Preliminary Engineering Report

FOR THE

SALIDA WASTEWATER TREATMENT FACILITY

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1.0 Executive Summary

This report evaluates the capacity of the existing Salida Waste Water Treatment Facility (WWTF), and finds that the plant is has a total capacity of 1.2 million gallons per day (MGD). This is lower than the permitted capacity of 2.1 MGD. When the different treatment components of the plant were designed they were not designed to treat for ammonia, at that time there were no ammonia limits. Since then the state has imposed ammonia limits on the plant, and as flows have increased the plant has experienced difficulties meeting these limits. The trickling filter portion of the plant has a treatment capacity of 0.2 MGD, and no ability to treat for ammonia. The Rotating Biological Contactor (RBC) portion of the plant has a treatment capacity of 1.0 MGD with some capacity to treat for ammonia that is limited by the Biochemical Oxygen Demand (BOD) loading that enters the RBC system. Currently during some summer months the maximum average daily flow can exceed 1.2 MGD. Thus the plant is approaching its treatment capacity.

The anaerobic digester supernatant and the centrifuge centrate are solids processing side streams that are dosed into the plant flow periodically, which contribute significant nutrient loading to the plant. The digester supernatant is returned to the trickling filter portion of the plant, which has no ability to treat for ammonia, thus the ammonia washes through the system to the effluent without treatment and jeopardizes the plant ability to meet its ammonia effluent limits. All ammonia treatment in the plant is taking place in the RBC.

In an effort to help the plant meet ammonia effluent limits several options were considered. First, a stand-alone sidestream treatment basin was analyzed to treat sidestreams. Three types of stand-alone activated sludge basins were examined. First, a traditional activated sludge basin, this involved excessive alkalinity addition for nitrification of the ammonia. Second, an activated sludge basin operated under an on-off aeration scheme to denitrify and recover alkalinity. These reduced alkalinity addition but not significantly, because denitrification was limited by the reduced amount of BOD in the sidestreams, the reaction becomes carbon limited. Third, an activated sludge basin operated under an on-off aeration scheme for sidestream treatment that would receive screened influent to provide a source of BOD was analyzed. To provide enough BOD for complete denitrification in order to eliminate alkalinity addition, the size of the necessary basin proved to be five times larger than the aerated sidestream basin alone. The size of the basin was excessive for the limited benefit of sidestream treatment. Operationally the construction of any activated sludge basin would entail the operators running two completely separate treatment plants, a suspended growth plant and an attached growth plant within one plant.

A patented biological process called ANAMMOX was evaluated for solids processing sidestreams but was found to be far outside the budget. The final sidestream treatment process analysis involved the conversion of the existing RBCs to sidestream treatment. Though the RBCs have the ability to treat sidestreams for ammonia they are barely capable of doing so, and in order to convert them to a sidestream treatment process a new treatment process must be constructed to treat the plant influent flow. If a new treatment process is constructed it would be better to design the new treatment process to handle the sidestreams also.

Lastly, the possibility of retaining the existing treatment processes to treat flows for BOD and adding a new treatment basin to treat the combined flow for ammonia was analyzed. This option involved constructing a large basin, but the process still consumed alkalinity from nitrification and involved significant alkalinity addition, without increasing capacity. A step-feed analysis to the RBC was also conducted to control 1^{st} stage BOD loading and increase overall treatment capacity. This could increase the treatment capacity of the RBC to 1.2 MGD but would necessitate the construction of a basin for nitrification, and thus alkalinity addition. This proved to be too large an investment for a minimal increase in capacity.

After all the possibilities for sidestream treatment had been exhausted it appeared necessary to evaluate a new treatment process for the plant that could handle current and future flows, treat sidestreams, and treat not only to current permit levels but also to anticipated future limits.

The twenty-year design buildout capacity of the plant was determined to be 2.7 MGD. This number was based on state and local population data combined with local wastewater loading data. The value of 2.7 MGD represents the average daily flow during the highest flow months of the year (summer months) in the year 2031. The average daily flow at buildout is 1.7 MGD.

The headworks, anaerobic digester, and biosolids dewatering portions of the plant will be kept in operation. Along with the new treatment process, the plant will require new primary and secondary clarification as well as a new septage receiving station, and an ultraviolet disinfection system.

Initially six treatment processes were considered, but these were narrowed down to three final processes; an oxidation ditch from Aeration Industries, an Integrated Fixed Film and Activated Sludge (IFAS) process from Kruger, and Vertical Loop Reactor (VLR) from Siemens Water Technologies. Evaluation matrices included in this report rank each process with the Kruger IFAS system being recommended.

2.0 Planning Conditions

2.1 Planning Area

The Wastewater Planning Service Area Map located in Appendix A shows the current and projected service area for the 20-year planning period within the City of Salida. The City of Salida has a service agreement with Poncha Springs to accept a total of 676 EQRs of flow from them at buildout, so Poncha Springs is also included on the map.

2.2 Plan Coordination

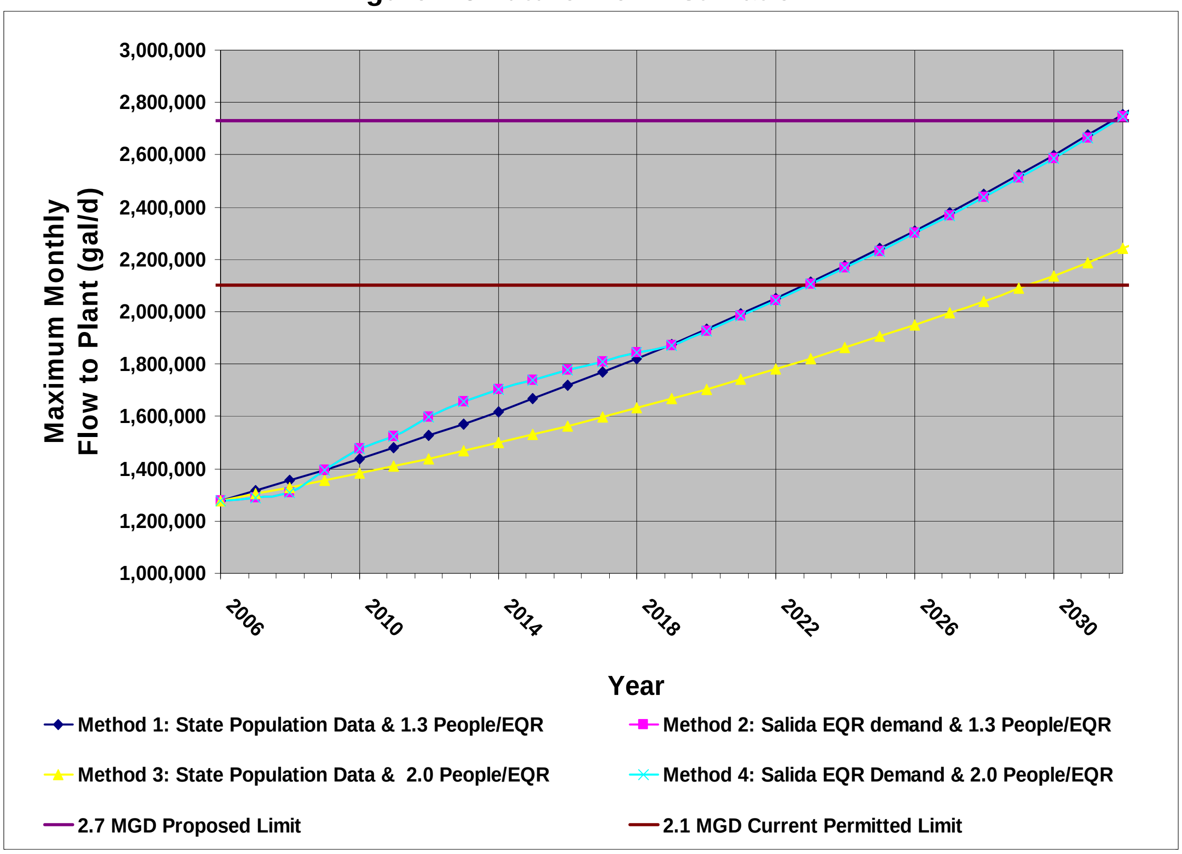
The proposed project is not within the boundaries of a 208 Agency or regional council of governments.

2.3 Growth Areas and Population Trends

To estimate flow to the plant either the population or the EQR demand must be related to number of people per EQR. Population data was obtained from the state demographers published population projections for Chaffee County then related to populations for Salida and Poncha Springs using historic census data. EQR demands were obtained from the city of Salida. The city conducted its own planning report and estimated future EQR demand out to 2019 by determining the potential development in the region. The number of people per EQR was determined from the actual data to be 1.3 people per EQR. This number is very low; at most plants this number is usually greater than 2.0 people per EQR. Because there is such a large discrepancy in the number of people per EQR, the estimated future plant flows were determined using four methods- (1.) determining the EQRs from the State demographers estimated population data and assuming 1.3 people per EQR (2.) using projected EQR data from the city of Salida and assuming 1.3 people per EQR, (3.) determining the EQRs from the state demographers estimated population data and assuming 2.0 people per EQR, (4.) using projected EQR data from the city of Salida assuming 2.0 people per EQR. Figure 2.3, below, shows the results of the analysis.

Figure 2.3 shows that methods 1, 2, and 4 are almost identical in predicted flows. Method 3 comparatively underestimates the flows. It is expected that Method 3 would be the least representative of actual expected growth because it is based off State population data, not the actual planned development in the communities, and an estimated 2.0 people per ELU. The facility will be designed to handle expected flows predicted from the average of methods 1,2, and 4.

Figure 2.3 Future Flow Estimation



The 2.7 MGD figure represents a monthly maximum flow, which is the average daily flow to the plant during the month with the highest flow. It is vital to design the plant to have the capacity to treat the maximum monthly flow to ensure the plant does not violate permit limits during high flow periods. Historically the annual average daily flow has

been up to 1.6 times less than the maximum monthly average daily flow, so a 1.6 peaking factor is used to relate the average daily flow to the maximum monthly flow. A plant designed with a monthly max flow of 2.7 MGD will provide 9,423 EQRs at 177 gal/EQR/day. This plant will provide 22 years of capacity if constructed in 2009, based on population and EQR averages from Methods 1, 2, and 4. The predicted growth in demand is summarized in Table 2.3.

Table 2.3 Demand Estimation Table for Future Expansion

Year	Projected Population	EQRs	Average Daily Flow Rate (MGD)	Monthly Max Flow (MGD)
2006	5,882	4,512	0.80	1.28
2007	7,030	4,582	0.81	1.30
2008	7,173	4,679	0.83	1.33
2009	7,561	4,924	0.87	1.39
Begin Construction				
2010	7,952	5,171	0.92	1.46
2011	8,200	5,332	0.94	1.51
2012	8,551	5,555	0.98	1.57
2013	8,850	5,748	1.02	1.63
2014	9,103	5,913	1.05	1.67
2015	9,322	6,057	1.07	1.72
2016	9,554	6,210	1.10	1.76
2017	9,739	6,335	1.12	1.79
2018	9,970	6,488	1.15	1.84
2019	10,147	6,609	1.17	1.87
2020	10,452	6,807	1.20	1.93
2021	10,765	7,011	1.24	1.99
2022	11,088	7,222	1.28	2.05
2023	11,421	7,438	1.32	2.11
2024	11,764	7,661	1.36	2.17
80% of Capacity Begin Planning Expansion				
2025	12,117	7,891	1.40	2.23
2026	12,480	8,128	1.44	2.30
2027	12,855	8,372	1.48	2.37
2028	13,240	8,623	1.53	2.44
2029	13,637	8,882	1.57	2.52
Capacity 20 year Life Cycle				
2030	14,046	9,148	1.62	2.59
2031	14,468	9,423	1.67	2.67
100% of Capacity				
2032	14,902	9,705	1.72	2.75
2033	15,349	9,996	1.77	2.83
2034	15,809	10,296	1.82	2.92
2035	16,284	10,605	1.88	3.00

2.5 Wastewater Flow Forecasts

Table 2.5a below summarized the design values used for the flow estimation for the design.

Table 2.5.a. Design Flows for New Treatment Process

New Process Average Daily Flow (MGD)	1.7
Monthly Max Flow (MGD)	2.7
Peak Hour Flow (MGD)	4.3
Monthly Max flow Peaking Factor	1.6
Peak Hour Flow Peaking Factor	2.5

Table 2.5b summarized the design parameters used to evaluate treatment processes.

Table 2.5.b. Design Parameters for New Treatment Process

Parameter	Average	Maximum	Effluent
	mg/l	mg/l	mg/l
BOD	285	491	5
TSS	280	370	10
Ammonia	23	30	0.5
TKN	38	48	10

3.0 Description of Existing Facilities

3.1 Service Area Features

The Wastewater planning service area map located in Appendix B shows the current and projected service area for the 20-year planning period, including the location of the existing WWTF site.

3.2 Area Discharge Permits

The Water and Sewer infrastructure map located in Appendix B shows the locations of other NPDES dischargers in the vicinity of the site. This map also shows the locations of sewer and water lines within the City of Salida city limits.

3.3 Facilities Layout and Description

The existing facility operates two separate treatment processes a Trickling Filter and a RBC system. Each of these processes are independent trains. Influent flows are split between them; the trickling filter receives 0.2MGD of the flow and the remaining portion travels to the RBC. A kinetic analysis of each process was conducted and results are presented below. Appendix C is site plan of the existing facility.

3.3.1 Trickling Filter

The trickling filter side of the plant was completed in 1956 and is over fifty years old. The plant operators have worked with this system for several years and found it performs best when the flow to this process train is limited to 0.2 MGD. This analysis is based on the assumption that the trickling filter will continue to be operated with its historically optimized flow of 0.2 MGD, allowing all hydraulic peaks to the plant to be absorbed in the RBC process train.

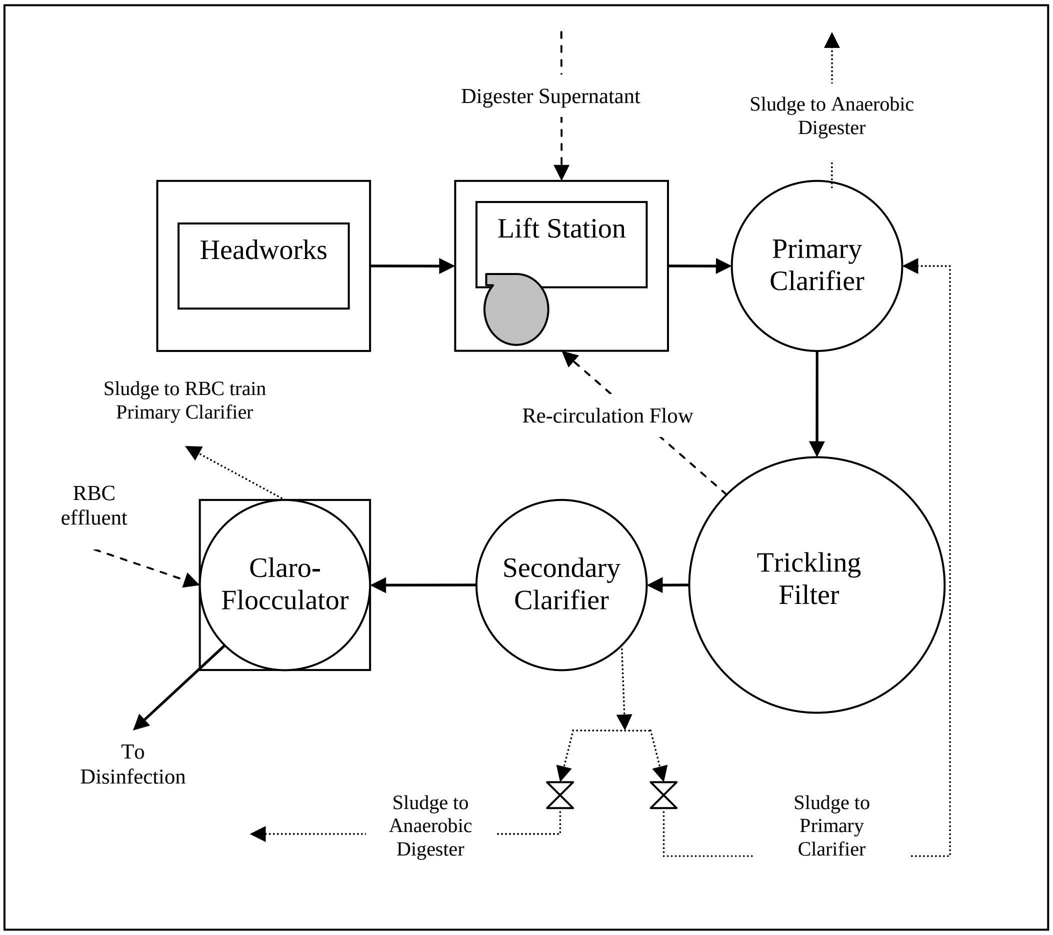
Though hydraulic peaks to the system can be avoided, organic peaks cannot. Therefore the ability of the trickling filter to handle the organic contributions from the average and monthly max BOD as well as the digester supernatant BOD and recirculation flow was evaluated. The table below summarizes the complete influent flow to the different processes in the system.

Table 3.3a. Design Criteria for Trickling Filter Process System

FLOW COMPONENTS	Q (MGD)	Q (m^3/d)	BOD (mg/l)	BOD (lb/d)	BOD_{peak} (mg/l)	BOD_{peak} (lb/d)
SCREENED INFLUENT	0.2	757.1	285	475.7	491	819.5
RECIRCULATION FLOW	0.25	946.4	82	171.1	30	62.6
DIGESTER SUPERNATANT	0.015	56.8	1000	125.2	1000	125.2
INFLUENT TO PRIMARY CLARIFIER	0.465	1760	199	772	260	1007
PRIMARY EFFLUENT/ INFLUENT TO TRICKING FILTER	0.465	1760	150	582	196	760
MODEL PREDICTED EFFLUENT FROM TRICKLING FILTER	**0.465**	**1760**	**24**	**44**	**45**	**80**
ACTUAL EFFLUENT FROM TRICKLING FILTER	**0.465**	**1760**	**82**	**318**	**NA**	**NA**

The system consists of a lift station that pumps screened influent from the headworks to a primary clarifier. From the primary clarifier, water is passed through the trickling filter to secondary clarifier. Currently 125% of the flow is re-circulated from the trickling filter back to the lift station for another pass through the trickling filter. After secondary clarification the effluent travels to a claroflocculator where it is mixed with the effluent from the RBC system. The claroflocculator was designed to settle suspended solids with chemical additions, but chemicals are not added. Thus the claroflocculator is currently operated as a "squircle" clarifier. The last vital component of this system is that the anaerobic digester supernatant is returned to the lift station and then to this trickling filter process train. The following paragraphs will discuss the individual components of the trickling filter system; see Figure 3.3.a. for a schematic of the trickling filter process train.

