence's Documentation provides otherwise, and the purchaser (whether end-user, integrator or whatsoever) (the "**Purchaser**") agrees that risk of loss with respect to the Systems passes to the Purchaser at the time that the Systems are delivered to the applicable common or private carrier. The property rights in the Systems, however, shall pass to the Purchaser only after Fluence has received payment in full. Until such time as the property rights in the Systems passes to the Purchaser, the Purchaser shall hold the Systems as Fluence's fiduciary agent and bailee. The carrier shall be selected by Fluence unless the Purchaser designates a carrier preference. Delivery date(s) quoted by Fluence are based on Fluence's best estimate and Fluence shall not be responsible for early or late delivery or partial shipments. If the Purchaser fails to take delivery of the Systems or fails to give Fluence adequate delivery instructions then without prejudice to any other right or remedy available to Fluence, Fluence may (i) store the Systems until and charge the Purchaser for the reasonable costs (including insurance) of storage; (ii) sell the Systems at the best price readily obtainable and (after deducting all reasonable storage and selling expenses) account to the Purchaser for the excess over sum paid in advance or charge the Purchaser for any shortfall below the sum received upon the sale thereof.
3. Payment. The Purchaser shall pay Fluence the full amount set forth in Fluence's Documentation. Payment terms shall be as follows: **Thirty percent (30%) down payment required at time of signed purchase order. Thirty percent (30%) due with approval and release to manufacture. No work will be started until payment is received. Forty percent (40%) due prior to shipment.** No equipment will leave the facility until proof of payment has been provided. Freight, storage, insurance and all taxes, duties or other governmental charges relating to the Systems shall be paid by the Purchaser. Federal, state or local indirect taxes, including but not limited to sales and/or use taxes, VAT, GST, transfer taxes or any similar tax are not included in prices quoted. If Fluence is required to pay any such charges, the Purchaser shall reimburse Fluence upon first demand. The Purchaser shall be charged the lower of 1 ½% interest per month or the maximum rate permissible by law, on all amounts not received by the due date and shall pay all of Fluence's reasonable costs (including attorneys' fees) associated with collecting amounts due but unpaid. Failure to make payment when due is a material breach of an order and without incurring any liability, Fluence may suspend performance until such time as the overdue payment is made. All orders are subject to credit approval and the applicable export licenses (to the extent required) being in force at such time.

4. Intellectual Property. Fluence retains all right, title and interest in any patent right, copyright, mask work right, sui generis database right, know-how, trade secret or other intellectual or industrial property right of any sort throughout the world (including any application therefor associated with its business including but not limited to the intellectual property rights associated with the Systems (the "Intellectual Property"), whether used in the past, currently being used or that will be used in the future, including without limitation (i) the proprietary original design of the Systems whether pursuant patent, copyright, industrial design or whatsoever, (ii) the technology, know-how, show-how, specifications and trade secrets with regard to amongst others the manufacture, marketing, sale and distribution of the Systems or other proprietary products and services, and (iii) trademarks, trade names (including but not limited to the name "Fluence" and the brand name, under which the Systems are currently marketed (collectively the "Brand"), slogans and marketing intangibles, and the Purchaser shall make no claim of any interest therein. The Purchaser shall not alter or remove any of Fluence's trademarks from the Systems. At no time during or after the term of this agreement shall Purchaser challenge or assist others to challenge Fluence's Intellectual Property or attempt to register any trademarks, marks or trade names similar to those of the Fluence. Any and all goodwill associated with the Fluence's Intellectual Property will inure exclusively to the benefit of Fluence. Fluence shall own all rights, title and interest in any ideas, designs, concepts, techniques, inventions, discoveries, improvements, results, data, know-how, reports and/or outcome relating to the Intellectual Property and the manufacture and functioning of the Systems, whether developed or conceived of by Fluence and/or the Purchaser or both. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Fluence, and all related intellectual property rights, shall remain Fluence's property. Subject to payment in full, Fluence grants Purchaser a non-exclusive, non-transferable license solely for the Purchaser's use of the Systems purchased. For the removal of doubt, it is hereby noted that other than aforementioned rights, no rights are granted to the Purchaser with regard to the Systems or the Intellectual Property.

5. Confidential Information. All information, drawings, plans, designs and specifications furnished to the Purchaser by Fluence have been developed at Fluence's expense and shall not be disclosed by the Purchaser or used for any purposes other than to install, operate and maintain the Systems.

