RIVER ROCK COUNTY WATER AND SEWER DISTRICT

ALTERNATIVE ANALYSIS FOR WASTEWATER TREATMENT FACILITY IMPROVEMENTS

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EXECUTIVE SUMMARY

River Rock County Water and Sewer District

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INTRODUCTION

The purpose of this Executive Summary is to highlight the results of the preliminary report describing wastewater treatment and disposal alternatives available for the River Rock County Water and Sewer District (RRCWSD). The Executive Summary and the five chapters following applies to the Montana Ground Water Pollution Control System (MGWPCS) permit number MTX000147 for discharging wastewater effluent to ground water from the River Rock Subdivision. This report is organized into the following chapters:

Executive Summary
Chapter 1: Introduction and Regulatory
Chapter 2: Planning Situation
Chapter 3: Existing Wastewater Treatment Facilities
Chapter 4: Development of Treatment System Alternatives
Chapter 5: Implementation Plan

APPROACH TO ALTERNATIVES CONSIDERED

In order to provide wastewater treatment that satisfies the MGWPCS permit, RRCWSD will need to upgrade their existing facilities or find another effluent disposal method. The alternatives considered for the RRCWSD included options for continuing to treat the wastewater at the existing site and discharging into the existing IP cells and options for treating and/or disposing of the wastewater at other locations, such as using the effluent at a nearby land application site or sending wastewater to the City of Belgrade for treatment.

For the alternatives considered that utilize the existing site, River Rock's MGWPCS permit contains two discharge limits that define the alternatives available. These two limits are nitrate (the system is effectively required to produce effluent with less than 10.3 mg/l of total nitrate as N at the monitoring wells) and E. coli (the system is not allowed to have a detection of E. coli at the monitoring wells).

The nitrate limit will require a level of treatment beyond what a standard lagoon system is able to provide. Therefore, the alternatives considered included either upgrading the lagoon system with additional treatment steps or replacing the lagoon system with a different type of treatment system that is capable of removing nitrogen.

The E. coli limit will require the treatment system to include a membrane filter in order to provide an absolute barrier for E. coli. The membrane filter would be an ultrafilter that has nominal pore sizes that are smaller than the size of an E. coli bacteria. In addition, a backup ultraviolet light (UV) disinfection system will be included in the design just as a precaution.

In addition to the constraints of the permit limits described above, the selected alternative must be able to meet the compliance schedule contained in the permit. For the alternatives that utilize the existing site, all of the factors that affect schedule will be under the control of the District and therefore have a much higher probability of meeting the schedule. For the alternatives that will require coordination with other entities, there would be several important issues that would need to be resolved quickly in order to meet the compliance schedule. The compliance schedule is summarized as follows:

- 1. Secure funding and submit report to DEQ outlining funding resources by August 15, 2011.
- 2. Submit plans and specifications to DEQ by July 15, 2012.
- 3. Receive approval by DEQ for plans and specifications by December 1, 2012.
- 4. System fully operational by October 1, 2013.

While facility upgrade considerations must ensure the wastewater effluent quality for the RRCWSD is within permit limits, maintaining affordability for the wastewater users is also of primary concern. The alternatives chosen for discussion are tailored to the wastewater facility based on its size, type of users, available technologies, property availability, proximity to other facilities, and effluent disposal availability.

TREATMENT SYSTEM ALTERNATIVES

The following alternatives were reviewed with the constraints noted above, and briefly highlighted as to their major benefits and/or drawbacks.

1. No Action
2. Send Wastewater to the City of Belgrade
3. Land Application of Effluent
4. Lagoon Upgrades
5. Activated Sludge (Earthen Basin or Oxidation Ditch)
6. Membrane Bio Reactor (MBR)

No Action

A no action alternative is listed, but is not feasible given the groundwater discharge permit requirements and the existing wastewater facility inability to produce adequate effluent. At a point in the near future, without voluntary action by the RRCWSD, the situation would produce a violation of the permit and become actionable by MDEQ.

Send Wastewater to the City of Belgrade

The nearest feasible public sewer system connection to the RRCWSD is owned by the City of Belgrade. Existing City of Belgrade sewer main infrastructure is located approximately 2 miles from the existing RRCWSD wastewater treatment site near the intersection of Jackrabbit Lane and Amsterdam Road. Figure 4-1 shows the alternative pipeline routes that were evaluated. This alternative would seek to make use of existing City of Belgrade sewer infrastructure including their collection system and wastewater treatment facility. A sewer connection concept would require a new lift station and new forcemain piping to convey the RRCWSD wastewater east to the existing City of Belgrade facilities.

This connection option is attractive because RRCWSD would discharge raw sewage to the City of Belgrade and would no longer be treating and disposing of wastewater. That convenience is accompanied by some complex hurdles related to the City of Belgrade wastewater treatment capacity, cost of connection (which would likely be addressed by impact fees), consideration of annexation to the City of Belgrade, long-term user rate predictions, and the need for rights of way and easements for a forcemain pipeline. If this option were selected, such questions will require extensive effort that would unlikely be solved in the near term. In order to address some of the questions, it is expected that the City of Belgrade will undergo a process to reconcile growth planning efforts and wastewater facility planning for the future. At the time of this preliminary study, it appears that the RRCWSD and the City of Belgrade would be best served in working together in the long term to anticipate the infrastructure needs of the area regardless of how the RRCWSD decides address their wastewater treatment and disposal.

Based on the uncertainty of the sewer connection negotiation with the City of Belgrade and in the interest of satisfying the schedule included in the RRCWSD groundwater discharge permit, this option was not selected as the recommended alternative.

Land Application of Effluent

Land application in the form of spray irrigation is an effective way to beneficially use wastewater effluent to irrigate crops, pasture land, golf courses, and/or open space areas under appropriate treatment conditions and access restrictions. Three potential irrigation sites within a reasonable proximity to the RRCWSD that are owned by the State of Montana were evaluated for spray irrigation viability. These sites are shown on Figure 4-2. Two of the three sites currently operate center pivots on agricultural land and the third would require new irrigation equipment along with initiation of agricultural crop operation. Each of the sites would require a storage reservoir to store the treated effluent during the irrigation off season. Treated effluent can only be spray irrigated to match plant uptake of water and nutrients during the growing season.

Upon consideration of the three sites, it became apparent that only one of the sites would be a reasonable option for the RRCWSD. That site is located just over 1 mile northwest of the RRCWSD. It is the closest potential disposal site that is currently used for agricultural crop production and is irrigated. In addition, there is an existing 20-acre parcel that is owned by Gallatin County located between the disposal site and the RRCWSD facilities. This parcel was used as a gravel pit by the County for many years, but is now reclaimed and is expected to be sold in 2010. The combination of the preferred disposal and reservoir sites appears to provide a practical option for spray irrigation of the RRCWSD treated wastewater effluent.

This option would also encounter long-term negotiation challenges to purchase or lease property to store and dispose of treated effluent. It is expected that the Gallatin County parcel would be purchased and the State of Montana agricultural land would be leased for irrigation for at least 20 years. Both of those agencies are bound to follow purchase and lease processes which may be time consuming and somewhat unpredictable at the time of this preliminary study. Each of these purchase and lease processes would need to be independently successful for the spray irrigation option to work out. In addition to that, there would need to be lift stations and forcemains to move treated effluent from the RRCWSD treatment facility to the storage reservoir and spray irrigation sites. Rights of way and easements would need to be in place for location of the forcemain connection pipelines.

There are other challenges to this option that are related to public interaction with the storage reservoir and spray irrigation site. Each of these facilities could be viewed as a negative by the neighbors even with proper setbacks and security measures along with public education about the safety of land application of treated wastewater effluent. Trading the existing ground water discharge for spray irrigation may be viewed by some as moving the wastewater issues from one location to another.

Based on the uncertainty of purchase and lease of required land, a potential long time-line, and public perception challenges, this alternative was not selected as the recommended alternative.

Lagoon Upgrades

The lagoon upgrade alternative considered using the existing RRCWSD wastewater treatment infrastructure with the necessary upgrades to achieve permit compliance (see Figure 4-6). While initially this might have been thought to be the most cost competitive alternative, the instantaneous "non-detect" E. coli discharge limit in the MGWPCS permit for the monitoring wells just downstrem of the discharge requires additional levels of protection to insure permit compliance. For the purposes of this report, the method of removing E. coli would be a tertiary membrane filtration unit coupled with ultraviolet disinfection. The cost of these levels of protection makes the capital cost of this alternative more than other equivalent options, while providing no real advantages.

Based on the analysis of the practical efficiency of lagoon upgrades and the resulting high cost, this alternative was not selected as the recommended alternative.

Activated Sludge (Oxidation Ditch or Earthen Basin)

An activated sludge alternative would effectively convert the existing RRCWSD lagoons into a mechanical plant providing a great benefit in reducing the physical footprint size of the required plant along with provision for improved treatment (see Figure 4-7). This alternative would easily meet the total nitrogen requirements but due to the strict requirements on instantaneous E. coli contained in the MGWPCS permit, also requires additional levels of protection be included in this alternative. This alternative would also need a tertiary treatment membrane filtration unit coupled with ultraviolet disinfection. The result is, again, that while an effective and reliable design is available, the cost of treatment causes this alternative to be more expensive than other alternatives.

Based on the high cost compared to other solutions to wastewater treatment at the RRCWSD, this alternative was not selected as the recommended alternative.

Membrane Bio Reactor

This alternative takes advantage of newer technology advances in mechanical plants which results in providing the higher level of treatment required with fewer unit processes (see Figure 4-8). This alternative also allows for implementation while keeping the existing facility in operation greatly reducing any upsets during construction and startup. After startup, the existing lagoon cells would continue to be utilized; one as a sludge storage pond and the other as an emergency effluent storage pond. For this type of plant, cost competitive bids for the membrane equipment are usually obtained through a pre-selection process which allows the design to focus around one system. This alternative will allow the ability to have side by side treatment trains, providing the ability to expand the system sizing as the effluent flowrates expand, for whatever reason. This alternative provides the greatest flexibility, the lowest capital and present worth cost, and is the best fit for achieving the permit limits due to the technology benefits of utilizing an ultrafiltration system as an integral part of the activated sludge process. Therefore, this is the recommended alternative.

PROJECT PHASING

Average current flowrates are significantly less than the full MGWPCS permitted flow of 0.374 MGD and since it is desired to retain the full 0.374 MGD permit rating, the project is being approached in two phases. Under the first phase, the project will provide for treatment capability of an average daily flow of 0.2 MGD. This will satisfy the existing population while still providing for moderate growth or flow fluctuation of approximately 15%. A second phase, if needed, would expand the system design to achieve the full 0.374 MGD capability. This approach will fully allow RRCWSD to satisfy the new MGWPCS permit limits at current population levels at a lower cost and only expand in the future if expansion of the wastewater service area is required.

CAPITAL COSTS

Capital costs for Phase 1 for each of Alternatives C2-C6 are shown in Table 1-1.

TABLE 1-1
SUMMARY OF TREATMENT ALTERNATIVE COST ESTIMATES

Alternative	Cost Estimate
Alt C2: Send Wastewater to the City of Belgrade	$3.4 MM
Alt C3: Land Application of Effluent	$2.5 MM
Alt C4: Lagoon Upgrades	$2.8 MM
Alt C5: Activated Sludge (Earthen Basin or Oxidation Ditch)	$4.3 MM
Alt C6: Membrane Bio Reactor (MBR)	$2.5 MM

Present worth costs for Phase 1 are shown in Table 1-2.

TABLE 1-2
PRESENT WORTH COST COMPARISON

Alternative	Capital Cost	Annual O&M Cost	O&M Present Worth	Total Present Worth
C2 – Send WW to Belgrade	$3.47 MM	$44 K	$0.55 MM	$4.02 MM
C3 – Land Applications	$3.55 MM	$327 K	$4.09 MM	$7.63 MM
C4 – Lagoon Upgrades	$4.02 MM	$144 K	$1.79 MM	$5.81 MM
C5 – Oxidation Ditch with Nitrification and Denitrification	$6.16 MM	$86 K	$1.07 MM	$7.23 MM
C6 – Packaged Membrane Plant	$4.90 MM	$129 K	$1.61 MM	$6.50 MM

PROJECT IMPLEMENTATION

Project Implementation is proposed to meet the following schedule.

Phase 1

August 2010	Begin Engineering Design for Phase 1
Feb 2011	Bidding
April 2011	Begin Construction
March 2012	Complete Construction

Phase 2

At such time as the effluent flows reach an average daily flow of 0.19 MGD or if RRCWSD wants to consider expansion of service area, Phase 2 of the project would include adding treatment trains to accommodate the anticipated growth. Phase 1 would be designed to allow for expansion without disruption to the existing system.

CHAPTER 1
INTRODUCTION AND REGULATORY REQUIREMENTS

1.1 OBJECTIVE OF THIS REPORT

The objective of this report is to provide the River Rock County Water and Sewer District (RRCWSD) with the necessary information for deciding on improvements to the River Rock wastewater treatment facility (WWTF). This report will analyze treatment options available and establish a recommended course of action to meet the needs of the River Rock Subdivision and the requirements of State and Federal regulations.

1.2 REPORT ORGANIZATION

This report is organized into five chapters which includes the following:

Chapter 1: Introduction and Regulatory Requirements
Chapter 2: Planning Situation
Chapter 3: Existing Wastewater Treatment Facilities
Chapter 4: Development of Treatment System Alternatives
Chapter 5: Recommended Alternative and Implementation Plan

Chapters 1 through 4 address Circular DEQ 2, Chapter 10 requirements for Facility Plans. Chapter 5 presents the recommended alternative based on screening parameters and also includes an implementation plan.

1.3 BACKGROUND AND SCOPE

The RRCWSD was recently issued a new MGWPCS permit which became effective April 1, 2010. The permit and Statement of Basis are included in Appendix A. This permit introduced new compliance requirements and deadlines for the RRCWSD. While the original subdivision approval included a clause to maintain acreage (lease or owned) for spray irrigation as a fallback measure, that requirement was removed in approximately 2003 as reported in the Statement of Basis and the subdivision no longer owns or leases land suitable for spray irrigation. The requirement was removed by Montana DEQ (MDEQ) in exchange for having the RRCWSD submit a voluntary application for a MGWPCS permit. Since then, monitoring wells downgradient of the facility have shown elevated nitrate levels exceeding the DEQ-7 human health standard resulting in a violation of the Montana Water Quality Act. Consequently, the MGWPCS permit became mandatory, rather than voluntary.

This report will review options for the RRCWSD to bring the wastewater treatment facility into compliance with the new permit requirements. These options include various treatment technologies that could be implemented for improved wastewater treatment; connection to the City of Belgrade wastewater system, and evaluation of the original fallback plan of spray irrigation.

1.4 DISCHARGE PERMIT

The River Rock Subdivision is located 10 miles northwest of Bozeman, adjacent to Interstate 90 on the west side of Belgrade (see Figure 1-1). The wastewater treatment facility discharges its effluent to groundwater by infiltration via up to 8 infiltration/percolation (IP) beds.

The current MGWPCS permit is effective from April 1, 2010 till March 31, 2015. It includes effluent limits for facility discharge before it is disposed of in the IP beds, as well as ground water compliance limits, some of which apply at the sampling wells while others apply at the end of the mixing zone. The permit grants a mixing zone of 400 feet downgradient of the IP beds or generally north of the facility (see Attachment 4 to the Statement of Basis). The most important requirements are those including limits on total nitrogen, nitrate, BOD_5, and E. coli bacteria as discussed below.

1.4.1 Wastewater Effluent Requirements

The numeric effluent limits for Outfall 001 apply to effluent from the aerated lagoons before it is deposited in the IP ponds. Table 1-1 lists Outfall 001 effluent limits.

TABLE 1-1
OUTFALL 001 EFFLUENT LIMITS

Parameter	Effluent Limits (units as noted)
BOD_5	85% Removal
pH	6.0-9.0 s.u.
Total Inorganic Nitrogen as N	91.1 lbs/day
Effluent Flow Rate	0.374 mgd

The discharge permit also includes limits that apply at the end of the 400-foot mixing zone. However, monitoring wells MW-1 and MW-2 are located only about 50 feet north of the northern most IP bed. Therefore, limits for nitrate as given in Table 1-2 below are back calculated for the end of the mixing zone. E. coli limits are based on actual presence or absence of the bacteria and are not back calculated to the end of the mixing zone.

TABLE 1-2
MONITORING WELLS MW-1 & MW-2 EFFLUENT LIMITS

Parameter	Effluent Limits (units as noted)
E. coli	Less than 1 cfu/100 mL
Nitrate as N	10.3 mg/L

1.4.2 Wastewater Monitoring Requirements

1.4.2.1 Influent

Influent monitoring of BOD_5 is required to allow for the calculation of the overall percent reduction of BOD_5 through the facility as required by the permit (see Table 1-1). Data included in the Statement of Basis indicated at least four samples where monthly testing revealed this minimum removal rate had not been satisfied. Therefore, any alternative put forward must also provide the means to improve BOD_5 removal to satisfy permit requirements.

1.4.2.2 Effluent

In addition to the parameters given by the permit limits, Table 3 of the permit lists a number of parameters to be sampled for in the effluent from the aerated lagoon. These include chloride, additional species of nitrogen, phosphorous, oil and grease, and a number of metals among others.

1.4.2.3 Groundwater

Table 1-3 lists groundwater monitoring parameters and sample frequency. The parameters apply to all four monitoring wells with varying reporting periods as shown.

TABLE 1-3
GROUNDWATER MONITORING REQUIREMENTS

Parameter[1]	Frequency	Sample Type
Static Water Level	Monthly/Quarterly[2]	Instantaneous
E-coli organisms/100 ml	Monthly/Quarterly[2]	Grab
Nitrate as N, mg/L	Monthly/Quarterly[2]	Grab
Ammonia as N, mg/L	Monthly/Quarterly[2]	Grab
Chloride, mg/L	Monthly/Quarterly[2]	Grab

1. These parameters apply to all four monitoring wells
2. Monthly for MW-1 and MW-2 and quarterly for MW-3 and MW-4.

Monitoring Wells MW-1 and MW-2 were constructed in 1999 for monitoring the shallow ground water immediately downgradient of Outfall 001. These two wells have a monthly monitoring reporting period. Wells MW-3 and MW-4 were added in 1999 and 2008, respectively, to monitor groundwater upgradient of Outfall 001. While Wells MW-3 and MW-4 have no E. coli and nitrate compliance limits, they are included as additional self-monitoring parameters with a quarterly reporting period. These additional monitoring requirements are required of all four monitoring wells.

1.4.3 Compliance Schedule

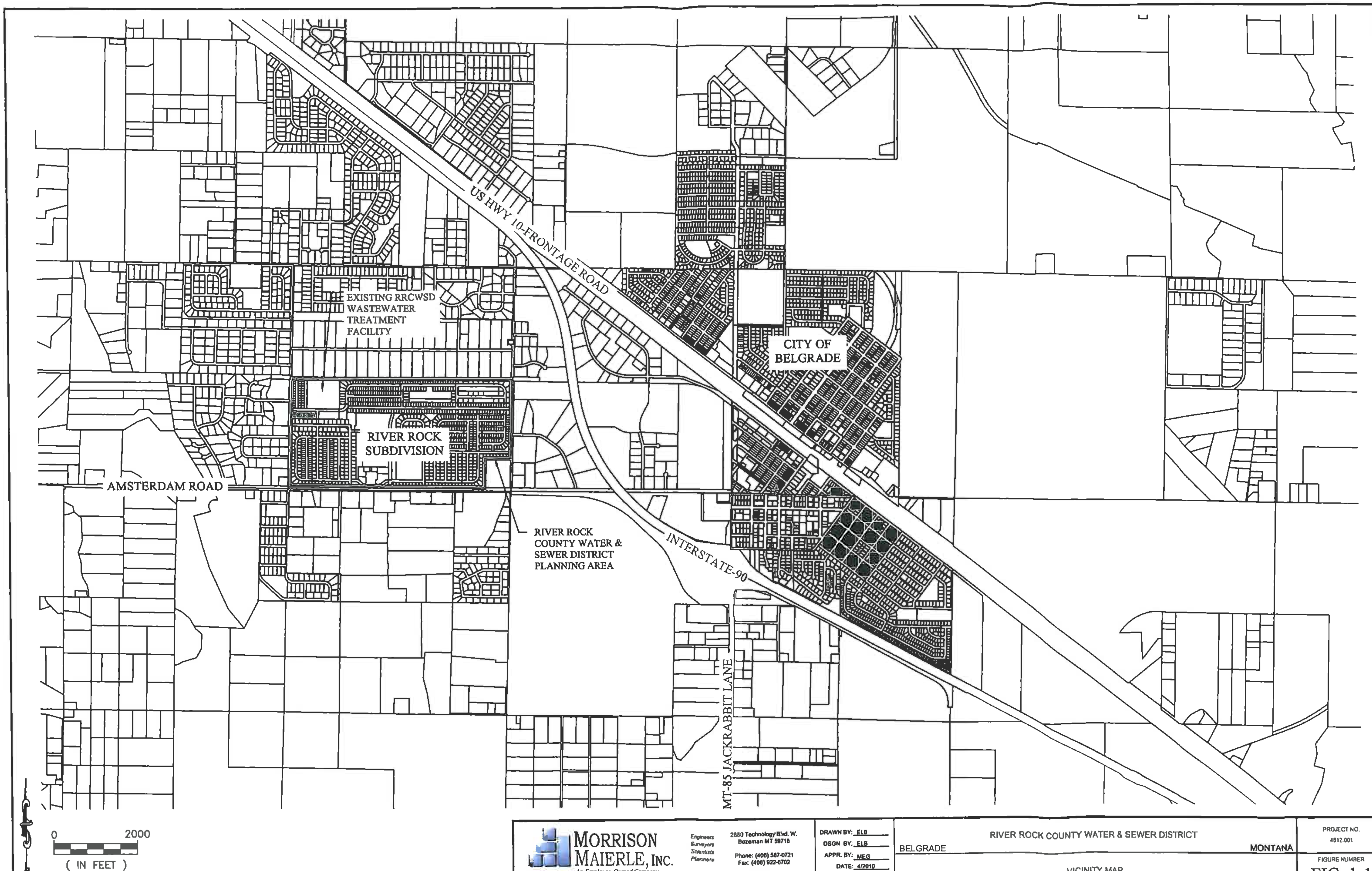
In addition to the above effluent limits, the permit has also established a compliance schedule which delays the effective date for meeting the discharge limits for BOD_5, total inorganic nitrogen, and E. coli bacteria. This allows the RRCWSD to plan and implement facility improvements that will bring it into compliance with the permit limits. The schedule also provides a means to track project progress as well as a final project completion date. With just over two years to deliver a package to MDEQ, it will require selecting an alternative in the next twelve months to allow roughly twelve months to complete a design for the selected alternative. Once MDEQ has approved plans and specifications by December 1, 2012, it will allow a full year for system construction and startup to meet the October 1, 2013 deadline contained in the MGWPCS permit (see Table 1-4).

TABLE 1-4
COMPLIANCE SCHEDULE

Parameter	Secure Funding and submit Report to DEQ outlining funding sources	Submit Plans and Specs to DEQ	Receive Approval by DEQ for Plans and Specs	System Fully Operational
$CBOD_5$	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013
Total Inorganic Nitrogen	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013
E. coli Bacteria	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013

1.4.4 Non-Degradation Limits

As discussed in the Statement of Basis, the wastewater discharge was approved prior to the enactment of the non-degradation rules. Therefore, this discharge is not considered a new or increased source under Montana ARM rules. As such, the primary effluent limits in Tables 1-1 and 1-2 are based on DEQ-7 Numeric Water Quality Standards, which are limited to total inorganic nitrogen and E. coli.