Figure 3.3.a. Schematic of Trickling Filter Process Train



3.3.1.a .Trickling Filter Primary Clarifier

After leaving the headworks, influent to this process train mixes with re-circulation flow and digester supernatant in the lift station and is pumped to the primary clarifier. The primary clarifier is 45 feet in diameter with a side water depth of 10 feet. Hydraulically the primary clarifier has a surface overflow rate of ~ 200 gal/ft2/day; this is very low. In the CDPHE 96-1 Design Criteria for Wastewater Treatment Facilities a surface overflow rate of 750-1,200 gal/ft2/day is recommended. The hydraulic detention time within this primary clarifier is ~ 9 hours, the CDPHE 96-1 regulations recommend a detention time of 4 hours. The primary clarifier is under-loaded hydraulically. Typically primary clarifiers remove 25-40% of influent BOD, and testing has shown that on average this primary clarifier is removing 25% of the influent BOD.

3.3.1.b. Trickling Filter

The trickling filter is 106 feet in diameter with large rock media and a depth of 3’9”. The filter is too shallow to allow for nitrification, so only BOD removal and hydraulic capacity were analyzed.

For low rate trickling filters, the CDPHE recommends hydraulic loading between 0.02 to 0.06 gpm/ft2, and organic loadings between 5 to 25 lb BOD/1000ft3-day. With these loading parameters a BOD removal of 80-90% is typical. At a flow of 0.2MGD the hydraulic loading to the trickling filter is 0.04 gpm/ft2, the average organic load to the filter is 15.1 lb BOD/ 1000ft3-day, and the peak organic loading is 23.0 lb BOD/ 1000ft3-day.

With 25% removal of BOD in the primary clarifiers the average influent BOD to the trickling filter is 171 mg/l and the peak BOD influent to the trickling filter is 260 mg/l. Kinetic analysis of the existing trickling filter shows that during average BOD loading 84% removal can be expected and during peak loading 77% removal can be expected. With these expected removal rates the trickling filter effluent during average BOD loading is 24mg/l and 45mg/l at peak loading.

Actual data shows that the trickling filter is not removing BOD at the expected rates. This is most likely due to the age of the trickling filter and the high influent BOD concentration from the digester supernatant. The average effluent BOD from the trickling filter is 82 mg/l, see Table 3.3a. This number is very high for treated effluent and does not meet the 30mg/l -30 day average BOD effluent requirement for the plant. The trickling filter cannot remove large influent BOD spikes from the supernatant loading. It is recommended the plant continue only allowing 0.2 MGD maximum flows to the trickling filter.

3.3.1.c. Trickling Filter Secondary Clarifier

After leaving the trickling filter effluent enters the secondary clarifier. The secondary clarifier has a diameter of 45 feet with a side water depth of 6.5 feet. The surface overflow rate in the clarifier is ~200 gal/ft2-d, this is much lower than the criteria of 500 gal/ft2-d dictated by the CDPHE, and so the secondary clarifier is under loaded.

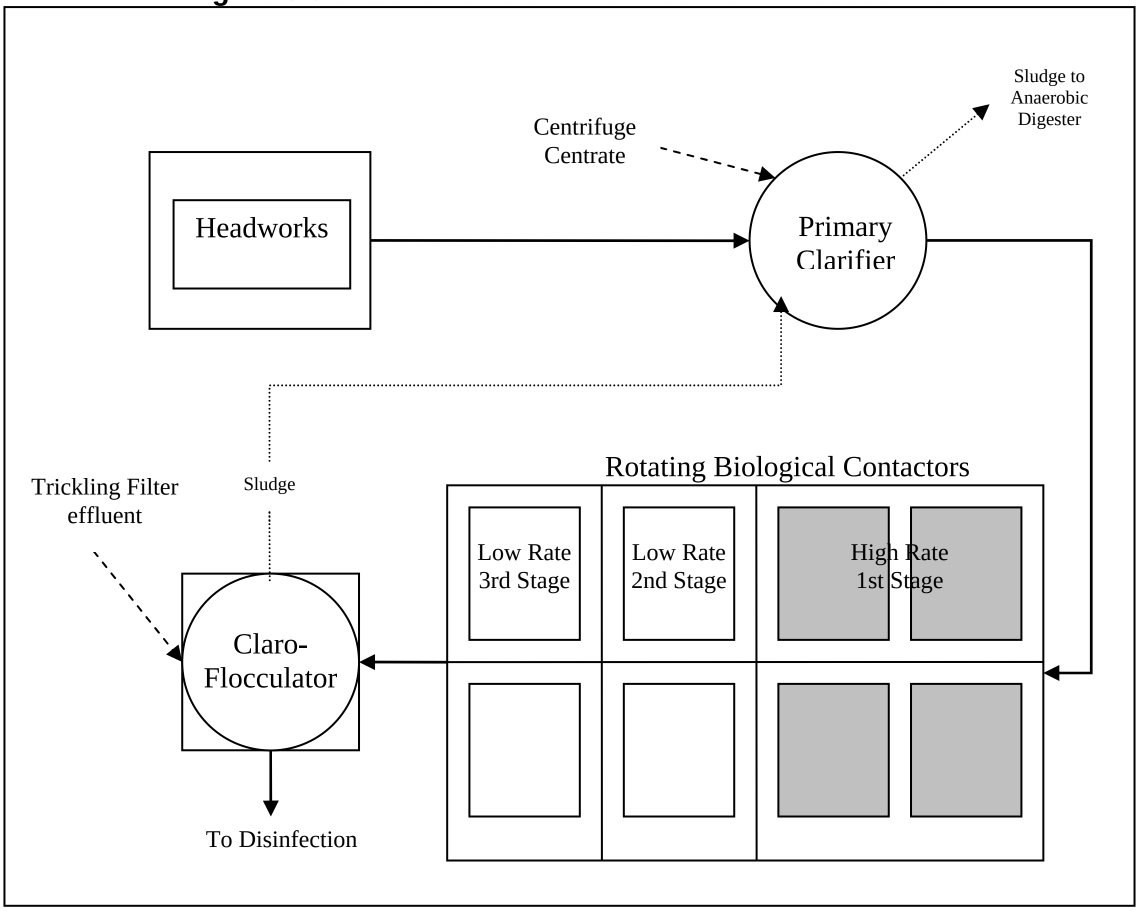
3.3.1.d. Trickling Filter Treatment Conclusion

The trickling filter treatment process train is limited by the organic treatment capacity of the trickling filter. Actual data confirms the trickling filter is not operating with its expected or design treatment capability. It is recommended that the plant continue only allowing 0.2 MGD maximum flows to the trickling filter. Currently the trickling filter is not even providing enough treatment to meet the plants 30mg/l limit for BOD, only through diluting the trickling filter effluent with the RBC effluent is the plant meeting this limit.

3.3.2. Evaluation of Rotating Biological Contactor Process

Figure 3.3.b. below shows the RBC treatment process train.

Figure 3.3.b. Schematic of RBC Treatment Process Train



3.3.2.a. RBC Primary Clarifier

After leaving the headworks, influent to the RBC process train gravity flows to the primary clarifier. The primary clarifier is 45 feet in diameter with a side water depth of 10 feet. Hydraulically the primary clarifier has an average surface overflow rate of ~490 gal/ft ^{2}-day, and a peak surface overflow rate of 838 gal/ft^2-day. In the CDPHE 96-1 Design Criteria for Wastewater Treatment Facilities a surface overflow rate of 750-1,200 gal/ft ^{2}-day is recommended; so the primary clarifier has additional hydraulic capacity. The hydraulic detention time within this primary clarifier is ~4 hours at average flow and ~2 hours at peak flow, the CDPHE 96-1 regulations recommend a detention time of 1-4 hours at average flow. The primary clarifier is operating at the high end of detention time with low surface overflow rates, so it is hydraulically under-loaded.

Tests of the BOD removal capability of the primary clarifier show 26% removal of BOD on average. Typically primary clarifiers remove 25-40% of influent BOD. The kinetic analysis was based of 25% removal in the primary.

3.3.2.b. Rotating Biological Contactors

The Rotating Biological Contactor (RBC) system train was completed in 1985. This system consists of two RBC basins with four RBCs in each basin. The basins are divided into three stages by removable baffle walls. The first stage houses two high density RBCs, the final two stages are single low density RBCs. A kinetic analysis of the capacity of the RBC was conducted and the limiting factors in capacity were found to be the ability of the system to nitrify effluent to less 5.9mg/l (the minimum monthly ammonia effluent limit), because of the first stage BOD loading. The data from this analysis is presented in Table 3.3b below. The table shows the results for an average BOD loading to the plant of 285mg/l, with a monthly maximum BOD of 491mg/l and average influent ammonia loading of 23mg/l with a peak of 30mg/l.

Table 3.3b. Average BOD Loading to RBC

	Average Influent Ammonia		Peak Influent Ammonia	
	Peak BOD Loading	Average BOD Loading	Peak BOD Loading	Average BOD Loading
Total BOD Load (lbs/ 1000ft^2/d)	2.91	2.45	2.91	1.97
1st Stage BOD Load (lbs/1000ft^2/d)	4.85	4.08	4.85	3.28
Ammonia Load (lb/ 1000ft^2/d)	0.24	0.35	0.24	0.28
Hydraulic Load (gal/d ft^2)	0.96	1.39	0.96	1.12
Remaining Ammonia (mg/l)	0	5.74	0	5.79
Sys. Capacity w/ Ammonia Removal (MGD)	**0.96**	**1.39**	**0.96**	**1.12**
Limiting Factor in Treatment	1^{st} stage biological loading	Ammonia Removal Capability	1^{st} stage biological loading	Ammonia Removal Capability

During peak BOD loading the limiting factor in treatment is the 1^{st} stage biological or BOD loading to the system. When the 1^{st} stage of an RBC is overloaded, the growth of filamentous bacteria is encouraged causing problems in the system. To prevent first stage overloading, the flow during peak BOD loading is limited to 0.96MGD. During average BOD loading, the ammonia removal is limiting because nitrification can only occur in the RBC when the soluble biochemical oxygen demand (sBOD) concentration in the system drops to below 10 g sBOD/m^2 d. When this occurs, the rate of nitrification is proportional to the remaining quantity of sBOD. This is because the microorganisms that consume sBOD out-compete the microorganisms capable of nitrifying for space on the RBCs. Only when the sBOD has been mostly consumed will sufficient populations of nitrifying organisms develop on the RBCs.

3.3.2.c. RBC Treatment Conclusion

The CDPHE recommends total organic (BOD) loading to the RBCs be less than 5 lb/1000ft^2-d and hydraulic loading be less than 4 gal/d-ft^2. Metcalf and Eddy state that first stage organic loading should be less than 4.9 lb BOD/1000ft^2-d. To meet all these criteria as well as to allow for nitrification (ammonia removal) it is recommended that the capacity of the RBC treatment system should be limited to a maximum of 1.0 MGD. If the peak flow is kept below this the plant should be able to maintain a viable population of nitrifiers on the RBC and not overload the first stage of the system with BOD, and thus be able to meet ammonia effluent limits.

3.3.3 Combined Effluent

The secondary clarifier effluent from the trickling filter process train combines with the RBC effluent and enters the claroflocculator for final clarification. The combined effluent then flows to disinfection. The combined effluent processes are discussed in this section.

3.3.3.a. Claroflocculator

The trickling filter effluent from the secondary clarifier combines with the RBC process effluent in the claroflocculator. The claroflocculator is a 50 ft^2 basin that is 12 feet deep. This basin was designed to be operated with chemical additions to aid in development of flocs for ease of settling and clarification. Due to concerns about the introduction of chemicals to water that will soon be discharged to the Arkansas River chemicals are not used. This creates a basin that is essentially a 50 foot diameter clarifier with 12' side water depth. By examining this basin as a clarifier, the surface overflow rate calculated for a recommended max flow of 1.2 MGD (0.2 MGD from the trickling filter and 1.0 MGD from the RBCs) is 611 gal/ft^2-d. This is at the low end of the recommend surface overflow rates (600-1050 gal/ft^2-d) for clarifiers with flow rates of 1.0-1.5 MGD. The claroflocculator is capable of handling a max flow of 2.0 MGD.

3.3.4 Existing Capacity Conclusion

The trickling filter process train is incapable of removing ammonia, thus all ammonia removal must take place in the RBC system. The Salida WWTP capacity is organically limited by its ability to remove ammonia without overloading the first stage of the RBC system In order for nitrification (ammonia removal) to occur within the RBC system, the sBOD must be brought down to a concentration of 10 g sBOD/m^2 d. Currently at flow rates averaging 0.78 MGD a large component of the sBOD is settled in the primary clarifier, and sBOD levels are brought below 10 g sBOD/m^2 d in the RBC. Thus biological BOD loading in the first stage is limited and nitrifying organisms have populated the RBC system. However as flow rates continue to increase the plant will lose its ability to consume most of the sBOD in the primary clarifier causing larger quantities of BOD and sBOD to enter the RBC. This will lead to biological overloading of first stage of the system and the possible growth of filamentous bacteria. The populations of bacteria that consume sBOD will out-compete the nitrifying bacteria for space on the RBC. When this occurs the nitrifiers will go dormant and the plant will lose its ability to remove ammonia. In order to maintain a healthy population of nitrifiers at current organic loading rates, it is recommended that the RBC receive a maximum flow of 1.0 MGD. Since the Trickling filter should be operated with no more than 0.2 MGD the total capacity of the existing plant is 1.2 MGD (winter condition with slow growth rates).

3.4 Wastewater Flows

The current plant is permitted for a capacity of 2.1 MGD, from the Colorado Department of Public Health and Environment (CDPHE), NPDES Permit Number CO-040339. The permit expired on July 31, 2007 and an application for a permit renewal was sent in to the CDPHE, but the City has currently received no response from the State. The plant has not seen toxic pollutants and does not expect to see any in the future. Peaking factors and influent parameters were discussed in section 2.5, please refer to this section for information on the influent characteristics. The design parameters used to evaluate existing and proposed treatment processes summarized in section 2.5 were based of DMR data collected from August of 2002 to May of 2008. The City of Salida receives large seasonal variation in flows. Historically average summer flows have been up to twice the average winter flow rates. The DMR data shows that organic loading to the plant is less variable and does not correlate with seasonal flow variations. There have been infiltration flows from the service connection from Poncha Springs, the City of Salida has made efforts to correct these problems, and has resolved the issues in the portion of this line they control.

3.5 Financial Status of Users

Both the existing and proposed facilities are owned and operated by the City of Salida and not part of a separate sanitation district. Therefore the City of Salida manages all related expenses and sets user rates and system development fees in order to balance all O&M cost, existing debt and capital improvements. Each year as part of the Cities annual proposed budget for the following year it creates a water and sewer budget and water and sewer capital improvement plans. The City has two separate reserve funds, one for sewer operating cost and one for capital improvements. The sewer budget detail breaks down both O&M cost and capital expenditures into detailed line items. The following is a historic cash flow summary table.

Table 3.5.a. Historic Cash Flow

	Actual					Projected
	2003	2004	2005	2006	2007	2008
OPERATING BUDGET						
Operating Revenues:						
Sewer Service Sales	$713,257	$783,962	$718,720	$764,329	$735,056	$750,660
Late Fee	$1,100	$7,950	$5,244	$6,020	$5,000	$5,000
Poncha Sewer Sales	$50,617	$74,617	$94,402	$60,499	$79,715	$102,848
Septage	$29,603	$28,559	$24,761	$38,088	$41,126	$41,126
Outside Lab Fees	$17,195	$15,323	$24,775	$18,212	$20,503	$20,000
Operating Grant	$0	$0	$0	$0	$0	$20,000
Other Revenue	$1,627	$862	$1,513	$1,099	$8,638	$9,141
Interest	$1,699	$1,353	$2,801	$4,732	$10,988	$11,000
Total Operating Revenues	**$815,098**	**$912,626**	**$872,216**	**$892,979**	**$901,026**	**$959,775**
Operating Expenditures:						
Sewer Plant Personnel Services	$182,461	$215,488	$210,808	$218,266	$222,879	$237,589
PW/Sewer Sys. Personnel Services	$57,939	$19,784	$17,193	$12,463	$9,871	$22,922
Sewer Plant Supplies	$38,092	$59,619	$45,577	$49,267	$65,532	$72,035
PW/Sewer Sys. Supplies	$0	$629	$344	$2,256	$2,556	$2,300
Sewer Plant Purchased Services	$122,496	$125,170	$120,344	$143,281	$158,343	$208,305
PW/Sewer Sys. Purchased Services	$51,000	$24,814	$36,082	$37,295	$45,374	$52,960
Sewer Plant Cons. and Build'g Mat.	$839	$3,037	$1,791	$1,277	$1,235	$2,650
PW/Sewer Sys. Cons. & Build'g Mat.	$13,000	$1,380	$102	$97	$2,301	$3,300
Sewer Plant Fixed Costs	$32,967	$22,846	$31,049	$33,946	$33,633	$37,715
Sewer Plant Maint. Of Ex. Infras.	$34,488	$55,048	$96,218	$839	$10,741	$94,000
PW/Sewer Sys. Maint. Of Ex. Infras.	$13,800	$52,183	$17,992	$258,551	$188,327	$247,426
Total Operating Expenditures	**$547,082**	**$579,998**	**$577,500**	**$757,538**	**$740,792**	**$981,202**
CAPITAL BUDGET						
Capital Revenue Sources:						
Sys. Development Fees (Tap Fees)	$74,850	$60,993	$100,494	$171,427	$124,648	$77,500
State Grants	$0	$0	$0	$160,214	$0	$0
Interest	$6,798	$5,412	$11,204	$18,928	$43,952	$44,000
Receipts from Grand Ave.	$0	$0	$27,441	$2,847	$5,102	$4,500
Loan Proceeds	$428,000	$121,775	$0	$0	$0	$0
Total Capital Revenues	**$509,648**	**$188,180**	**$139,139**	**$353,416**	**$173,702**	**$126,000**
Capital Expenditures:						
Sewer Plant New Infrastructure	$1,002,741	$260,209	$0	$6,043	$1,777	$328,000
PW/Sewer Sys. New Infras.	$0	$695	$187,028	$7,300	$50,000	$10,000
Sewer Plant Debt Service	$0	$67,272	$67,272	$67,272	$67,272	$67,272
Total Capital Expenditures	**$1,002,741**	**$328,176**	**$254,300**	**$80,615**	**$119,049**	**$405,272**
Beginning Reserves					**$1,573,079**	**$1,787,965**
Ending Reserves					**$1,787,965**	**$1,500,046**

The City collects most of the revenues for both operating and capital from user rates and system development fees. The City has increased the system development fees by 5% in 2009 and plans on increasing the user rates as well 5-20% but is currently in the process of reviewing a rate study that takes into account the proposed plant improvement before the rate is increased in 2009. Tables from the rate study are included in section 6.3. Currently the City has existing debt in the form of a Colorado Resource and Power Authority Fund loan, five more annual payments of $67,272 are due on this loan (ending in 2013).