6. Warranty. Fluence warrants that under normal usage and subject to appropriate installation and suitable infrastructure, the Systems, except for membranes, will, for a period of twelve (12) months from startup or eighteen(18) months from delivery EX-Works (the earlier of the foregoing), be free from defects in material and workmanship, subject to the exclusions set forth below (the "**Warranty Period**"). The foregoing warranty shall not apply to any equipment furnished or specified by the Purchaser. This warranty excludes any damage or deficiencies caused by or resulting from accident, fire, other hazards or acts of God; or alteration, modification, misuse, tampering, negligence, improper installation, improper storage, maintenance conducted by unauthorized personnel, misapplication, mishandling or abuse of the Systems. Fluence's warranty is conditioned upon the Purchaser (a) operating and maintaining the Systems in accordance with Fluence's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Fluence. Fluence's warranty does not cover damage caused by chemical action or abrasive material, misuse, improper installation or unsuitable infrastructure. Fluence shall, at its sole and exclusive discretion and as the Purchaser's sole remedy, repair or replace the subject parts FOB port of manufacture, or refund the purchase price therefor, at its sole and exclusive discretion. If Fluence determines that any claimed breach is not, in fact, covered by this warranty, Purchaser shall pay Fluence its then customary charges for any repair or replacement made by Fluence. Membranes and designs are sold "AS IS". EXCEPT AS EXPRESSLY STATED IN THIS WARRANTY SECTION, SELLER PROVIDES PRODUCTS "AS IS" AND MAKES NO OTHER EXPRESS WARRANTIES, WRITTEN OR ORAL, AND ALL OTHER WARRANTIES ARE SPECIFICALLY EXCLUDED, INCLUDING, BUT NOT LIMITED TO THE IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT, AND ANY WARRANTY ARISING BY STATUTE, OPERATION OF LAW, COURSE OF DEALING OR PERFORMANCE, OR USAGE OF TRADE.

7. Force Majeure. Fluence shall not be liable for any loss, damages or breach caused by circumstances beyond its reasonable control including but not limited to extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government including inability to obtain appropriate regulatory approval such as export license or other government or institutional approval required, or any other cause beyond its reasonable control, whether similar or dissimilar to those listed.

8. Cancellation or Alteration of Order. No order which has been accepted by Fluence may be cancelled by Purchaser except with Fluence's agreement in writing and subject to the Purchaser indemnifying Fluence in full against all loss, costs, damages, charges and expenses incurred by Fluence as a result of such cancellation. No order which has been accepted by Fluence may be changed or altered by the Purchaser except with Fluence's agreement in writing and an adjustment of appropriate price, if required. If the Purchaser cancels or suspends its order for any reason other than Fluence's breach, Purchaser shall promptly pay Fluence for work performed prior to cancellation or suspension, and for any other direct costs incurred by Fluence as a result of such cancellation or suspension.

9. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, FLUENCE SHALL NOT BE LIABLE FOR ANY LOST PROFITS, CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, WHETHER ARISING UNDER WARRANTY, CONTRACT, NEGLIGENCE, STRICT LIABILITY, INDEMNIFICATION, OR ANY OTHER CAUSE OR COMBINATION OF CAUSES WHATSOEVER. FLUENCE'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE SYSTEMS SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE SYSTEMS.

10. Installation, Field Service. Installation of goods furnished hereunder shall be the responsibility of Purchaser, unless otherwise agreed to in writing. The Purchaser shall be responsible for all infrastructure modifications that may be required. Field service may be provided, upon prior written authorization by Fluence and will be charged at the rates in effect at the time such services are provided, unless otherwise agreed. In addition, purchaser will be required to cover costs of travel, lodging and *per diem* for field staff.

11. Export Sales. No provision of this agreement will be construed to require Fluence to export or deliver any technical information, data and/or equipment if such export or delivery is prohibited or restricted by any applicable law or regulation. Purchaser will not, directly or indirectly, sell, export, re-export or otherwise dispose of the Systems or any other technology or services received in connection with this order to any person, entity, or destination without obtaining prior written authorization from Fluence.