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RIVER ROCK COUNTY WATER & SEWER DISTRICT

BELGRADE MONTANA

VICINITY MAP

PROJECT NO. 4812.001

FIGURE NUMBER

FIG. 1-1

N:\4812\001\ACAD\Exhibits\FIGURE 1-1.dwg Plotted by eric blankams on Apr/28/2010

CHAPTER 2
PLANNING SITUATION

2.1 PLANNING AREA

The planning area for this report is equal to the wastewater service area and is limited to the River Rock Subdivision (see Figure 1-1). The subdivision is fully built out and includes 1,192 single family residences, some commercial businesses and a school. As the River Rock Subdivision developments are essentially complete, no additional wastewater flow into the WWTF is expected. The only way to increase flows to the facility would be connection of surrounding properties to the RRCWSD sewer system. The RRCWSD would need to expand the wastewater service area beyond the current boundaries and develop a system that would provide the financial means to expand or upgrade the facility as necessary when flows increase.

2.2 PLANNING PERIOD

The planning period of 25 years is assumed but with full build-out currently complete and with average discharge flows at less than 50 percent of design flows, there is not expected to be any significant flow increase over the course of the planning period. After 25 years, the most likely increase over the current flowrate would come only as a result of expansion of the planning area and wastewater service area.

2.3 POPULATION

The River Rock Subdivision includes 1,192 single family residences. According to the 2000 Census, the average number of residents per household for Gallatin County as a whole is 2.3, Bozeman is at 2.4, and Belgrade has an average of 2.6 residents per household. For planning purposes, it was assumed that the average number of residents in the River Rock Subdivision is currently 2.6 persons for each of the 1,192 residences. As mentioned previously, the Subdivision is fully built out and barring expansion of the service area, an increase in the population served by the wastewater facilities is not anticipated. Therefore, a design population of 3,100 was used in the development of treatment alternatives.

2.4 WASTEWATER FLOWS AND LOADING

2.4.1 Existing Flows

A new effluent flow meter was installed at the RRCWSD wastewater treatment facility in April of 2008. Figure 2-1 shows effluent flows for 2009. A small set of data was excluded because recorded flows suggested faulty readings. No explanation is known for the cause of the erratic readings but the data is otherwise very consistent on a day to day basis. The average flow during this 2009 period was approximately 111 gpm or

160,000 gpd. Effluent flows during the summer months were lower, presumably due to higher evaporation rates. Winter effluent flows may be more representative of influent flows and averaged at 170,000 gpd. The peak day flow recorded in 2009 was approximately 212,000 gpd and occurred twice in 2009. The design flow rate for the existing WWTF is 374,000 gpd.

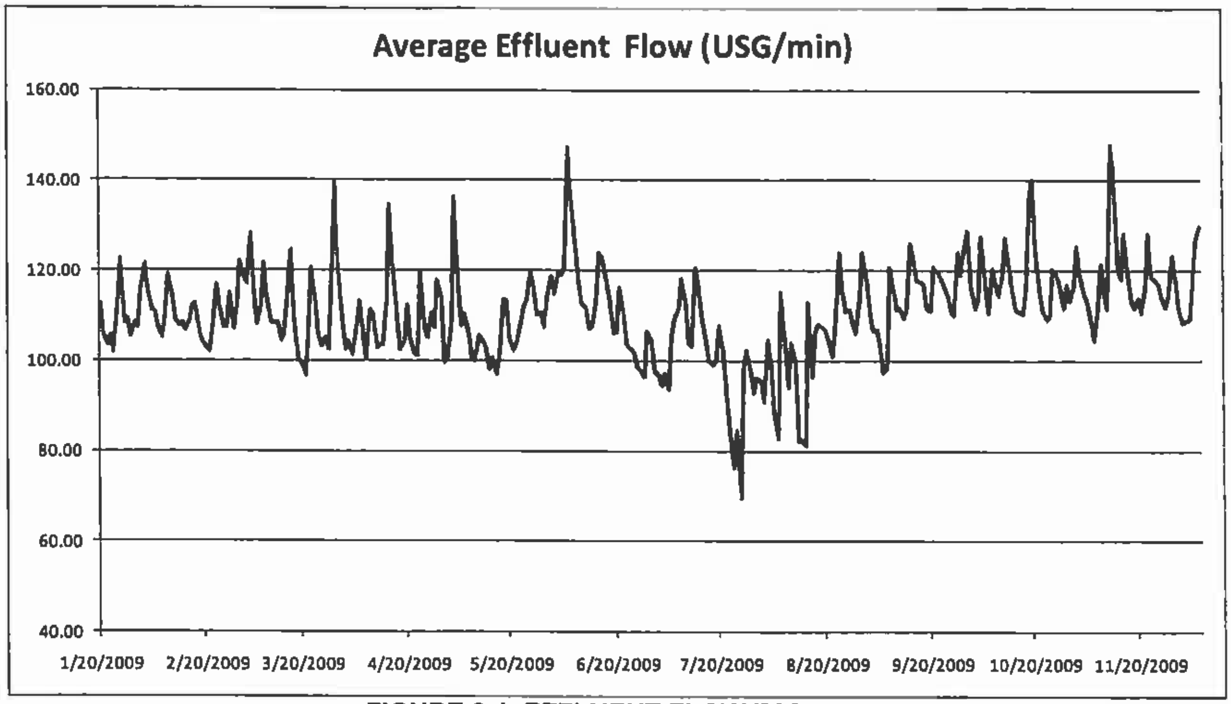


FIGURE 2-1 EFFLUENT FLOW FOR 2009

2.4.2 Projected Flows

With full build-out nearly complete, no increase is expected in flows; however for planning purposes, a flow of 0.374 mgd is used in accordance with the discharge permit which lists 0.374 mgd as the design flowrate. For the purpose of alternative evaluation the project was broken into two phases where the phase 1 design would be based on an average day flow of 0.2 mgd, and the phase 2 design would provide treatment for the full 0.374 mgd flow.

With an average daily design flow of 0.374 mgd (260 gpm), Circular DEQ-2 provides criteria for establishing peak hour flow for equipment size. Given a population of 3,100, a peaking factor of 3.5 is used to determine the peak hour flow of 1.31 mgd (910 gpm). DEQ Circulars do not provide specific guidance on determining a peak month flow but Metcalf and Eddy provide a peak month peaking factor of 1.2 resulting in a 0.45 mgd (312 gpm) peak month flow for design purposes.

Minute by minute effluent flow data is also available from the effluent flowmeter installed in April, 2008. This data was used to develop wet weather and dry weather diurnal curves for a 24 hour period. These diurnal curves reveal ratios of maximum flow to minimum flow of 1.1 or less. The data from the effluent flowmeter is likely dampened by a flow equalizing effect of the lagoons and minimum and maximum influent flows appear less extreme. Because of this dampening effect, the peaking factor was not developed from the flowmeter readings, and instead Circular DEQ-2 and Metcalf and Eddy factors were conservatively used.

2.4.3 Existing BOD and TSS Loading

Influent samples were routinely taken and BOD and TSS loading for 2009 are shown in Figure 2-2.

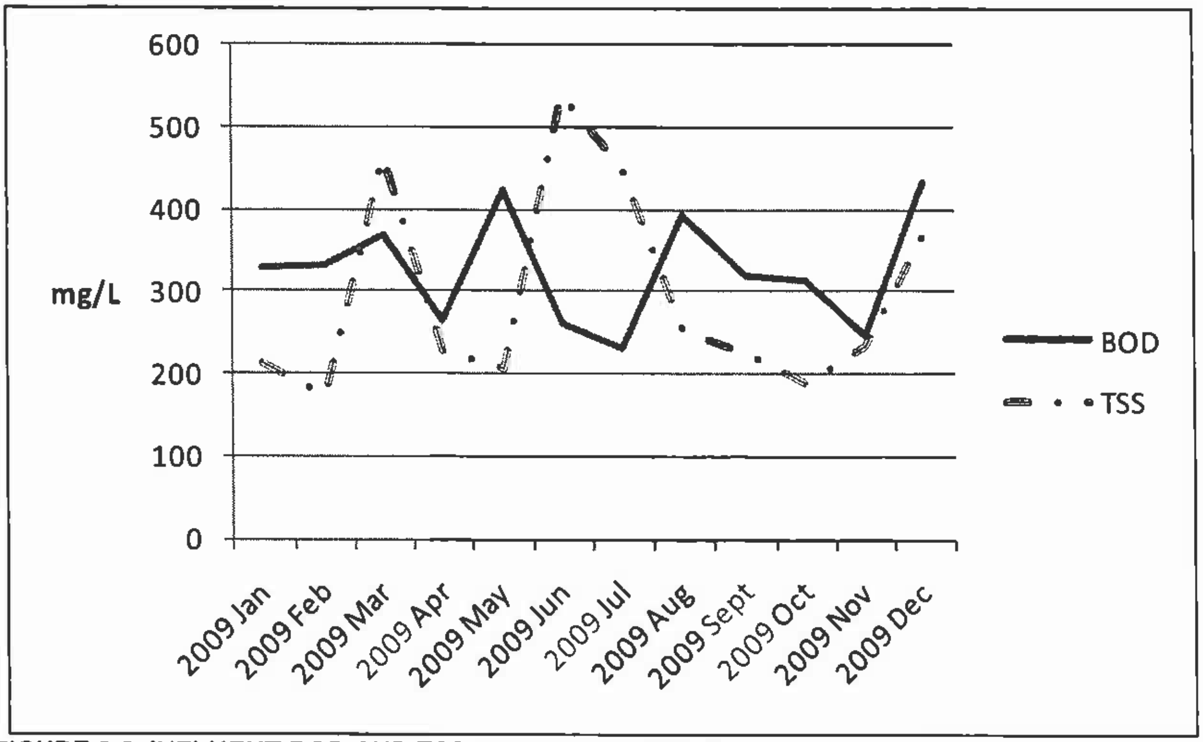


FIGURE 2-2 INFLUENT BOD AND TSS CONCENTRATIONS FOR 2009

Using the population estimate of 3,100 people, BOD and TSS per capita loading rates are shown below. The average influent BOD concentration for 2009 was 325 mg/L and the average TSS influent concentration was 315 mg/L. Additionally, the winter average effluent flowrate of 170,000 gallons per day is used to calculate the per capita loading. Each per capita rate is calculated according to the following equation:

Per capita BOD loading = 0.149 lbs BOD/capita/day
Per capita TSS loading = 0.144 lbs TSS/capita/day

2.4.4 Projected BOD and TSS Loading

The current loading rates were compared to traditional design values in the literature. Metcalf and Eddy (4th Ed.) provide a typical range of 0.11 to 0.265 lbs/capita/day for BOD and 0.132 to 0.331 lbs/capita/day for TSS. Existing per capita loading rates are at the low end of the typical range. It is not clear why these numbers are low but could be a result of River Rock having lower population density than the assumed 2.6 per residence. For design purposes, the upper quartile range of each of the Metcalf and

Eddy ranges will be used as a conservative approach. Values of 0.22 and 0.25 lbs/capita/day for BOD and TSS, respectively, will be used to calculate design loads.

Current average concentrations for BOD and TSS are 325 mg/l and 315 mg/l, respectively. Maximum month concentrations measured in May 2009 and January 2010 were 425 mg/L and 473 mg/L or 603 and 671 lbs/day, respectively. The proposed BOD design average loading of 682 lbs/day still is in excess of the January 2010 loading of 671 lbs/day. A maximum month peaking factor of 1.44 was applied to BOD and TSS loads. See Table 2-3 for a summary of the design loads.

2.4.5 Ammonia and Nitrogen Loading

Influent data was also reviewed for ammonia and total nitrogen. This data was used to confirm the influent design criteria for the alternatives analysis. All available data was analyzed from years 2003 through 2010. The older data was used because during the latter years, data was not available for some of the parameters. The influent and effluent loading for the nitrogen species are shown in Table 2-1. It shows approximately 42 percent of the ammonia in the effluent is converted to other species before it enters the IP beds. Similarly, approximately 37 percent of the TKN is removed across the lagoons. The nitrate + nitrite concentration leaving the lagoons is relatively low but is elevated at the monitoring wells probably due to the ammonia converting to nitrate in the ground.

TABLE 2-1
2003 – 2010 SAMPLING RESULTS FOR SEVERAL NITROGEN SPECIES

Sample	Influent (mg/L)	Effluent (mg/L)	Well #1 (mg/L)
Ammonia-N	36	20.7	0.56
Nitrate + Nitrite-N	0.8	3.8	8.9
TKN	46.1	32.5	1.6

2.5 DESIGN CRITERIA

The design criteria presented here will be used for developing treatment alternatives for the River Rock WWTF. BOD and TSS loads are conservative estimates based on a design population of 3,100 and the upper end of typical values given in the literature. These design values exceed current loading. TKN and TP loading rates were based on typical values given in the literature and verified with existing influent data where available. Table 2-2 lists peaking factors for flow and loading and Table 2-3 lists loading rates for current and design flows.

TABLE 2-2 FLOW AND LOADING			
Parameter	**Maximum Month**	**Peak Day**	**Peak Hour**
Flow	1.2	1.5	3.5
BOD	1.44	--	--
TSS	1.44	--	--
TKN	1.44	--	--
TP	1.36	--	--

TABLE 2-3 FLOW AND LOADING					
Parameter	**Per Capita Loading (lbs/day)**	**Loading (lbs/day)**		**Concentration (mg/L)**	
		Average	**Maximum Month**	**Average**	**Maximum Month**
Flow (mgd)	--	374,000	450,000	374,000	450,000
BOD	0.22	682	990	220	264
TSS	0.25	775	1,125	250	300
TKN	0.032	99	143	32	38
TP	0.008	25	34	8	9

CHAPTER 3
EXISTING WASTEWATER TREATMENT FACILITY

3.1 DESCRIPTION OF EXISTING TREATMENT SYSTEM

For the purpose of this summary, the description of the existing system only includes the wastewater treatment process and does not include any of the collection system infrastructure. The controls and blower equipment for this treatment system are located in a Blower Building located just to the southeast of Cell No. 1. See Figure 3-1 for an existing site plan with equipment call-outs as noted. Raw sewage is pumped through a lift station just outside the Blower Building where it passes through a valve vault and is pumped in a 6-inch pipe to the lagoons. The treatment system is composed of three lagoon cells. The first two lagoon cells are lined and aerated and are operated in series. The third lagoon cell is not lined and can either be operated as a facultative lagoon cell or as an infiltration/percolation (IP) bed. Once the wastewater has been treated in the two aerated lagoons, it is discharged into either the third lagoon cell or into one of seven smaller IP beds. Record Drawings for the existing wastewater treatment facility are included in Appendix B.

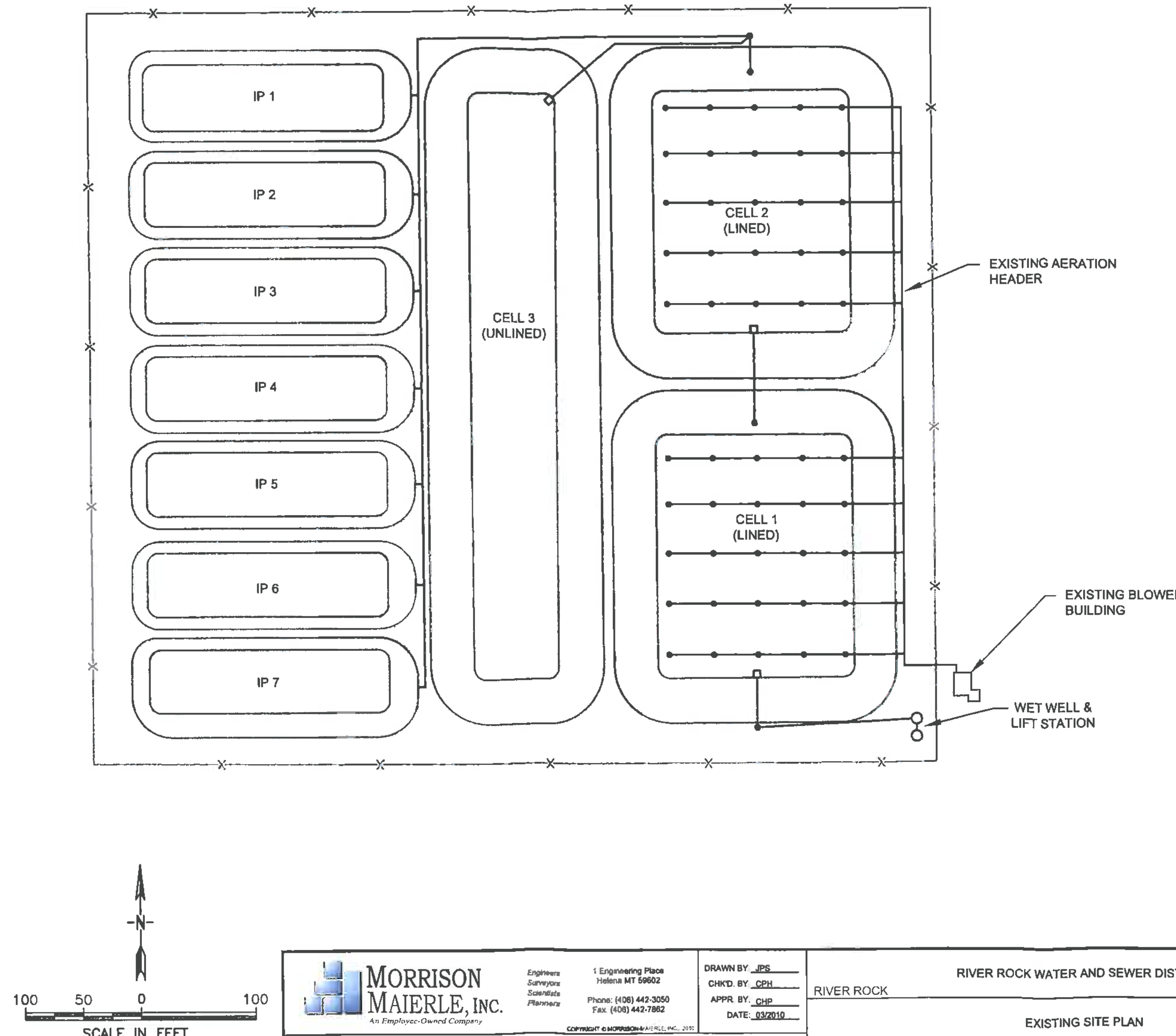
3.1.1 Blower Building and Blowers

There are two blowers located in the Blower Building which provides compressed air delivery to lagoon Cell 1 and Cell 2. The discharge from the blower building is initially an 8-inch line which reduces in size to a 6-inch as it runs to Cell 1 and finally reduces down to a 3-inch at its furthest point at Cell 2.

3.1.2 Lagoons

Aeration is provided to Cells 1 and 2 through five laterals per cell, each with five Helixor aeration devices located approximately 36 feet on center. Lateral spacing is 45 feet between adjacent laterals and 20 feet between laterals near the cell dike toe and closest lateral. Both cells are 13 feet deep with a sidewater depth of approximately 11 feet. Cells 1 and 2 are lined with Hypalon Liner to prevent leakage. Bottom dimensions of both cells are approximately 220 feet by 180 feet with 3 : 1 side slopes holding approximately 4,520,000 gallons if operated with two feet of freeboard. With both cells this totals 9,040,000 gallons which represents 25 days of HRT.

Although, normally operated in series, each of the two aerated cells can also flow directly into Cell No. 3 which as mentioned previously is an unlined cell which can function as an un-aerated lagoon or during the winter months as an IP cell. Normal summer time operation would be to flow through Cell No. 1, through Cell No. 2 and exit Cell No. 2 and then flow into one of the seven IP cells. Cell No. 3 is approximately 80 feet by 530 feet with a total depth of 13.5 feet. At side slopes of 3 to 1, it will have a capacity of approximately 5,900,000 gallons.



MORRISON MAIERLE, INC. An Employee-Owned Company. Engineers Surveyors Scientists Planners. 1 Engineering Place Helena MT 59602. Phone: (406) 442-3050 Fax (406) 442-7862	DRAWN BY: JPS CHK'D. BY: CPH APPR. BY: CHP DATE: 03/2010	RIVER ROCK WATER AND SEWER DISTRICT RIVER ROCK MONTANA	PROJECT NO 4812.001
		EXISTING SITE PLAN	FIGURE NUMBER FIG. 3-1

R:\4812\000\ACAD\Exhibits\FIGURE S-1.dwg Plotted by nka lashley on Apr/29/2010

3.1.3 Effluent Flow Meter

An effluent flowmeter was installed in April 2008. This meter is located on the outlet of the aeration cells and prior to the IP beds. No other details on the meter were available but presumably it can be used in place or relocated to serve the various alternatives that will be considered.

3.1.4 Infiltration/Percolation Beds

Seven identically sized IP beds with their long axis running east to west are located immediately west of Cell 3. Each of these beds has an inlet pipe on its east end allowing effluent to enter the cell and percolate into the ground. The configuration of the IP beds is shown on Figure 3-1. No design information on infiltration rates was noted in any of the documents obtained for review. It is expected that the IP beds will continue to serve as the disposal method following any recommended improved treatment process.

3.1.5 System Capacity

As identified in the Statement of Basis, the system was originally designed for a 0.374 mgd maximum flowrate. This design rate was likely reached by calculating the expected population at full build-out times 100 gallons/capita/day. With Cells 1 and 2 operating in series, the 0.374 mgd rate provides approximately a 20 day HRT. At the current average flowrate of 0.17 mgd, the system is actually achieving approximately 55 days of HRT. Circular DEQ-2 requires a minimum 20-day HRT for aerated lagoons. The existing lagoon system has excess capacity with respect to the DEQ-2 requirement.

CHAPTER 4
DEVELOPMENT OF TREATMENT SYSTEM ALTERNATIVES

4.1 TREATMENT SYSTEM ALTERNATIVES

In order to provide wastewater treatment that satisfies the requirements of Montana Ground Water Pollution Control System (MGWPCS) permit MTX000147 for discharging wastewater effluent to ground water, the River Rock County Water & Sewer District (RRCWSD) will need to upgrade their existing facilities. There are a wide range of potential solutions to treat wastewater which will meet permit requirements and fit the practical needs of the RRCWSD. A no-action alternative is also discussed in this report for the purpose of comparing it to the other potential solutions. Alternatives considered in this report include:

1. Alternative C1: No Action
2. Alternative C2: Send Wastewater to the City of Belgrade
3. Alternative C3: Land Application of Effluent
4. Alternative C4: Lagoon Upgrades
5. Alternative C5: Activated Sludge (Earthen Basin or Oxidation Ditch)
6. Alternative C6: Membrane Bio Reactor (MBR)

Alternatives 3 through 6 all include a sludge management component. Lagoon operations of Alternatives C3 and C4 would allow for sludge settling and storage in the lagoon. Periodical removal of sludge would be necessary as determined by sludge depth measurements with typical removal intervals ranging from five to ten years. Sludge management for Alternatives C5 and C6 are discussed below.

4.1.1 Approach to Alternatives Considered

Facility upgrade considerations must ensure that the new facilities are adequate to meet discharge permit requirements, are economically viable, and will be functional for many years into the future. In order to avoid large increases in sewer rates, facility improvements must be cost effective. The alternatives chosen for discussion are tailored to the River Rock Subdivision based on its size, type of users, available technologies, property availability, proximity to other facilities, and effluent disposal availability. Considerations of the relevant alternatives included providing safe, time-sensitive, practical, innovative, and economical facilities.

4.2 SLUDGE MANAGEMENT

Alternatives C5 and C6 do not require the existing lagoons for wastewater treatment and instead propose to use one of them for sludge stabilization, reduction, and storage. Based on typical long-term sludge reduction calculations, the annual sludge production will be approximately 300,000 gallons. As mentioned in Chapter 3, the volume of existing lagoons is about 4.5 million gallons, resulting in an approximate sludge removal interval of 15 years.