The following is a table of existing user rates and system development fees as well as the percent of each type of customer. The City of Salida has no significant industrial users.

Table 3.5.b. Current Wastewater Customer Types and Rates

Type	Quarterly Base Rate	Additional per 1000 gallon Fee	Current % of Total Customers	2019% Estimate
SEWER ONLY:			2.0%	1%
Within City Limits	$66 per ELU	-		
Outside City Limits	$99 per ELU	-		
EXISTING PONCHA:			9.1%	11%
Within City Limits	$66 per ELU	-		
Outside City Limits	$99 per ELU	-		
SEWER AND WATER CUSTOMER WITHIN CITY LIMITS:				
Single Family Residential	$39	$0.85	67.5.%	54%
Multi-Family Residential	$39 1st unit, $10 each additional unit	$0.85	5.2%	17%
Outside City Limits Rates Are 1.5 Times Inside City Limits				
Commercial 3/4in water service	$42	$1.55	16.2%	17%
Commercial 1in water service	$58	$1.55		
Commercial 1 1/2in water service	$87	$1.55		
Commercial 2in water service	$130	$1.55		
Commercial 3in water service	$165	$1.55		
Commercial 4in water service	$205	$1.55		

Table 3.5.c. System Development Fees

Type	Current Fees	5% increase as of January 1st 2009
Single Family Residential	$4,000	$4,200
Multi-Family Residential per water meter	$4,000	$4,200
Accessory Dwelling Unit	$3,000	$3,150
Commercial 3/4in water service	$6,000	$6,300
Commercial 1in water service	$13,000	$13,650
Commercial 1 1/2in water service	$13,200	$13,860
Commercial 2in water service	$34,000	$35,700
Commercial 3in water service	$61,350	$64,418

4.0 Project Purpose and Need

4.1 Compliance

As previously mentioned in section 3.4 the facilities NPDES permit expired. The proposed designs were based off the exceeding limits dictated by the expired permit (NPDES Permit Number CO-040339). The limiting factor in the existing plants ability to meet discharge limits is its ability to treat ammonia. The permit imposes a seasonal 2-year rolling average ammonia effluent limit. The ammonia limit is the arithmetic mean of ammonia samples from the previous 24 months. During the months of February, March and October the 2-yr rolling average discharge limit for ammonia is 5.9 mg/l. As discussed in section 5.3 the trickling filter has no ability to treat for ammonia and the RBCs have limited treatment capacity for ammonia. In fact though the plant is permit to treat a flow rate of 2.1 MGD the kinetic capacity of the plant is limited to 1.2 MGD. The facility was never designed to remove ammonia and has approached its treatment and compliance limits. In an effort to avoid any future compliance issues all the proposed new treatment processes were designed around the ability to treat ammonia to a level of 0.5 mg/l and to treat TKN to below 10mg/l.

4.2 Security

The site is bordered on the North, South, and East by an 8' chain link fence with barb wire. The western site boundary is formed by the Arkansas River. There are no apparent security concerns, or vulnerabilities at the site.

4.3 Operation and Maintenance

The trickling filter was build over fifty years ago, it has outlived its useful service life and as a result there is substantial work associated with maintaining its operability. In the winter the surface has been prone to freezing, and the trickling arm has needed frequent replacement.

The RBC system has also outlasted the 20 year design life-cycle. The bearings in the RBC shafts have needed replacement as well as frequent lubrication.

4.4 Growth

Please refer to section 2.3 for future growth projections and trends. Due to the increase of users and the related system development fees of future development increased revenues will take place to pay for future O&M cost of the proposed plant. Increases in the rate will also be required in addition to the increase of users due price inflation. The City of Salida does not have sufficient capital reserves built up to pay for the required proposed plant project but with the increased projected development and increase to system development fees will be able to pay for the payment on a 20 year loan with an interest rate of 1.75%. See the 20 year projected cash flow spread sheet in section 6.3.

5.0 Assessment of Alternatives

When the analysis of this plant began the intent was to design a system capable of treating the sidestreams generated from the anaerobic digester supernatant and the biosolids dewatering centrifuge centrate. These sidestream liquors have extremely high nutrient loads and at the beginning of the project it was believed that by treating this sidestreams independently the plant could achieve compliance with its ammonia regulations and continue operation. After an analysis of the potential sidestream treatment alternatives it was determined treating the sidestreams will only temporarily help deal with the ammonia compliance issue because the entire plant is approaching its organic treatment capacity. The following four alternatives for sidestream treatment were considered:

1. Construction of an Activated Sludge Basin for Sidestream Treatment
2. ANAMMOX
3. Conversion of the existing RBC to a sidestream Treatment Process
4. Construction of Nitrification (ammonia treatment) Basin to receive the effluent from the existing TF and RBC basins.

The parameters used in the design of the sidestream process flows are shown in Table 5.0.a below:

Table 5.0.a. Supernatant and Centrate Sidestream Process Flow Parameters

Flowrate (gal/d)	30,000
BOD (mg/l)	200
TSS (mg/l)	674
NH_3-N (mg/l)	568
Alkalinity (mg/l as $CaCO_3$)	1,448
Temperature (degrees C)	20

These parameters are based off the weighted average of a single grab sample of the centrate and supernatant. The measurement results were translated into design values by multiplying by a factor of safety of 2.0 for flowrate, 1.5 for BOD, TSS, NH_3-N, and a factor of safety of 0.75 for alkalinity. These values fall within the expected design ranges published for other treatment facilities.

5.0.1 Alternative 1- Separate Activated Sludge Aeration Basin

The first alternative explored was to treat the sidestreams in an activated sludge process. To create and sustain the activated sludge microorganisms, the treatment system must consist of three components aeration, clarification, and return/wasting. Wasting (WAS) removes dead cells, and returning (RAS) returns "hungry" microorganisms to the food source. In traditional activated sludge treatment returning and wasting is accomplished by pumping a portion of the settled sludge in the clarifier to the aeration basin for return and the remaining portion to the digester to be wasted. It is common in facilities with sidestream treatment to return activated sludge from the plant treatment process to the sidestream treatment process to "seed" the aerated sidestream reactor with microorganisms, but the facility at Salida operates attached growth processes that do not involve sludge return, thus any sidestream process designed must be an independent activated sludge process. The system must be designed to handle the total supernatant and centrate flows at the 2.7 MGD buildout, and provide 2-4 days of solids retention time with 1-2 days of hydraulic residence time within the basin. Effluent would be returned to the primary clarifier to be mixed with the screened influent. The reuse of existing structures and basins on-site was considered, but the basins were all too shallow to allow for adequate oxygen transfer or settling. So this alternative involves the construction of a new aeration basin, clarifier, and pump room.

Aeration is used to cultivate an environment for nitrifying microorganisms. As nitrification occurs, alkalinity is consumed. However, centrate and supernatant sidestreams have limited alkalinity levels. Thus in order to maximize treatment potential by aeration, alkalinity control is necessary within the aeration basin. The final sidestream process flows were estimated at 30,000 gallons/day. For this flowrate the aeration tank volume is estimated to be 6,820 ft^3. The air requirements for this process are ~360 ft^3/min of air. For every pound of ammonia nitrified 7.1 pounds of alkalinity, as calcium carbonate, are consumed and with influent alkalinity of 1,448 mg/l, 646.6 lb/d of alkalinity (as $CaCO_3$) must be added to buffer for nitrification.

As an alternative, since a large amount of alkalinity must be added each day, air within this basin could be sequentially turned on and off to create an anoxic environment and allow for some level of denitrification and alkalinity recovery. Denitrification in an anoxic environment consumes carbon in the form of BOD so denitrification is a function of available BOD. By denitrifying, 3.57mg/l of alkalinity as $CaCO_3$ could be recovered for every 2.87 mg/l of BOD consumed, thus only ~250 mg/l of alkalinity could be recovered. This reduces the supplemental alkalinity demand to 584.3 lb/d.

Adding over 500 pounds of chemicals each day to the treatment process each day is a huge operational commitment. Large dry storage areas for the chemicals must be obtained and operators must ensure the chemical feed system is adequately supplied with chemicals to maintain alkalinity levels. This is not an ideal working scenario because it is so operationally intensive and only provides a solution to the sidestreams overloading the plant not the plant influent ammonia. Flows and organic loadings to the plant will continue to increase; the RBCs and Trickling Filter do not have the capacity to treat the future flows for ammonia. This necessitates the construction of a new treatment process in the near future. Since any new treatment process could easily be designed to treat the sidestream within the process, it seems illogical to build a separate treatment system at this time for the sidestreams, considering the existing treatment processes are on the border of meeting discharge limits.

BOD is the limiting component in denitrification. The addition of screened influent to the reactor would increase the BOD and denitrification potential of a sidestream process. The minimum amount of screened influent necessary to not require alkalinity addition is ~0.1 MGD. This necessitates a basin that is 35,000 ft^3, five times larger than a sidestream treatment basin alone. This basin would require 575 ft^3/min of air. The construction of a basin this large, a clarifier, and return and wasting pumping will involve large capital expenditures. The RBCs are so close to their organic loading limits it seems wasteful to invest in an activated sludge system to just treat sidestreams when an entirely new process could be constructed to handle the plants full flow and sidestreams.

5.0.2 Alternative 2- ANAMMOX

The second option for treatment of the solids processing sidestreams is a patented biological process called ANAMMOX. This process converts ammonia in the presence of nitrite to nitrogen gas under anoxic conditions in a sequencing batch reactor. This is a relatively new process, but it has many advantages including lower operational costs, lower energy consumption, and smaller footprint. The disadvantage is this process needs a great deal of monitoring, and it is a new process that has not been thoroughly tested. The manufacturer of this process prepared a preliminary proposal for this application, but was found to be far outside of budgetary limits.

5.0.3 Alternative 3- Convert RBCs to a Sidestream Treatment Process

The third alternative would be to convert the existing RBC treatment train into a solids sidestream processing treatment train. The RBC train would accept digester supernatant and centrifuge centrate then mix these flows with a portion of screened influent. The combined flow could be pre-treated in the existing primary clarifier then pass through the RBC channels. In this scenario the RBC would be hydraulically under-loaded but optimally organically loaded to nitrify. The BOD concentration from the sidestreams is low and the ammonia concentration is high, so the RBCs would develop populations of nitrifying bacteria. Nitrification may be limited by alkalinity so alkalinity control may need to be added to the system. The sidestreams could be fully treated with existing equipment, and the influent flows could be treated separately with a new treatment process. Table 5.0.b, below, shows expected treatment results in the RBC treating 30,000 gallons/day of sidestreams flows combined with various screened influent under average and peak loading scenarios.

Table 5.0.b. Alternative 3- Results of RBC conversion to Sidestream Treatment

	Peak Conditions	Average Conditions
Remaining Nitrogen Stage 1 (mg/l)	25.22	21.28
Remaining Nitrogen Stage 2 (mg/l)	15.89	13.87
Remaining Nitrogen RBC Effluent (mg/l)	**5.70**	**5.75**

While this level of treatment is theoretically possible it must be kept in mind that this is only a kinetic model. Actual flows and loadings to this basin may change, and effect effluent quality. Regulatory constraints may also change, so this level of performance should not be expected indefinitely.

The plant must always remain operational, and the trickling filter alone is incapable of treating the flow to the plant. Alternative 3 assumes that the RBCs could be used to treat the sidestreams, but for this to work an additional treatment process must be constructed to treat the influent plant flow currently treated by the RBCs to "free them up" so they can be converted to sidestream treatment. If a new process is constructed it would make more sense to design the new process to treat the sidestreams than to have to rely on the RBCs theoretical capability to effectively treat the sidestreams.

5.0.4 Alternative 4-Combined Nitrification Basin for Full flow from Plant

The final alternative would be to add a single reactor that would serve as a nitrification/denitrification basin and accept all the flow from the trickling filter and RBC process trains. This would allow the trickling filter and RBCs to be fully utilized for BOD treatment only. This new aerated basin could be operated as an attached growth moving bed bioreactor with a plastic media, or an activated sludge basin. The intent of this basin would be to provide a separate reactor for nitrification. Thus the loading to the RBCs could be increased without concern for maintaining a viable population of nitrifiers within the RBCs. Both the Trickling filter and RBCs could be optimized to simply provide BOD removal. Table 5.0.c, below, shows the influent parameters to the nitrification reactor.

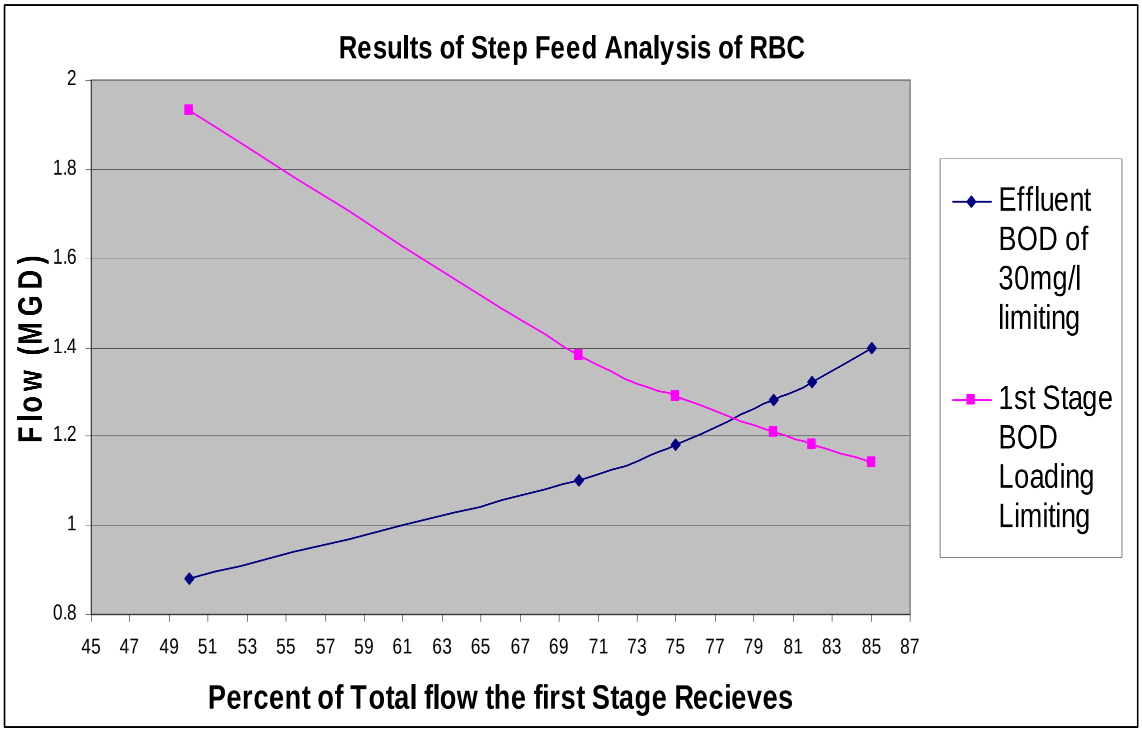
Table 1.0.c. Nitrification Reactor Influent Flow Parameters

Flowrate (gal/d)	1,200,000
BOD (mg/l)	29
TSS (mg/l)	41
NH_3-N (mg/l)	43
Alkalinity (mg/l as $CaCO_3$)	250
Temperature (degrees C)	15

BOD treatment capacity within the RBC is limited by 1st stage organic loading thus the maximum flow the RBC could receive would still be 1.0 MGD. The size of an aerated polishing pond to handle the nitrification of the total 1.2 MGD flow is ~10,000 ft^3 (~24'x24'x18'), requiring 900 ft^3/min of air, alkalinity addition would also be necessary. Approximately 200 pounds alkalinity (as $CaCO_3$) per day would be needed. Like alternative 1 there is a large amount of capital investment necessary, but no additional plant capacity is created.

To minimize 1st stage biological overloading an analysis of step feeding the RBCs was conducted. This means a portion of the flow from the primary clarifier would be diverted away from the 1st stage of the RBC, bypass this stage and enter the 2nd stage of the RBC. The results are presented in Figure 5.0 below:

Figure 5.0. Results of Step Feed Analysis



The step-feed analysis shows that during peak BOD and ammonia loading the capacity of the RBCs could be increased to ~1.2 MGD by allowing only ~78% of the flow to enter the first stage of the RBC then forcing the rest of the flow to bypass the first stage. Under this scenario the RBCs provide only BOD treatment and no nitrification. Thus, a reactor for nitrification would be needed. The size of an aerated reactor to handle the nitrification/denitrification of the total 1.4 MGD flow is 11,500 ft^3 (~25'x25'x18'), requiring 1,570 ft^3/min of air. Alkalinity addition would also be necessary. Approximately 120 pounds alkalinity (as $CaCO_3$) per day would be needed. Hydraulically it may be difficult to step feed to the RBC, pumping may be necessary, and the additional capacity gained from this process is minimal only increasing the overall plant capacity by less than 15%.