12. Governing Law and Venue. This agreement shall be subject to and interpreted under the laws of the USA. The Purchaser hereby consents to the exclusive jurisdiction of the courts of New-York for the adjudication of any dispute arising under this agreement. Both sides may jointly elect to resolve any dispute by arbitration. In such case, the arbitration laws existing in the USA will bind the parties. All disputes arising out of or in connection with this agreement shall be finally settled under the Rules of Arbitration of the International Chamber of Commerce by one arbitrator appointed in accordance with the said Rules. The place of the arbitration shall be New York, and the language of the arbitration shall be English.

13. Description. Fluence will furnish only those items listed on our proposal or order. The use of specification section numbers, model numbers, and headings is for descriptive purposes only and does not imply that proposal or order covers more than what is specifically listed on it.

14. Returned Goods. Goods may be returned only after receiving a returned material order number, shipping instructions, and identification procedure from Fluence. Goods must be packaged properly to avoid damage and returned FOB Fluence factory unless otherwise authorized by Fluence. Buyer will be invoiced for all charges resulting from rework required to place goods in salable condition plus a restocking charge and any transportation charges we might pay. Custom goods manufactured for this order are not returnable. Any credit issued will be at the discretion of Fluence. No refunds will be issued for returned goods, only credit against future purchases.

15. Approvals. When necessary, all equipment proposed is subject to the approval of the Purchaser. Fluence shall not be liable for any costs or damages should equipment not be approved, regardless of the reason.

16. Miscellaneous. These terms, together with any quotation, purchase order or acknowledgement issued or signed by Fluence, comprise the complete and exclusive statement of the agreement between the parties (collectively, the "**Agreement**") and supersede any terms contained in the Purchaser's documents, unless separately signed by Fluence. No part of the Agreement may be changed or cancelled except by a written document signed by Fluence and Purchaser. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Purchaser may not assign or permit any other transfer of the Agreement without Fluence's prior written consent.

4. Customer Acceptance

Submitted By:	Accepted By:
Dina Palumbo Product Sales Manager, US Operations AEROMIX Systems Inc, dba Fluence 7135 Madison Avenue West Minneapolis, MN 55427-3601 USA Direct: 763-746-9271 Fax:763-746-8408	Authorized Purchaser Name and Title, Company/Organization, Complete Address, Phone Number, Email address
Authorized Signature	*Authorized Signature*
Authorized Printed Name	*Authorized Printed Name*
Date: March 22, 2022	Date

Submitted to: Farr West Engineering

Submitted by: Sarah Spivey
Applications Engineer

Date: March 21, 2022

Water Technologies

Veolia Water Technologies, Inc. (dba Kruger)
4001 Weston Parkway
Cary, NC 27513
tel. +1 919-677-8310 • fax +1 919-677-0082
www.veoliawatertech.com

Introduction

Kruger is pleased to present this budgetary proposal for our D-Ditch system, a Phased Isolation Ditch (PID), for biological nutrient removal for the first phase.

For this proposal, Kruger has included a potential solution for the expansion sequence of the Grass Valley, NV WasteWater Treatment Plant (WWTP). Kruger has assumed that the wastewater composition becomes more concentrated following the first phase because the new sewage system will be a separate system. Refinements to the ditch volumes can be made based on further definition of the future influent loads. One possible sequence is as follows.

- For the first phase, Kruger is proposing our D-Ditch system that eliminates the need for secondary clarifiers. The two ditches operate in phases with one of them providing the duties of clarification while the other is reacting.
- For the second phase, Kruger proposes to convert the D-Ditch into a BIO-DENITRO system by adding secondary clarifiers. By removing settling duties from the ditch, they gain significant loading capacity.
- For the expansion to the third phase, an additional ditch can be added to the existing BIO-DENITRO system and the system becomes a Triple BIO-DENITRO System.
- For the fourth phase, the system can be converted into two BIO-DENITRO trains by adding a fourth ditch that will be operated in series with the existing third ditch added in phase 3.

If the strength of the wastewater does not increase; the system can still be expanded in the above order with a D-Ditch for the first phase, a single BIO-DENITRO system for the second and third phase, and a Triple Ditch BIO-DENITRO for the fourth phase.

If fewer construction mobilizations are desired, there are other options that could be considered. For example, two construction phases could install sufficient capacity for Phases 1-2 and 3-4, thereby reducing the number of construction periods.