In order to reduce odor formation by the stored sludge, the basin would be aerated. One option would be to retain the existing aeration system, which uses submerged diffusers that introduce air from the bottom. This may not be desirable, as the aeration would also mix the sludge. Another option would be a mechanical surface aerator that continuously turns over the top layer of the sludge creating an aerobic cap that would reduce odors without mixing the settled sludge. Anaerobic conditions would be maintained at the bottom, which are generally better suited to sludge stabilization and reduction. These continued processes would potentially serve to reduce sludge volume sufficiently to increase the sludge removal interval to 20 or more years.

Sludge would be removed by a contractor specializing in sludge removal. Removal is possible without taking the cell out of service by dredging sludge from the pond bottom. Sludge would then be dewatered with a mobile belt filter press, and disposed either at a landfill or by land application. Both disposal methods require the sludge to be tested for nutrients and metals and to pass certain standards. Landfills generally require that the sludge passes a paint filter test, however, coordination with the accepting landfill would be necessary to ensure all local requirements are fulfilled. Land application is subject to 40 CFR 503 regulations and the Montana General Permit for disposal of sewage sludge. The General Permit contains application requirements for land application, as well as testing and reporting requirement.

4.3 ALTERNATIVE C1: NO ACTION

A no-action alternative for the RRCWSD would put the wastewater facility in violation of the recently issued MGWPCS permit based on the existing treatment facility performance. The permit allows for adequate time to complete improvements to the wastewater facility, but will require measured actions to be taken in order to meet compliance milestones. Specifically, the permit requires the facility have an 85% removal of BOD_5, pH of 6.0-9.0, and Total Nitrogen as N of 91.1 lb/day with an effluent flow rate of 374,000 gallons per day maximum flow. In addition to the effluent limits, specific groundwater compliance limits will be <1 organism/100mL E-coli and 10.3 mg/L Nitrate as N in monitoring wells MW-1 and MW-2 which are located on the northern boundary of the treatment facility property just downstream of the discharge. Based on effluent data from the existing wastewater treatment system, the limits will not be met without treatment facility improvements.

In addition to the MGWPCS discharge permit requirements, there are legal actions against the RRCWSD by neighboring property owners with accusations of pollution to their drinking water supplies. The legal arguments have not yet been decided to determine any fault on the part of the RRCWSD, but the no-action alternative would not contribute to a resolution of the legal matters facing the RRCWSD. Therefore, the no-action alternative is not a realistic solution and will not be considered further.

4.4 ALTERNATIVE C2: SEND WASTEWATER TO BELGRADE

The City of Belgrade, Montana wastewater treatment facility is located approximately 3.10 miles northeast of the RRCWSD wastewater facility. The City's wastewater treatment facility is situated on property owned by the State of Montana and leased and controlled by the Gallatin Airport Authority. It is a lagoon wastewater treatment system with rapid infiltration disposal to groundwater and spray irrigation discharges. Wastewater collection piping for the City consists of a majority of gravity sewer mains along with three lift stations and forcemains for areas of the City where there is not enough grade to produce gravity flow. Evaluation of Alternative C2 includes discussion of available wastewater treatment capacity, negotiation for wastewater service, potential connection points, and probable costs.

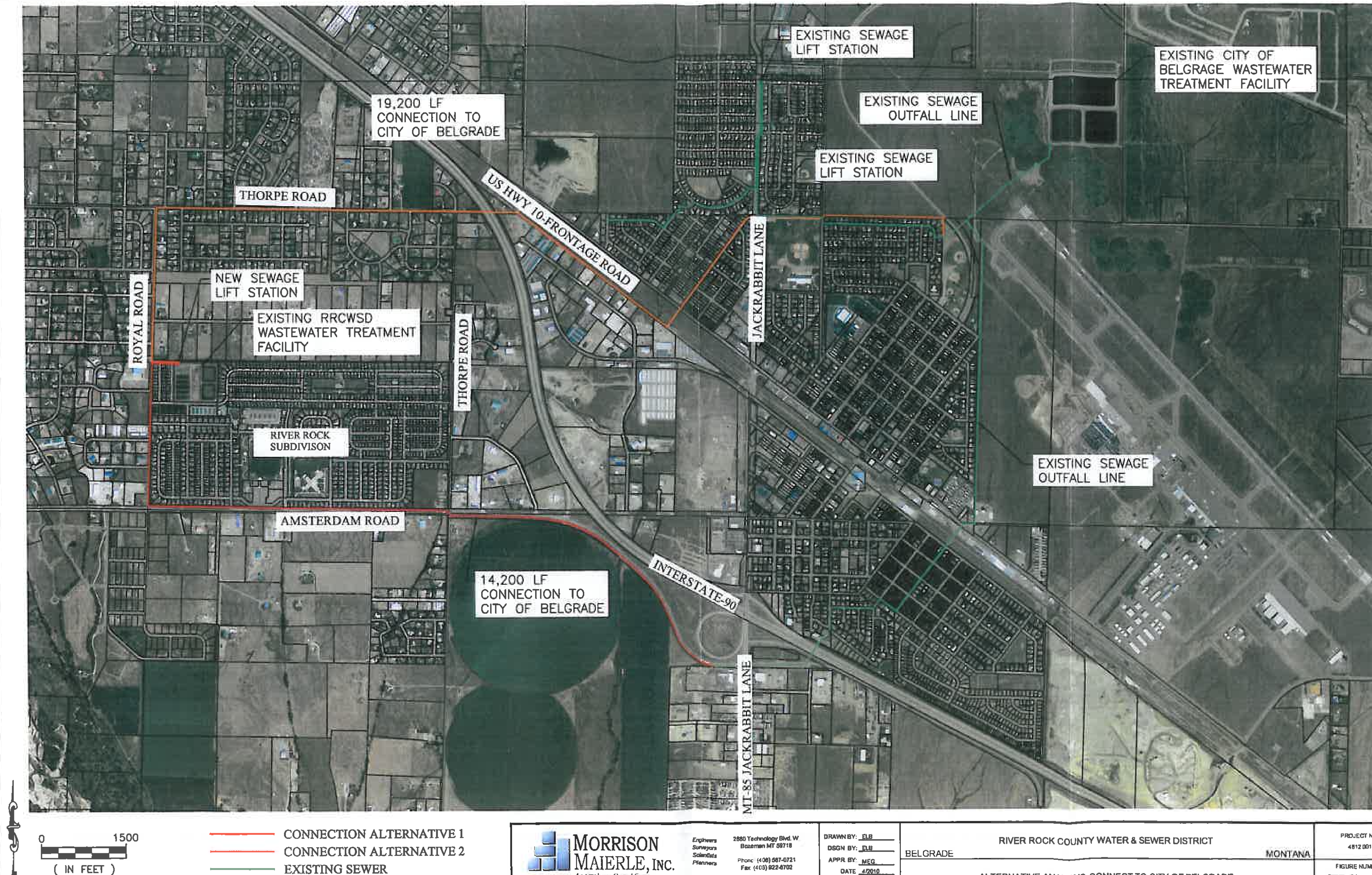
4.4.1 Treatment Facility

Based on the Wastewater Treatment and Collection Facilities Report for the City of Belgrade dated August 1997, a 20-year treatment capacity of 642,700 gpd or 7,500 people at 86 gpd per person was included in the plan. In 1990, census data indicated that Belgrade had a population of 3,422. More recently, 2000 census counted a population of 5,728. Using the growth trend from 1990 to 2000, the current population prediction estimate is 8,034 people. That population could be generating 690,924 gpd based on the 86 gpd per person estimate. During recent years, growth of the City has caused the wastewater treatment system to reach capacity which is consistent with the predictions in the Facilities Report and the population growth estimates. Since wastewater treatment capacity has become an issue, there is a moratorium on new annexations to the City until the limitations on wastewater treatment capacity can be alleviated. Public discussions have taken place about how to move forward with providing additional capacity and an alternative treatment technology may be needed to upgrade the City's lagoon system.

4.4.2 Collection System

Any potential path for wastewater or effluent transport from the RRCWSD to the City of Belgrade wastewater facilities would require acquisition of easements or property and occupancy permits in Right-of-Ways of existing infrastructure. A pipeline installation would also require crossing of Interstate 90, railroad tracks, and the Frontage Road highway. Such crossings would be expensive on a cost per foot basis and agency coordination intensive due to the need to bore casings beneath those facilities without disturbing vehicle and train traffic. Existing City of Belgrade gravity sewer main infrastructure has been studied to determine two conceptual connection points for the purpose of determining the feasibility of this alternative. Although there may be other options that could be determined during a detailed design project, two alternative routes are proposed to provide a general idea of the scope of such an undertaking.

Figure 4-1 shows both routes. Connection Alternative 1 with 3.64 miles would be the longer of the two routes. The most difficult portions of this route include crossing of Interstate 90, the railroad tracks and Frontage Road. This alternative would tie into a 21-inch gravity sewer relatively close to the Belgrade WWTF. An estimate of costs for this



MORRISON MAIERLE, INC. An Employee-Owned Company	Engineers Surveyors Scientists Planners — 2880 Technology Blvd. W Bozeman MT 59718 Phone (406) 587-0721 Fax (406) 922-6702	DRAWN BY: ELB DSGN BY: ELB APPR BY: MEG DATE 4/2010	RIVER ROCK COUNTY WATER & SEWER DISTRICT BELGRADE MONTANA	PROJECT NO 4812.001
			ALTERNATIVE ANALYSIS-CONNECT TO CITY OF BELGRADE	FIGURE NUMBER FIG. 4-1

N:\4812\001\ACAD\Exhibits\FIGURE 4-1.dwg Plotted by eric blankers on Apr/28/2010 alternative is $4.30 million including potential City of Belgrade sewer impact fees to compensate for wastewater treatment system improvements.

Connection Alternative 2 would be 2.69 miles long and would avoid crossing the interstate highway. The most difficult portion would include a bore to cross Amsterdam Road which would require Montana Department of Transportation approval. The force main would tie into a 12-inch gravity sewer near the Flying J Truck Stop. An estimate of costs for this alternative is $3.37 million including potential City of Belgrade sewer impact fees to compensate for wastewater treatment system improvements. Detailed cost estimates are included in Appendix C.

4.4.3 Other Considerations

In 2007 the City of Belgrade adopted Ordinance 2007-11 which includes a sewer impact fee for new development of $1,489 per single family residence. Although the RRCWSD is not new development, the additional wastewater flows would produce an impact on the wastewater facilities in a similar manner as new development. An estimated sewer impact fee to be paid to the City would be $1.79 million based on 1,200 single family residence equivalents.

Sewer rates for River Rock Subdivision residents would be calculated based on Belgrade's current rats of $15.90 for the first 5,000 gallons and $1.26 per additional 1,000 gallons each month, and the infrastructure costs for connection of the RRCWSD to the City sewer system along with the above-mentioned impact fees.

A critical challenge for connecting the RRCWSD to the City of Belgrade sewer system would be determination of the type of relationship between the two entities. An option would be annexation of the River Rock Subdivision to the City of Belgrade. Challenges with this option include the physical separation between the Subdivision and the City, coordination of water system, streets, open space, and involvement of the River Rock Property Owners Association. Another option would be for the City of Belgrade to provide sewer services on a contractual basis. Either case would involve negotiation with public works officials, public meetings, and City Council decisions to determine the course of action.

Connection of the RRCWSD to the City of Belgrade wastewater facilities would relieve RRCWSD from operating their own treatment and disposal facilities. However, this alternative includes uncertainty with respect to the Belgrade WWTF capacity, and the required negotiations with multiple local and state entities may result in a project schedule exceeding the compliance schedule of the discharge permit.

4.5 ALTERNATIVE C3: LAND APPLICATION

Land application of wastewater effluent by spray irrigation is a disposal option that is effectively used by other small communities in the state. Land application can be used to irrigate crops, pasture land, golf courses, and/or open space areas with appropriate treatment, setbacks, and access/use restrictions. Treatment facility effluent used for spray irrigation must be adequately oxidized and disinfected. The facility would have to include a large storage basin sized to store effluent outside of irrigation season, a pump station and piping to the spray irrigation site, irrigation equipment and controls. If the storage basin is not located at the treatment facility site, an additional pump station would be required to pump effluent to the storage basin.

4.5.1 Application Rates and Available Land

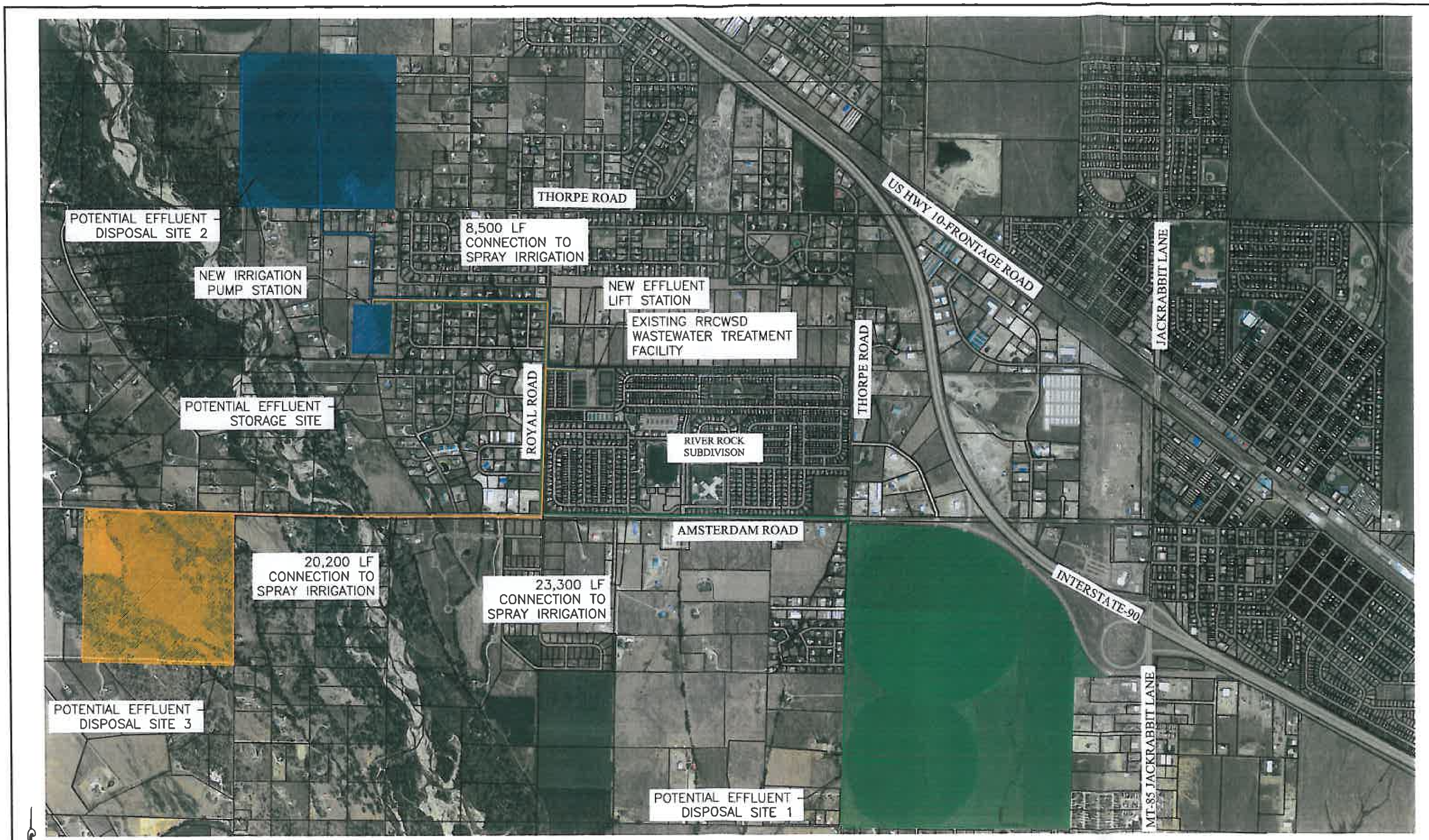
Land application rates for treated wastewater are controlled by percolation rates through the soil and agronomic uptake of nutrients. Preliminary calculations indicate that 125 acres would be needed to dispose of treated effluent flows averaging up to 200,000 gpd for existing wastewater flow and 234 acres for 375,000 gpd for the facility design capacity. As mentioned previously, River Rock Subdivision no longer maintains land suitable for spray irrigation and land would need to be leased or purchased for this purpose. Three agricultural areas within reasonable distance of the Subdivision were identified as potential spray irrigation sites as shown in Figure 4-2. These properties are owned by the State of Montana and leased to farmers and ranchers.

Existing crop irrigation operations on the two of the properties currently utilize center pivot application. Water for irrigation comes from surface water irrigation ditches through water rights dedicated to the properties. Wastewater effluent spray irrigation may reduce or eliminate the need for irrigation ditch water usage on the property. That would create some issues for the water rights owner relating to the future use of the irrigation ditch water. If the irrigation water is not used, the water rights might be forfeited, so an alternative use of the water would need to be found in order to continue beneficial use of those water rights. Irrigation with wastewater effluent would also create some setback and access issues that would need to be considered in the design and permitting process. A 100-foot setback from the property boundary along with fencing and signage is expected to maintain separation with public land. Coordination with an agricultural leasee of the property on those issues would be essential and the State would have to agree that spray irrigation disposal be permitted for a period of 20 years through a lease or contract on the property.

4.5.2 Alternatives

Evaluations of three spray irrigation alternatives have been completed to further understand the potential options available. All three alternatives include a storage basin located 3,500 feet northwest of the RRCWSD treatment facility on a 20 acre Gallatin County property which would need to be purchased (see Figure 4-2).

Alternative 1 would spray irrigate effluent on agricultural land approximately 4,700 feet northwest of the River Rock WWTF on 160 acres of State property. Effluent would be pumped by a lift station through a 4,800 foot long forcemain from the treatment facility to the storage facility and an irrigation pump station with a 3,700 foot pipeline would transport effluent to an existing center pivot irrigation system. The irrigation system would have to be modified to maintain a 100 foot buffer zone to the property boundary as its existing use appears to extend to the edges of the property. Installation of the lift station forcemain and irrigation pipeline would be in existing Right of Way (ROW)



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			ALTERNATIVE ANALYSIS-SPRAY IRRIGATION DISPOSAL		FIGURE NUMBER FIG. 4-2

N:\4812\001\ACAD\Exhibits\FIGURE 4-1.dwg Plotted by eric blenkarns on Apr/28/2010 outside of finished driving surfaces where possible. Expected cost of this alternative is $2.47 million including the purchase of 20 acres from Gallatin County. No cost is expected for the spray irrigation lease, but the RRCWSD would have to provide the water under pressure to the disposal site for irrigator use.

Alternative 2 would use a State property located 5,100 feet southeast of the River Rock WWTF. This parcel is approximately 472 acres in size as shown on Figure 4-2. The parcel is currently advertised by the State for a commercial development lease. There are two existing center pivot irrigation systems along with wheel lines and hand lines used to irrigate the property. Installation of the lift station forcemain and irrigation pipeline would be in existing Right of Way (ROW) outside of finished driving surfaces where possible. Expected cost of Alternative 2 is $3.55 million, most of which is related to sewer force main construction. The lease of the State property is expected to require a payment of around 5% of appraised property value with a 3% annual increase according to the DNRC Central Land Office. An appraisal of the property has not been completed, but an estimate of value using $20,000 per acre for 125 acres is $2,500,000. Using the 5% figure, the lease payment would be $125,000 per year.

Alternative 3 would use a State parcel located 6,400 feet southwest of the RRCWSD treatment facility. This parcel of 160 acres is not currently used for agricultural production. Preliminary indication from the DNRC is that the property could be put into agricultural production with some unusable areas in wetlands, stream corridor, or forest. A new source of irrigation water from wastewater effluent would be beneficial because the property does not currently have irrigation water rights allocated to it. Challenges to the Alternative 3 option include crossing the Gallatin River for irrigation pipeline installation and finding an irrigation system to fit the irregular areas that would be put into agricultural production. Installation of the forcemain and pipeline would be located in existing ROW wherever possible and would be constructed with the least amount of disturbance possible to existing facilities and would include restoration. Expected cost of this alternative is $3.73 million. No cost is expected for the spray irrigation lease on this property, but the RRCWSD would have to provide the water under pressure to the disposal site for irrigator use.

4.5.3 Other Considerations

Advantages of effluent spray irrigation for agricultural use would be more appealing to a property that does not currently have a water right available for irrigation, but would still be beneficial to existing irrigated property. Spray irrigation effluent would be reliable and plentiful since it would be stored in the irrigation off-season for use during the peak need during the summer. This is advantageous because later in the summer, depending on the year, some irrigation water rights begin to disappear based on water right priority due to drops in river levels. Nutrients in the spray irrigation effluent would also reduce the need for application of synthetic fertilizer.

Spray irrigation of treated wastewater effluent is a viable solution for many wastewater treatment systems located in areas with access to land that is compatible with irrigation. Although there are some parcels of land large enough to irrigate the treated effluent from the River Rock WWTF, the facility is surrounded by residential properties and would require long pumping distances to the storage basin and the irrigation sites. In addition, there are unpredictable purchase and lease negotiations that may exceed the compliance schedule of the discharge permit. Furthermore, if land used for spray irrigation of treated wastewater is not owned by the sewer district, the district is open to future problems regarding use agreements of the property.

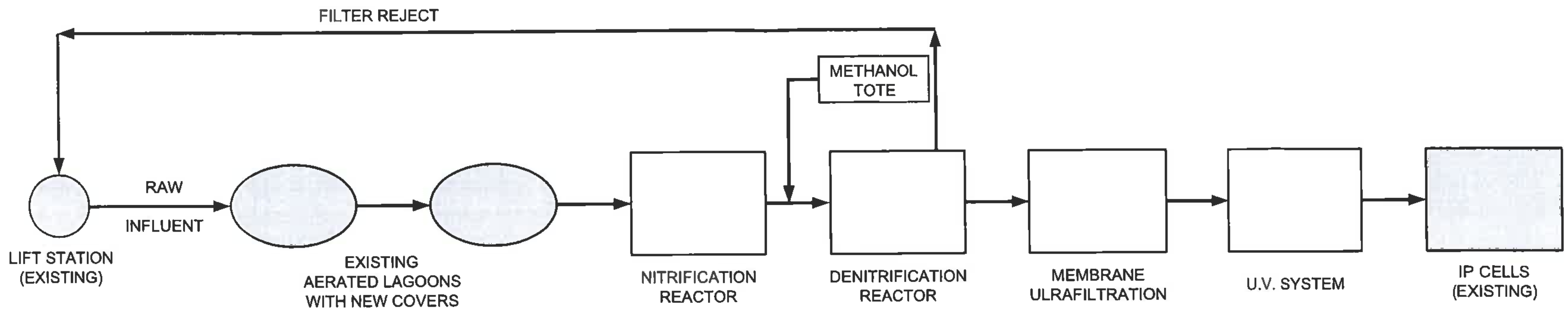
4.6 ALTERNATIVE C4: LAGOON UPGRADE

This alternative would use the existing Cells 1 and 2 and aeration system with the addition of insulated covers on both cells. Baffle curtains would divide each cell into two, and the aeration system would be modified to improve treatment efficiency. This will facilitate nitrification processes during the winter months which convert ammonia to nitrite and nitrate. An aerated post nitrification reactor would follow the aerated lagoons to ensure that all of the ammonia is converted to nitrate. A denitrification reactor would follow to remove the nitrate/nitrite from the wastewater by converting it to nitrogen gas in anoxic (no dissolved oxygen) conditions. An additional carbon source would be required because the aerated lagoons would have removed most of the available BOD already. Chemical addition of methanol or acetic acid by a chemical metering system would be flow paced to the influent flow. Denitrification would be followed by ultrafiltration to remove remaining solids as well as some bacteria and viruses. Removal of these solids would optimize UV disinfection. A UV disinfection system would be designed for 100% redundancy at peak hour flow (1.3 mgd) at >40,000 mw-s/cm2 dose.