5.0.5 Solids Processing Sidestream Treatment Conclusion

All the sidestream treatment process alternatives analyzed required large basins, large capital investments, and involved the addition of large amounts of chemicals to control alkalinity. There are also many potential problems associated with sidestream treatment. For example, the high concentration of ammonia and sulfide present in the sidestreams can be extremely odorous. Another major concern with sidestream treatment is the potential for struvite formation. Struvite is a precipitate that forms when carbon dioxide in digested sludge liquors is reduced due to aeration. When struvite forms it is can clog pipes and valves, creating problems for the entire plant.

The construction of a sidestream treatment process does not resolve the ammonia loading problem in the long term; it only deals with the sidestreams that are currently overloading the plant. The RBCs and trickling filter are approaching organic overloading, so even if the sidestreams are dealt with independently in the near future the plant will lose its ability to treat to influent effectively for ammonia. It is recommended that the Salida Waste Water Treatment Facility begin planning an overall plant improvement and expansion. The plant expansion would deal with the organic loading issues as well to prepare the plant for future growth. A plant expansion would allow the City of Salida to continue to grow while avoiding violations. Because the sidestream treatment processes are not a viable solution to the long-term issues at the plant they will not be considered as feasible solutions for the plant for the remainder of section 5 of this report.

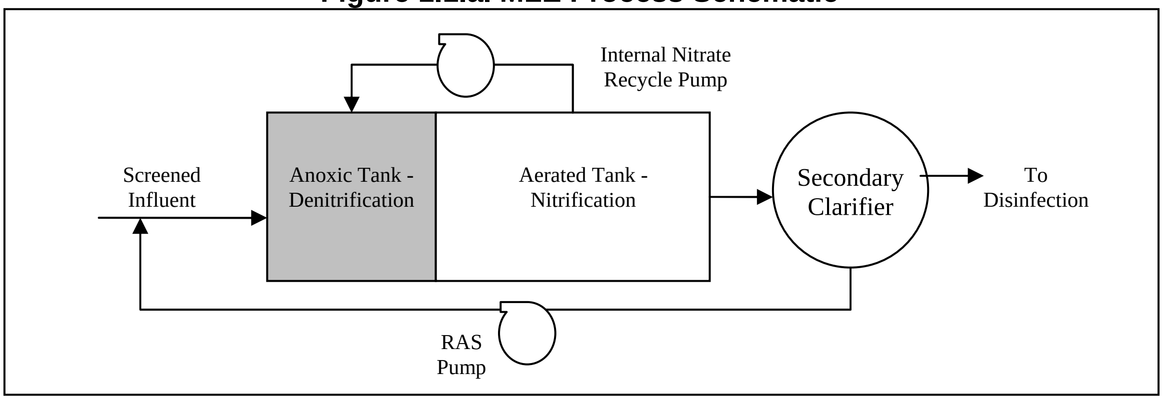
5.1 Description

The master plan for the future of the Salida WWTF must include provisions to allow treatment of flows to meet not only current regulations but anticipated future discharge limitation regulations. It is expected that a total Nitrogen regulation will eventually be placed on the facility. Thus all planning, for future expansions, includes treatment/modification for total Nitrogen removal. The following processes were initially considered for the final future treatment process: Modified Ludzack-Ettinger process (MLE), Krüger moving bed bioreactor (MBBR), Krüger integrated fixed-film and activated sludge (IFAS), oxidation ditch, Aero-Mod SEQUOX process, and Siemens Vertical Loop Reactors (VLR). The following sections will discuss each process individually.

5.1.1 Modified Ludzack-Ettinger Process (MLE)

The MLE process is a combined nitrification-denitrification process that uses suspended growth activated sludge in two reactors. An anoxic reactor, used for denitrification, is upstream of an aerated reactor for nitrification. The position of the denitrification tank at the beginning of the process takes advantage of influent carbon from the screened influent mixed with aerated reactor effluent that is pumped to the beginning of the process train. With the anoxic tank at the front of the process no additional carbon source is necessary for denitrification. The figure below shows the major components of the MLE process.

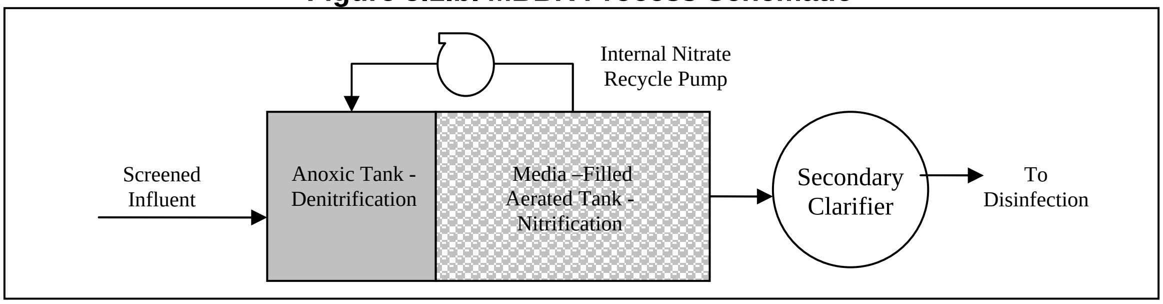
Figure 1.1.a. MLE Process Schematic



5.1.2 Krüger Moving Bed Bioreactor (MBBR)

The Krüger MBBR process is an attached growth process. In this process media is placed in the aerated reactor basin(s). The media provides surface area for microorganisms to live on. The figure below shows the major components of the MBBR process.

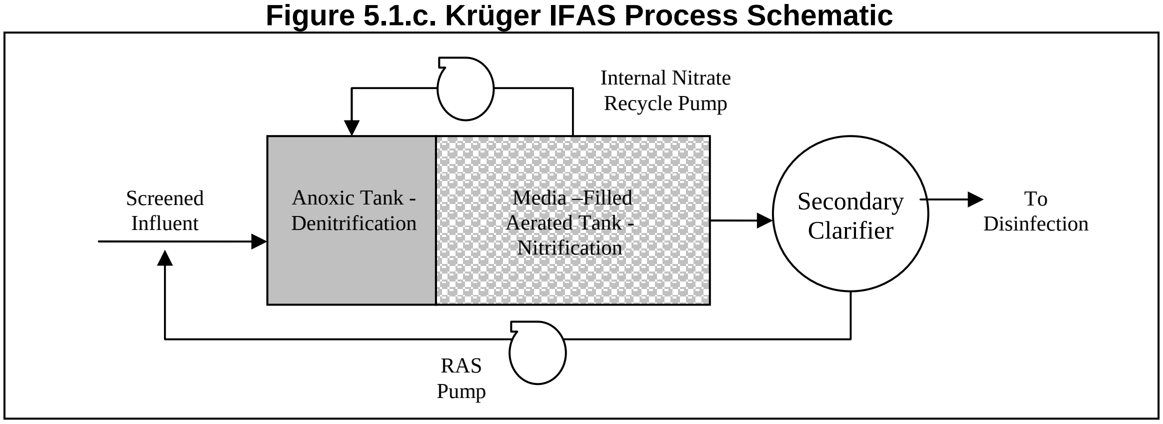
Figure 5.1.b. MBBR Process Schematic



5.1.3 Krüger Integrated Fixed Film – Activated Sludge Process (IFAS)

The Krüger IFAS process is hybrid process that combined an attached growth process (MBBR) with an activated sludge process. In this process media is placed in the aerated reactor basin(s). The media provides surface area for microorganisms to live on; in addition to the fixed film population there is a population of microorganisms that live suspended in the reactors. The figure below shows the major components of the IFAS process, notice that this process is the same as the MBBR process except a RAS component is added from the secondary clarifier to provide the suspended activated sludge population.

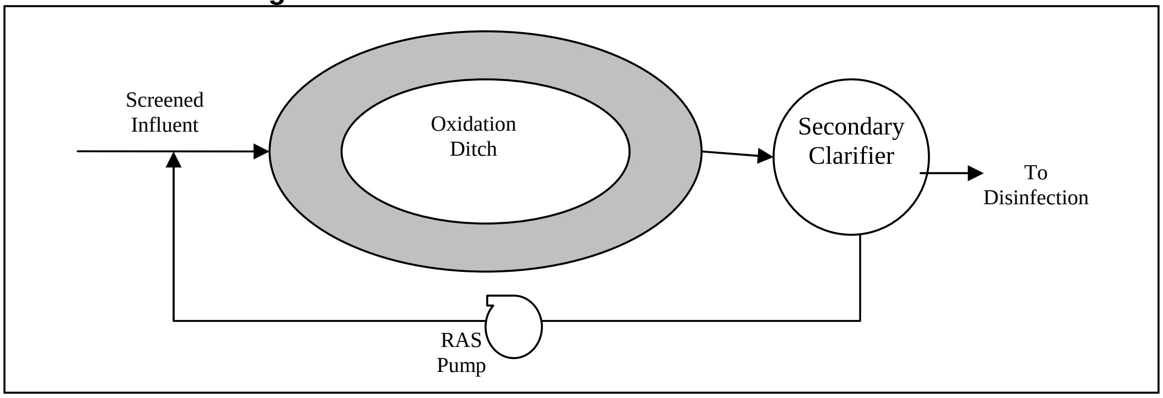
Figure 5.1.c. Krüger IFAS Process Schematic



5.1.4 Oxidation Ditch

An Oxidation Ditch is a suspended growth activated sludge process that consists of an oval shaped channel that is equipped with mixing and aeration equipment. The channel acts as a plug flow reactor, flow enters the channel and passes through both anoxic and aerated zones for nitrification and denitrification.

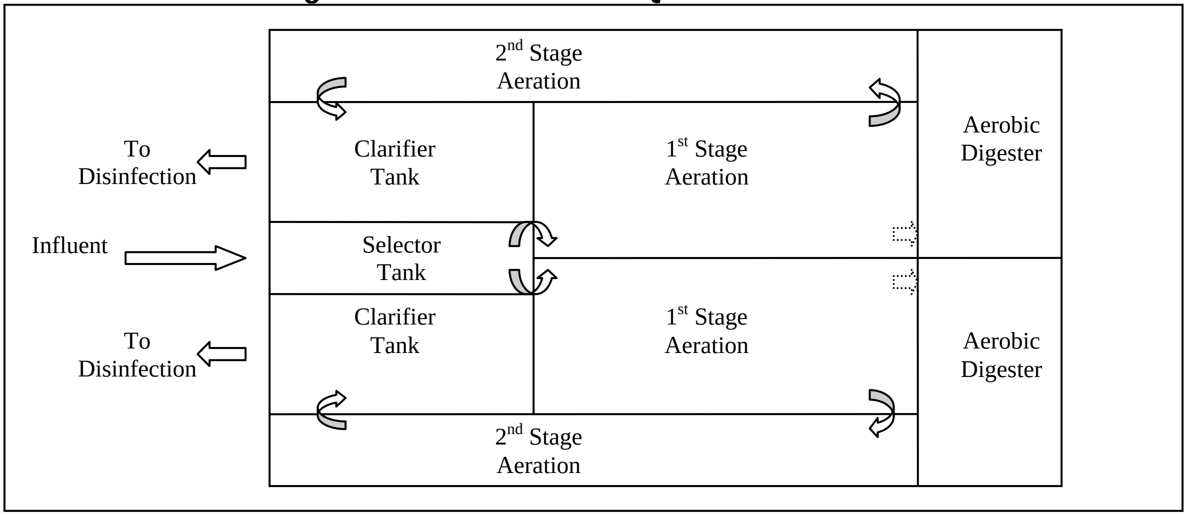
Figure 5.1.d. Oxidation Ditch Process Schematic



5.1.5 Aero-Mod SEQUOX

The SEQUOX process is a proprietary plant process from Aero-Mod that incorporates sequential aerated reactors for nitrogen removal. The system has internal clarifiers and aerobic digesters constructed with a common-wall compact design. The schematic below shows an Aero-Mod SEQUOX system.

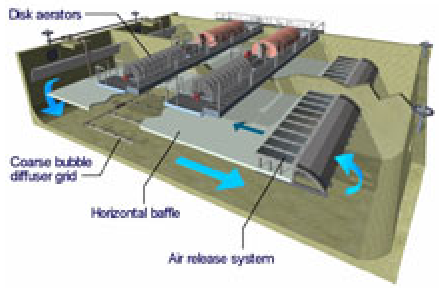
Figure 5.1.e. Aero-Mod SEQUOX Schematic



5.1.6 Siemens Vertical Loop Reactor

Siemens Vertical Loop Reactors (VLRs) are similar to oxidation ditches that have been flipped on their sides. There is an upper and lower compartment separated by a baffle running the length of the tank. Surface mounted discs provide mixing, and aeration within the system. Multiple reactors are used in series to provide anoxic and aerated environments. The system uses common-wall construction between tanks, and has a smaller footprint than traditional oxidation ditches.

Figure 5.1.f. Siemens VLR Schematic (from http://www.water.siemens.com)



5.1.7 Feasible Technologies

After initially examining each technology it was determined that the SEQUOX and the MBBR processes were too expensive to be competitive with the other processes. Thus, more detailed comparison for only the Modified Ludzack-Ettinger process (MLE), Krüger integrated fixed-film and activated sludge (IFAS), Aeration Industries Oxidation Ditch, and Siemens Vertical Loop Reactors (VLR) were further considered.

5.2 Design Criteria

The feasible treatment technologies presented in section 5.1 were designed to meet the effluent criteria presented in section 2.5, Table 2.5.b. and all associated processed were designed within all criteria presented in the 96-1 regulations.

5.3 Environmental Impacts

Analysis of the environmental and social impacts of proposed treatment alternatives shows that each alternative has minimum impacts to the environment and no measurable social impacts. The only adverse environmental impacts from the proposed expansion are related to construction, and will thus only be temporary impacts such as noise, and dust. Every effort will be made to mitigate these impacts during construction.

There are no adverse environmental affects from this project. Conversely, the plant will deliver a higher quality effluent to the receiving water. This will be accomplished in several manners; first, the proposed expansion will use UV disinfection instead of chlorine eliminating chemical inputs to the receiving waters. Second the plant will treat for total nitrogen to meet current ammonia regulations, but also to remove nitrates. Nitrate removal protects the public health of downstream users of the Arkansas River as drinking water, as well as wildlife within the river an its surrounding ecosystem. Lastly the proposed expansion will operate hydraulically by gravity flow, thus eliminating the need to for influent pumping, and all the associated energy usage.

The plant will remain on the existing site, within the existing boundary. All structures will be constructed at least one foot above the FEMA 100 year flood elevation for the Arkansas River. The current site is not located on any historical or archeological sites, or wetlands, thus an expansion within the site will not affect of the areas in question.

The expansion will benefit both the communities of Salida and Poncha Springs as well as all downstream users of the Arkansas River. All socio-economic classes within these communities will receive benefit, because the proposed future developments that plan to tap into this system include all types of dwellings including apartments, single and multi-family homes as well as businesses.

The proposed wastewater treatment plant expansion is less than a 30% increase over the existing capacity. Accordingly, it qualifies for Categorical Exemption from the NEPA environmental site assessment requirements.

5.4 Land Requirements

All the proposed technologies were designed to remain on the existing site, within the existing boundary. The site is currently owned by the City of Salida, but is outside of city limits.

5.5 Construction Problems

There is limited land space on the site so technologies with smaller footprints (IFAS, MBBR, and VLR) are favored to allow for site access and construction. It is also necessary for the plant to continue operating during construction thus any new technology must fit within the site, but not interfere with the existing RBC process train. The site is located next on the Arkansas River and thus the water table is high. Dewatering will be necessary for construction.

5.6 Operational Aspects

CDPHE Regulation No. 100 “Water and Wastewater Facility Operators Certification Requirements” outlines the certification requirements as a function of plant size and process type. Plant sizes in the 2.01-4.00 MGD range require certification level B for trickling filters, extended aeration, and any activated sludge process where used beyond secondary treatment. Oxidation Ditches, the IFAS process, and the VLR would fall into this later category and would also require a class B operator. Currently Salida has a Class B operator on its staff.

Staffing levels will vary from process to process. Primary treatment, headworks, lab facilities, disinfection etc. will be common to all the alternative processes. As a general rule the headworks processes of screening, screening press, grit removal, flow measurement will require between a ¼ time employee to ½ time employee. The lab facility will also require between a ¼ time to a ½ time employee. Generally ultraviolet disinfection will require a fraction of a full time employee.

Any of the process alternatives will require biosolids management and disposal as contrasted at this time for the two lagoon facilities that only required removal of sludge from the bottom of the ponds once every 10 years. Biosolids management will require compliance with CDPHE Regulation No. 64 “Biosolids Regulation”. Sludge management for a plant of this size will require a full time dedicated operator or maintenance person to work with sludge dewatering, thickening and disposal, monitoring DO levels, monitoring volatile solids levels etc. Use of biosolids for agriculture and reclamation and or land application of biosolids requires significant time spent on establishing cumulative pollutant loading limits, notification requirements, determining slope and application requirements, soil and groundwater issues, nutrient management, and biosolids monitoring and analysis.

Anaerobic Digestion will require additional operator time for process control, management, rectifying upset conditions, lab analysis, heat exchangers, off gas venting etc. than aerobic digestion. A ½ time person will be required to work with anaerobic digestion that is required for aerobic digestion.

As a base condition all of the secondary biological process will require two full time dedicated employees. First a chief plant operator should be in charge of the entire plant with a significant amount of time spent on supervision process control for the activated sludge or fixed film process. Further a second operator will be required for basic maintenance, for these processes to included return and waste pumping controls, MLSS process controls, DO and blower operation, clarifier and scum pumping requirements.

Based upon the above discussion the base plant of any of the process will require between 4-4 ½ employees.

The remaining discussion will contrast the various differences in staffing requirements for the alternative processes.

Extended aeration and modification (Oxidation Ditches, IFAS, VLR) of the extended aeartion process are generally processes suitable for small to medium size utilities, because of process control simplicity, longer detention times which can handle upset conditions more easily, and minimal process control input. Generally EA process would be in the lower range of staffing requirements as stated above or around 4.

5.7 Cost Estimates

Detailed cost estimates for each proposed process, with capital, equipment, construction, and annual operational costs are included in Appendix D The following table summarizes the results of the cost analysis.