We appreciate the opportunity to provide this proposal to you. If you have any questions or need further information, please contact our local Representative, JBI , or our Regional Sales Manager, Rodrigo Lara, at 503-380-3995 (rodrigo.lara@veolia.com).

cc: AW, AJS, GT, TMJ, project file (Kruger)
JBI

Revision	Date	Process Eng.	Comments
0	03/21/2022	PP	Initial, budgetary proposal.

We Know Water

Kruger is a water and wastewater solutions provider specializing in advanced and differentiating technologies. Kruger provides complete processes and systems ranging from biological nutrient removal to mobile surface water treatment. The ACTIFLO® Microsand Ballasted Clarifier, BioCon® Dryer, BIOSTYR® Biological Aerated Filter (BAF) and NEOSEP™ MBR are just a few of the innovative technologies offered by Kruger. Kruger is a subsidiary of Veolia Water, a world leader in engineering and technological solutions in water treatment for industrial companies and municipal authorities.

Veolia Water Technologies, the fully-owned subsidiary of **Veolia**, is the world leader in water and wastewater treatment with over 155 years of experience. As an experienced design-build company and a specialized provider of technological solutions in water treatment, Veolia combines proven expertise with unsurpassed innovation to offer technological excellence to our industrial customers. Based on this expertise, we believe that we have developed the best solution for your application. Below is a brief description of the proposed project.

Energy Focus

Kruger, along with Veolia is dedicated to delivering sustainable and innovative technologies and solutions.
We offer our customers integrated solutions which include resource-efficient technology to improve operations, reduce costs, achieve sustainability goals, decrease dependency on limited resources, and comply with current and anticipated regulations.

Veolia's investments in R&D outpace that of our competition. Our focus is on delivering

- neutral or positive energy solutions
- migration towards green chemicals or zero chemical consumption
- water-footprint-efficient technologies with high recovery rates

Our carbon footprint reduction program drives innovation, accelerates adoption and development of clean technologies, and offers our customers sustainable solutions.

Kruger is benchmarking its technologies and solutions by working with our customers and performing total carbon cost analysis over the lifetime of the installation.

By committing to the innovative development of clean and sustainable technologies and solutions worldwide, Kruger and Veolia will continue to maximize the financial benefits for every customer.

Process Description

Double Ditch

Kruger is pleased to present designs utilizing a dual oxidation ditch treatment system. The proposed dual oxidation ditch treatment system will operate in the Double Ditch (D-Ditch) mode of phased isolation ditch technology. The D-Ditch process is a continuous flow activated sludge process in which the main treatment phases of the treatment process are isolated into separate oxidation ditches. A distinguishing feature of this process is the alternating flow pattern and process conditions (aerobic or sedimentation) occurring within the oxidation ditches. The D-Ditch process functions by phasing the conditions within each ditch between aerated and settling conditions. This operating strategy allows nitrification, BOD and suspended solids removal to occur within the active process volume, eliminating the need for final clarifiers and return sludge pumping stations.

View of a rotor from inside the ditch.

A submersible mixer in the ditch.

BIO-DENITRO® Phased Isolation Ditch

The proposed ditch system will operate in the BIO-DENITRO mode of Phased Isolation Ditch (PID) technology. A distinguishing feature of this process is the alternating flow pattern and process conditions (aerobic and anoxic) occurring within the oxidation ditches. This operating strategy allows nitrogen and carbonaceous BOD removal to occur within the active process volume, eliminating the need for internal recycle pumping.

Oxidation ditch systems that incorporate PID technology share several common features. These treatment systems typically include multiple interconnected oxidation ditches to allow the isolation of a ditch for a specific treatment objective. To enable the alternating flow pattern between the oxidation ditches, these treatment systems include influent and effluent hydraulic controls. The influent controls typically

consist of either an influent distributor or motor actuated influent weirs. Aeration equipment typically includes brush aerators but can incorporate jet aeration systems. Motor actuated effluent weirs control the hydraulic flow between the ditches and the discharge from the oxidation ditches. Besides permitting the series flow pattern of the process, the weirs function to maintain a constant water level within the oxidation ditches. This results in the rotors operating at their optimum transfer efficiency. Inherent to all phased isolation ditch systems is a time based treatment strategy.