A process flow diagram for this alternative are shown in Figure 4-3 and a suggested site layout is shown on Figure 4-4. Equipment and unit operations for this alternative include:

- Installation of modular covers and baffles and aeration system modifications in the existing treatment Cells 1 and 2.
- Installation of a new nitrification reactor and aeration system on a portion of the existing 3rd treatment cell.
- Installation of a new denitrification reactor and chemical feed system on a portion of the existing 3rd treatment cell.
- Installation of an ultrafiltration facility for physical removal of remaining solids and bacteria.
- Installation of a 100% redundant UV System.

Various estimates from vendors have been solicited and generally the lowest cost estimates are included with necessary ancillary equipment to get to a total capital cost. A budget price for the floating covers, baffles, aeration system modifications and the



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DATE: 03/2010

RIVER ROCK WATER AND SEWER DISTRICT
RIVER ROCK — MONTANA

ALTERNATIVE C4
COVERED AERATED LAGOONS WITH
POST NIT/DENIT

PROJECT NO: 4812 001
FIGURE NUMBER: FIG. 4-3

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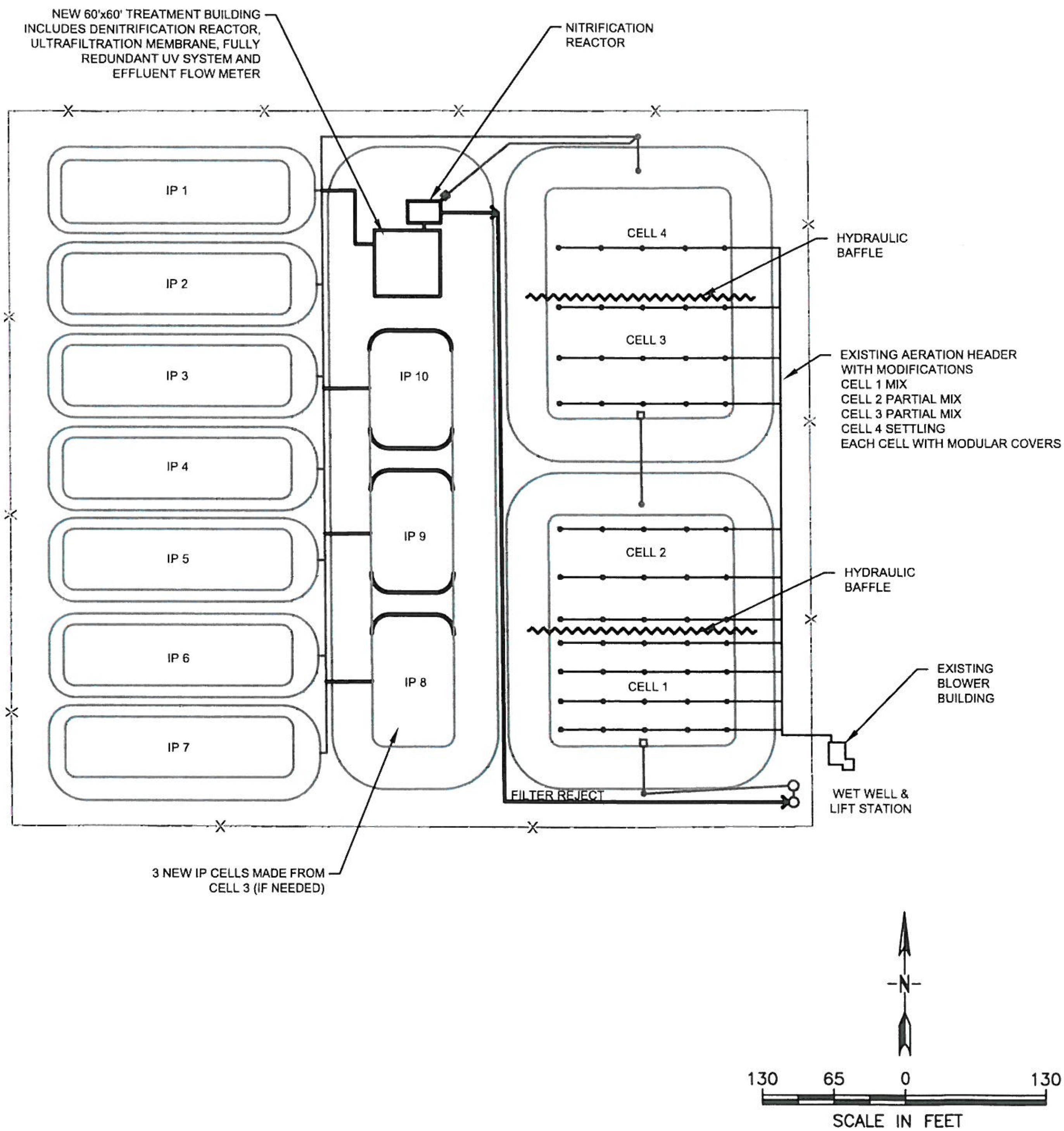


MORRISON MAIERLE, INC. An Employee-Owned Company. Engineers Surveyors Scientists Planners. 1 Engineering Place Helena MT 59602. Phone: (406) 442-3050 Fax: (406) 442-7862	DRAWN BY: JPS CHK'D. BY: CPH APPR. BY: CPH DATE: 04/2010	RIVER ROCK WATER AND SEWER DISTRICT RIVER ROCK MONTANA	PROJECT NO 4812.001
		ALTERNATIVE C4 SITE PLAN	FIGURE NUMBER FIG. 4-4

R:\4812\000\ACAD\Exhibits\FIGURE 4-4.dwg Plotted by rika lashley on Apr/29/2010 post nitrification reactor was obtained from Lemna. Other manufacturers provide elements of this system but do not offer it as a package with a process guarantee.

A budget price for the denitrification reactor was obtained for the Centra-flo TM moving bed sand filter. This technology would incorporate a carbon source injection just prior to the pretreatment zone ahead of the reactor itself. The influent is fed into the supply tube which enters and flows up through the sand which is slowly moving from top to bottom. Denitrifying bacteria are using the nitrate as energy source and convert it to nitrogen gas. The reject stream from the moving bed sand filter includes biomass and would be returned to the head of the lagoons. Other similar technologies are provided by Parkson such as the DynaSand TM Upflow Filter.

The estimate for the ultrafiltration membrane was based on a budget price for the AltaFilter TM membrane system. The AltaFilter is often used in drinking water treatment but also has applications in waste water reuse due to its ability to meet strict coliform requirements. The AltaFilter membrane is a PolymemTM hollow fiber which is designed for outside-in flow. The unit comes pre-fabricated, skid mounted with fully automated controls. As with all membrane systems, they require chemical cleaning in place (CIP).

Vendor quotes are included in Appendix D. The cost estimate for the complete treatment system is $4,000,000 (see Appendix C).

Each of the nitrification, denitrification, ultrafiltration membrane and UV systems would be located within a new headworks building. This building would also be located on a portion of the footprint Cell 3. Preliminary design criteria are shown in Table 4-1.

TABLE 4-1
ALTERNATIVE C4 PRELIMINARY DESIGN CRITERIA

Unit Process or Size Parameter	Design Value
Extended Aeration/Activated Sludge Cells	
Number of Cells	4
Cell 1A - Complete Mix Volume	2.1 MG
Cell 1B - Partial Mix Volume	1.8 MG
Cell 2A - Partial Mix Volume	1.8 MG
Cell 2B - Settling Volume	2.1 MG
Side Water Depth	10 Feet
Aeration System:	
Estimated Oxygen Requirement (AOR)	2,242 lbs/day
Estimated Airflow	1728 scfm
Number of Diffusers	129
Positive Displacement Blowers	
Number	3 (2 duty, 1 standby)
Discharge Pressure	5.5 psi
Horsepower (each)	50 hp

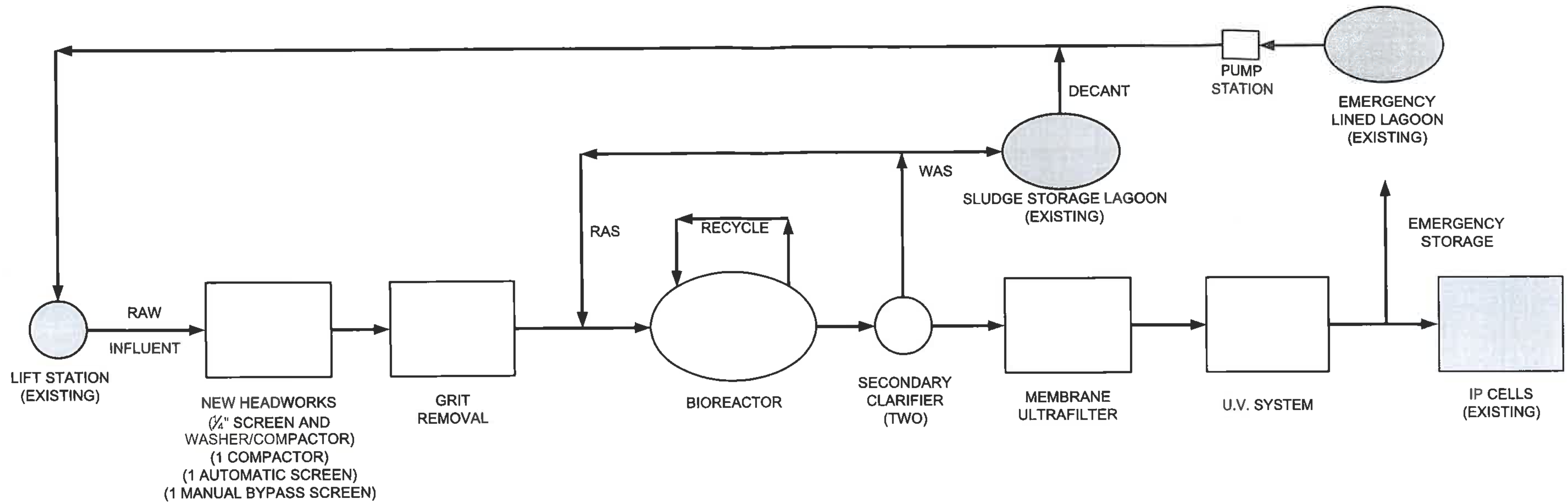
TABLE 4-1 ALTERNATIVE C4 PRELIMINARY DESIGN CRITERIA	
Unit Process or Size Parameter	**Design Value**
Mixers in Cell 1A	
Number	2
Horsepower Each	5
Polishing Nitrification Reactor	
Dimensions	24' x 48' x12' Deep
Media Required	16 Cubes
Estimated Airflow	162 SCFM
Denitrification Filter	
Number	4, (3-duty, 1 standby)
Type	Moving Bed Sand Filter
UV Disinfection	
Type	Open Channel
Number of Banks	3, (2-duty, 1 redundant)
Minimum UV Transmittance	70%
Minimum Design Dose	40,000 μW/cm2/sec
Sludge Management	
Type	Periodic Dredging
Frequency	10 Years

4.7 ALTERNATIVE C5: ACTIVATED SLUDGE

This alternative evaluates traditional activated sludge processes using recycled activated sludge to promote denitrification in an anoxic basin where nitrates are converted to nitrogen gas. BOD removal occurs in both the denitrification basin as well as the aerobic basin. This alternative can either be designed to have the activated sludge process within earthen basins, in new concrete basins, in an oxidation ditch, or as a proprietary package such as the Bio-Wheel technology. This alternative eliminates the use of the existing Cells 1 and 2 for treatment and makes them available for sludge storage or as emergency storage. Appurtenant facilities to the different activated sludge system are identical. Capital costs for the different systems vary with ease of constructability, possibility for retrofitting existing facilities, and general manufacturer differences. An activated sludge facility would be constructed in the space of Cell 3, suggesting the need for large amounts of fill material to bring the cell floor up to grade.

A process flow diagram for this alternative is shown in Figure 4-5 and a suggested site layout is shown in Figure 4-6. Equipment and unit operations for this alternative include:

- New headworks screens necessary for course screening, washer/compactor and grit removal requirements installed within a new headworks building.



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RIVER ROCK WATER AND SEWER DISTRICT

RIVER ROCK MONTANA

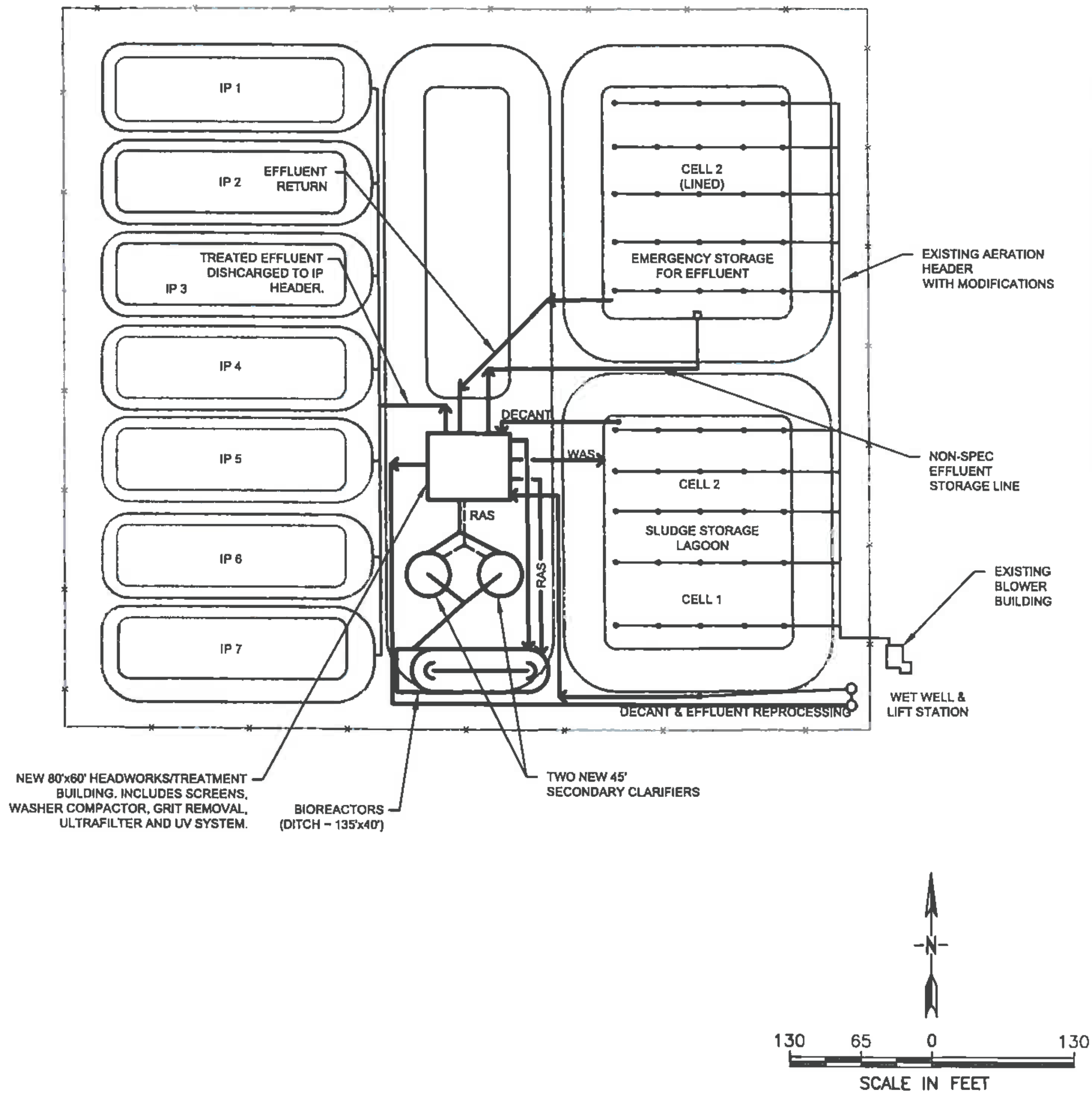
ALTERNATIVE C5
ACTIVATED SLUDGE BLOREACTORS

PROJECT NO 4812.001

FIGURE NUMBER

FIG. 4-5

R:\4812\000\ACAD\Exhibits\FIGURE 4-5.dwg Plotted by rita lashley on Apr/29/2010



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CHK'D BY: CPH
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DATE: 04/2010

RIVER ROCK WATER AND SEWER DISTRICT
RIVER ROCK MONTANA

PROJECT NO 4812.001

ALTERNATIVE C5 SITE PLAN

FIGURE NUMBER
FIG. 4-6

R:\4812\000\ACAD\Exhibits\FIGURE 4-6.dwg Plotted by rika lashley on Apr/29/2010

- Installation of a new bioreactor with an integrated or separate anoxic zone.
- Installation of two secondary clarifiers located on the discharge end of the bioreactor.
- Installation of an ultrafiltration system for physical removal of solids and bacteria. Same design as C4 alternative.
- Installation of a fully redundant UV System. Same design as C4 alternative.
- Piping and controls to allow transfer of effluent to one of the existing Cells 1 and 2 on an emergency basis upon detection of E. coli.
- Piping to allow for sludge transfer and sludge storage in the remaining lined cells.
- Piping and pump station infrastructure to allow sludge decant and emergency storage transfer back to the influent lift station.

This alternative provides a significant redundancy advantage with little increase in cost over Alternative C4 by using the existing Cells 1 and/or 2 for emergency storage only upon detection of E. coli in the facility effluent. This may become extremely important with the strict non-detect limit on E. coli. The storage capacity of Cells 1 and 2 would provide multiple days to diagnose and fix the problem. After correcting the problem, the effluent would have to be metered back into the influent lift station for processing.

A cost estimate for an activated sludge system in an oxidation ditch is $6,200,000 (see Appendix C.

The unit process parameters are shown in the Table 4-2.

TABLE 4-2
ALTERNATIVE C5 PRELIMINARY DESIGN CRITERIA

Unit Process or Size Parameter	Design Value
Headworks	
Automatic Course Screen	¼ Inch
Manual Bypass Screen	¼ Inch
Screenings Washer/Compactor	
Vortex Grit Chamber	6 Foot Diameter
Oxidation Ditch	
Length	140ft
Width	40 ft
Side Water Depth	10 ft
Basin Volume	300,000 gal
Surface Aerators:	
Number	2 (1 duty, 1 standby)
Oxygen Transfer (each)	2,000 lb/day
Horsepower (each)	25 hp
Clarifier	
Number of Clarifiers	2
Clarifier diameter	45 ft
RAS/WAS Pumps	
Number of RAS Pumps	2
Number of WAS Pumps	2
Ultrafiltration Filter	
Number	1
UV Disinfection	
Type	Open Channel
Number of Banks	3, (2 duty, 1 redundant)
Minimum UV Transmittance	70%
Minimum Design Dose	40,000 µW/cm2/sec
Emergency Effluent Return Pump Station	
Number of Pumps	2, (1 duty, 1 standby)

4.8 ALTERNATIVE C6: MBR

This alternative evaluates the technology that combines activated sludge and membranes into a package design which is available from several manufacturers. Instead of having bioreactors, clarifiers, and filtration as separate processes, the MBR design incorporates ultrafiltration with the bioreactor basins necessary for nitrogen removal. The membranes are identical in pore size to the ultrafiltration filters used for

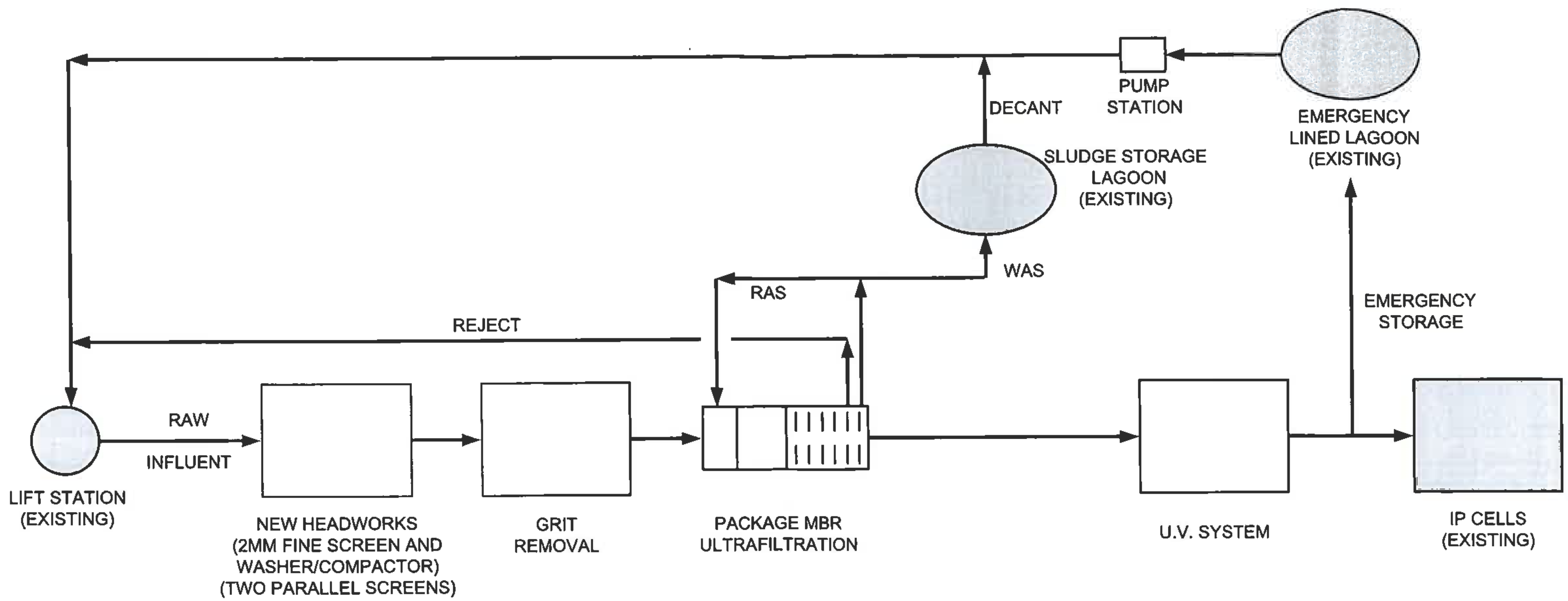
Alternative C5 as a separate process. MBR systems provide biological nutrient removal (BNR) and can be added to existing facilities where space is a very restricted. This is advantageous for the River Rock WWTF, as new construction is limited to the footprint of Cell 3 while keeping the existing cells in operation to provide continuous treatment.

A process flow diagram for an MBR system is shown in Figure 4-7 and a suggested lite layout is shown in Figure 4-8. The UV system, sludge lagoon for sludge storage, and emergency storage to the existing lined lagoons are the same in design and cost for this alternative as they are for Alternative C5. Equipment and unit operations for this alternative include:

- New 2-mm fine screens, washer/compactor and grit removal requirements installed within a new headworks building.
- Installation of a package MBR system for biological treatment and clarification.
- Installation of a fully redundant UV System. Same design as C4 and C5.
- Piping and controls to allow transfer of effluent to one of the existing lined treatment cells on an emergency basis upon detection of E. coli.
- Piping to allow for sludge transfer and sludge storage in the remaining lined treatment cells.
- Piping to allow sludge decant and emergency storage transfer back to the influent lift station.