COMPONENT	MLE	Aeration Industries	Siemens VLR	Kruger IFAS
capital cost	$ 13,216,600	$ 13,689,000	$ 13,201,900	$ 12,574,000
annual cost	$ 1,008,500	$ 1,024,800	$ 1,015,500	$ 1,074,400
annual cost present worth	$ 12,568,100	$ 12,771,300	$ 12,655,400	$ 13,389,400
total present worth	**$ 25,784,700**	**$ 26,460,300**	**$ 25,857,300**	**$ 25,963,400**

5.8 Advantages/Disadvantages

5.8.1 MLE Process

The MLE process was included to serve as a design control. This process is not as robust or stable as the other processes and is not recommended for use as Salida's future treatment process.

5.8.1 Oxidation Ditch

The Aeration Industries Oxidation Ditch is very similarly priced to the other options so it showed no real cost advantage. This process produces the smallest amount of sludge which may be highly beneficial because it will save operator time and energy in solids processing, and will not stress the digesters as much as the other processes. The only major drawback to this system is its large size. The oxidation ditch has a foot print of 15,593 square feet. The tank is over 200 feet long. It would be very difficult to fit this on site, and would probably require the largest earthwork and excavation cost. These costs have not been included in the cost analysis, so the capital cost of the Aeration Industries Oxidation Ditch may be artificially low. It would be very difficult to coordinate construction of this oxidation ditch while maintaining the operation of the existing treatment facilities. The oxidation ditch is excellent for plug flow conditions. The combination of the aerobic and anoxic stages within the ditch result in excellent nitrification/dentrification treatment. The ditch is extremely simple to operate and can handle upset conditions more easily than lower detention time processes. The brush or paddle aerator is a simple method of process aeration. The process controls are simple which minimizes staffing requirements.

5.8.1 IFAS

The Kruger IFAS system includes two possible options. The first option involves building the system to handle the full buildout design flow of 2.7 MGD. The next option is to build the tankage for the full 2.7 MGD flow but to minimize the amount of media added to the process. This IFAS phased option allow for the treatment of 1.7 MGD in the IFAS system allowing the city to save money initially and to achieve treatment limits in a robust system, then as the flows increase the city can purchase and add more media to increase its treatment capacity. This is a highly desirable scenario because it minimizes the initial capital investment, but maximizes potential for plant growth in the future without large future infrastructure investments. The IFAS process also has the smallest footprint, less than half the size of the Aeration Industries Oxidation Ditch; it would fit nicely on the site without complications in maintaining operability of the RBCs during construction. This process has the greatest operational costs, highest air and energy requirements as well as the greatest sludge production. The IFAS process is easy to operate with simple process controls. This system will have the smallest learning curve for the current wastewater staff due to their knowledge of the fixed film treatment processes that they currently operate.

5.8.1 VLR

The Siemens VLR is not only more affordable than a traditional oxidation ditch but it has a smaller footprint. The more compact VLR design would fit onto the site well, allowing for construction of the VLR while maintaining the operability of the existing wastewater treatment plant. The VLR also has the lowest operational costs, and due to the uncertainty of future energy costs it could be very advantageous for the City to invest in a treatment process that minimizes future energy consumption. Just like the oxidation ditch the combination of the aerobic and anoxic stages result in excellent nitrification/dentrification treatment. The VLR is also simple to operate with simple process controls which will help staffing requirements.

Table 5.8 Process Comparison Matrix

PROCESS	MLE Process	Aeration Industries Oxidation Ditch	Kruger IFAS Process	Siemens VLR
Footprint	3	4	1	2
Energy Use	3	2	4	1
Environmental Impacts	4	2	2	2
Social Costs / Public Concern	3	4	1.5	1.5
Sludge Production	4	1	3	2
Ease of Maintenance / Operator Attention	4	3	1	2
Ease of Expandability & Adaptability	2	4	1	3
Stability / Reliability	4	2.5	1	2.5
Process Controls	4	2	2	2
Overall Cost	1	4	3	2
Rank	3.20	2.85	1.95	2.00
Overall Rank	**4**	**3**	**1**	**2**

6.0 Selected Alternative

6.1 Justification of Selected Alternative

Table 5.8 the process comparison matrix in section 5.8 shows the IFAS system is the best alternative for the City of Salida. This matrix weighs the financial, social, and environmental costs of each alternative, creating a comprehensive picture of each proposed technology in a clear format for comparison. Though the state design criteria does not specifically address IFAS systems, but they have been previously approved by the CDPHE in Broomfield, New Castle, Fairplay, and Johnstown, Colorado.

6.2 Technical Description

The existing collection system, headworks, anaerobic digester, biosolids dewatering, and septage receiving station on site will be reused. The primary clarifier that feeds the RBC will also be reused, but an additional primary must be constructed to achieve the necessary capacity for the expanded plant. The plant will need new secondary clarification; it is proposed that two new secondary clarifiers are constructed to handle the full flow, but that the existing claroflocculator be kept in place as a redundant clarifier for emergency situations when a clarifier is taken off-line. The chlorine contact chamber will be retrofit for a UV disinfection system. Table 6.2.a. below outlines the capacities of existing components of the plant that will be reused.

Table 6.2.a. Capacities of Existing Items on Site that will be reused

Item	Description	Criteria	Capacity
Mechanical Bar Screen	2' x 2'	3 ft/s ave. approach vel.	7.8 MGD
Washer/Compactor			>7.8 MGD
Parshall Flume	9" wide		5.73 MGD
Grit Tanks	2 aerated basins	6,100 gal each	>5.7 MGD
Grit Blowers	2 P.D. Rotary Blowers	75 scfm, 3 hp	>5.7 MGD
Grit Pumps	2 Recessed Impellers	205 gpm, 5 hp	>5.7 MGD
Grit Classifier	Dorr-Oliver type	205 gpm	>5.7 MGD
Anaerobic Digester	152' dia x 26' deep =413,020 gal	20 d SRT @ 20°C	8,800 lb/d sludge
Centrifuge		70 gpm	11.2 MGD

The IFAS process was designed to treat to the effluent limits outlined in section 2.5, Table 2.5.b. based on flow in Table 2.5.a. All the associated primary and secondary clarification units, and UV disinfection units were sized/designed to meet all parameters outlined in the 96-1 regulations. The new blowers, and pumps will be VFD controlled to reduce energy demand, the blowers will run off feedback from DO sensors in the IFAS basin to optimize the system. Appendix E is a preliminary site layout, and hydraulic profile for the proposed facility.

6.3 Costs

For itemized costs associated with the IFAS system please refer to Appendix D. Included in Appendix are construction, equipment, and operation costs.

A full Rate Study was conducted along side the alternative assessment. Data was collected on all operating and capital expenditures that were related to waste water collection and treatment. This includes a portion of public works budget for dealing with the collection system. All expenditures were separated item by item, but also grouped together in larger subsections for readability. The subsections can be seen in the Projected Expenditures Table in Appendix F and a full expanded version showing each line item from the master spread sheet is available upon request in an excel spread sheet.

The history of each operating expenditure line item was analyzed and broken down into cost per gallon and percent increase per year for each. The combination of this and industry traits for each item were taken into account in projecting future cost for each line item. Some of the line items have “jump” increases in a particular year based on specifics from the new plant operations then continue to increase from the jump on a percentage basis. One example of this is the jump in the sewer plant personal services in 2009 base in the increase from three operators to four operators. Another example is the increase in sewer plant purchased services in 2012 accounting for the new pant coming on line, primarily due to increased electrical use of the IFAS system.

Projection of the capital expenditures was done in very much the same fashion. Additional data was included in the projection of the capital expenditures from the 2008 Water and Sewer Capital Detail document from the City of Salida, and estimated proposed WWTP. Another component which is factored into the projected capital cost is the estimate on loan/grant matches during large capital improvements, such as the WWTP expansion. Currently the WWTP is estimated at $12 million in 2010 with no grant (the spread sheet is set up to add that in if received) and is represented through 20 year loan with a 1.75% interest rate. The spreadsheet is created so that the actual interest rate can be plugged in whether higher or lower. There will, however, be future sewer infrastructure (lines, manholes, lift stations, meters) capital replacement projects which are represented in the capital expenditures as yearly amounts as well. It is anticipated that such projects will not occur every year but this expenditure is added annually to total up for larger projects.

The construction of a new WWTP starting in 2010 had many effects on both the capital and operating projected expenditures from capital cost to the additional staffing, training, materials, and electricity these anticipated cost increases are itemized in the spreadsheet.

After projected expenditures were estimated, the revenues were created based on the projected population increase. The population was converted into EQRs to relate wastewater flow as this is how customers are billed, not by number of people. The first step in evaluating the rate structure is to run the projected development and population increase using the current rates. The cash flow is then evaluated to see how the projected revenues with the current rates balance to the projected expenditures. Then a number of iterations were preformed to find optimal rate increases to balance out the cash flow. The recommended, but not yet adopted, rate increase is an initial 15% rate increase in 2009 followed in 2011 8% increase every other year after that. See Appendix F for 20 year cash flow with recommended rates.

6.4 Project Implementation

The City of Salida is currently scheduling a public meeting to present the proposed plant to stakeholders. A public notice of this meeting will be published in the local newspapers 30 days prior to the meeting. After the meeting has occurred the city will send a summary of the public response/concerns raised at the meeting to the CDPHE.

The following is a workable timeline for the design, permitting and construction of the Salida WWTF. This timeline assumes efficient processing by all regulatory agencies.

Notice of Public meeting Published	Jan. 19, 2009
CDPHE Preliminary Effluent Limit	Feb. 1, 2009
Public Meeting Held	Feb. 19, 2009

CDPHE Site Application	Mar. 1, 2009
CDPHE Process Design Report	Apr. 15, 2009
CDPHE Construction Review	June 1, 2009
Advertise Bid	July 1, 2009
Open Bids	Aug 1, 2009
Award Bid	Aug. 15, 2009
Start Construction	Aug 30, 2009
Storm Water Mgmt Permit	Sept. 1, 2009
Draft O&M manual	April 2010
NPDES Discharge Permit application	May 2010
Plant Startup	Nov. 2010

Projected Expenditures

Operating Expenditures:	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Sewer Plant Personnel Services	$237,589	$333,200	$352,731	$373,454	$395,445	$418,786	$443,564	$469,872	$497,809	$527,482	$559,004	$592,497	$628,091	$665,924	$706,145	$748,914	$794,400	$842,787	$894,269	$949,057	$1,007,375	$1,069,462	$1,135,578	$1,205,999	$1,281,022	$1,360,965	$1,446,170	$1,537,004
PW/Sewer Collection System Personnel Services	$22,922	$24,252	$25,765	$27,264	$28,856	$30,548	$32,345	$34,254	$36,284	$38,443	$40,738	$43,180	$45,779	$48,544	$51,488	$54,624	$57,964	$61,522	$65,314	$69,357	$73,668	$78,267	$83,173	$88,410	$94,000	$99,970	$106,346	$113,159
Total Personnel Services Costs	$260,511	$357,452	$378,495	$400,717	$424,301	$449,333	$475,908	$504,126	$534,094	$565,925	$599,743	$635,678	$673,869	$714,468	$757,634	$803,538	$852,364	$904,309	$959,584	$1,018,414	$1,081,043	$1,147,729	$1,218,752	$1,294,409	$1,375,022	$1,460,934	$1,552,516	$1,650,163
Sewer Plant Supplies	$72,035	$78,917	$86,525	$94,939	$104,251	$112,063	$120,487	$129,572	$139,369	$149,938	$161,337	$173,636	$186,904	$201,220	$216,667	$233,337	$251,328	$270,744	$291,701	$314,322	$338,741	$365,103	$393,562	$424,289	$457,465	$493,287	$531,969	$573,741
PW/Sewer Collection System Supplies	$2,300	$2,369	$2,440	$2,513	$2,589	$2,666	$2,746	$2,829	$2,914	$3,001	$3,091	$3,184	$3,279	$3,378	$3,479	$3,583	$3,691	$3,802	$3,916	$4,033	$4,154	$4,279	$4,407	$4,539	$4,675	$4,816	$4,960	$5,109
Total Supplies Costs	$74,335	$81,286	$88,965	$97,453	$106,839	$114,729	$123,233	$132,400	$142,283	$152,939	$164,428	$176,819	$190,183	$204,597	$220,146	$236,921	$255,019	$274,546	$295,617	$318,355	$342,895	$369,381	$397,969	$428,828	$462,140	$498,103	$536,929	$578,850
Sewer Plant Purchased Services	$208,305	$186,956	$202,939	$239,300	$265,106	$285,236	$306,792	$329,879	$354,612	$381,113	$409,513	$439,957	$472,595	$507,595	$545,135	$585,406	$628,617	$674,991	$724,769	$778,214	$835,605	$897,248	$963,469	$1,034,625	$1,111,098	$1,193,301	$1,281,683	$1,376,727
PW/Sewer Collection System Purchased Services	$52,960	$49,868	$51,852	$53,915	$56,061	$58,292	$60,613	$63,027	$65,538	$68,149	$70,864	$73,689	$76,626	$79,682	$82,859	$86,164	$89,602	$93,178	$96,897	$100,765	$104,789	$108,974	$113,327	$117,855	$122,565	$127,464	$132,560	$137,861
Total Purchased Services Cost	$261,265	$236,824	$254,791	$293,215	$321,167	$343,528	$367,405	$392,906	$420,150	$449,261	$480,378	$513,645	$549,222	$587,277	$627,994	$671,570	$718,219	$768,168	$821,666	$878,979	$940,394	$1,006,221	$1,076,796	$1,152,480	$1,233,662	$1,320,765	$1,414,243	$1,514,588
Sewer Plant Construction and Building Materials	$2,650	$2,797	$2,954	$3,121	$3,299	$3,490	$3,693	$3,910	$4,143	$4,391	$4,657	$4,942	$5,247	$5,574	$5,924	$6,300	$6,703	$7,136	$7,601	$8,100	$8,636	$9,213	$9,833	$10,500	$11,218	$11,990	$12,822	$13,718
PW/Sewer Collection System Cons. & Build'g Mat.	$3,300	$3,446	$3,599	$3,759	$3,927	$4,102	$4,286	$4,479	$4,680	$4,892	$5,114	$5,346	$5,589	$5,845	$6,112	$6,393	$6,687	$6,996	$7,320	$7,659	$8,016	$8,390	$8,782	$9,194	$9,626	$10,080	$10,557	$11,057
Total Construction & Building Materials Cost	$5,950	$0	$6,553	$6,880	$7,226	$7,592	$7,979	$8,389	$8,823	$9,283	$9,771	$10,288	$10,837	$11,419	$12,037	$12,693	$13,391	$14,132	$14,921	$15,759	$16,652	$17,603	$18,615	$19,694	$20,844	$22,070	$23,379	$24,775
Sewer Plant Fixed Costs	$37,715	$39,676	$41,739	$43,909	$46,193	$48,595	$51,121	$53,779	$56,576	$59,518	$62,612	$65,868	$69,293	$72,896	$76,687	$80,674	$84,869	$89,282	$93,924	$98,808	$103,946	$109,351	$115,037	$121,018	$127,311	$133,931	$140,895	$148,221
Total Fixed Costs	$37,715	$39,676	$41,739	$43,909	$46,193	$48,595	$51,121	$53,779	$56,576	$59,518	$62,612	$65,868	$69,293	$72,896	$76,687	$80,674	$84,869	$89,282	$93,924	$98,808	$103,946	$109,351	$115,037	$121,018	$127,311	$133,931	$140,895	$148,221
Sewer Plant Maint. Of Existing Infrastructure	$94,000	$103,400	$113,740	$125,114	$137,625	$151,388	$166,527	$183,179	$201,497	$221,647	$243,812	$268,193	$295,012	$324,513	$356,965	$392,661	$431,927	$475,120	$522,632	$574,895	$632,385	$695,623	$765,186	$841,704	$925,875	$1,018,462	$1,120,309	$1,232,339
PW/Sewer collection System Maint. Of Ex. Infras.	$247,426	$257,323	$267,616	$278,321	$289,453	$301,032	$313,073	$325,596	$338,620	$352,164	$366,251	$380,901	$396,137	$411,982	$428,462	$445,600	$463,424	$481,961	$501,240	$521,289	$542,141	$563,826	$586,380	$609,835	$634,228	$659,597	$685,981	$713,420
Total Maint. Of Existing Infrastructure	$341,426	$360,723	$381,356	$403,435	$427,079	$452,420	$479,600	$508,775	$540,117	$573,811	$610,063	$649,094	$691,149	$736,496	$785,427	$838,262	$895,352	$957,081	$1,023,872	$1,096,185	$1,174,526	$1,259,450	$1,351,565	$1,451,539	$1,560,103	$1,678,060	$1,806,290	$1,945,760
Total Sewer Plant Operating Expenditures	$652,294	$744,946	$800,628	$879,837	$951,918	$1,019,556	$1,092,183	$1,170,192	$1,254,007	$1,344,088	$1,440,937	$1,545,093	$1,657,142	$1,777,723	$1,907,523	$2,047,293	$2,197,844	$2,360,060	$2,534,897	$2,723,397	$2,926,688	$3,146,000	$3,382,665	$3,638,136	$3,913,988	$4,211,937	$4,533,848	$4,881,751
Total PW/Sewer Collection System Operating Exp.	$328,908	$337,258	$351,271	$365,772	$380,886	$396,640	$413,063	$430,185	$448,036	$466,649	$486,058	$506,300	$527,411	$549,430	$572,401	$596,365	$621,368	$647,458	$674,686	$703,104	$732,768	$763,735	$796,069	$829,832	$865,094	$901,926	$940,404	$980,606
Total Operating Expenditures	**$981,202**	**$1,082,204**	**$1,151,899**	**$1,245,609**	**$1,332,804**	**$1,416,196**	**$1,505,247**	**$1,600,376**	**$1,702,042**	**$1,810,737**	**$1,926,995**	**$2,051,392**	**$2,184,553**	**$2,327,153**	**$2,479,924**	**$2,643,657**	**$2,819,212**	**$3,007,518**	**$3,209,583**	**$3,426,501**	**$3,659,456**	**$3,909,735**	**$4,178,734**	**$4,467,968**	**$4,779,082**	**$5,113,863**	**$5,474,252**	**$5,862,357**