A PID operation strategy imparts tremendous process flexibility. The time-based operational strategy provides the ability to effectively vary the process volumes (e.g. aerobic, anoxic or settling), unlike conventional processes where these volumes are fixed. By adjusting the specific phase lengths of the process, the volume allocated to a specific treatment objective can be adjusted, thereby enabling the treatment process to accommodate a wide range in influent flow and character. This capability provides an extremely flexible treatment solution that allows the facility to accommodate the actual loading, as opposed to treating flows with a treatment strategy designed for 20 year projected loadings. For example, during start-up conditions a greater fraction of the process volume could be allocated to settling (anoxic in the case of other PID processes), thereby decreasing the run-time and energy consumption of the aeration equipment.

The PID operation is executed by a PLC-based control system that coordinates the operation of the mechanical process equipment and controls the phase lengths within each ditch. The PLC control system can allow both manual and automatic control of the treatment process. The PLC-based control panel also includes pre-programmed operational modes, such as the storm water mode to address I/I concerns. For example, automatic or manual activation of the storm water mode extends the settling phases of the D-Ditch process to prevent solids washout during severe rain events.

To ensure economical and efficient treatment, the control system also controls the aeration equipment by automatic dissolved oxygen control. Dissolved oxygen probes continuously monitor and report residual dissolved oxygen levels within the oxidation ditches to a PLC-based control panel that controls the aeration equipment to meet, but not exceed, the current oxygen demand. This control eliminates costly and wasteful over-aeration that can comprise process stability and operational budgets. The D-Ditch process with its built-in flexibility offers the most cost-effective treatment solution available.

Design Summary

The design assumes that the raw influent wastewater is biodegradable, no toxic compounds are present, sufficient alkalinity is available to avoid pH depressions, that the COD/BOD ratio is between 1.7 and 2.3, and that none of the equipment provided would be used in a classified area (e.g. Class 1, Division 1 or Class 1, Division 2).

Influent Design Basis

Parameter	Phase 1	Phase 2	Phase 3	Phase 4
Influent Flow, Average Design (MGD)	0.27	0.474	0.673	0.88
Influent Flow, Max Day (MGD)	0.405	0.71	1.015	1.320
BOD_5 (mg/L)	240	300	300	300
TSS (mg/L)	240	300	300	300
TKN (mg/L)	40	50	50	50
NH_4-N (mg/L)	25	31	31	31
TP (mg/L)	8	8	8	8
Elevation (ft AMSL)	4,300			
Min/Max Temperature (°C)	12/30			

a - Phase 2-4 concentrations are assumed values.

Effluent Objectives

Parameter	Value
$CBOD_5$ (mg/L)	< 25
TSS (mg/L)	< 30
TN (mg/L)	< 10 (Yearly AVG)
NH_4-N (mg/L)	< 3.0

1. Listed values represent anticipated performance; any performance guarantees may be different
2. Non-biodegradable soluble organic nitrogen is assumed to be less than 1.5 mg/L

Design Summary

Parameter	Phase 1	Phase 2	Phase 3	Phase 4
Process Configuration	D-Ditch	Bio-Denitro	Triple Ditch	Bio-Denitro
Number of Trains	1	1	1	2
Total Number of Oxidation Ditches	2	2	3	4
Internal Length per Ditch (ft)	79	79	79	79
Internal Width per Ditch (ft)	35	35	35	35
Internal Channel Width per Ditch	17.5	17.5	17.5	17.5
Average Side Water Depth (ft)	10	10	10	10
Total System Volume (MG)	0.38	0.38	0.57	0.76
Design Aerobic / Anoxic / Settling / Anoxic Operating Time (%)	38 / 0 / 62	80 / 20 / 0	80 / 20 / 0	80 / 20 / 0
System HRT (hrs)	~33	~19	~20	~21
System SRT (days)	~21	~10	~10.5	~11
MLSS at 12°C (mg/L)	3,500	3,500	3,500	3,500
System F/M Ratio ($days^{-1}$)	0.07	0.14	0.14	0.13
Design Sludge Yield (lbs MLSS/lb BOD_5 applied)	0.94	0.94	0.94	0.94
Waste Activated Sludge (lb WAS/day)	500	1,100	1,600	2,100