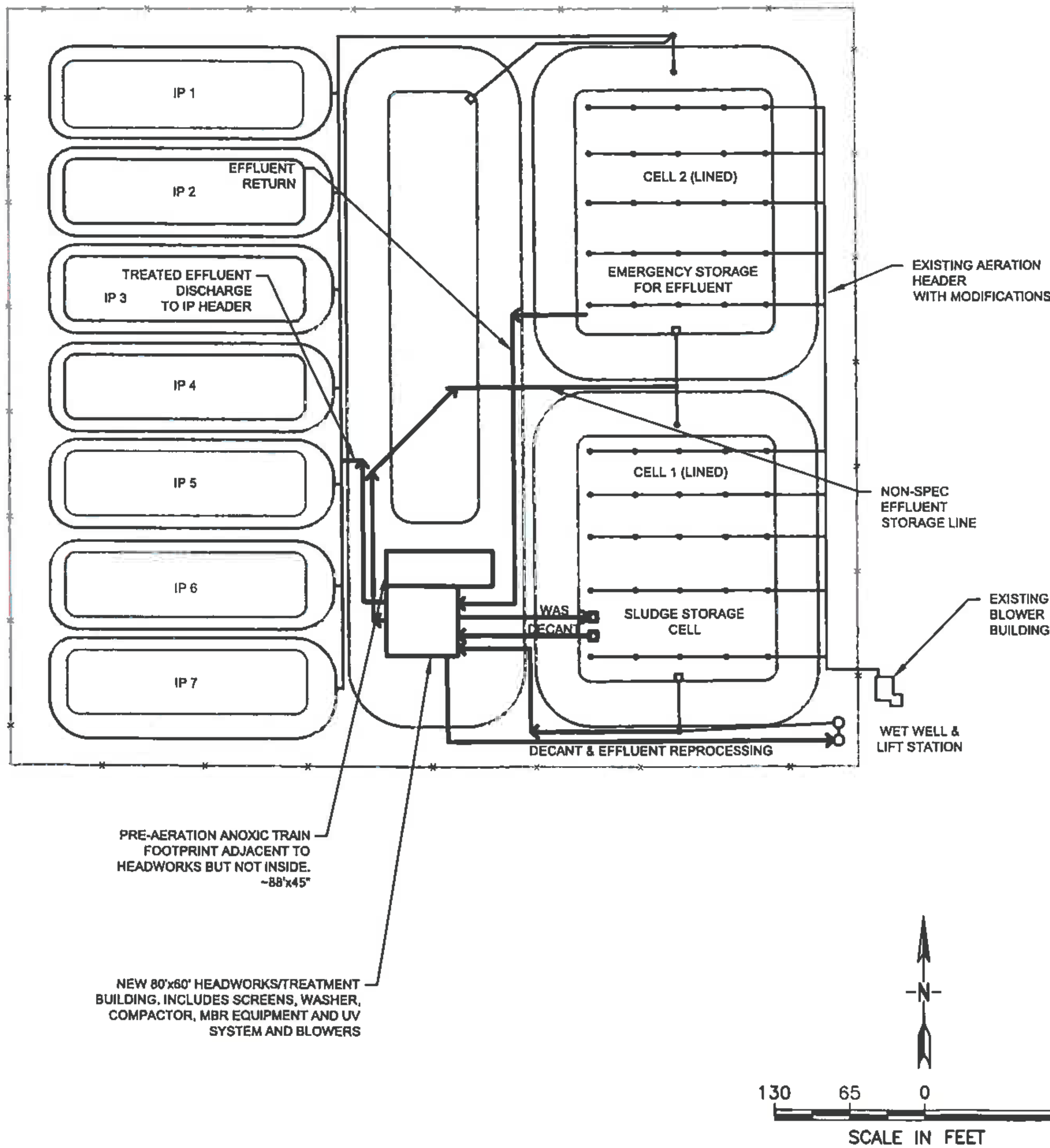
Ahead of the MBR system, fine screening and grit removal are required to protect membranes and pumps from excessive wear. The recommended screen opening size is typically 3 mm or less and varies depending on the membrane manufacturer and type. Options for screens include manually cleaned or mechanically cleaned screens with automated cleaning often including brushes and/or water spray to help keep screens clear while maintaining low headloss through the screen. Two parallel screens would be sized to each handle the full peak hour flow and provide full redundancy. The washer/compactor will need to be adequately sized to handle the screening volumes which are expected to be larger than those of Alternatives C4 and C5 due to the smaller screen opening. The most common type of washer/compactor is a wash/press type. This type uses an auger that conveys screenings through the wash zone and compaction/dewatering zone often with the ability for forward and reverse action to further aid in organics removal. For this alternative, a single washer/compactor is provided to collect screenings from either of the fine screens.

Grit would be removed by a vortex grit chamber and deposited in Cells 1 and 2 along with the sludge.



MORRISON MAIERLE, INC. An Employee-Owned Company Engineers Surveyors Scientists Planners 1 Engineering Place Helena MT 59602 Phone (406) 442-3050 Fax (406) 442-7862	DRAWN BY JPS CHK'D BY CPH APPR BY. CHP DATE 03/2010	RIVER ROCK WATER AND SEWER DISTRICT RIVER ROCK MONTANA		PROJECT NO 4812 001
		ALTERNATIVE C6 MEMBRANE BIOREACTOR		FIGURE NUMBER FIG. 4-7

R \4812\000\ACAD\Exhibits\FIGURE 4-7.dwg Plotted by rika lashley on Apr/29/2010



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RIVER ROCK WATER AND SEWER DISTRICT
RIVER ROCK MONTANA

ALTERNATIVE C6 SITE PLAN

PROJECT NO 4812 001

FIGURE NUMBER FIG. 4-8

R:\4812\000\ACAD\Exhibits\FIGURE 4-8.dwg Plotted by nka lashley on Apr/29/2010

Following grit removal, flow would enter the packaged MBR system consisting of three zones. The first zone is an anoxic denitrification zone fed with influent and recycled activated sludge (RAS) rich in nitrates which are converted to nitrogen gas. The second zone is aerated to provide BOD removal and nitrification. The third zone contains the membrane cassettes. Water is drawn into the membranes by a slight vacuum created by permeate pumps. The sludge is periodically scoured from the outside of the membranes and excess sludge would be wasted and disposed of in Cells 1 and/or 2. The permeate pumps would discharge the effluent to the UV System. This alternative also has the flexibility for an emergency bypass by routing effluent to the existing lined treatment cells. The pore size of the membranes is about six times smaller than E. coli bacteria in their smallest dimension. Similar to ultrafiltration, the membranes provide a physical barrier to E. coli bacteria and remove them from the wastewater.

Multiple vendor estimates were solicited (see Appendix D) and a cost estimate for the complete treatment system is $4,900,000 (see Appendix C). The preliminary design criteria for the MBR option are shown in Table 4-3.

TABLE 4-3
ALTERNATIVE C6 PRELIMINARY DESIGN CRITERIA

Unit Process or Size Parameter	Design Value
Headworks	
Automatic Fine Screen (2)	2 mm opening
Screenings Washer/Compactor	
Vortex Grit Chamber	6 Foot Diameter
MBR	
Number of Treatment Trains	2
Total Number of Membrane Units	6
Total Membrane Cartridges	2400
Nominal Pore Size	0.08 μm
Basin Volume	350,000 gal
Flux at maximum month flow	12.02 gal/(ft^{2}xday)
Permeate Pumps	3, (2 duty, 1 standby)
Positive Displacement Pumps	3, (2 duty, 1 standby)
Feed Forward Pump Design	4, (2 duty, 2 standby)
Chemical Cleaning System	1
UV Disinfection	
Type	Open Channel
Number of Banks	3, (2 duty, 1 redundant)
Minimum UV Transmittance	70%
Minimum Design Dose	40,000 μW/cm2/sec
Emergency Effluent Return Pump Station	
Number of Pumps	2, (1 duty, 1 standby)

4.9 CAPITAL COST

Capital costs were estimated for all of the evaluated alternatives based on the design flow of 0.374 mgd. Cost estimates include engineering and construction, as well as a 20% contingency. Detailed cost estimates are located in Appendix C. Table 4-4 lists the cost estimates for each alternative. Table 4-5 lists present worth costs for full build-out of all evaluated alternatives.

TABLE 4-4
SUMMARY OF TREATMENT ALTERNATIVES COST ESTIMATES

Alternative	Cost Estimate
Alt C2: Send Wastewater to the City of Belgrade	$3.5 MM
Alt C3: Land Application of Effluent	$3.5 MM
Alt C4: Lagoon Upgrades	$4.0 MM
Alt C5: Activated Sludge (Earthen Basin or Oxidation Ditch)	$6.2 MM
Alt C6: Membrane Bio Reactor (MBR)	$4.9 MM

TABLE 4-5
PRESENT WORTH COST COMPARISON

Alternative	Capital Cost	Annual O&M Cost	O&M Present Worth	Total Present Worth
C2 – Send WW to Belgrade	$3.47 MM	$44 K	$0.55 MM	$4.02 MM
C3 – Land Applications	$3.55 MM	$327 K	$4.09 MM	$7.63 MM
C4 – Lagoon Upgrades	$4.02 MM	$144 K	$1.79 MM	$5.81 MM
C5 – Oxidation Ditch with Nitrification and Denitrification	$6.16 MM	$86 K	$1.07 MM	$7.23 MM
C6 – Packaged Membrane Plant	$4.90 MM	$129 K	$1.61 MM	$6.50 MM

4.10 ENVIRONMENTAL IMPACTS OF WWTF IMPROVEMENT ALTERNATIVES

With the exception of the no-action alternative, none of the evaluated alternatives raise concerns with respect to environmental impacts. All of them will reduce or eliminate introduction of wastewater constituents to the groundwater. Groundwater recharge with treated and safe effluent may be beneficial to surrounding water users. Alternatives C2 and C4 through C6 would not significantly affect vegetation and animal life since improvements would be limited to the existing facility site and developed corridors around the River Rock Subdivision and the City of Belgrade. Use of the land to the southwest of the Subdivision for Alternative C3, spray irrigation, may need to be evaluated more closely as it includes streams, woods and possible wetlands. Any impacts caused by construction of either alternative would be mitigated as part of the project.

CHAPTER 5
RECOMMENDATION AND IMPLEMENTATION

5.1 WASTEWATER DESIGN FLOWRATE

The cost estimates in Chapter 4 were prepared for the permitted design flowrate of 0.374 mgd. This approach did not take into consideration that the River Rock Subdivision is fully built-out and barring the expansion of the service area, flow increases are limited to increases of the number of people in the existing households. Therefore, it is recommended that the implementation plan include a phased approach. The initial phase would provide a design for a flow rate of 200,000 gpd, and the second phase would allow for full build out to the permitted design flow. As discussed in Chapter 2, the current average flowrate is 170,000 gpd and the 200,000 gpd flow rate represents an 18 percent safety factor over existing flowrates. Modifying the design flowrate under a phased approach will provide substantial cost savings regardless of the final alternative selected. A Phase 1 flowrate of 200,000 gpd represents a 64.5 gallons per capita per day water usage, which is well below DEQ design guidelines. A deviation from Circular DEQ-2 may be necessary but is well justified, as the Phase 1 flowrate it based on actual flow measurements and is in line with published literature. Therefore, under Phase 1, the following revised capital estimates are compared to provide a treatment flow ability at 200,000 gallons per day.

5.2 REVISED CAPITAL COST COMPARISONS

Most vendor estimates were obtained at the full 0.374 mgd flow. These estimates were modified for the lower 0.20 mgd flow and incorporated into scaled overall cost estimates. Table 5-1, lists the revised capital costs for Phase 1.

TABLE 5-1
PHASE 1 TREATMENT ALTERNATIVE COST ESTIMATES

Alternative	Cost Estimate
C2 – Send Wastewater to Belgrade	$3.4 MM
C3 – Land Application of Effluent	$2.5 MM
C4 – Lagoon Upgrades	$2.8 MM
C5 – Activated Sludge (Oxidation Ditch)	$4.3 MM
C6 – Membrane Bio Reactor (MBR)	$2.5 MM

Phase 1 capital costs, while still significant, are more feasible for the River Rock County Water and Sewer District. Table 5-2 details the cost estimates factored into determining the total present worth for each of the alternatives for Phase 1.

TABLE 5-2
PHASE 1 TREATMENT ALTERNATIVE PRESENT WORTH

Alternative	Capital Cost	Annual O&M Cost	O&M Present Worth	Total Present Worth
C2 – Send WW to Belgrade	$3.4 MM	$21 K	$0.26 MM	$3.6 MM
C3 – Land Application	$2.5 MM	$82 K	$1.03 MM	$3.5 MM
C4 – Lagoon Upgrades	$2.8 MM	$89 K	$1.10 MM	$3.9 MM
C5 – Activated Sludge with Nitrification and Denitrification	$4.3 MM	$55 K	$0.69 MM	$5.0 MM
C6 – Packaged Membrane Plant	$2.5 MM	$85 K	$1.06 MM	$3.5 MM

Ranking of alternatives with respect to project cost was largely based on the revised Phase 1 cost estimates. However, costs associated with the full build-out were considered when ranking scores were assigned.

5.3 NON-ECONOMIC CONSIDERATIONS

The WWTF improvement alternatives presented in this study were also evaluated in a variety of non-monetary ways. To provide structure to this comparison, the alternatives were compared based on five broad criteria:

Treatment reliability - the ability of an alternative to consistently meet the permitted effluent criteria, prevent effluent violations and generally provide a reliable facility.

Operational ease – maintained with minimal to moderate attention.

Facility Flexibility - the ability of an alternative to adapt to future conditions which may necessitate facility expansion, including possible additional phosphorus limits or other unanticipated conditions.

Energy and resource use – the ability of a facility to operate without tremendous energy input and turn byproducts of the facility into a resource.

Each alternative is compared below within the framework of these criteria.

Treatment Reliability. All WWTF improvement alternatives will improve the overall reliability of the treatment processes compared to the existing system. All of the proposed treatment options have track records for consistent performance in installations in the U.S. Treatment alternatives C4, C5 and C6 would all satisfy the required treatment limits. Alternative C2 would avoid the strict effluent limits on E. coli as the Belgrade permit would become the driver for treatment requirements. Alternative C3 would avoid the permit requirements altogether and agronomic nutrient uptake would become the driver for application rates.

Operational Ease. All alternatives will require proper maintenance and regular repair of any aeration/mixing system components. Alternatives C4, C5 and C6 will require the most operator training for processes associated with operating activated sludge and mechanical treatment systems. Alternative C6 represents the newest technology approach with elimination of clarifiers. Alternative C3 will have added operational requirements associated with land application and operation of the irrigation equipment. However, this equipment is minimized to providing pressurized effluent and the details on application rates for the specific crop. Alternative C5 provides nitrification and denitrification in one oxidation ditch, eliminating some of the complexity required in Alternative C4 which requires a separate carbon source. The addition of a disinfection system will require additional operation and maintenance compared to the existing system, but is equivalent for three of the five alternatives.

Facility Flexibility. Alternative C2 would transfer responsibility for future changes in discharge permit requirements to the City of Belgrade and would relieve RRCWSD from having to add or upgrade treatment capabilities in the future. Alternative C3 avoids the strict permit requirements and would be largely immune to future discharge permit changes. Addition of phosphorous limits, for example, would not affect the land application process. However, upgrading the capacity from Phase 1 to the full design flow, may require installation of additional pump stations and piping to a spray irrigation site separate from the one used for Phase 1. This would increase facility complexity and operational requirements. Alternatives C4, C5, and C6 have the flexibility to incorporate future phosphorus removal requirements which are not considered likely. Capacity upgrades from Phase 1 to Phase 2 would be easily incorporated, especially if planned for during Phase 1.

Energy and Resource Use. Electrical usage is not particularly high for any of the alternatives as the system flowrate is relatively small. Alternative C3 has overall lower electrical requirements due to the lack of mechanical equipment, but may see some higher costs during the irrigation season.

5.4 COMPARISON AND RANKING OF ALTERNATIVES

Utilizing the economic and non-economic information presented above, a comparative summary evaluation and ranking of alternative combinations is presented in Table 5-3. For each of the criteria discussed above, alternatives were assigned ranking scores from 1 to 5, with 5 being the most favorable and 1 being least favorable. The ranking factors were then multiplied by the relative weight of importance assigned to each evaluation criteria. The weighted rank scores were then summed, resulting in a weighted rank total score, the greatest score indicating the highest ranking. Under this ranking method, the highest possible score is 100 points. The weighting of each criterion, in descending order, was as follows:

- Cost Effectiveness – 5
- Treatment Reliability – 4
- Operational Ease – 3
- Facility Flexibility – 3
- Energy and Resource Use – 2

The weighting of the criteria has a substantial effect on the final alternative ranking. The weighting of the criteria is inherently open to differences of opinion. The weighting documented above and used in this analysis is suggested as a starting point, based on the relative importance of these factors as measured by other Montana communities. Many times the capital cost becomes the dominant weighting factor negating most other items as long as the required treatment can be achieved.

TABLE 5-3
TREATMENT ALTERNATIVE RANKING

Comparison Parameter	Parameter Weight	Alt. C2 Send WW to Belgrade	Alt. C3 Land Application	Alt. C4 Lagoon Upgrades	Alt. C5 Oxidation Ditch with Nit./Denit.	Alt. C6 Packaged Membrane Plant
COST EFFECTIVENESS	5	3	5	4	2	5
TREATMENT RELIABILITY	4	4	4	5	5	5
OPERATIONAL EASE	3	5	3	4	4	4
FACILITY FLEXIBILITY	3	3	3	4	4	5
ENERGY/RESOURCE USE	2	5	4	3	3	3
WEIGHTED RANK TOTAL		**65**	**67**	**70**	**60**	**78**

5.5 RECOMMENDED ALTERNATIVE

Based on the financial and non-economic factors discussed above, the recommended alternative is a Membrane Bio Reactor (MBR). Further breaking this project into phases will help keep costs feasible initially until such time as the wastewater flow increases to require additional treatment capacity. A Phase 1 design capacity of 200,000 gallons per day is recommended likely requiring MDEQ to approve this lower than recommended per capita/per day flowrate.

The MBR system is an excellent choice when removal of E. coli is a critical treatment requirement. Similar to ultrafiltration, the nominal pore size of bio reactor membranes is 0.08 micrometers (µm) while E. coli bacteria in their smallest dimension are 0.5 µm or about 6 times larger. Therefore, ultrafiltration and membrane plants provide a physical barrier to E. coli and other bacteria of its size. Removal of solids to a very small particle size also has the advantage of optimizing UV disinfection. If not removed, larger particles have the potential for shading smaller ones from the UV radiation. Figure 5-1 illustrates that ultrafiltration and bioreactor membranes remove particles larger than 0.1 μm with bacteria ranging in size from 0.2 to 11 μm.

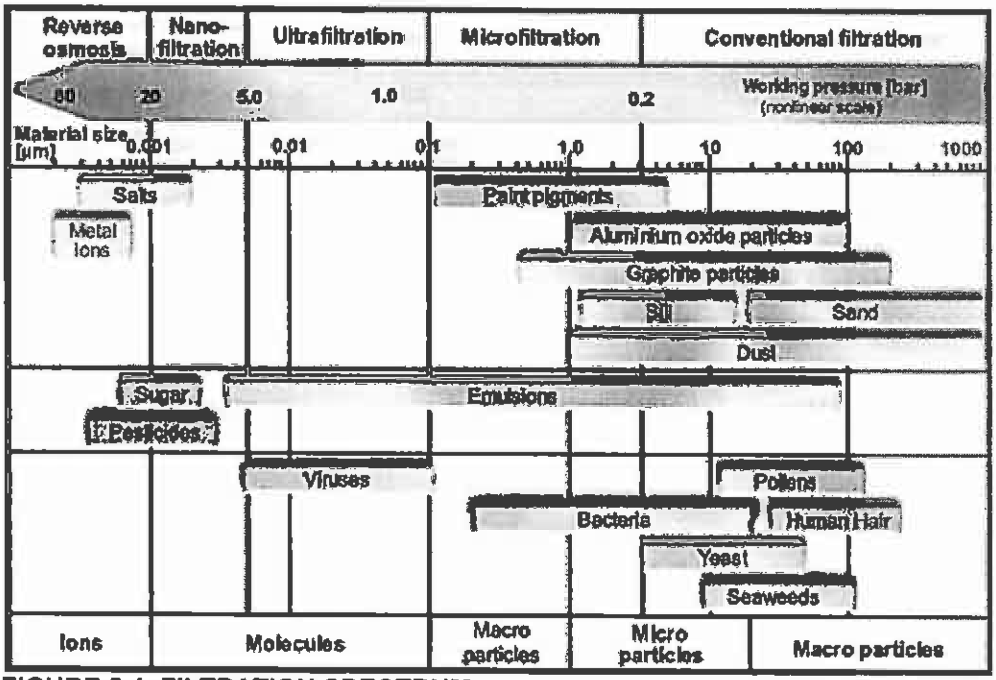

FIGURE 5-1 FILTRATION SPECTRUM

5.6 PROJECT SCHEDULE

In order to meet the compliance schedule set by the discharge permit, the following project schedule is proposed:

<u>Phase 1</u>

August 2010	Begin Engineering Design for Phase 1
Feb 2011	Bidding
April 2011	Begin Construction
March 2012	Complete Construction

<u>Phase 2</u>

At such time as the effluent flows reach an average daily flow of 0.19 MGD or if RRCWSD wants to consider expansion of service area, Phase 2 of the project would include adding treatment trains to accommodate the anticipated growth. Phase 1 would be designed to allow for expansion without disruption to the existing system.

5.7 FUNDING STRATEGY

This section provides a summary of potential loan or financing options for the River Rock WSD:

Water Pollution Control SRF

- Available funding is dwindling due to increased demand.
- Projects must be on MDEQ Project Priority List before applying. River Rock is on the priority list.
- Loan fees currently waived.
- Current interest rate (i-rate) is 3.75%, but first $500,000 can be loaned at i-rate of 2.75% in qualifying "hardship" cases.
- 20-year loan term.
- 125% coverage required.
- One annual payment as Bond Reserve must be established (or borrowed) up front.

DNRC/RRGL

- Less competitive option for water and wastewater projects.
- 3% Loan Origination Fee applies.
- Loan term typically 20 years, but can be up to 30 years maximum.
- Legislature authorizes loans and i-rates for each specific project, after DNRC staff recommendation; typical i-rates are 4.5% or higher.
- 125% coverage required if backed by Revenue Bond (no excess coverage if GO bond or tax assessment).
- One-half of one annual payment as Bond Reserve must be established (or borrowed) up front.

USDA/RD

- Loan funds at market i-rate (similar to SRF rate).
- RD grants are available for low income communities or for communities that have very high user rates compared to other similar communities. Grants are rarely awarded if user rate is less than target rate.
- Loan term 30 years, but can be pre-paid; 110% coverage required; and loan reserve can be "accumulated" from excess rate revenues over the first several years of the loan rather than having to be established up front.

Revenue Bonds

- Terms set by bond issuer, but typically 20-year with 125% coverage and one annual payment as Bond Reserve up front.
- Market determines i-rate at time of issue.
- Additional brokerage fees and bond-rating costs apply, compared to agency loans.

General Obligation Bonds, Tax Levies, and RIDs

- Requirements vary, but generally assess project capital cost (only) against County property taxes in District; O&M costs must still be collected as user rate revenues.
- Debt election requirements differ from Revenue Bonds and different thresholds for passage apply; voting potentially indexed to property square- or frontage-footage or per service connection; RID elections are typically on a "protest vote" basis.
- (Consult bond counsel for further details on options and legal requirements.)

Bank Lending

- The $2.5 to $3 million may exceed local lenders' capability, but the District could check with a local bank(s); banks sometimes get a tax benefit, allowing them to compete with some agency lending rates.
- Reserve requirements, coverage, i-rate, and term would be determined by the bank.

5.7.1 Interim Financing

INTERCAP Loan

- Can be used to pay for engineering fees prior to construction loan
- Administered by State of Montana Board of Investments
- Current interest rate is 3.25%, term is 3 years
- No matching money is required
- For <$1,000,000 loan, application is approved by board staff within 4 weeks
- INTERCAP loan will be rolled into construction loan and final funding package once project construction funding is secured.
- See Appendix E for further information.

As a water and sewer district, River Rock will likely be required to hold a debt election for any type of loan or bonding. First, the District Board would typically pass a resolution declaring the purpose, land benefited, amount and term of indebtedness. A mailed ballot may be acceptable for the debt election. Election requirements, voter participation and passage thresholds should be verified with the District's attorney or bond counsel.