Capital Expenditures:	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Sewer Plant Maintenance Machinery & Equipment	$10,000	$10,400	$10,816	$11,249	$11,699	$11,933	$12,171	$12,415	$12,663	$12,916	$13,175	$13,438	$13,707	$13,981	$14,261	$14,831	$15,424	$16,041	$16,683	$17,350	$18,044	$18,766	$19,516	$20,297	$21,109	$21,953	$22,832	$23,745
P/W Sewer Collection System Main. Mach. & Equi.	$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$14,802	$15,395	$16,010	$16,651	$17,317	$18,009	$18,730	$19,479	$20,258	$21,068	$21,911	$22,788	$23,699	$24,647	$25,633	$26,658	$27,725	$28,834
Total Maintenance Machinery & Equipment Cost	$20,000	$20,800	$21,632	$22,497	$23,397	$24,099	$24,824	$25,574	$26,349	$27,149	$27,977	$28,833	$29,717	$30,632	$31,577	$32,840	$34,154	$35,520	$36,941	$38,419	$39,955	$41,554	$43,216	$44,944	$46,742	$48,612	$50,556	$52,578
Sewer Plant Building Maintenance	$15,000	$15,600	$16,224	$16,873	$17,548	$17,723	$17,901	$18,080	$18,260	$18,443	$18,627	$18,814	$19,002	$19,192	$19,384	$20,159	$20,965	$21,804	$22,676	$23,583	$24,527	$25,508	$26,528	$27,589	$28,693	$29,840	$31,034	$32,275
Total Building Maintenance Cost	$15,000	$15,600	$16,224	$16,873	$17,548	$17,723	$17,901	$18,080	$18,260	$18,443	$18,627	$18,814	$19,002	$19,192	$19,384	$20,159	$20,965	$21,804	$22,676	$23,583	$24,527	$25,508	$26,528	$27,589	$28,693	$29,840	$31,034	$32,275
PW/Sewer Collection Infra. Replacement Maint.	$145,000	$150,800	$156,832	$163,105	$169,629	$176,415	$183,471	$190,810	$198,443	$206,380	$214,635	$223,221	$232,150	$241,436	$251,093	$261,137	$271,582	$282,446	$293,743	$305,493	$317,713	$330,421	$343,638	$357,384	$371,679	$386,546	$402,008	$418,088
Total Infrastructure Replacement & Maintenance	$145,000	$150,800	$156,832	$163,105	$169,629	$176,415	$183,471	$190,810	$198,443	$206,380	$214,635	$223,221	$232,150	$241,436	$251,093	$261,137	$271,582	$282,446	$293,743	$305,493	$317,713	$330,421	$343,638	$357,384	$371,679	$386,546	$402,008	$418,088
Sewer Plant New Infrastructure	$15,000	$15,600	$16,224	$16,873	$17,548	$18,250	$18,980	$19,739	$20,529	$21,350	$22,204	$23,092	$24,015	$24,976	$25,975	$27,014	$28,095	$29,219	$30,387	$31,603	$32,867	$34,182	$35,549	$36,971	$38,450	$39,988	$41,587	$43,251
PW/Sewer Collection System New Infrastructure	$50,000	$52,000	$54,080	$56,243	$58,493	$60,833	$63,266	$65,797	$68,428	$71,166	$74,012	$76,973	$80,052	$83,254	$86,584	$90,047	$93,649	$97,395	$101,291	$105,342	$109,556	$113,938	$118,496	$123,236	$128,165	$133,292	$138,623	$144,168
Total New Infrastructure Costs	$65,000	$67,600	$70,304	$73,116	$76,041	$79,082	$82,246	$85,536	$88,957	$92,515	$96,216	$100,065	$104,067	$108,230	$112,559	$117,061	$121,744	$126,614	$131,678	$136,945	$142,423	$148,120	$154,045	$160,207	$166,615	$173,279	$180,211	$187,419
Sewer Plant Debt Service	$67,272	$67,273	$783,568	$783,568	$783,568	$783,568	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$0	$0				
Total Debt Services Cost	$67,272	$67,273	$783,568	$783,568	$783,568	$783,568	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$0	$0	$0	$0	$0	$0
Total Sewer Plant Capital Expenditures	$107,272	$82,873	$799,792	$800,441	$801,116	$801,817	$735,274	$736,034	$736,823	$737,644	$738,498	$739,387	$740,310	$741,271	$742,270	$743,309	$744,389	$745,513	$746,682	$747,897	$749,162	$750,476	$35,549	$36,971	$38,450	$39,988	$41,587	$43,251
Total PW/Sewer Collection System Capital Expen.	$205,000	$52,000	$54,080	$56,243	$58,493	$60,833	$63,266	$65,797	$68,428	$71,166	$74,012	$76,973	$80,052	$83,254	$86,584	$90,047	$93,649	$97,395	$101,291	$105,342	$109,556	$113,938	$118,496	$123,236	$128,165	$133,292	$138,623	$144,168
Total Capital Expenditures	**$312,272**	**$134,873**	**$853,872**	**$856,684**	**$859,609**	**$783,568**	**$716,295**	**$801,830**	**$805,252**	**$808,810**	**$812,511**	**$816,359**	**$820,362**	**$824,524**	**$828,854**	**$833,356**	**$838,038**	**$842,908**	**$847,973**	**$853,240**	**$858,718**	**$864,415**	**$154,045**	**$160,207**	**$166,615**	**$173,279**	**$180,211**	**$187,419**

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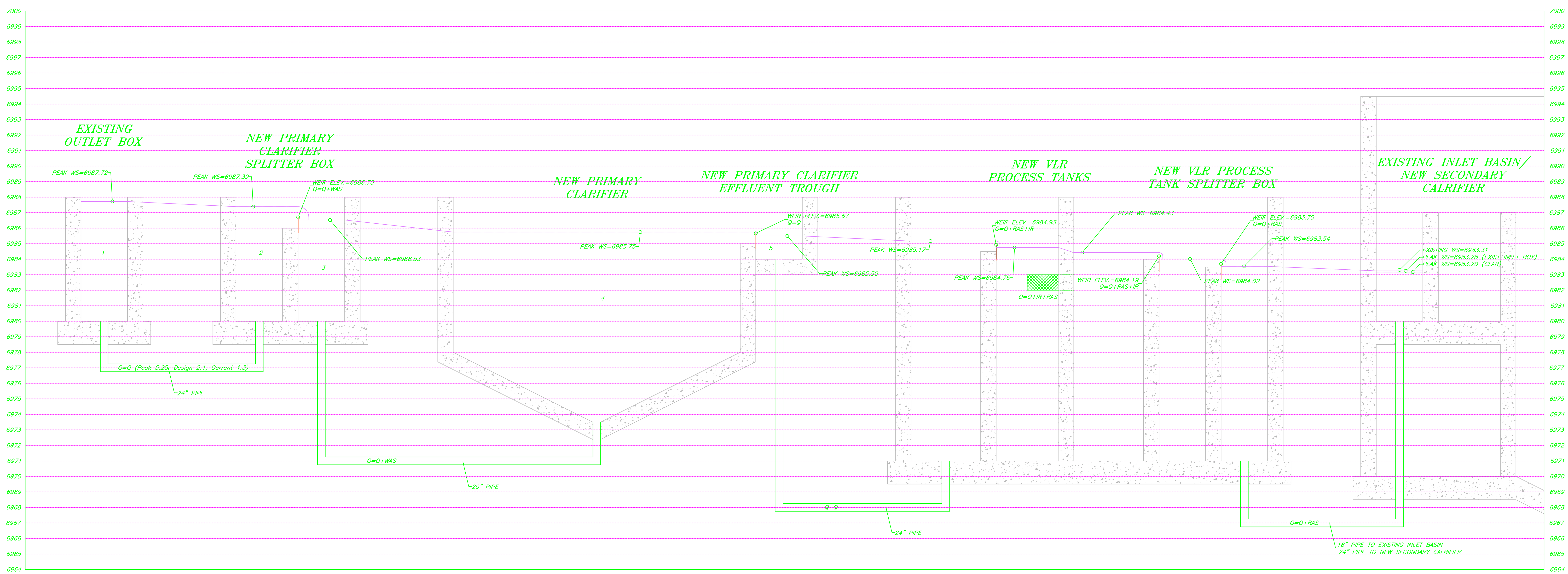


NOT FOR CONSTRUCTION

SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

SCHMUESER GORDON MEYER
118 W. 6th Street, Suite 200
Glenwood Springs, Colorado 81601
(970) 945-1004 FAX (970) 945-5948
Aspen, Colorado (970) 925-6727
Crested Butte, CO (970) 349-5355

SALIDA WWTF
Salida, Colorado

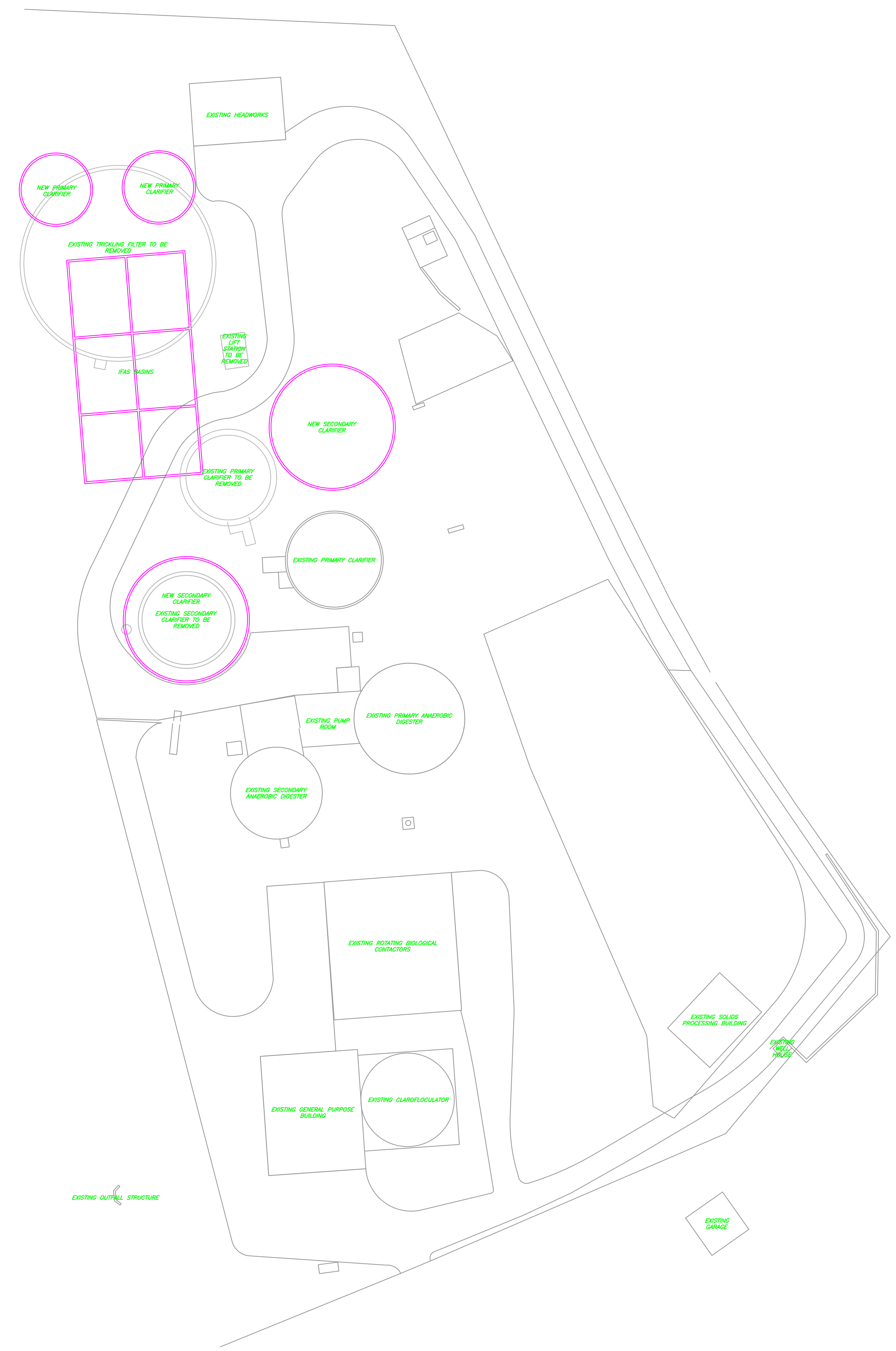
NUMBER	REVISION	DATE	BY

KRUGER
FIXED-FILM
ACTIVED SLUDGE

Job No.	2008-380
Drawn by:	AMK
Date:	10/06/08
QC:	PE:
File:	HydProfile

IFAS

OF



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SALIDA WWTF
Salida, Colorado

NUMBER	REVISION	DATE	BY

KRUGER FIXED-FILM ACTIVED SLUDGE

Job No.	2008-380
Drawn by:	AMK
Date:	10/06/08
QC:	PE:
File:	SITEPROCESSLAYOUT

IFAS

OF

Appendix D

Cost Summary

COMPONENT	MLE	Aeration Industries	Siemens VLR	Kruger IFAS
capital cost	$ 13,216,600	$ 13,689,000	$ 13,201,900	$ 12,574,000
annual cost	$ 1,008,500	$ 1,024,800	$ 1,015,500	$ 1,074,400
annual cost present worth	$ 12,568,100	$ 12,771,300	$ 12,655,400	$ 13,389,400
total present worth	**$ 25,784,700**	**$ 26,460,300**	**$ 25,857,300**	**$ 25,963,400**

Annual Cost Summary

PROCESS	Units	MLE	Aeration Industries	Siemens VLR	Kruger IFAS
Capital Cost					
Equipment		$ 4,581,600	$ 5,072,400	$ 5,707,900	$ 6,680,900
Structures		$ 8,635,000	$ 8,616,600	$ 7,494,000	$ 5,893,100
Total Capital Cost		$ 13,216,600	$ 13,689,000	$ 13,201,900	$ 12,574,000
Labor Cost					
number of operators		4	4	4	4
work hours	per person	40	40	40	40
Total Labor Cost	$/ year	$ 360,000	$ 360,000	$ 360,000	$ 360,000
Power Usage					
Electrical equip. run time	Days /wk	7	7	7	7
	Hrs /day	24	24	24	24
Installed Horsepower	hp	460	450	375	490
Used Horsepower	hp	276	270	225	294
Process Electricity usage	kWhrs /yr	1,797,984	1,758,898	1,465,748	1,915,244
Total Process Power Cost	$/year	$ 143,839	$ 140,712	$ 117,260	$ 153,220
Other Power Consumption In Plant	$/year	$ 60,000	$ 60,000	$ 60,000	$ 60,000
Total Power Costs	$/year	$ 203,839	$ 200,712	$ 177,260	$ 213,220
Plant Supply Costs	$/year	$ 75,000	$ 75,000	$ 75,000	$ 75,000
Maintenance Cost					
Equipment (4%)		$ 183,264	$ 202,896	$ 228,316	$ 267,236
Structures (1%)		$ 86,350	$ 86,166	$ 74,940	$ 58,931
Total Maintenance Cost	$/year	$ 269,614	$ 289,062	$ 303,256	$ 326,167
Total Annual Costs					
Total Annual Costs	**$/year**	**$ 1,008,500**	**$ 1,024,800**	**$ 1,015,500**	**$ 1,074,400**

MLE Cost Analysis

	Quantity	Units	Unit Price $	Total $
Equipment				
Lift Station Costs	1	LS	100000	100,000
Primary clarifier mechanisms	1	EA	110,000	110,000
Primary clarifier pumps	1	LS	30,000	30,000
Aeration system	1	EA	200,000	200,000
Piping	1	LS	500,000	500,000
Septage Receiving Station	1	LS	275,000	275,000
Blowers	4	LS	45,000	180,000
Clarifier mechanisms	2	EA	102,500	205,000
RAS/WAS pumps	3	EA	22,000	66,000
Grit Pumps	2	EA	20,000	40,000
UV Disinfection System	1	LS	200,000	200,000
SCADA / Electrical	1	LS	300,000	300,000
Odor Control System	1	LS	450,000	450,000
contractor overhead & profit	10	%		265,600
mobilization/demobilization	10	%		265,600
contingencies	25	%		796,800
engineering and inspection	15	%		597,600
EQUIPMENT SUBTOTAL				4,581,600
Structures				
Primary clarifier slab	119	CY	700	83,300
Primary clarifier walls	121	CY	800	96,800
Primary clarifier covers	232	SF	100	23,248
Aeration tank slabs	980	CY	700	686,000
Aeration tank walls	900	CY	800	720,000
Aeration basin covers	15,048	SF	100	1,504,800
clarifiers slab	280	CY	700	196,000
clarifiers walls	290	CY	800	232,000
Secondary clarifier covers	6,637	SF	100	663,661
Primary sludge pumping	2,000	SF	200	400,000
RAS/WAS building	2,000	SF	200	400,000
contractor overhead & profit	10	%		500,581
mobilization/demobilization	10	%		500,581
contingencies	25	%		1,501,743
engineering and inspection	15	%		1,126,307
STRUCTURES SUBTOTAL				8,635,000
FACILITIES				**$13,216,600**

Aeration Industries Oxidation Ditch Cost Analysis

	Quantity	Units	Unit Price $	Total $
Equipment				
Lift Station Costs	1	LS	100000	100,000
Primary clarifier mechanisms	2	EA	110,000	220,000
Primary clarifier pumps	1	LS	30,000	30,000
Mixing & Aeration & Controls	1	LS	505,304	505,304
Clarifier mechanisms	2	EA	102,500	205,000
Piping	1	LS	500,000	500,000
Septage Receiving Station	1	LS	275,000	275,000
RAS/WAS pumps	1	LS	115,243	115,243
Grit Pumps	2	EA	20,000	40,000
UV Disinfection System	1	LS	200,000	200,000
SCADA / Electrical	1	LS	300,000	300,000
Odor Control System	1	LS	450,000	450,000
contractor overhead & profit	10	%		294,055
mobilization/demobilization	10	%		294,055
contingencies	25	%		882,164
engineering and inspection	15	%		661,623
EQUIPMENT SUBTOTAL				5,072,400
Structures				
Primary clarifier slab	119	CY	700	83,300
Primary clarifier walls	121	CY	800	96,800
Primary clarifier covers	232	SF	100	23,248
oxidation ditch slab	884	CY	700	618,975
oxidation ditch walls	857	CY	800	685,278
oxidation ditch aerator mixer mounting platforms	34	CY	700	23,520
Oxidation ditch covers	15,723	SF	100	1,572,350
clarifiers slab	280	CY	700	196,000
clarifiers walls	290	CY	800	232,000
Secondary clarifier covers	6,637	SF	100	663,661
RAS/WAS building	2,000	SF	200	400,000
Primary sludge pumping	2,000	SF	200	400,000
contractor overhead & profit	10	%		499,513
mobilization/demobilization	10	%		499,513
contingencies	25	%		1,498,540
engineering and inspection	15	%		1,123,905
STRUCTURES SUBTOTAL				8,616,600
FACILITIES				**$13,689,000**