Aeration Summary

Parameter	Phase 1	Phase 2	Phase 3	Phase 4
AOR BOD Basis (lbs O_2/lb BOD_5 applied)	1.2			
AOR TKN Basis (lbs O_2/lb TKN nitrified)	4.6			
AOR Denite Basis (lbs O_2/lb NO_3-N denitrified)	-2.85			
Total System AOR (lbs O_2/day)	817	1,750	2,500	3,255
Design Residual DO during Aerobic Phase	2.0	2.0	2.0	2.0
Design Alpha / Beta	0.85 / 0.95			
Diurnal Peaking Factor	1.3	1.3	1.3	1.3
Total System Design SOR[1] (lbs O_2/day)	5,736	5,856	8,350	10,870
Total System Design SOR (lbs O_2/hr)	239	244	348	453
Installed SOTE (lbs O_2/hr)	258	258	386	515
Number of MIDI Rotors per Ditch	2	2	2	2
Nameplate Power per MIDI (HP)	20	20	20	20

1: The wastewater load is typically received according to a diurnal flow pattern resulting in organic and nitrogen loads that exceed the average load during limited periods of the day. Kruger recommends a safety factor be in place in determining the design AOR that accounts for the diurnal characteristics of the influent wastewater.

Scope of Supply

Kruger is pleased to present our scope of supply which includes process engineering design, equipment procurement, and field services required for the proposed treatment system, as related to the equipment specified. The work will be performed to Kruger's high standards under the direction of a Project Manager. All matters related to the design, installation, or performance of the system shall be communicated through the Kruger representative giving the Engineer and Owner ready access to Kruger's extensive capabilities.

Process and Design Engineering

Kruger provides comprehensive process engineering and design support for our D-Ditch system, including but not limited to:

- Provision of drawings and specifications for use by the consulting engineer in developing the detailed plant design.
- Provision of calculations and other data and attendance at meetings as necessary during state approval processes.
- Shop drawing submittal for Engineer's review and approval. Includes detailed equipment information for all equipment supplied by Kruger.
- Equipment installation instructions for all equipment supplied by Kruger, as well as detailed Operations and Maintenance Manuals.

Double Ditch System Equipment - Phase 1 and 2 System

Mechanical Equipment Items	Qty	Description	Est. HP
Influent Flow weirs	2	2.5 meter automated HDG Weir	1/2
Effluent Flow Control Weirs	2	2.5 meter automated HDG Weir	1/2
Ditch Mixers	2	TR90 submersible mixers with guide rail and hoist	7.4
Brush Rotors	4	4.0 meter MIDI Rotor Assembly with HDG Rotor Blades	20
Rotor Accessories	4	Splash Plate, Painted Steel Flow Directional Baffle, Aluminum Access Grating,	N/A

Instrumentation and Controls Equipment Items*	Qty	Description
Submersible Pressure Transducer	2	Ditch Liquid Level Measurement
Dissolved Oxygen Probe	2	Hach LDO w/ SC200 Transmitter
PLC Control Cabinet	1	NEMA 12; ControlLogix PLC; Panelview HMI; 120V Feed

Field Services

Kruger provides very comprehensive support of our systems throughout the installation and start-up period. Our experienced staff of field service personnel will inspect the installation of each component and assist in mechanical start-up, and will typically include direct manufacturer assistance for key pieces of equipment. Our dedicated team of instrumentation and controls engineers will provide calibration and start-up of all instrumentation and onsite verification of proper functioning of our PLC programming and operator interface systems. Process Engineers will assist in verification of program functions, start-up of the process, any process performance testing and optimization of the process. Kruger personnel will also provide onsite instruction of the operations staff in the proper operation of the Kruger supplied equipment and systems. Together, Kruger's estimate of on-site field service for this project includes:

- **o** Four (4) Total Trips to the Project Site
- o Sixteen (16) Total Man-Days of Service (Travel Time Inclusive)

Scope of Supply BY INSTALLER/PURCHASER

The following items are NOT included in the scope of supply for the system and should be provided for by the Installing Contractor/Purchaser of the system *unless explicitly stated as included in the above scope of supply*. These items include, but are not necessarily limited to, the following items:

- Concrete foundations, pads, tanks, structural components, walkways, handrail, grating and covers,
- Equipment installation, piping to and from the system, interconnecting piping, manual isolation valves or gates, anchor bolts, epoxy/adhesive for anchors,
- Raw influent wastewater pumping, influent screening and grit removal facilities,
- Solids handling/disposal system, WAS pumps, digester equipment,
- Effluent holding tanks/equipment, disinfection equipment, outfalls,
- Chemical addition systems, containment, odor control equipment, laboratory systems or equipment,
- Overhead gantries or cranes,
- Motor control center, motor starters, adjustable frequency drives, main disconnects, breakers, generators, or power supply,
- Field wiring, interconnecting wiring, conduit, wiring terminations at equipment, local equipment disconnects, local equipment control panels, and wiring terminations at control panels,
- All electrical and mechanical hardware with the exception of the equipment that is identified above,
- All work associated with buildings or other structures used for housing any part of the system provided, including HVAC and electrical work.