Appendix A

MGWPCS Discharge Permit
Statement of Basis

Permit No.: MTX000147

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

AUTHORIZATION TO DISCHARGE UNDER THE MONTANA GROUND WATER POLLUTION CONTROL SYSTEM

In compliance with Montana Code Annotated (MCA) Section 75-5-101 *et seq.*, MCA, and the Administrative Rules of Montana (ARM) 17.30.1001 *et seq.*,

River Rock County Water and Sewer District

is authorized to discharge from the **River Rock Subdivision** to its Infiltration/Percolation Beds,

located in the **SW ¼ of Section 3, Township 1 South, Range 4 East in Gallatin County,**

to receiving waters, **Class I groundwater,**

in accordance with discharge point(s), effluent limitations, monitoring requirements and other conditions set forth herein. Authorization for discharge is limited to the outfall specifically listed in the permit.

This permit shall become effective: **April 1, 2010.**

This permit and the authorization to discharge shall expire at midnight, **March 31, 2015**

FOR THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Jenny Chambers

Jenny Chambers, Chief
Water Protection Bureau
Permitting & Compliance Division

Issued: February 3, 2010

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I. EFFLUENT LIMITATION AND MONITORING REQUIREMENT

A. Description of the Discharge Point

The authorization to discharge provided under this permit is limited to the outfalls that are specifically designated below as the discharge locations. Discharges at any location not authorized under an MGWPCS permit is a violation of the Montana Water Quality Act and could subject the person(s) responsible for such discharge to penalties under the Act. Knowingly discharging from an unauthorized location or failing to report an unauthorized discharge within a reasonable time from first learning of an unauthorized discharge could subject such person to criminal penalties as provided under Section 75-5-632 of the Montana Water Quality Act.

Outfall Serial Number	Description of Discharge Point
001	The discharge is from up to eight infiltration/percolation (IP) beds discharging domestic wastewater at a design rate of 374,000 gpd from the River Rock Subdivision. The wastewater will receive treatment in two aerated lagoons prior to discharge to ground water via the infiltration/percolation (IP) beds. Outfall 001 is located at 45° 46' 44" North latitude and 111° 13' 24" West longitude, situated near the northwest corner of the subdivision. The Department has granted a source-specific ground water mixing zone pursuant to [ARM 17.30.518] extending from the source for a distance of 400 feet downgradient in a N29°E direction.

B. Specific Effluent Limitations

Effective immediately and lasting through the term of the permit, the quality of effluent discharged by the facility shall, at a minimum, meet the limitations set forth in Table 1 except as described in Part I.E. (compliance schedule) of this permit.

Table 1. Numeric Effluent Limits for Outfall 001

Parameter[1]	Effluent Limit (units as noted)
$CBOD_5$[2]	85% removal[3]
pH	6.0 – 9.0 s.u.
Total Inorganic Nitrogen (as N)[4]	91.1 lb/day[5][6]
Effluent Flow Rate	374,000 gallons per day (maximum flow)

(1) See definitions in Part VI of this permit.
(2) $CBOD_5$ – Five-day carbonaceous biological oxygen demand.
(3) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85% removal).
(4) Total Inorganic Nitrogen (TIN) is the sum of nitrate, nitrite, and ammonia (as N).
(5) Calculations based on the 30-day average values of flow and concentration.
(6) Calculations based on the average values of design flow and concentration for the specified time period. Equation is Load (lb/d) = flow (gpd) x concentration (mg/L) x 8.34×10^{-6}.

C. Specific Ground Water Compliance Limits

Effective immediately and lasting through the term of the permit, the ground water shall not exceed the water quality compliance limits at MW-1 and MW-2 shown in Table 2 except as described in Part I.E. (compliance schedule) of this permit.

Table 2. Ground Water Compliance Limits for Monitoring Wells MW-1 and MW-2

Parameter	Instantaneous Maximum[1]
Escherichia Coliform (e-coli) Bacteria, organisms/100 ml	Less than 1
Nitrate (as N), mg/L	10.3

(1) See definitions, Part VI of this permit.

D. Self-Monitoring Requirements

1. As a minimum, upon the effective date of this permit, the constituents in Table 3 shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored discharge. Effluent monitoring shall be conducted in a location (location C2 as shown in Attachment 2B of the statement of basis) after all treatment in the lagoon cells is complete and prior to discharge in the IP beds.

2. The reporting period for the constituents in Table 3 is monthly.

3. An effluent flow meter was installed in April 2008. The flow monitoring device is an ultrasonic echo ranging type open channel flow meter (weir-type).

4. The TN and total phosphorus (TP) loads shall be calculated monthly using the monthly averages for flow and concentration using the following equations:

$$TN\ (lb/d) = TN(mg/L) \times flow\ (gpd) \times 8.34 \times 10^{-6}$$
$$TP\ (lb/d) = TP(mg/L) \times flow\ (gpd) \times 8.34 \times 10^{-6}$$

Table 3. Outfall 001 Effluent Parameters Monitored (prior to discharge to lagoon cell #3 and/or IP beds)

Parameter(1)	Frequency	Sample Type(2)
Effluent Flow Rate, gpd(3)	Continuous	Continuous
pH, s.u.	Monthly	Grab
Total Suspended Solids (TSS), mg/L	Monthly	Grab/Composite(4)
Five-day Carbonaceous Biological Oxygen Demand ($CBOD_5$), mg/L	Monthly	Grab/Composite(4)
Chloride, mg/L	Monthly	Grab/Composite(4)
Escherichia Coliform (e-coli) Bacteria, organisms/100 ml	Monthly	Grab
Total Phosphorus as P(5), mg/L	Monthly	Grab/Composite(4)
Nitrate (as N), mg/L	Monthly	Grab/Composite(4)
Nitrite (as N), mg/L	Monthly	Grab/Composite(4)
Ammonia (as N), mg/L	Monthly	Grab/Composite(4)
Total Kjeldahl Nitrogen (as N), mg/L	Monthly	Grab/Composite(4)
Total Nitrogen(6), mg/L	Monthly	Calculated
Total Inorganic Nitrogen (as N)(7),(8), mg/L	Monthly	Calculated
Total Phosphorus, lb/day(8)	Monthly	Calculated
Total Nitrogen, lb/day(8)	Monthly	Calculated
Total Inorganic Nitrogen (as N)(7),(8), lb/day	Monthly	Calculated
Oil & Grease, mg/L	Semi-annually	Grab/Composite(4)
Total Phenols, mg/L	Semi-annually	Grab/Composite(4)
Arsenic, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Cadmium, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Chromium, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Copper, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Lead, dissolved, mg/L	Semi-annually	Grab/Composite(4)

Mercury, dissolved, mg/L	Semi-annually	Grab/Composite[4]
Selenium, dissolved, mg/L	Semi-annually	Grab/Composite[4]
Silver, dissolved, mg/L	Semi-annually	Grab/Composite[4]
Zinc, dissolved, mg/L	Semi-annually	Grab/Composite[4]

(1) Laboratory detection limits must be equal to or less than the required reporting value (RRV) in DEQ-7 (February, 2008) for those parameters where an RRV is specified in DEQ-7.
(2) See definitions in Part VI of this permit.
(3) To be measured by a recorder or totalizing flow meter.
(4) Grab samples will be allowed until December 31, 2011. Thereafter, composite samples will be required.
(5) EPA Method 365.1 or equivalent.
(6) Total Nitrogen (TN) is the sum of nitrate, nitrite and total kjeldahl nitrogen (as N).
(7) Total Inorganic Nitrogen (TIN) is the sum of nitrate, nitrite and ammonia (as N).
(8) See text for calculations.

5. As a minimum, upon the effective date of this permit, the constituents in Table 4 shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the volume and nature of the monitored influent wastewater. The reporting period for the constituents in Table 4 is monthly.

Table 4. Outfall 001 Influent Parameters Monitored

Parameter	Frequency	Sample Type[1]
Five-day Carbonaceous Biological Oxygen Demand ($CBOD_5$), mg/L	Monthly	Composite

(1) See definitions in Part VI. of the permit

6. As a minimum, upon the effective date of this permit, the constituents in Table 5 shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the ground water from MW-1, MW-2, MW-3 and MW-4. The reporting period for the constituents in Table 5 is monthly for MW-1 and MW-2. The reporting period for the constituents in Table 5 is quarterly for MW-3 and MW-4.

Table 5. Ground Water Monitoring Parameters for Monitoring Wells MW-1, MW-2, MW-

3 and MW-4

Parameter	Frequency	Sample Type(1)
Static Water Level (SWL) (feet below top of casing)	Monthly/Quarterly(2)	Instantaneous
Escherichia Coliform (e-coli) Bacteria, organisms/100 ml	Monthly/Quarterly(2)	Grab
Nitrate (as N), mg/L	Monthly/Quarterly(2)	Grab
Ammonia (as N), mg/L	Monthly/Quarterly(2)	Grab
Chloride, mg/L	Monthly/Quarterly(2)	Grab

(1) See definitions, Part VI of this permit.
(2) Monthly for MW-1 and MW-2. Quarterly for MW-3 and MW-4

6. MW-1 and MW-2 were constructed in 1999 for monitoring the shallow ground water immediately downgradient of outfall 001. MW-3 and W-4 were constructed in 1999 and 2008, respectively, for monitoring the shallow ground water uprgradient of outfall 001.

7. Within 60 days of the effective date of this permit the permittee shall submit a copy of the standard operating procedures proposed for monitoring MW-1, MW-2, MW-3 and MW-4. These procedures should address at a minimum, well purging equipment and procedures, sample collection equipment and procedures, equipment decontamination procedures, and sample storage and transportation procedures.

E. Compliance Schedule

The following compliance schedules in Table 6 apply to this facility. These compliance schedules are in place to protect the quality of the ground water beneath and downgradient of the wastewater discharge. The permittee must provide annual updates to the Department demonstrating that they are performing adequately to meet the compliance schedule deadlines. The annual updates to the DEQ will be due on December 31 of 2010, 2011, and 2012. Upon completion of the compliance schedule the specific parameter in question shall meet all the applicable effluent limits and/or ground water compliance limits set forth in this permit. As long as the permittee is working towards and meeting the compliance schedule requirements with reasonable due diligence and to the satisfaction of the Department, the Department will not issue violation notices for exceeding the $CBOD_5$ and the Total Inorganic Nitrogen effluent limits in Table 1 of this permit, nor for failing to meet the E-coli bacteria or nitrate ground water compliance limits in Table 2 of this permit.

Table 6. Compliance Schedule

Parameter	Start of Compliance Schedule	Date to secure funding and submit report to DEQ outlining funding sources	Date to submit complete plans and specifications to DEQ	Date to have plans and specifications approved by DEQ	Date to complete construction and full operation of modifications
$CBOD_5$	Effective date of permit	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013
Total Inorganic Nitrogen	Effective date of permit	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013
E-Coli Bacteria	Effective date of permit	August 15, 2011	July 15, 2012	December 1, 2012	October 1, 2013

II. MONITORING, RECORDING AND REPORTING REQUIREMENTS

A. Representative Sampling

Effluent samples taken in compliance with the monitoring requirements established under Part I shall be representative of the volume and nature of the monitored medium.

B. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under Part 136, Title 40 of the Code of Federal Regulations, unless other test procedures have been specified in this permit. All flow-measuring and flow-recording devices used in obtaining data submitted in self-monitoring reports must indicate values within 10 percent of the actual flow being measured. Flow meter calibration must be done on a yearly basis and documented for the record.

C. Penalties for Tampering

The Montana Water Quality Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $25,000, or by imprisonment for not more than six months, or by both.

D. Reporting of Monitoring Results

Self-monitoring reports shall be submitted to the Department monthly. Monitoring results obtained during the previous reporting period shall be summarized and reported on a Discharge Monitoring Report Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed reporting period. Following the issuance of this permit, if no discharge occurs during the reporting period, "no discharge" shall be reported. Legible copies of these, and all other reports required herein, shall be signed and certified in accordance with the Signatory Requirements (Part IV, Section G) and submitted to the Department at the following address:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, Montana 59620
Phone: (406) 444-3080

All reports, notifications and inquires regarding compliance with this permit shall be submitted to the Department at the above address.

E. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any Compliance Schedule of this permit shall be submitted no later than 14 days following each schedule date.

F. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using approved analytical methods as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency shall also be indicated.

G. Records Contents

Records of monitoring information shall include:

1. The dates, exact place, and time of sampling or measurements;
2. The initials or name(s) of the individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The time analyses were initiated;
5. The initials or name(s) of individual(s) who performed the analyses;
6. References and written procedures, when available, for the analytical techniques or methods used; and,
7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, etc., used to determine these results.

H. Retention of Records

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of the Department at any time. Data collected on site, copies of monitoring reports, and a copy of this MGWPCS permit must be maintained on site during the duration of activity at the permitted location.

I. Twenty-four Hour Notice of Noncompliance Reporting

The permittee shall report serious incidents of noncompliance as soon as possible, but no later than twenty-four (24) hours from the time the permittee first became aware of the circumstances. The report shall be made to the Water Protection Bureau at (406) 444-3080 or the Office of Disaster and Emergency Services at (406) 841-3911. The following examples are considered serious incidents:

1. Any noncompliance which may seriously endanger health or the environment;

2. Any unanticipated bypass which exceeds any effluent limitation in the permit (See

Part IV.G of this permit, "Bypass of Treatment Facilities");

3. Any upset which exceeds any effluent limitation in the permit (See Part IV.H of this permit, "Upset Conditions").

4. A written submission shall also be provided within five days of the time that the permittee becomes aware of the circumstances. The written submission shall contain:

   a. A description of the noncompliance and its cause;

   b. The period of noncompliance, including exact dates and times;

   c. The estimated time noncompliance is expected to continue if it has not been corrected; and,

   d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

5. The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours by the Water Protection Bureau, by phone, at (406) 444-3080.

6. Reports shall be submitted to the addresses in Part II.D of this permit, "Reporting of Monitoring Results".

J. Other Noncompliance Reporting

Instances of noncompliance not required to be reported within 24 hours shall be reported at the time that monitoring reports for Part II.D of this permit are submitted. The reports shall contain the information listed in Part II.I.4 of this permit.

K. Inspection and Entry

The permittee shall allow the head of the Department or the Director or an authorized representative thereof, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

3. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and,

4. Sample or monitor at reasonable times, for the purpose of assuring permits compliance, any substances or parameters at any location.

III. COMPLIANCE RESPONSIBILITIES

A. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application. The permittee shall give the Department and the Director advanced notice of any planned changes at the permitted facility or of an activity which may result in permit noncompliance.

B. Penalties for Violations of Permit Conditions

The Montana Water Quality Act provides that any person who violates a permit condition of the Act is subject to civil or criminal penalties not to exceed $25,000 per day or one year in prison, or both, for the first conviction, and $50,000 per day of violation or by imprisonment for not more than two years, or both, for subsequent convictions. MCA 75-5-611(a) also provides for administrative penalties not to exceed $10,000 for each day of violation and up to a maximum not to exceed $100,000 for any related series of violations. Except as provided in permit conditions on Part III.G of this permit, "Bypass of Treatment Facilities" and Part III.H of this permit, "Upset Conditions", nothing in this permit shall be construed to relieve the permittee of the civil or criminal penalties for noncompliance.

C. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

E. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. However, the permittee shall operate, as a minimum, one complete set of each main line unit treatment process whether or not this process is needed to achieve permit effluent compliance.

F. Removed Substances

Collected screenings, grit, solids, sludges, or other pollutants removed in the course of treatment shall be disposed in such a manner so as to prevent any pollutant from entering any waters of the state or creating a health hazard. Sludge shall not be directly blended with or enter either the final plant discharge and/or waters of the United States. Any sludges removed from the facility shall be disposed of in accordance with 40 CFR 503, 258 or other applicable rule. EPA and MDEQ shall be notified at least 180 days prior to such disposal taking place.

G. Bypass of Treatment Facilities

1. Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Parts III.G.2 and III.G.3 of this permit.

2. Notice:

   a. Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of the bypass.

   b. Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required under Part II.I of this permit, "Twenty-four Hour Reporting".

3. Prohibition of Bypass.

   a. Bypass is prohibited and the Department may take enforcement action against a permittee for a bypass, unless:

      (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

      (2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and,

(3) The permittee submitted notices as required under Part III.G.2 of this permit.

b. The Department may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in Part III.G.3.a of this permit.

H. Upset Conditions

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with operational based permit effluent limitations if the requirements of Part IV.H.2 of this permit are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review (i.e., Permittees will have the opportunity for a judicial determination on any claim of upset only in an enforcement action brought for noncompliance with operational-based permit effluent limitations).

2. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

   a. An upset occurred and that the permittee can identify the cause(s) of the upset;
   b. The permitted facility was at the time being properly operated;
   c. The permittee submitted notice of the upset as required under Part II.I of this permit, "Twenty-four Hour Notice of Noncompliance Reporting"; and,
   d. The permittee complied with any remedial measures required under Part IV.D of this permit, "Duty to Mitigate".

3. Burden of proof. In any enforcement proceeding, the permittee seeking to establish the occurrence of an upset has the burden of proof.

IV. GENERAL REQUIREMENTS

A. Planned Changes

The permittee shall give notice to the Department as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition could significantly change the nature or increase the quantity of pollutant discharged. This notification applies to pollutants which are not subject to effluent limitations in the permit; or,

2. There are any planned substantial changes to the existing sewage sludge management practices of storage and disposal. The permittee shall give the Department notice of any planned changes at least 180 days prior to their implementation.

B. Anticipated Noncompliance

The permittee shall give advance notice to the Department of any planned changes in the permitted facility or activity, which may result in noncompliance with permit requirements.

C. Permit Actions

This permit may be revoked, modified and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

D. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The application must be submitted at least 180 days before the expiration date of this permit.

E. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine whether cause exists for revoking, modifying and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

F. Other Information

When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information with a narrative explanation of the circumstances of the omission or incorrect submittal and why they weren't supplied earlier.

G. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified.

1. All permit applications shall be signed by either a principal executive officer or ranking elected official.

2. All reports required by the permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is considered a duly authorized representative only if:

    a. The authorization is made in writing by a person described above and submitted to the Department; and,

    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

3. Changes to authorization. If an authorization under Part IV.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part IV.G.2 of this permit must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under this section shall make the following certification:

    > "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and

complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

H. Penalties for Falsification of Reports

The Montana Water Quality Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $25,000 per violation, or by imprisonment for not more than six months per violation, or by both.

I. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Department. As required by the Clean Water Act, permit applications, permits and effluent data shall not be considered confidential.

J. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Clean Water Act.

K. Property or Water Rights

The issuance of this permit does not convey any property or water rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations.

L. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

M. Transfers

This permit may be transferred to a new permittee if:

1. The current permittee notifies the Department at least 30 days in advance of the proposed transfer date;

2. The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them;

3. The Department does not notify the existing permittee and the proposed new permittee of intent to revoke or modify and reissue the permit. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Part IV.M.2 of this permit; and

4. Required annual, application, and transfer fees have been paid.

N. Fees

The permittee is required to submit payment of an annual fee as set forth in ARM 17.30.201. If the permittee fails to pay the annual fee within 90 days after the due date for the payment, the Department may:

1. Impose an additional assessment consisting of 15% of the fee plus interest on the required fee computed at the rate established under 15-1-216(3), MCA, or

2. Suspend the processing of the application for a permit or authorization or, if the nonpayment involves an annual permit fee, suspend the permit, certificate or authorization for which the fee is required. The Department may lift suspension at any time up to one year after the suspension occurs if the holder has paid all outstanding fees, including all penalties, assessments and interest imposed under this sub-section. Suspensions are limited to one year, after which the permit will be terminated.

O. Reopener Provisions

This permit may be reopened and modified (following proper administrative procedures) to include the appropriate effluent limitations (and compliance schedule, if necessary), or other appropriate requirements if one or more of the following events occurs:

1. Water Quality Standards: The water quality standards of the receiving water(s) to which the permittee discharges are modified in such a manner as to require different effluent limits than contained in this permit.

2. Water Quality Standards are Exceeded: If it is found that water quality standards in the receiving waters, excluding mixing zones as designated by ARM 17.30.501-17.30-518, are exceeded for parameters included in the permit, the department may modify the effluent limits or water management plan.

3. <u>TMDL or Wasteload Allocation</u>: TMDL requirements or a wasteload allocation is developed and approved by the Department and/or EPA for incorporation in this permit.

4. <u>Water Quality Management Plan</u>: A revision to the current water quality management plan is approved and adopted which calls for different effluent limitations than contained in this permit.

5. <u>Toxic Pollutants</u>: A toxic standard or prohibition is established under Section 307(a) of the Clean Water Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit.

P. Biosolids

Sewage sludge (which is not landfilled in accordance with solid waste regulation at 40 CFR Part 258) must meet all applicable requirements for disposing of sludge through land application or surface disposal site at 40 CFR Part 503. The regulations are administered by the U.S. Environmental Protection Agency.

For land application, the regulations require demonstration of an approvable land application site; compliance with pollutant limits for metals and fecal coliform; treatment for pathogens; treatment for vector attraction reduction; agronomic application rates; site restriction on public access, animal grazing, and crop harvesting; monitoring; recording keeping; and reporting.

For surface disposal, the regulations require an approvable surface disposal site; compliance with pollutant limits for metals; protection of groundwater from nitrate contamination; treatment for pathogens; treatment for vector attraction reduction; monitoring; recordkeeping; and reporting.

Implement other measures as determined by the Department, which may include invoking the permit condition set forth in Part IV. O., "Reopener Provisions".

V. SPECIAL CONDITIONS

There are no special conditions for this permit.

VI. DEFINITIONS

1. **"30-day (and monthly) average,"** other than for fecal coliform bacteria, means the arithmetic average of all samples collected during a consecutive 30-day period or calendar month, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The calendar month shall be used for purposes of reporting self-monitoring data.

2. **"90-day (and quarterly) average,"** other than for fecal coliform bacteria means the arithmetic average of all samples collected during a consecutive 90-day period or 3 calendar months, whichever is applicable. Geometric means shall be calculated for fecal coliform bacteria. The calendar quarter shall be used for purposes of reporting self-monitoring data.

3. **"30-day Average Load"** means the arithmetic mean of all 30-day or monthly average loads reported during a calendar quarter for a monitored parameter.

4. **"7-day Average (and weekly) average"** means the highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

5. **"BOD_5"** means a measurement of the amount of oxygen utilized by the decomposition of organic material, over a five-day period of time in a wastewater sample; it is used as a measurement of the readily decomposable organic content of wastewater.

6. **"Bypass"** means the intentional diversion of waste streams from any portion of a treatment or storage facility.

7. **"$CBOD_5$"** means the five day measure of the pollutant parameter carbonaceous biochemical oxygen demand.

8. **"Composite sample"** means a sample composed of two or more discrete samples and shall be flow proportioned. The aggregate samples will reflect the average water quality covering the compositing or sample period. The composite sample shall, as a minimum, contain at least four (4) samples collected over the compositing period. Unless otherwise specified, the time between the collection of the first sample and the last sampled shall not be less than six (6) hours nor more that 24 hours. Acceptable methods for preparation of composite samples are as follows:

   a. Constant time internal between samples, sample volume proportional to flow rate at time of sampling;
   b. Constant time internal between samples, sample volume proportional to total flow (volume) since last sample. For the first sample, the flow rate at

the time the sample was collected my be used;

c. Constant sample volume, time interval between samples proportional to flow (i.e., sample taken every "X" gallons of flow); and ,

d. Continuous collections of sample, with sample collection rate proportional to flow rate.

9. **"Continuous"** means the measurement of effluent flow which occurs without interruption throughout the operating hours of the facility, except for infrequent shutdowns for maintenance process changes, or other similar activities.