Siemens VLR Cost Analysis

	Quantity	Units	Unit Price $	Total $
Equipment				
Lift Station Costs	1	LS	100,000	100,000
Primary clarifier mechanisms	1	EA	110,000	110,000
Primary clarifier pumps	1	LS	30,000	30,000
Vertical Loop Reactor equipment	1	LS	897,950	897,950
Coarse bubble diffuser blower	3	EA	45,000	135,000
Clarifier mechanisms	2	EA	102,500	205,000
Piping	1	LS	500,000	500,000
Septage Receiving Station	1	LS	275,000	275,000
RAS/WAS pumps	3	EA	22,000	66,000
Grit Pumps	2	EA	20,000	40,000
UV Disinfection System	1	LS	200,000	200,000
SCADA / Electrical	1	LS	300,000	300,000
Odor Control System	1	LS	450,000	450,000
contractor overhead & profit	10	%		330,895
mobilization/demobilization	10	%		330,895
contingencies	25	%		992,685
engineering and inspection	15	%		744,514
EQUIPMENT SUBTOTAL				5,707,900
Structures				
Primary clarifier slab	119	CY	700	83,300
Primary clarifier walls	121	CY	800	96,800
Primary clarifier covers	232	SF	100	23,248
oxidation ditch slab	627	CY	700	438,667
oxidation ditch walls	853	CY	800	682,667
Oxidation ditch covers	11,280	SF	100	1,128,000
clarifiers slab	280	CY	700	196,000
clarifiers walls	290	CY	800	232,000
Secondary clarifier covers	6,637	SF	100	663,661
RAS/WAS building	2,000	SF	200	400,000
Primary sludge pumping	2,000	SF	200	400,000
contractor overhead & profit	10	%		434,434
mobilization/demobilization	10	%		434,434
contingencies	25	%		1,303,303
engineering and inspection	15	%		977,477
STRUCTURES SUBTOTAL				7,494,000
FACILITIES				**$13,201,900**

Krüger IFAS Cost Analysis

	Quantity	Units	Unit Price $	Total $
Equipment				
Lift Station Costs	1	LS	100000	100,000
Primary clarifier mechanisms	1	EA	110,000	110,000
Primary clarifier pumps	1	LS	30,000	30,000
Mixing & Aeration syst/ Media / Sieves/Controls/Blowers/IR pumps	1	LS	1,597,000	1,597,000
Clarifier mechanisms	2	EA	102,500	205,000
Piping	1	LS	500,000	500,000
Septage Receiving Station	1	LS	275,000	275,000
RAS/WAS pumps	3	EA	22,000	66,000
Grit Pumps	2	EA	20,000	40,000
UV Disinfection System	1	LS	200,000	200,000
SCADA / Electrical	1	LS	300,000	300,000
Odor Control System	1	LS	450,000	450,000
contractor overhead & profit	10	%		387,300
mobilization/demobilization	10	%		387,300
contingencies	25	%		1,161,900
engineering and inspection	15	%		871,425
EQUIPMENT SUBTOTAL				6,680,900
Structures				
Primary clarifier slab	119	CY	700	83,300
Primary clarifier walls	121	CY	800	96,800
Primary clarifier covers	232	SF	100	23,248
Process Tank Slab	399	CY	700	279,300
Process Tank Walls	440	CY	800	352,000
Process covers	6,900	SF	100	690,000
clarifiers slab	280	CY	700	196,000
clarifiers walls	290	CY	800	232,000
Secondary clarifier covers	6,637	SF	100	663,661
RAS/WAS building	2,000	SF	200	400,000
Primary sludge pumping	2,000	SF	200	400,000
contractor overhead & profit	10	%		341,631
mobilization/demobilization	10	%		341,631
contingencies	25	%		1,024,893
engineering and inspection	15	%		768,670
STRUCTURES SUBTOTAL				5,893,100
FACILITIES				**$12,574,000**

LEGEND

- W — WATER SPIGOT
- E — ELECTRIC SERVICE
- CO — CLEAN-OUT
- UTILITY POLE
- GUY WIRE
- SIGN
- G — GAS SERVICE
- MH — MANHOLE
- ET — ELECTRIC TRANSFORMER
- 6"SL — 6" SLUDGE LINE
- 6"W — 6" WATER LINE
- 12"W — 12" WATER LINE
- 14"W — 14" WATER LINE
- 10"W — 10" WATER LINE
- 18"W — 18" WATER LINE
- 21"W — 21" WATER LINE
- 24" INFLUENT — 24" INFLUENT LINE
- EX4"NP — EXISTING 4" NONPOTABLE WATER LINE
- EX4"Sludge — EXISTING 4" SLUDGE LINE
- ex6"Scum — EXISTING 6" SCUM LINE
- ex2"NP — EXISTING 2" NONPOTABLE WATER LINE
- ex6"SUP — EXISTING 6" SUPERNATANT
- X — EXISTING FENCELINE
- OHE — OVERHEAD ELECTRIC LINE
- 1"NP — MANHOLE
- EG — EXISTING GAS LINE
- N12"A — 12" AIR LINE
- E — ELECTRIC LINE
- IRR — IRRIGATION LINE
- 4"IRR — 4" IRRIGATION LINE
- UD — UNDERDRAIN LINE

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

NOTE: ALL INFORMATION FOR THIS EXHIBIT MAP WAS TAKEN FROM THE FOLLOWING SOURCES. ALL ACTUAL BUILDING LOCATIONS, SURFACE FEATURES, AND SERVICE LINES SHOULD BE FIELD VERIFIED FOR ANY FUTURE DESIGN OR CONSTRUCTION PURPOSES.

--McLAUGHLIN WATER ENGINEERS (DENVER JUNE 1984)

--BIGLOW LAND SURVEYORS (SALIDA)– WASTEWATER TREATMENT PLANT TOPOGRAPHY SURVEY, (MARCH 2003)

--RTW PROFESSIONAL ENGINEERS & CONSULTANTS, INC. (DENVER MAY 23, 2003)

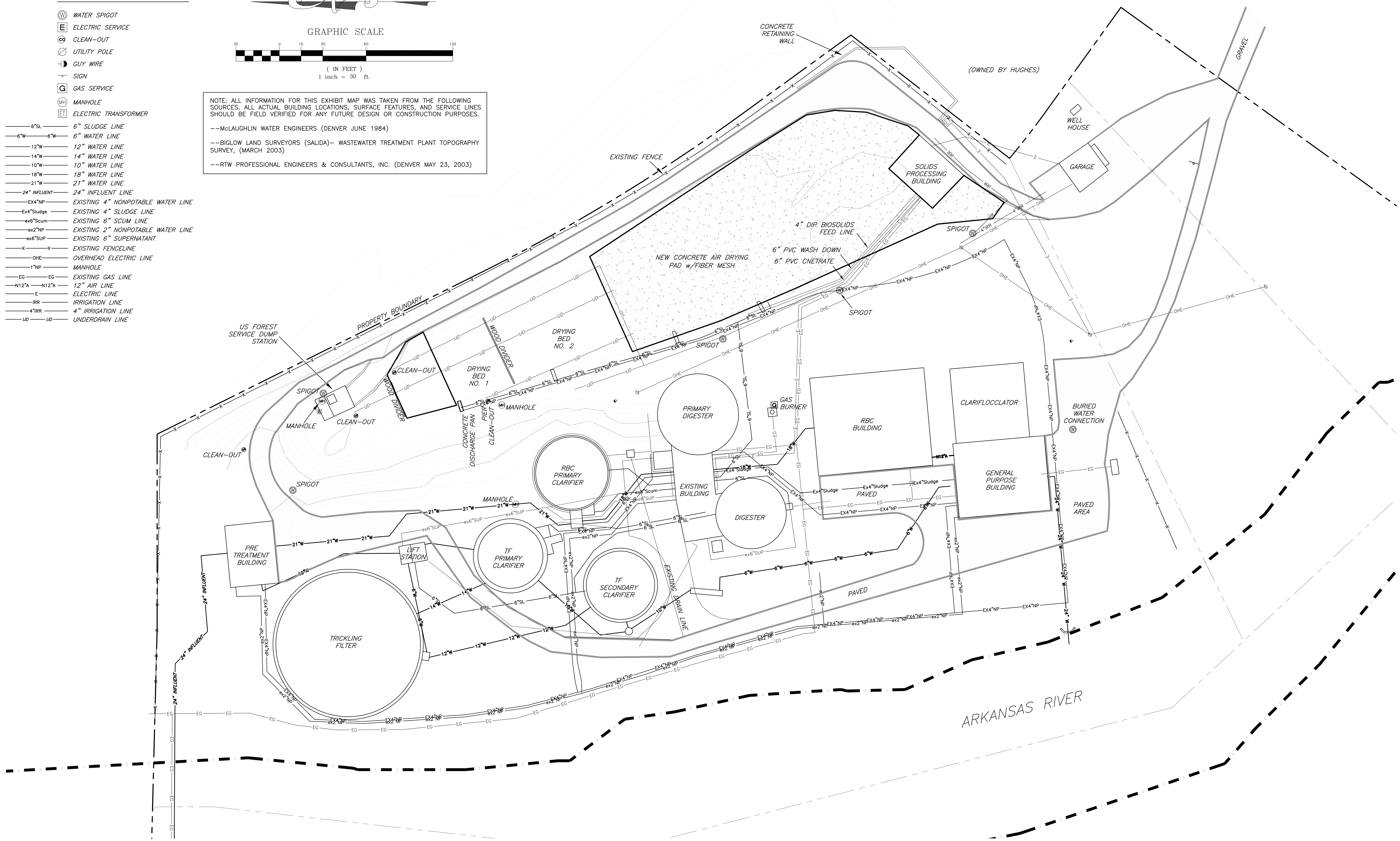

EXHIBIT MAP	SCHMUESER | GORDON | MEYER ENGINEERS | SURVEYORS	SCHMUESER GORDON MEYER 118 W. 6TH STREET, SUITE 200 GLENWOOD SPRINGS, COLORADO 81601 (970) 945-1004 FAX (970) 945-5948 ASPEN, COLORADO (970) 925-6727 CRESTED BUTTE, CO (970) 349-5355	CITY OF SALIDA

NUMBER	REVISION	DATE	BY

WASTEWATER TREATMENT PLANT SITE PLAN

Job No.	2008-380.001
Drawn by:	JK
Date:	01-16-09
QC:	PE:
File:	SITEPLAN

1 OF

PRELIMINARY
NOT
FOR
CONSTRUCTION

SCHMUESER | GORDON | MEYER
ENGINEERS | SURVEYORS

SCHMUESER GORDON MEYER
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Aspen, Colorado (970) 925-6727
Crested Butte, CO (970) 349-5355

Water & Sewer
Infrastructure

NUMBER	REVISION	DATE	BY

CITY OF
SALIDA

Job No.	2008-380
Drawn by:	MMM
Date:	1/16/09
QC:	PC:
File:	SGM-Salida-BM

OF

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CONSTRUCTION

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Aspen, Colorado (970) 925-6727
Crested Butte, CO (970) 349-5355