Schedule

- Drawings and Specifications for use in preparation of Engineer's Bidding Documents can be provided following completion of Kruger P&S Questionnaire and follow-up design discussions to confirm materials, equipment preferences, overall scope of supply, controls requirements, etc. Drawings and specifications typically require 1-2 weeks following questionnaire completion and confirmation of scope.
- Shop drawings will be submitted within 6-8 weeks of receipt of an executed contract by all parties.
- All equipment will be delivered within 18-20 weeks after receipt of written approval of the shop drawings.
- Installation manuals will be furnished upon delivery of equipment.
- Operation and Maintenance Manuals will be submitted within 90 days after receipt of approved shop drawings.

Pricing

The price for the Kruger Double Ditch system, as defined herein, including process and design engineering, field services, and equipment supply is:

D-Ditch with Rotor System: $775,000

Pricing is FOB shipping point, with freight allowed to the job site. This pricing does not include any sales or use taxes. In addition, pricing is valid for thirty (30) days from the date of issue. The proposed goods may be affected by the ongoing market fluctuations impacting material and shipping costs. Kruger reserves the right to re-evaluate the Proposal price prior to order acceptance.

Please note that the above pricing is expressly contingent upon the items in this proposal and are subject to Kruger Standard Terms of Sale detailed herein.

Kruger Standard Terms of Payment

The terms of payment are as follows:

- 10% on receipt of fully executed contract
- 15% on submittal of shop drawings
- 75% on the delivery of equipment to the site

Payment shall not be contingent upon receipt of funds by the Contractor from the Owner. There shall be no retention in payments due to Kruger. All other terms per our Standard Terms of Sale are attached.

All payment terms are net 30 days from the date of invoice. Final payment not to exceed 120 days from delivery of equipment.

STATEMENT REGARDING COMPETITIVE TRANSPARENCY

Veolia takes all issues surrounding probity and confidentiality very seriously in all of its dealings with competitors and stakeholders. In this spirit and for the sake of transparency, we inform you that the publicly traded parent company Veolia Environnement S.A., recently acquired a 29.9% interest in Suez S.A ("Suez") and launched a public bid for the remainder of Suez' share capital.

Consistent with our commitment to competition law compliance, Veolia will continue to act entirely independent of Suez until all relevant antitrust approvals of Veolia's acquisition of Suez have been obtained and we will of course let you know if this would change before the end of the tender proceedings.

Specifically, none of Veolia's representatives sit on the board of Suez, Veolia has no influence over the strategy or operations of Suez, and Veolia has no access to competitively sensitive information about Suez's operations. Accordingly, Veolia's ongoing project to acquire Suez will have no effect on our participation in, or response to, this tender.

Kruger Standard Terms of Sale

1. Applicable Terms. These terms govern the purchase and sale of the equipment and related services, if any (collectively, "Equipment"), referred to in Seller's purchase order, quotation, proposal or acknowledgment, as the case may be ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.

2. Payment. Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation provides otherwise, freight, storage, insurance and all taxes, duties or other governmental charges relating to the Equipment shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.

3. Delivery. Delivery of the Equipment shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, Delivery terms are F.O.B. Seller's facility.

4. Ownership of Materials. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's property. Seller grants Buyer a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the Equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.

5. Changes. Seller shall not implement any changes in the scope of work described in Seller's Documentation unless Buyer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.

6. Warranty. Subject to the following sentence, Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. The foregoing warranty shall not apply to any Equipment that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from beneficial use, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price therefore. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO SECTION 10 BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

7. Indemnity. Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.

8. Force Majeure. Neither Seller nor Buyer shall have any liability for any breach (except for breach of payment obligations) caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government or any other cause beyond such party's reasonable control.

9. Cancellation. If Buyer cancels or suspends its order for any reason other than Seller's breach, Buyer shall promptly pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.

10. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

11. Miscellaneous. If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. These terms, together with any quotation, purchase order or acknowledgement issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Buyer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of North Carolina without regard to its conflict of laws provisions.