10. **"Daily Maximum Limit"** means the maximum allowable discharge of a pollutant during a calendar day. Expressed as units of mass, the daily discharge is cumulative mass discharged over the course of the day. Expressed as a concentration, it is the arithmetic average of all measurements taken that day.

11. **"Department"** means the Montana Department of Environmental Quality.

12. **"Grab"** sample, for monitoring requirements, means a single "dip and take" sample collected at a representative point in the discharge stream or monitoring well.

13. **"Instantaneous"** measurement, for monitoring requirements, means a single reading, observation, or measurement.

14. **"Load limits"** means mass-based discharge limits expressed in units such as lb/day

15. **"Mixing zone"** means a limited area of a surface water body or aquifer where initial dilution of a discharge takes place and where water quality changes may occur. Also recognized as an area where certain water quality standards may be exceeded.

16. **"Nondegradation"** means the prevention of a significant change in water quality that lowers the quality of high-quality water for one or more parameters. Also, the prohibition of any increase in discharge that exceeds the limits established under or determined from a permit or approval issued by the Department prior to April 29, 1993.

17. **"Semi-Annual Average"** means the arithmetic average of all samples collected during a consecutive 180-day period or 6 calendar months, whichever is applicable.

18. **"Severe property damage"** means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not

mean economic loss caused by delays in production.

19. **"TMDL"** means the total maximum daily load of a parameter, representing the estimated assimilative capacity for a water body before other designated uses are adversely affected. Mathematically, it is the sum of waste load allocations for point sources, load allocations for non-point and natural background sources, and a margin of safety.

20. **"TSS"** means total suspended solids, which is a measure of the filterable solids present in a sample, as determined by the method specified in 40 CFR part 136.

STATEMENT OF BASIS
(for Proposed Permit Limits (New Permit))

PERMITTEE:	River Rock County Water and Sewer District
PERMIT NUMBER:	MTX000147
RECEIVING WATERS:	Class I Ground Water
FACILITY NAME:	River Rock Subdivision 265 N. River Rock Road Belgrade, MT 59714
SOURCE LOCATION:	SW 1/4 Section 3, Township 1 South, Range 4 East, Gallatin County (Attachment 1)
CONTACT:	Steve Rude, President, River Rock County Water and Sewer District
TELEPHONE:	(406)388-0613
FEE INFORMATION	
Type:	Ground Water, domestic wastes
Number of Outfalls:	1
Outfall Type:	Infiltration Percolation Cells

I. PERMIT STATUS

The permittee submitted their initial MGWPCS permit application on October 6, 2003. On March 5, 2004 the Department requested that the application fee and first years annual fee be submitted. On April 8, 2004 the Department received the appropriate fees. The application was deemed complete on May 19, 2004. The public comment period for the draft permit was March 11 through April 10, 2006. The only comments received were from a representative of the permittee. The Department's response to comments and the final permit were never issued at the request of the River Rock County Water and Sewer District (RRCWSD). A June 15, 2006 letter from the RRCWSD requested that issuance of the final permit be delayed while the RRCWSD worked on designs and funding for effluent flow monitoring and a new monitoring well that was required in the draft permit. Since the permit was voluntary, the Department agreed to delay issuing final permit. In a letter dated June 21, 2007, TD&H Engineering Consultants on behalf of the RRCWSD requested that the Department finalize the permit and issue it. Based on the amount of time that lapsed between the RRCWSD request to stop and then continue the permit this statement of basis and the permit have been modified to account for the new effluent and ground water monitoring data that have been collected since the statement of basis was originally written in 2006.

The owner of the wastewater system has a requirement in their subdivision approval (EQ#03-2444) to maintain an area that is large enough for spray irrigation of the treated wastewater generated by this development in case the existing treatment system does not operate properly. This requirement was in accordance with the agreement between the original owner of the facility (Wallace Diteman) and the Department (formerly Department of Health and Environmental Sciences) on August 28, 1978. In 2003 the Department agreed to remove the requirement that land for spray irrigation be owned or leased by the wastewater system owner if the applicant voluntarily applied for and received a MGWPCS permit. However, as detailed in this statement of basis, the wastewater discharge has created exceedences of the DEQ-7 human health standard for nitrate (as N) in the ground water monitoring wells (MW-1 and MW-2) located directly downgradient of the infiltration-percolation (IP) cells (there have also been detections of fecal coliform bacteria and escherichia coliform bacteria in those wells). Because a mixing zone was not previously granted for this discharge, MW-1 and MW-2 have been the ground water compliance points for this discharge. The treatment system also has elevated five-day biological oxygen demand (BOD_5) and total suspended solids (TSS) in the treated effluent. The exceedences of the nitrate (as N) human health standard in the ground water wells was a violation of the Montana Water Quality Act (75-5-605(1)(a), Montana Code Annotated) as described in a letter from the Department to the RRCWSD dated August 29, 2007. That violation letter required that the RRCWSD work with the Department to complete and issue the wastewater discharge permit. Due to the issuance of that violation letter, the MGWPCS permit was no longer a voluntary permit pursuant to the requirement of Administrative Rules of Montana (ARM) 17.30.1022(1)(c).

The RRCWSD has not maintained a lease or ownership of land for spray irrigation. Therefore, that land is no longer available for use to mitigate the impacts to the ground water from the wastewater discharge.

The wastewater treatment system received plan and specification approval from the Department on October 19, 1999 (EQ #99-2750). The system construction was completed in 1999.

The community wastewater treatment system is designed to serve 1,192 single-family homes, a school and some retail commercial businesses. The system is used to treat residential strength (domestic) wastewater.

The wastewater will be transported to the treatment system via gravity-flow and lift stations. The wastewater will receive primary treatment in two aerated lagoons in series. During the summer months, after treatment in the lagoons, the wastewater can be diverted to a third lagoon cell prior to final disposal in one of seven IP cells. During the winter months, lagoon cell #3 can be used as an additional IP cell. The design flow rate for the treatment system is 374,000 gallons per day (gpd).

III. DESCRIPTION OF DISCHARGE

A. Outfall Location

The permit authorizes the permittee to discharge treated domestic wastewater from IP cells and lagoon cell #3 (Outfall 001) to ground water.

Outfall 001 is located at 45°46'44'' North latitude (45.7790) and 111°13'24'' West longitude (–111.2234), which is in Section 3, Township 1 South, Range 4 East, Gallatin County.

B. Past Monitoring Data / Effluent Characteristics

1. Past Monitoring Data

The wastewater treatment system was constructed in 1999. Between 1999 and May 2009, 51 influent and effluent wastewater samples were collected for analysis. The results for some of the parameters monitored are summarized in Table 1.

Table 1. Wastewater Influent and Effluent Monitoring Data for River Rock Wastewater Treatment System

Date	Influent/ Effluent Total Nitrogen (mg/L)	Influent/ Effluent Total Inorganic Nitrogen (mg/L)	Influent/ Effluent Fecal Coliform (org./100 ml))	Influent/ Effluent Biological Oxygen Demand (BOD_5) (mg//L))	Influent/ Effluent Total Suspended Solids (TSS) (mg/L)
11/18/99[1]	3.65 / 0.85	NS / <1.0	8.0E+3 / 2.0E+0	3 / 4.5	15 / 4
01/05/00[1]	2.25 / NS	NS / NS	1.2E+3 / NS	7.5 / NS	14 / NS
02/22/00[1]	NS / 3.25	NS / <2.2	NS / 3.0E+2	NS / 10.5	NS / 18
8/24/00	51.6 / 1.2	NS / 0.9	5.0E+7 / 9.0E+0	375 / 16.5	280 / 14
10/20/00	60.4 / 1.5	NS / <0.2	2.0E+7 / 2.2E+1	270 / 18	290 / 17
11/22/00	41 / 0.8	NS / 0.6	4.0E+7 / 3.6E+3	285 / 13.5	15 / 4
1/5/01	47.8 / 7.9	NS / 7.9	4.0E+6 / 1.0E+1	360 / 19.5	230 / 21
2/27/01	43.4 / 11.8	NS / 12.7	1.0E+9 / 8.0E+1	390 / 9	210 / 32
5/2201	57.8 / 7.6	NS / 3.9	1.9E+6 / 5.0E+0	225 / 27	158 / 28
6/29/01	37.1 / 6.5	NS / 2.6	4.0E+4 / 2.0E+1	330 / 28.5	140 / 24
11/7/02	48.3 / 17.6	NS / 16.6	3.0E+7 / 4.2E+5	240 / 22.1	225 / 24
1/20/03	44 / 21.6	NS / 18.9	NS[(3)] / NS	240 / 36	220 / 26
8/8/03	53.4 / 12.2	0.32 / 0.62	7.4E+2 / 7.0	225 / 24	490 / 10
9/7/04	38.2 / 21.4	33.5 / 16.7	8.1E+7 / 2.0E+6	225 / 1.5	112 / 8
10/13/04	34.2 / 17.1	29.1 / 13.0	3.0E+6 / 2.3E+3	195 / 1.5	80 / 2
12/1/04	50.3 / 20.9	48.8 / 18.2	2.3E+6 / 1.8E+4	330 / 18	158 / 36

3/29/05	26.2 / 32.3	27.1 / 22.5	1.4E+6 / 5.4E+3	255 / 36	146 / 76
6/30/05	39.6 / 16.4	46.3 / 13.5	3.7E+4 / 2.7E+4	675 / 105	32 / 84
9/26/05	29.8 / 37.2	33.8 / 21.2	4.0E+4 / 4.0E+3	210 / 345	52 / 420
12/29/05	36.9 / 39.9	33.0 / 48.1	1.0E+6 / 1.0E+4	285 / 90	90 / 104
6/14/06	NS / NS	NS / NS	NS / NS	2,200 / 278	NS / NS
7/6/06	70.8 / 25.8	60.0 / 15.85	TNTC[2] / 3.0E+2	240 / 130	280 / 36
9/7/06	NS / NS	NS / NS	NS / NS	340 / 76	304 / 60
12/28/06	93.4 / 64.9	71.7 / 45.96	2.7E+6 / 1.1E+4	380 / 64	306 / 69
3/26/07	40.8 / 69.3	19.28 / 49.2	6.9E+6 / 7.0E+3	360 / 250	243 / 268
6/30/07	NS / NS	NS / NS	NS / NS	280 / 92	157 / 74
7/30/07	NS / NS	NS / NS	NS / NS	260 / 68	NS / NS
8/27/07	NS / NS	NS / NS	NS / NS	410 / 87	227 / 53
9/17/07	NS / NS	NS / NS	2.5E+7 / 1.8E+4	250 / 78	208 / 36
10/22/07	NS / NS	NS / NS	NS / NS	300 / 56	NS / NS
11/19/07	NS / NS	NS / NS	NS / NS	230 / 39	188 / 38
12/10/07	NS / NS	NS / NS	NS / NS	380 / 99	161 / 53
1/28/08	NS / NS	NS / NS	NS / NS	400 / 47	308 / 54
2/18/08	NS / NS	NS / NS	NS / NS	434 / 64	253 / 40
3/17/08	NS / NS	NS / NS	NS / NS	660 / 84	200 / 60
4/14/08	NS / NS	NS / NS	NS / NS	268 / 50	285 / 125
5/19/08	NS / NS	NS / NS	NS / NS	260 / 99	180 / 27
6/9/08	NS / NS	NS / NS	NS / NS	260 / 75	143 / 90
7/14/08	NS / NS	NS / NS	NS / NS	214 / 83	180 / 23
8/25/08	NS / NS	NS / NS	NS / NS	310 / 37	173 / 47
9/24/08	NS / NS	NS / NS	NS / NS	265 / 26	159 / 50
10/31/08	NS / NS	NS / NS	NS / NS	331 / 29	193 / 30
11/11/08	NS / NS	NS / NS	NS / NS	238 / 53	233 / 17
1/19/09	NS / NS	NS / NS	NS / NS	328 / 37	213 / 33
2/2/09	NS / NS	NS / NS	NS / NS	331 / 39	173 / 67
3/29/09	NS / NS	NS / NS	NS / NS	369 / 91	463 / 83
4/6/09	NS / NS	NS / NS	NS / NS	264 / 107	227 / 87
5/04/09	NS / NS	NS / NS	NS / NS	425 / 71	207 / 140
6/18/09	NS / NS	NS / NS	NS / NS	263 / 32	540 / 200
7/20/09	NS / NS	NS / NS	NS / NS	230 / 21	450 / 160
8/17/09	NS / NS	NS / NS	NS / NS	393 /50	251 21

(1) Data for these dates is not representative of the typical raw wastewater or treated wastewater due to low flows into the treatment system.
(2) TNTC = to numerous to count
(3) NS = No sample analyzed

Total nitrogen (TN) consists of the sum of nitrate, nitrite, ammonia and the organic fraction of nitrogen in the wastewater (the sum of ammonia and the organic fraction are referred to as total kjeldahl nitrogen, or TKN). Total inorganic nitrogen (TIN) consists of the sum of nitrate, nitrite, and ammonia.

The TN, TIN, fecal coliform bacteria, TSS and BOD_5 data show increasing effluent concentrations over time. These trends are likely related to the build-out of the River Rock development. As the total number of homes contributing wastewater to the treatment system increased between 1999 and 2009, the retention time in the treatment system decreased thereby increasing effluent concentrations. Since June 2005, 22 of the 34 BOD_5 effluent concentrations measured would not meet the 85% reduction required for secondary treatment under federal regulations (40CFR Part 133.102). 85% reduction of five-day carbonaceous biological oxygen demand ($CBOD_5$) is the effluent limit in Section V. of this SOB (the federal regulation, 40CFR Part 133.102, allows the use of BOD_5 or $CBOD_5$ to demonstrate compliance with secondary treatment standards). Due to the history of elevated BOD_5 concentrations above the proposed effluent limit, the permit (Part 1, Section E) will include a compliance schedule for $CBOD_5$.

In April 2008 the RRCWSD installed a flow meter to measure the amount of wastewater being treated by the wastewater system. That flow meter has shown that the average flow is approximately 150,000 gallons per day (gpd), which is well below the system design capacity of 374,000 gpd. The population in the River Rock Development is at or near full build-out, therefore the flows to the wastewater system should not increase in the future. The flows are well below design capacity which is due, in part, to the use of modern low-flow fixtures that weren't accounted for in the original design of the system in the 1970's.

2. Effluent Characteristics

Using discharge monitoring data from three other wastewater treatment systems (the towns of Superior, Gardiner and Belt) that use similar treatment technology as used at the River Rock facility, the average and 90th percentile effluent concentrations for TN, BOD_5, TSS, and total phosphorus produced by those facilities from 2002 through 2004 are listed in Table 2.

Table 2. Wastewater Effluent Statistics for Similar Wastewater Treatment Facilities (2002-2004)

Facility	Total Nitrogen (mg/L)	Biological Oxygen Demand (mg/L)	Total Suspended Solids (mg/L)	Total Phosphorus (mg/L)
GARDINER				
Average	21.0	15.4	22.1	4.1
90th Percentile	28	26.4	58.8	5.4
SUPERIOR				
Average	22.8	18.6	20.3	5.8
90th Percentile	34.1	31.8	53	5.3
BELT				
Average	10.0[1]	16.0	25.3	2.4[1]
90th Percentile	15.9[1]	28.4	46.2	2.9[1]

(1) These values based only on one year of data (2002).

The results indicate that the River Rock system produces similar effluent quality, except for the nutrients in the Belt effluent. The TN and total phosphorus effluent concentrations are noticeably lower in the Belt wastewater than the other two facilities. Whether this difference is due to better treatment efficiencies or different influent wastewater characteristics cannot be determined from the existing data.

The 90th percentile statistic is included in Table 2 to demonstrate the type of effluent concentrations that can be expected on a regular basis for these types of treatment systems.

IV. RECEIVING WATER

A. Water Use Classifications and Applicable Water Quality Standards

The facility has been collecting background ground water quality data since 1999 from a monitoring well (MW-3) located in the southwest corner of the River Rock development. MW-3 was constructed as a background ground water quality monitoring point for comparison to two wells (MW-1 and MW-2) that are located north (downgradient) of the IP cellls (see Attachment 2A and 2B). Between March 1999 and July 2009, ground water samples from MW-1, MW-2 and MW-3 were collected and analyzed for several water quality parameters on 42 dates (see Attachment 3). In February 2008, the RRWCSD installed an additional ground water monitoring well, MW-4. MW-4 is a new background monitoring well that is located immediately upgradient of the IP cells (see Attachment 2A). MW-4 was installed to better determine the ground water quality immediately prior to the discharge from the IP cells, and to confirm that the concentrations measured further upgradient in MW-3 were representative of the ground water quality flowing beneath the IP cells. Six samples collected in 2008 and 2009 from MW-4 show average nitrate (3.41 mg/L) and chloride (7.62 mg/L) concentrations at similar concentrations as in MW-3 (see Attachment 3).

The IP cells are constructed on top of quaternary alluvial deposits of the Gallatin valley. Based on two monitoring wells (MW-1 and MW-2) the soils consist of sandy gravels and gravelly sands down to the water table at 50 to 56 feet below ground surface.

Based on the 37 water quality analyses from MW-3 (see Attachment 3), the average nitrate+nitrite (as N) of the upgradient ground water is 3.43 mg/L. However, prior to May 2002, the highest nitrate+nitrite (as N) concentration in MW-3 did not exceed 3.7 mg/L and the average of those first ten samples was only 1.77 mg/L. Since July 2002, the average nitrate+nitrite (as N) concentration from 27 sampling events has been 4.04 mg/L, and has been as high as 8.1 mg/L. The cause of the increase is not certain, but may be related to historic manure storage/distribution practices or agricultural practices on the land located to the south (upgradient) from MW-3. The chloride concentration in MW-3 has not risen concurrently with the nitrate+nitrite concentrations (the chloride concentrations have remained below 18 mg/L), which indicates the nitrate+nitrite increase is likely not due to human-derived wastewater. Domestic wastewater typically includes elevated concentrations of chloride that are not typically present in agriculturally-related sources or in manure sources.

The nitrate+nitrite concentrations in the two monitoring wells (MW-1 and MW-2) directly north of the wastewater system have also shown increases. Those two monitoring wells have exceeded the nitrate+nitrite (as N) DEQ-7 human health standard of 10 mg/L on 21 dates, with a maximum concentration of 49 mg/L in MW-2 (see Attachment 3). MW-1 and MW-2 have also shown concurrent increases in their chloride concentrations (from less than 10 mg/L to as high as 85 mg/L), which is an indication that the increasing nitrate+nitrite concentrations in MW-1 and MW-2 are likely related to the River Rock wastewater discharge. The low chloride concentrations in MW-3 and MW-4 also support the conclusion that the elevated nitrate concentrations in MW-1 and MW-2 are primarily due to the wastewater discharge from the RRCWSD IP cells.

MW-1 and MW-2 have also had fecal coliform bacteria or esherichia (e-coli) bacteria detections above the DEQ-7 human health standard of less than one on 21 dates (see Attachment 3).

Due to exceedences of the nitrate ground water quality standard, the permit (Part I, Section E) will include a compliance schedule for reducing nitrate to below the water quality standard at the end of the mixing zone and to below the effluent limit. In addition, due to exceedences of the e-coli bacteria ground water quality standard (and historic exceedences of the previous DEQ-7 limit for fecal coliform bacteria), the permit will include a compliance schedule for reducing e-coli bacteria below the water quality standard in MW-1 and MW-2. Fecal coliform bacteria was the pathogenic standard in DEQ-7 prior to February 2006 and therefore was the required monitoring parameter in MW-1 and MW-2. Since February 2006 e-coli bacteria has been the pathogen standard in DEQ-7; MW-1, MW-2, MW-3 and MW-4 have been monitored for e-coli bacteria since September 2008 (see Attachment 3).

A nitrate+nitrite (as N) concentration of 10.0 mg/L was recorded in MW-2 in September 2003. According to the Certificate of Subdivision Plat Approval for River Rock (EQ#99-2750), an increase of the nitrate+nitrite(as N) concentration in MW–1 or MW-2 above 7.5 mg/L requires the monitoring frequency for MW-1 and MW-2 to be increased from semi-annually to quarterly. However, in violation of the certificate of subdivision plat approval, no samples were collected or analyzed from MW-1 or MW-2 between December 2003 and September 2004. The RRWCSD was not issued a violation letter for that, but were requested to increase the monitoring frequency to quarterly. Quarterly monitoring has been conducted since September 2004 except for one quarter in 2005 and 2006.

In 2007 and 2008 the Gallatin County Local Water Quality District monitored the ground water quality of 71 wells in the vicinity of the River Rock wastewater discharge. This study concentrated many of those wells in the area downgradient of the River Rock IP cells. The data shows some elevated nitrate and chloride concentrations in domestic wells located downgradient (northerly) from the IP cells. Some of the wells also contained coliform bacteria. However, none of the wells included in the study exceeded DEQ-7 water quality standards for nitrate or e-coli bacteria. The domestic well located closest to the IP cells (located at 34 Wildhorse Trail) had reported a nitrate concentration on August 12, 2007 of 21.2 mg/L from a sample collected by the homeowner. In 2009, landowners near to or adjacent to the River Rock IP cells installed three ground water monitoring wells just north and downgradient of the River Rock IP cells that have been sampled several times. Two of the adjacent monitoring wells have reported nitrate (as N) concentrations above the DEQ-7 human health standard (the highest concentrations reported were 41.0 and 39.8 mg/L). Those same two off-site wells have also reported the presence of e-coli bacteria. The nitrate monitoring results of the off-site monitoring wells are similar to concentrations previously measured in MW-1 and MW-2.

Based on the 23 water quality analyses from MW-3 from 1999 through 2007, the average specific conductivity of the ground water is 450 umhos/cm. Therefore, the classification of the receiving ground water is Class I.

The receiving water for Outfall 001 is Class I ground water as defined by the Administrative Rules of Montana [ARM 17.30.1006 (1)(a)]. Class I ground water is suitable for the following beneficial uses with little or no treatment: public and private water supplies, culinary and food processing purposes, irrigation, drinking water for livestock and wildlife and for industrial and commercial uses. Secondary and human health standards (DEQ-7, February 2008) apply to concentrations of substances in Class I ground waters (water with specific conductance equal to or less than 1,000 microSiemens/cm). Class I ground waters are considered high quality waters and are subject to Montana's Nondegradation Policy [75-5-303, Montana Code Annotated (MCA)].

Because this wastewater discharge was originally approved by the state prior to April 29, 1993, it is not considered a new or increased source pursuant to ARM 17.30.702(18). Therefore, the nondegradation limits do not apply to this discharge, but the DEQ-7 water quality standards do apply. The applicable water quality standards are shown in Table 3.

Table 3. Applicable Water Quality Standards

Parameter	DEQ-7 Numeric Human Health Ground Water Standards
Nitrate (as N), mg/L	10(1)
Total Phosphorus, mg/L	No numeric standard
E-coli Bacteria, organisms/100 ml	<1(2)

(1) Instantaneous maximum, no single sample shall exceed this value, DEQ-7 (February, 2008).
(2) Maximum based on 24-hour geometric mean, DEQ-7 (February, 2008).

The nearest downgradient surface water from the outfall is Ben Hart Creek. In the direction of ground water flow (N29°E) Ben Hart Creek is approximately 25,400 feet from the northeast corner of the IP cells. Ben Hart Creek is classified as a B-2 surface water [ARM 17.30.610(1)].