Wastewater Planning
Service Area

NUMBER	REVISION	DATE	BY

CITY OF
SALIDA

Job No.	2008-380
Drawn by:	MMM
Date:	1/16/09
QC:	PE:
File:	SGM-Salida-BM

OF

Table 8 Projected Cash Flow With Recommended Rates

	2003	2004	Actual 2005	2006	2007	Budget 2008	2009	2010	2011	2012	2013	Estimated 2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
OPERATING BUDGET							15% Increase	8% Every Other Year																									
Operating Revenues:																																	
Sewer Service Sales	$713,257	$783,962	$718,720	$764,329	$735,056	$750,660	$899,010	$944,038	$1,051,379	$1,094,120	$1,227,322	$1,267,876	$1,402,682	$1,432,951	$1,580,847	$1,616,097	$1,782,226	$1,824,287	$2,020,629	$2,069,370	$2,292,931	$2,354,524	$2,615,595	$2,694,491	$3,001,941	$3,100,515	$3,454,114	$3,566,438	$3,983,782	$4,126,528	$4,622,392	$4,799,710	$5,387,691
Late Fee	$1,100	$7,950	$5,244	$6,020	$5,000	$5,000	$5,050	$5,101	$5,152	$5,203	$5,255	$5,308	$5,361	$5,414	$5,468	$5,523	$5,578	$5,634	$5,690	$5,747	$5,805	$5,863	$5,922	$5,981	$6,041	$6,101	$6,162	$6,224	$6,286	$6,349	$6,412	$6,476	$6,541
Poncha Sewer Sales	$50,617	$74,617	$94,402	$60,499	$79,715	$102,848	$129,500	$139,942	$162,415	$173,692	$199,767	$209,815	$236,465	$243,042	$269,589	$276,692	$306,498	$314,169	$347,588	$355,873	$393,291	$402,238	$444,081	$453,745	$500,481	$510,917	$563,063	$574,334	$632,454	$644,628	$709,345	$722,492	$794,491
Septage	$29,603	$28,559	$24,761	$38,088	$41,126	$41,126	$42,154	$43,208	$44,288	$45,395	$46,530	$47,694	$48,886	$50,108	$51,361	$52,645	$53,961	$55,310	$56,693	$58,110	$59,563	$61,052	$62,578	$64,143	$65,746	$67,390	$69,074	$70,801	$72,571	$74,386	$76,245	$78,151	$80,105
Outside Lab Fees	$17,195	$15,323	$24,775	$18,212	$20,503	$20,000	$20,600	$21,218	$21,855	$22,510	$23,185	$23,881	$24,597	$25,335	$26,095	$26,878	$27,685	$28,515	$29,371	$30,252	$31,159	$32,094	$33,057	$34,049	$35,070	$36,122	$37,206	$38,322	$39,472	$40,656	$41,876	$43,132	$44,426
Operating Grant																																	
Other Revenue	$1,627	$862	$1,513	$1,099	$8,638	$9,141	$9,415	$9,698	$9,989	$10,288	$10,597	$10,915	$11,242	$11,580	$11,927	$12,285	$12,653	$13,033	$13,424	$13,827	$14,241	$14,669	$15,109	$15,562	$16,029	$16,510	$17,005	$17,515	$18,041	$18,582	$19,139	$19,713	$20,305
Interest	$1,699	$1,353	$2,801	$4,732	$10,988	$10,728	$9,477	$10,467	$11,120	$12,938	$13,878	$17,188	$19,511	$23,962	$26,673	$31,509	$34,348	$39,495	$42,372	$48,030	$51,069	$57,201	$60,453	$67,332	$71,103	$79,201	$83,920	$93,544	$99,197	$110,712	$117,995	$132,381	$142,215
Total Operating Revenues	**$815,098**	**$912,626**	**$872,216**	**$892,979**	**$901,026**	**$939,503**	**$1,115,206**	**$1,173,671**	**$1,306,197**	**$1,364,147**	**$1,526,534**	**$1,582,676**	**$1,748,744**	**$1,792,393**	**$1,971,960**	**$2,021,628**	**$2,222,949**	**$2,280,443**	**$2,515,766**	**$2,581,208**	**$2,848,059**	**$2,927,641**	**$3,236,794**	**$3,335,301**	**$3,696,411**	**$3,816,756**	**$4,230,544**	**$4,367,178**	**$4,851,803**	**$5,021,840**	**$5,593,405**	**$5,802,056**	**$6,475,774**
Operating Expenditures:																																	
Sewer Plant Personnel Services	$182,461	$215,488	$210,808	$218,266	$222,879	$237,589	$333,200	$352,731	$373,454	$395,445	$418,786	$443,564	$469,872	$497,809	$527,482	$559,004	$592,497	$628,091	$665,924	$706,145	$748,914	$794,400	$842,787	$894,269	$949,057	$1,007,375	$1,069,462	$1,135,578	$1,205,999	$1,281,022	$1,360,965	$1,446,170	$1,537,004
PW/Sewer Collection System Personnel Services	$57,939	$19,784	$17,193	$12,463	$9,871	$22,922	$24,252	$25,765	$27,264	$28,856	$30,548	$32,345	$34,254	$36,284	$38,443	$40,738	$43,180	$45,779	$48,544	$51,488	$54,624	$57,964	$61,522	$65,314	$69,357	$73,668	$78,267	$83,173	$88,410	$94,000	$99,970	$106,346	$113,159
Total Personnel Services Costs	$240,400	$235,272	$228,001	$230,729	$232,750	$260,511	$357,452	$378,495	$400,717	$424,301	$449,333	$475,908	$504,126	$534,094	$565,925	$599,743	$635,678	$673,869	$714,468	$757,634	$803,538	$852,364	$904,309	$959,584	$1,018,414	$1,081,043	$1,147,729	$1,218,752	$1,294,409	$1,375,022	$1,460,934	$1,552,516	$1,650,163
Sewer Plant Supplies	$38,092	$59,619	$45,577	$49,267	$65,532	$72,035	$78,917	$86,525	$94,939	$104,251	$112,063	$120,487	$129,572	$139,369	$149,938	$161,337	$173,636	$186,904	$201,220	$216,667	$233,337	$251,328	$270,744	$291,701	$314,322	$338,741	$365,103	$393,562	$424,289	$457,465	$493,287	$531,969	$573,741
PW/Sewer Collection System Supplies	$0	$629	$344	$2,256	$2,556	$2,300	$2,369	$2,440	$2,513	$2,589	$2,666	$2,746	$2,829	$2,914	$3,001	$3,091	$3,184	$3,279	$3,378	$3,479	$3,583	$3,691	$3,802	$3,916	$4,033	$4,154	$4,279	$4,407	$4,539	$4,675	$4,816	$4,960	$5,109
Total Supplies Costs	$38,092	$60,248	$45,921	$51,523	$68,088	$74,335	$81,286	$88,965	$97,453	$106,839	$114,729	$123,233	$132,400	$142,283	$152,939	$164,428	$176,819	$190,183	$204,597	$220,146	$236,921	$255,019	$274,546	$295,617	$318,355	$342,895	$369,381	$397,969	$428,828	$462,140	$498,103	$536,929	$578,850
Sewer Plant Purchased Services	$122,496	$125,170	$120,344	$143,281	$158,343	$208,305	$186,956	$202,939	$239,300	$265,106	$285,236	$306,792	$329,879	$354,612	$381,113	$409,513	$439,957	$472,595	$507,595	$545,135	$585,406	$628,617	$674,991	$724,769	$778,214	$835,605	$897,248	$963,469	$1,034,625	$1,111,098	$1,193,301	$1,281,683	$1,376,727
PW/Sewer Collection System Purchased Services	$51,000	$24,814	$36,082	$37,295	$45,374	$52,960	$49,868	$51,852	$53,915	$56,061	$58,292	$60,613	$63,027	$65,538	$68,149	$70,864	$73,689	$76,626	$79,682	$82,859	$86,164	$89,602	$93,178	$96,897	$100,765	$104,789	$108,974	$113,327	$117,855	$122,565	$127,464	$132,560	$137,861
Total Purchased Services Cost	$173,496	$149,984	$156,426	$180,576	$203,717	$261,265	$236,824	$254,791	$293,215	$321,167	$343,528	$367,405	$392,906	$420,150	$449,261	$480,378	$513,645	$549,222	$587,277	$627,994	$671,570	$718,219	$768,168	$821,666	$878,979	$940,394	$1,006,221	$1,076,796	$1,152,480	$1,233,662	$1,320,765	$1,414,243	$1,514,588
Sewer Plant Construction and Building Material	$839	$3,037	$1,791	$1,277	$1,235	$2,650	$2,797	$2,954	$3,121	$3,299	$3,490	$3,693	$3,910	$4,143	$4,391	$4,657	$4,942	$5,247	$5,574	$5,924	$6,300	$6,703	$7,136	$7,601	$8,100	$8,636	$9,213	$9,833	$10,500	$11,218	$11,990	$12,822	$13,718
PW/Sewer Collection System Cons. & Build'g Mat	$13,000	$1,380	$102	$97	$2,301	$3,300	$3,446	$3,599	$3,759	$3,927	$4,102	$4,286	$4,479	$4,680	$4,892	$5,114	$5,346	$5,589	$5,845	$6,112	$6,393	$6,687	$6,996	$7,320	$7,659	$8,016	$8,390	$8,782	$9,194	$9,626	$10,080	$10,557	$11,057
Total Construction & Building Materials Cost	$13,839	$4,417	$1,893	$1,374	$3,536	$5,950	$0	$6,553	$6,880	$7,226	$7,592	$7,979	$8,389	$8,823	$9,283	$9,771	$10,288	$10,837	$11,419	$12,037	$12,693	$13,391	$14,132	$14,921	$15,759	$16,652	$17,603	$18,615	$19,694	$20,844	$22,070	$23,379	$24,775
Sewer Plant Fixed Costs	$32,967	$22,846	$31,049	$33,946	$33,633	$37,715	$39,676	$41,739	$43,909	$46,193	$48,595	$51,121	$53,779	$56,576	$59,518	$62,612	$65,868	$69,293	$72,896	$76,687	$80,674	$84,869	$89,282	$93,924	$98,808	$103,946	$109,351	$115,037	$121,018	$127,311	$133,931	$140,895	$148,221
Total Fixed Costs	$32,967	$22,846	$31,049	$33,946	$33,633	$37,715	$39,676	$41,739	$43,909	$46,193	$48,595	$51,121	$53,779	$56,576	$59,518	$62,612	$65,868	$69,293	$72,896	$76,687	$80,674	$84,869	$89,282	$93,924	$98,808	$103,946	$109,351	$115,037	$121,018	$127,311	$133,931	$140,895	$148,221
Sewer Plant Maint. Of Existing Infrastructure	$34,488	$55,048	$96,218	$839	$10,741	$94,000	$103,400	$113,740	$125,114	$137,625	$151,388	$166,527	$183,179	$201,497	$221,647	$243,812	$268,193	$295,012	$324,513	$356,965	$392,661	$431,927	$475,120	$522,632	$574,895	$632,385	$695,623	$765,186	$841,704	$925,875	$1,018,462	$1,120,309	$1,232,339
PW/Sewer collection System Maint. Of Ex. Infras	$13,800	$52,183	$17,992	$258,551	$188,327	$247,426	$257,323	$267,616	$278,321	$289,453	$301,032	$313,073	$325,596	$338,620	$352,164	$366,251	$380,901	$396,137	$411,982	$428,462	$445,600	$463,424	$481,961	$501,240	$521,289	$542,141	$563,826	$586,380	$609,835	$634,228	$659,597	$685,981	$713,420
Total Maint. Of Existing Infrastructure	$48,288	$107,231	$114,210	$259,390	$199,068	$341,426	$360,723	$381,356	$403,435	$427,079	$452,420	$479,600	$508,775	$540,117	$573,811	$610,063	$649,094	$691,149	$736,496	$785,427	$838,262	$895,352	$957,081	$1,023,872	$1,096,185	$1,174,526	$1,259,450	$1,351,565	$1,451,539	$1,560,103	$1,678,060	$1,806,290	$1,945,760
Total Sewer Plant Operating Expenditures	$411,343	$481,208	$505,787	$446,876	$492,363	$652,294	$744,946	$800,628	$879,837	$951,918	$1,019,556	$1,092,183	$1,170,192	$1,254,007	$1,344,088	$1,440,937	$1,545,093	$1,657,142	$1,777,723	$1,907,523	$2,047,293	$2,197,844	$2,360,060	$2,534,897	$2,723,397	$2,926,688	$3,146,000	$3,382,665	$3,638,136	$3,913,988	$4,211,937	$4,533,848	$4,881,751
Total PW/Sewer Collection System Operating Exp	$135,739	$98,790	$71,713	$310,662	$248,429	$328,908	$337,258	$351,271	$365,772	$380,886	$396,640	$413,063	$430,185	$448,036	$466,649	$486,058	$506,300	$527,411	$549,430	$572,401	$596,365	$621,368	$647,458	$674,686	$703,104	$732,768	$763,735	$796,069	$829,832	$865,094	$901,926	$940,404	$980,606
Total Operating Expenditures	**$547,082**	**$579,998**	**$577,500**	**$757,538**	**$740,792**	**$981,202**	**$1,082,204**	**$1,151,899**	**$1,245,609**	**$1,332,804**	**$1,416,196**	**$1,505,247**	**$1,600,376**	**$1,702,042**	**$1,810,737**	**$1,926,995**	**$2,051,392**	**$2,184,553**	**$2,327,153**	**$2,479,924**	**$2,643,657**	**$2,819,212**	**$3,007,518**	**$3,209,583**	**$3,426,501**	**$3,659,456**	**$3,909,735**	**$4,178,734**	**$4,467,968**	**$4,779,082**	**$5,113,863**	**$5,474,252**	**$5,862,357**
OPERATING SURPLUS/DEFICIT						**-$41,699**	**$33,002**	**$21,772**	**$60,588**	**$31,343**	**$110,338**	**$77,430**	**$148,368**	**$90,351**	**$161,222**	**$94,633**	**$171,557**	**$95,890**	**$188,613**	**$101,285**	**$204,401**	**$108,428**	**$229,276**	**$125,718**	**$269,910**	**$157,300**	**$320,809**	**$188,444**	**$383,835**	**$242,758**	**$479,541**	**$327,804**	**$613,417**
RESERVE FUND BALANCE																																	
Beginning Reserves						**$357,593**	**$315,894**	**$348,896**	**$370,668**	**$431,256**	**$462,599**	**$572,936**	**$650,366**	**$798,734**	**$889,085**	**$1,050,307**	**$1,144,941**	**$1,316,498**	**$1,412,388**	**$1,601,001**	**$1,702,285**	**$1,906,687**	**$2,015,115**	**$2,244,391**	**$2,370,109**	**$2,640,019**	**$2,797,320**	**$3,118,128**	**$3,306,572**	**$3,690,407**	**$3,933,165**	**$4,412,706**	**$4,740,511**
Ending Reserves					**$357,593**	**$315,894**	**$348,896**	**$370,668**	**$431,256**	**$462,599**	**$572,936**	**$650,366**	**$798,734**	**$889,085**	**$1,050,307**	**$1,144,941**	**$1,316,498**	**$1,412,388**	**$1,601,001**	**$1,702,285**	**$1,906,687**	**$2,015,115**	**$2,244,391**	**$2,370,109**	**$2,640,019**	**$2,797,320**	**$3,118,128**	**$3,306,572**	**$3,690,407**	**$3,933,165**	**$4,412,706**	**$4,740,511**	**$5,353,927**
CAPITAL BUDGET								5% Increase 2010																									
Capital Revenue Sources:																																	
System Development Fees (Tap Fees)	$74,850	$60,993	$100,494	$171,427	$124,648	$77,500	$1,073,100	$760,200	$963,480	$955,080	$837,480	$658,560	$567,000	$575,400	$604,800	$588,000	$659,400	$722,400	$701,400	$764,400	$806,400	$873,600	$940,800	$1,008,000	$1,075,200	$1,066,800	$1,129,800	$1,222,200	$1,314,600	$1,407,000	$1,499,400	$1,591,800	$1,591,800
State Grants	$0	$0	$0	$160,214	$0	$0																											
Interest	$6,798	$5,412	$11,204	$18,928	$43,952	$42,911	$37,290	$66,556	$65,742	$70,919	$75,910	$79,805	$80,467	$75,836	$71,216	$67,232	$62,513	$59,680	$58,532	$56,594	$56,358	$57,240	$60,024	$64,762	$71,505	$80,309	$88,961	$99,591	$134,624	$173,294	$215,705	$261,959	$312,166
Receipts from Grand Ave.	$0	$0	$27,441	$2,847	$5,102	$4,500																											
Loan Proceeds	$428,000	$121,775	$0	$0	$0	$0																											
Total Capital Revenues	**$509,648**	**$188,180**	**$139,139**	**$353,416**	**$173,702**	**$124,911**	**$1,110,390**	**$826,756**	**$1,029,222**	**$1,025,999**	**$913,390**	**$738,365**	**$647,467**	**$651,236**	**$676,016**	**$655,232**	**$721,913**	**$782,080**	**$759,932**	**$820,994**	**$862,758**	**$930,840**	**$1,000,824**	**$1,072,762**	**$1,146,705**	**$1,147,109**	**$1,218,761**	**$1,321,791**	**$1,449,224**	**$1,580,294**	**$1,715,105**	**$1,853,759**	**$1,903,966**
Capital Expenditures:																																	
Sewer Plant Maintenance Machinery & Equipment						$10,000	$10,400	$10,816	$11,249	$11,699	$11,933	$12,171	$12,415	$12,663	$12,916	$13,175	$13,438	$13,707	$13,981	$14,261	$14,831	$15,424	$16,041	$16,683	$17,350	$18,044	$18,766	$19,516	$20,297	$21,109	$21,953	$22,832	$23,745
P/W Sewer Collection System Main. Mach. & Equi						$10,000	$10,400	$10,816	$11,249	$11,699	$12,167	$12,653	$13,159	$13,686	$14,233	$14,802	$15,395	$16,010	$16,651	$17,317	$18,009	$18,730	$19,479	$20,258	$21,068	$21,911	$22,788	$23,699	$24,647	$25,633	$26,658	$27,725	$28,834
Total Maintenance Machinery & Equipment Cost						$20,000	$20,800	$21,632	$22,497	$23,397	$24,099	$24,824	$25,574	$26,349	$27,149	$27,977	$28,833	$29,717	$30,632	$31,577	$32,840	$34,154	$35,520	$36,941	$38,419	$39,955	$41,554	$43,216	$44,944	$46,742	$48,612	$50,556	$52,578
Sewer Plant Building Maintenance						$15,000	$15,600	$16,224	$16,873	$17,548	$17,723	$17,901	$18,080	$18,260	$18,443	$18,627	$18,814	$19,002	$19,192	$19,384	$20,159	$20,965	$21,804	$22,676	$23,583	$24,527	$25,508	$26,528	$27,589	$28,693	$29,840	$31,034	$32,275
Total Building Maintenance Cost						$15,000	$15,600	$16,224	$16,873	$17,548	$17,723	$17,901	$18,080	$18,260	$18,443	$18,627	$18,814	$19,002	$19,192	$19,384	$20,159	$20,965	$21,804	$22,676	$23,583	$24,527	$25,508	$26,528	$27,589	$28,693	$29,840	$31,034	$32,275
PW/Sewer Collection Infra. Replacement Maint						$145,000	$150,800	$156,832	$163,105	$169,629	$176,415	$183,471	$190,810	$198,443	$206,380	$214,635	$223,221	$232,150	$241,436	$251,093	$261,137	$271,582	$282,446	$293,743	$305,493	$317,713	$330,421	$343,638	$357,384	$371,679	$386,546	$402,008	$418,088
Total Infrastructure Replacement & Maintenance						$145,000	$150,800	$156,832	$163,105	$169,629	$176,415	$183,471	$190,810	$198,443	$206,380	$214,635	$223,221	$232,150	$241,436	$251,093	$261,137	$271,582	$282,446	$293,743	$305,493	$317,713	$330,421	$343,638	$357,384	$371,679	$386,546	$402,008	$418,088
Sewer Plant New Infrastructure	$1,002,741	$260,209	$0	$6,043	$1,777	$15,000	$15,600	$16,224	$16,873	$17,548	$18,250	$18,980	$19,739	$20,529	$21,350	$22,204	$23,092	$24,015	$24,976	$25,975	$27,014	$28,095	$29,219	$30,387	$31,603	$32,867	$34,182	$35,549	$36,971	$38,450	$39,988	$41,587	$43,251
PW/Sewer Collection System New Infrastructure	$0	$695	$187,028	$7,300	$50,000	$50,000	$52,000	$54,080	$56,243	$58,493	$60,833	$63,266	$65,797	$68,428	$71,166	$74,012	$76,973	$80,052	$83,254	$86,584	$90,047	$93,649	$97,395	$101,291	$105,342	$109,556	$113,938	$118,496	$123,236	$128,165	$133,292	$138,623	$144,168
Sewer Plant Debt Service	$0	$67,272	$67,272	$67,272	$67,272	$67,272	$67,273	$783,568	$783,568	$783,568	$783,568	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$0	$0				
Total Debt Services Cost	$0	$67,272	$67,272	$67,272	$67,272	$67,272	$67,273	$783,568	$783,568	$783,568	$783,568	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$716,295	$0	$0	$0	$0	$0	$0
Total Sewer Plant Capital Expenditures	$1,002,741	$327,481	$67,272	$73,315	$69,049	$107,272	$82,873	$799,792	$800,441	$801,116	$801,817	$735,274	$736,034	$736,823	$737,644	$738,498	$739,387	$740,310	$741,271	$742,270	$743,309	$744,389	$745,513	$746,682	$747,897	$749,162	$750,476	$35,549	$36,971	$38,450	$39,988	$41,587	$43,251
Total PW/Sewer Collection System Capital Expen	$0	$695	$187,028	$7,300	$50,000	$205,000	$52,000	$54,080	$56,243	$58,493	$60,833	$63,266	$65,797	$68,428	$71,166	$74,012	$76,973	$80,052	$83,254	$86,584	$90,047	$93,649	$97,395	$101,291	$105,342	$109,556	$113,938	$118,496	$123,236	$128,165	$133,292	$138,623	$144,168
Total Capital Expenditures	**$1,002,741**	**$328,176**	**$254,300**	**$80,615**	**$119,049**	**$312,272**	**$134,873**	**$853,872**	**$856,684**	**$859,609**	**$783,568**	**$716,295**	**$801,830**	**$805,252**	**$808,810**	**$812,511**	**$816,359**	**$820,362**	**$824,524**	**$828,854**	**$833,356**	**$838,038**	**$842,908**	**$847,973**	**$853,240**	**$858,718**	**$864,415**	**$154,045**	**$160,207**	**$166,615**	**$173,279**	**$180,211**	**$187,419**
CAPITAL SURPLUS/DEFICIT						**-$187,361**	**$975,517**	**-$27,116**	**$172,539**	**$166,390**	**$129,823**	**$22,070**	**-$154,363**	**-$154,016**	**-$132,794**	**-$157,279**	**-$94,446**	**-$38,282**	**-$64,593**	**-$7,860**	**$29,402**	**$92,802**	**$157,916**	**$224,789**	**$293,465**	**$288,392**	**$354,346**	**$1,167,747**	**$1,289,017**	**$1,413,680**	**$1,541,825**	**$1,673,549**	**$1,716,547**
RESERVE FUND BALANCE																																	
Beginning Reserves						**$1,430,372**	**$1,243,011**	**$2,218,528**	**$2,191,413**	**$2,363,951**	**$2,530,341**	**$2,660,164**	**$2,682,234**	**$2,527,871**	**$2,373,855**	**$2,241,061**	**$2,083,782**	**$1,989,336**	**$1,951,055**	**$1,886,462**	**$1,878,602**	**$1,908,004**	**$2,000,806**	**$2,158,722**	**$2,383,511**	**$2,676,976**	**$2,965,368**	**$3,319,714**	**$4,487,461**	**$5,776,478**	**$7,190,158**	**$8,731,983**	**$10,405,532**
Ending Reserves					**$1,430,372**	**$1,243,011**	**$2,218,528**	**$2,191,413**	**$2,363,951**	**$2,530,341**	**$2,660,164**	**$2,682,234**	**$2,527,871**	**$2,373,855**	**$2,241,061**	**$2,083,782**	**$1,989,336**	**$1,951,055**	**$1,886,462**	**$1,878,602**	**$1,908,004**	**$2,000,806**	**$2,158,722**	**$2,383,511**	**$2,676,976**	**$2,965,368**	**$3,319,714**	**$4,487,461**	**$5,776,478**	**$7,190,158**	**$8,731,983**	**$10,405,532**	**$12,122,079**