B. Mixing Zone

The RRCWSD has proposed to discharge all wastewater from Outfall 001 and has requested a standard ground water mixing zone for nitrate and e-coli bacteria of 500 feet. The RRCWSD has also requested that the width of the mixing zone be increased for the cold weather season (from a width of 470 feet to a width of 660 feet in the cold weather season). The "cold weather mixing zone" is wider and accounts for discharges from lagoon cell #3 that may be used as an IP bed during the cold months. At the time the treatment system was originally designed and approved by the Department (1970's), storage cells did not have maximum allowable leakage rates, therefore lagoon cell #3 can be used as a discharge location and can also be used as a storage cell when the inflow to the cell #3 exceeds the discharge rate. Due to the difficulty in assigning multiple effluent limits over a 30-day averaging period depending on whether lagoon cell #3 is used as an IP bed or not and for how long over that 30-day period it is used, it is not feasible to assign multiple effluent limits or designate different mixing zone dimensions for different seasons. Therefore, the granted mixing zone will be based on the wider cold weather discharge. To insure there are no exceedences of water quality standards at the end of the mixing zone, the more conservative scenario between warm-weather discharges (when cell #3 is not used for discharge of treated wastewater) and cold-weather discharges (when cell #3 may be used for discharge of treated wastewater) will be used in determining water quality-based effluent limits.

From October 2000 through June 2007 the permittee conducted 19 rounds of effluent monitoring for chloride and TN and concurrent monitoring of MW-1 and MW-2 (the data from MW-1 was not used in the following analysis because it did not show as consistent or long-term water quality impacts as were observed in MW-2). This monitoring was conducted to determine the amount of natural denitrification (reduction of nitrate to nitrogen gas) that is occurring beneath the IP beds. The amount of natural denitrification beneath the IP beds can then be used in calculating the water quality-based effluent limits (WQBEL). Chloride is considered a conservative element (i.e. it does not degrade in the environment). Therefore, the percent reduction of the chloride concentration between the discharge point and MW-2 can be solely attributed to ground water dilution. If the amount of chloride dilution is compared to the concentration reduction of TN between the discharge point and MW-2, any additional percent reduction of TN (as compared to the percent reduction of chloride) can be reasonably attributed to denitrification. Based on this method, the water quality information indicated that denitrification accounted for a 50% concentration reduction of TN between the effluent monitoring point and MW-2. That 50% reduction will be accounted for in determination of the total inorganic nitrogen (TIN) WQBEL (see Part V.D. of this SOB).

The permittee must comply with the ground water mixing zone rules pursuant to ARM 17.30 Subchapter 5. Due to an existing domestic drinking water well (well located on 40 Wildhorse Trail) that is located 500 feet downgradient of the IP cells, the mixing zone cannot extend the standard length of 500 feet. Pursuant to ARM 17.30.508(2) a mixing zone may not extend into the zone of influence of an existing drinking water supply well. The zone of influence for a domestic well is commonly assumed to be a 100 foot radius around the well. Therefore, the Department can grant a source specific ground water mixing zone that extends to a point that is 100 feet upgradient of the existing drinking water supply well. Based on the location of the existing downgradient drinking water wells, the mixing zone can be a maximum length of 400 feet. However, the RRCWSD does not own the property at the end of a 400 foot mixing zone and cannot gain access in perpetuity to that property for the purpose of installing compliance monitoring wells. Therefore, the source specific ground water mixing zone length will be set at 400 feet but the monitoring location will be based on the point where the RRCWSD can monitor the impacts in the ground water. That monitoring point is defined by the existing monitoring wells MW-1 and MW-2, which are approximately 50 feet downgradient from the northern end of the IP cells (see Attachment 4). The ground water nitrate concentration limit at the end of the 400-foot mixing zone will be back-calculated to the monitoring well locations in Part V. D. of this SOB. Because the e-coli standard is based on an actual presence or absence of that bacteria, the ground water limit will not be back calculated for e-coli bacteria. It will be set at the DEQ-7 human health standard of less than one at MW-1 and MW-2.

The mixing zone will extend downgradient of the IP cells and lagoon cell #3 in a N29°E direction (parallel to the local ground water gradient) and end on adjacent properties to the north that are not owned by the RRCWSD (see Attachment 4). The hydraulic gradient is based on an average of eleven quarterly water level monitoring events on wells MW-1, MW-2 and MW-3 between June 2000 and January 2003. The shape of the mixing zone is determined from the dimensions of the IP beds/lagoon cell #3 and the measured ground water flow direction. Water level data collected off-site by the Gallatin County Local Water Quality Protection District in 2007 and 2008 indicates that the ground water flow direction used in the permit is accurate, and eventually curves to the north and northwest downgradient of the RRCWSD IP cells.

The source specific ground water mixing zone is granted for nitrate and for e-coli bacteria.

V. PROPOSED WATER QUALITY-BASED EFFLUENT LIMITS

The permittee must comply with the Numeric Water Quality Standards included in Circular DEQ-7 (February 2008) and protection of beneficial uses [ARM 17.30.1006]. Ground water quality standards may be exceeded within a Department authorized mixing zone provided that all existing and future beneficial uses of the state waters are protected [ARM 17.30.1005]. In addition, for parameters that do not have human health standards in DEQ-7 (February 2008), the discharge may not cause an increase of a parameter to a level that renders the waters harmful, detrimental or injurious to the beneficial uses listed for Class I ground water [ARM 17.30.1006(1)(c)(ii)].

The Montana Water Quality Act requires that a discharge to state water shall not cause a violation of a water quality standard outside a Department authorized mixing zone. Ground water quality standards for nitrate (as N) apply at the down-gradient mixing zone boundary in the unconfined aquifer. Water quality standards for other parameters that have not been granted a mixing zone apply below the discharge area. The WQBELs have been determined as follows:

A. $CBOD_5$

Effluent monitoring and WQBELs for five-day carbonaceous biological oxygen demand ($CBOD_5$) will be required to maintain USEPA primary and secondary drinking water limits and DEQ-7 human health standards in the ground water downgradient from the discharge.

As $CBOD_5$ is discharged to ground water, the $CBOD_5$ in the wastewater will decrease the dissolved oxygen (DO) concentration in the ground water. As the DO concentration in the ground water decreases the potential for odor problems in the ground water and leaching of metals from the soils and rock increases (USEPA, 2002). The USEPA has secondary drinking water limits (40 CFR 143.3) for odor. The regulatory limits for metals are in USEPA primary drinking water limits (40 CFR 141.62) and in DEQ-7 human health standards. To prevent potential exceedences of these ground water limits, the permit will require monitoring and effluent limits for $CBOD_5$ in the wastewater discharge.

Because $CBOD_5$ does not have drinking water or ground water concentration limits, the narrative water quality standards [ARM 17.30.1006(1)(b)(ii)] for class I ground waters will be used to determine the effluent limits to protect ground water quality. Those narrative standards allow the Department to use any pertinent credible information to determine the appropriate levels of effluent discharge to maintain water quality in the receiving water. Because there are no WQBELs for discharges of $CBOD_5$ to ground water, the permit will use the technology based effluent limits that have been adopted for discharges to surface water. The Board of Environmental Review (BER) has adopted technology-based effluent limits for $CBOD_5$ from the national secondary treatment standards [40 CFR 133.102(a)(4)] for surface water discharges. Those national secondary treatment standards (see Table 4) will be used in the permit in lieu of any other applicable limits to ensure protection of the ground water quality.

B. TSS

There are no narrative or numerical standards for TSS discharges to ground water. Therefore, there is no WQBEL for TSS for Outfall 001. The permit will require monitoring for TSS for determining proper operation of the wastewater system.

C. pH

Effluent monitoring and WQBELs for pH will be required to maintain USEPA secondary drinking water standards (6.5 – 8.5 standard units) in the ground water and to protect the quality of the class I groundwater pursuant to ARM 17.30.1006(1)(b)(ii). The national secondary treatment standards [40 CFR 133.102(c)] will be used in the permit in lieu of any other applicable limits to ensure protection of the ground water quality (see Table 4).

D. Nitrate

The total inorganic nitrogen (TIN) concentration in the I/P cell effluent is estimated to determine whether the applicable ground water quality standard (10 mg/L) can be met at the end of the mixing zone (nondegradation limits are not applicable as discussed in Part IV. A. of this SOB). A sensitivity analysis estimates the ground water nitrate+nitrite (as N) concentration at the end of the mixing zone that would result from the discharge. This estimate is derived from a dilution calculation utilizing the following mass balance equation:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2} \qquad \textit{(eqn. 1)}$$

where:

C_1 = Ambient (background) ground water nitrate+nitrite (as N) concentration (mg/L).
C_2 = Allowable nitrate (as N) discharge concentration (mg/L).
C_3 = Ground water concentration limit for nitrate (as N) [from Circular DEQ-7 or other appropriate water quality standard] at the end of the mixing zone
Q_1 = Ground water volume mixing with the discharge (ft^3/day).
Q_2 = Design discharge volume (ft^3/day).

As discussed in Part IV. A., the average background ground water nitrate+nitrite (as N) concentration (C_1 in equation 1) in MW-3 has been 4.04 mg/L since May 2002. The nitrate+nitrite concentrations were significantly lower during the two years prior to May 2002. However, because the nitrate+nitrite concentrations in MW-3 have been typically elevated since May 2002, the background concentration used for determining the WQBEL will be based on those values.

The allowable nitrate (as N) concentration (C_3 in equation 1) at the end of the ground water mixing zone is the ground water human health standard, 10 mg/L (DEQ-7, February 2008).

The design flow (Q_2 in equation 1) is 374,000 gpd (50,000 ft^3/day).

The volume of ground water that will mix with the discharge (Q_1 in equation 1) is estimated using Darcy's equation:

$$Q_l = K\,I\,A \qquad \textit{(eqn. 2)}$$

Where:
- Q_l = ground water flow volume (ft^3/day)
- K = hydraulic conductivity (ft/day)
- I = hydraulic gradient (ft/ft)
- A = cross-sectional area of flow at the down-gradient boundary of the 50-foot mixing zone (ft^2).

Two Q_l values need to be calculated for the warm-weather and cold-weather mixing zones. For the warm-weather mixing zone (470 feet wide at the source), Q_l is:

$$Q_{l(warm)} = (600 \text{ ft/day})(0.0079 \text{ ft/ft})(8{,}100 \text{ ft}^2)$$
$$Q_{l(warm)} = 38{,}394 \text{ ft}^3\text{/day}$$

For the cold-weather mixing zone (660 feet wide at the source), Q_l is:

$$Q_{l(cold)} = (600 \text{ ft/day})(0.0079 \text{ ft/ft})(10{,}950 \text{ ft}^2)$$
$$Q_{l(cold)} = 51{,}903 \text{ ft}^3\text{/day}$$

Hydraulic conductivity of the shallow ground water (600 feet/day) is based on a summary of previous aquifer tests performed in this general area (Custer, 1994). Three of those aquifer tests were included in a U.S. Geological Survey report (Hackett, et. al., 1960). Additional aquifer tests were not performed on the onsite wells since the existing data was sufficient to estimate the aquifer characteristics.

As discussed in Part IV. B., the hydraulic gradient is based on an average of eleven quarterly water level monitoring events on wells MW-1, MW-2 and MW-3 between June 2000 and January 2003. The gradient is 0.0079 ft/ft at a direction of N29 °E.

The area (A) is calculated by the width at the end of the 400 foot long mixing zone times a standard depth in the groundwater of 15 feet. It is assumed that the entire TIN load in the effluent converts to nitrate and enters the ground water.

The effluent concentration necessary to maintain the nitrate concentration at the end of the warm-weather mixing zone at less than 10 mg/L is calculated below using equation 1:

$$C_{2(warm)} = \frac{10\ mg/L\ (38{,}394\ ft^3/d + 50{,}000\ ft^3/d) - [(4.04\ mg/L)(38{,}394\ ft^3/d)]}{(50{,}000\ ft^3/day)}$$

$$C_{2(warm)} = 14.6\ mg/L$$

The effluent concentration necessary to maintain the nitrate concentration at the end of the cold-weather mixing zone at less than 10 mg/L is calculated below using equation 1:

$$C_{2(cold)} = \frac{10\ mg/L\ (51{,}903\ ft^3/d + 50{,}000\ ft^3/d) - [(4.04\ mg/L)(51{,}903\ ft^3/d)]}{(50{,}000\ ft^3/day)}$$

$$C_{2(cold)} = 16.2\ mg/L$$

The more restrictive value of the two calculations (the warm-weather mixing zone) will be used to calculate the effluent limit. Therefore, at the design capacity of 374,000 gpd, the maximum concentration of TIN discharged to ground water must not exceed 14.6 mg/L at outfall 001. This effluent limit ensures the nitrate (as N) concentration at the end of the ground water mixing zone will remain at or below the water quality standard of 10 mg/L. As discussed in Part V.B., there is approximately a 50% reduction of TN (due to denitrification) beneath the IP beds. Therefore, to discharge a TIN concentration of 14.6 mg/L to the ground water, the WQBEL for outfall 001 is 29.2 mg/L. Using this concentration, and a design flow of 374,000 gpd, provides a TIN load limit of 91.1 lbs/day, which will be the WQBEL for outfall 001. Because the mass balance calculation used to determine the WQBEL is based on the total load of inorganic nitrogen (which is a factor of the concentration and volume of wastewater) entering the ground water, the WQBEL will be based on the 30-day average load, not on a concentration limit.

E. E-coli Bacteria

E-coli bacteria monitoring in the ground water is included in this permit because:

- The shallow aquifer is a coarse grained alluvial aquifer with a high hydraulic conductivity (600 ft/day), which will allow relatively rapid transport of e-coli bacteria if any are able to migrate into the groundwater;
- The IP beds are designed to discharge a significant amount of wastewater (374,000 gpd) at a relatively rapid rate; and
- This area is experiencing rapid high density development;
- The existing influent/effluent data shows that the treatment system does not remove all of the fecal coliform bacteria; and
- The existing ground water monitoring data in MW-1 and MW-2 indicates fecal coliform and e-coli bacteria contamination.

A virus transport study conducted in western Montana revealed a four log decrease of pathogens when discharged directly into the ground water but the results are site specific and are dependent on the amount of fine soil present at the site (Woessner, 1998).

The permit will require ground water monitoring at MW-1 and MW-2 to insure that the DEQ-7 (February 2008) ground water human health standard (<1 e-coli bacteria/100 ml) is not exceeded.

F. Phosphorus

Phosphorus does not have a numeric ground water quality standard, and the nondegradation limits do not apply to this discharge. Therefore, there is no WQBEL for phosphorus for Outfall 001.

The WQBELs for Outfall 001 are summarized in Table 4.

Table 4. Water Quality-Based Effluent Limits for Outfall 001

Parameter	Effluent Limit (units as noted)	Rationale
$CBOD_5$	85% removal[(1)]	ARM 17.30.1006(1)(b)(ii)
pH	6.0 – 9.0 s.u.	ARM 17.30.1006(1)(b)(ii)
Total Inorganic Nitrogen [(2)]	91.1 lb/day[(3)(4)]	ARM 17.30.1006(1)(b)(i)

(1) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85% removal).
(2) Total Inorganic Nitrogen (TIN) is the sum of nitrate, nitrite, and ammonia (as N).
(3) Calculations based on the 30-day average values of flow and concentration.
(4) Calculations based on the average values of design flow and concentration for the specified time period. Equation is Load (lb/d) = flow (gpd) x concentration (mg/L) x 8.34×10^{-6}.

The mass-based TIN effluent limit in Table 4 is based on the following equation:

Load (lbs/day) = Design Flow (mgd) x Average Concentration (mg/L) x 8.34

Total Inorganic Nitrogen Load (lbs/day) = (0.374 mgd)(29.2 mg/L)(8.34) = 91.1 lb/day

VI. FINAL PROPOSED EFFLUENT LIMITS

The proposed effluent limitations, which are all based on WQBELs, for Outfall 001 are summarized in Table 5.

Table 5. Numeric Effluent Limits for Outfall 001

Parameter	Effluent Limit (units as noted)
$CBOD_5$	85% removal[(1)]
pH	6.0 – 9.0 s.u.
Total Inorganic Nitrogen (as N)[(2)]	91.1 lb/day[(3)(4)]
Effluent Flow Rate	374,000 gallons per day (maximum flow)

(1) The arithmetic mean of the values for effluent samples collected in a period of 30 consecutive days shall not exceed 15% of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85% removal).
(2) Total Inorganic Nitrogen (TIN) is the sum of nitrate, nitrite, and ammonia (as N).
(3) Calculations based on the 30-day average values of flow and concentration.
(4) Calculations based on the average values of design flow and concentration for the specified time period. Equation is: Load (lb/d) = flow (gpd) x concentration (mg/L) x 8.34×10^{-6}.

VII. MONITORING REQUIREMENTS

A. Effluent Monitoring

Effluent monitoring is essential to ensure the effective treatment of the wastewater discharged from the facility. The effluent limits are established to protect the ground water from a change in water quality that would exceed a water quality standard [ARM 17.30.1006(1)(b)(i)] or cause a change in beneficial use [ARM 17.30.1006(1)(b)(ii)].

At a minimum, upon the effective date of the permit, the constituents in Table 6 shall be monitored at the frequency and with the type of measurement indicated. Samples or measurements shall be representative of the volume and nature of the monitored discharge. The flow monitoring device is an ultrasonic echo ranging type open channel flow meter (weir-type) manufactured by Greyline Instruments, as approved by the Department on September 19, 2007.

The effluent sampling location shall be from the discharge manhole near the exit from lagoon cell 2 at location "C2" (see Attachment 2B) prior to discharge to lagoon cell #3 and/or the IP beds. Location C2 is the last point of control in the treatment process.

The reporting period for the constituents in Table 6 is monthly.

Table 6. Parameters Monitored in the Effluent for Outfall 001 (prior to discharge to lagoon cell #3 and/or IP beds)

Parameter(1)	Frequency	Sample Type(2)
Effluent Flow Rate, gpd(3)	Continuous	Continuous
pH, s.u.	Monthly	Grab
Total Suspended Solids (TSS), mg/L	Monthly	Grab/Composite(4)
Five-day Carbonaceous Biological Oxygen Demand ($CBOD_5$), mg/L	Monthly	Grab/Composite(4)
Chloride, mg/L	Monthly	Grab/Composite(4)
Escherichia Coliform (e-coli) Bacteria, organisms/100 ml	Monthly	Grab
Total Phosphorus as P(5), mg/L	Monthly	Grab/Composite(4)
Nitrate (as N), mg/L	Monthly	Grab/Composite(4)
Nitrite (as N), mg/L	Monthly	Grab/Composite(4)
Ammonia (as N), mg/L	Monthly	Grab/Composite(4)
Total Kjeldahl Nitrogen (as N), mg/L	Monthly	Grab/Composite(4)
Total Nitrogen(6), mg/L	Monthly	Calculated
Total Inorganic Nitrogen (as N)(7),(8), mg/L	Monthly	Calculated
Total Phosphorus, lb/day(8)	Monthly	Calculated
Total Nitrogen, lb/day(8)	Monthly	Calculated
Total Inorganic Nitrogen (as N)(7),(8), lb/day	Monthly	Calculated
Oil & Grease, mg/L	Semi-annually	Grab/Composite(4)
Total Phenols, mg/L	Semi-annually	Grab/Composite(4)
Arsenic, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Cadmium, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Chromium, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Copper, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Lead, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Mercury, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Selenium, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Silver, dissolved, mg/L	Semi-annually	Grab/Composite(4)
Zinc, dissolved, mg/L	Semi-annually	Grab/Composite(4)

(1) Laboratory detection limits must be equal to or less than the required reporting value (RRV) in DEQ-7 (February, 2008) for those parameters where an RRV is specified in DEQ-7.
(2) See definitions in Part VI of the permit
(3) To be measured by a recorder or totalizing flow meter
(4) Grab samples will be allowed for the first 24 months after effective date of the permit. Thereafter, composite samples will be required.
(5) EPA Method 365.1 or equivalent.
(6) Total Nitrogen (TN) is the sum of nitrate, nitrite and total kjeldahl nitrogen (as N).
(7) Total Inorganic Nitrogen (TIN) is the sum of nitrate, nitrite and ammonia (as N).
(8) See definition of "monthly average" in Part VI. of the permit. The calculation used for determining load is: Load (lb/d) = flow (gpd) x concentration (mg/L) x 8.34×10^{-6}.

B. Influent Monitoring

Influent monitoring of $CBOD_5$ is necessary because the effluent limit in the permit will be based on a percent reduction from the influent concentration.

At a minimum, upon the effective date of the permit, the constituents in Table 7 shall be monitored at the frequency and with the type of measurement indicated. Samples or measurements shall be representative of the volume and nature of the influent wastewater. The reporting period for the constituent in Table 7 is monthly.

Table 7. Parameters Monitored in the Influent for Outfall 001

Parameter	Frequency	Sample Type[1]
Five-day Carbonaceous Biological Oxygen Demand ($CBOD_5$), mg/L	Monthly	Composite

(1) See definitions in Part VI. of the permit

C. Ground Water Monitoring and Compliance Limits

Ground water monitoring is required in this permit due to the following site-specific conditions:

- The shallow aquifer is a coarse grained alluvial aquifer with a high hydraulic conductivity (600 ft/day), which will allow relatively rapid transport of contaminants that are able to migrate into the groundwater;
- The IP beds are designed to discharge a significant amount of wastewater (374,000 gpd) at a relatively rapid rate;
- This area is experiencing rapid high density development;
- The existing ground water monitoring data in MW-1 and MW-2 indicates fecal coliform bacteria, e-coli bacteria and nitrate contamination.

The permittee is required to monitor the ground water on the downgradient edge of the IP beds from existing monitoring wells, MW-1 and MW-2. In addition, the permit will require monitoring of both upgradient monitoring wells, MW-3 and MW-4. The well locations are shown on Attachment 2A. Monitoring results from MW-4 will be used for comparison with results from MW-1, MW-2 and MW-3, to help determine potential causes of ground water quality fluctuations.

The parameters to be monitored in MW-1, MW-2, MW-3 and MW-4 and frequency are listed in Table 8. The reporting period for the constituents in Table 8 is monthly for MW-1 and MW-2. The reporting period for the constituents in Table 8 is quarterly for for MW-3 and MW-4.

Table 8. Ground Water Monitoring Parameters for Monitoring Wells MW-1, MW-2, MW-3 and MW-4

Parameter	Frequency	Sample Type(1)
Static Water Level (SWL) (feet below top of casing)	Monthly/Quarterly(2)	Instantaneous
E-coli Bacteria, organisms/100 ml	Monthly/Quarterly(2)	Grab
Nitrate (as N), mg/L	Monthly/Quarterly(2)	Grab
Ammonia (as N), mg/L	Monthly/Quarterly(2)	Grab
Chloride, mg/L	Monthly/Quarterly(2)	Grab

(1) See definitions, Part VI. of the permit.
(2) Monthly for MW-1 and MW-2. Quarterly for MW-3 and MW-4.

The monitoring of chloride is used as an indicator of wastewater impacts, and will be used to assess the effectiveness of the well location in monitoring ground water impacts when the permit is renewed.

MW-1 and MW-2 are located inside of the 400 foot long mixing zone for Outfall 001 (see Attachment 4). MW-1 and MW-2 will be used as the ground water compliance monitoring locations. The ground water compliance limits for MW-1 and MW-2 are listed in Table 9.

Table 9. Ground Water Compliance Limits for Monitoring Wells MW-1 and MW-2

Parameter	Instantaneous Maximum[1]
E-coli Bacteria, organisms/100 ml	Less than 1
Nitrate (as N), mg/L	10.3

1 See definitions, Part VI. of the permit.

The ground water compliance limit for nitrate (as N) is set at 10.3 mg/L in Table 9. The compliance limit is above the ground water quality standard for nitrate (as N) of 10 mg/L (DEQ-7, February 2008) because MW-1 and MW-2 are not located at the end of the mixing zone (see Attachment 4). As discussed in Part IV. B. of this SOB, the compliance monitoring wells MW-1 and MW-2 are located inside the mixing zone (50 feet from the discharge location) instead of at the end of the 400-foot mixing zone. This is a result of the inability of the permittee to secure access to install monitoring wells at the end of the mixing zone.

The nitrate (as N) numeric effluent limit will be based on a mass-balance calculation, see equation 1 in section V. D of this S.O.B. Equation 1 is rearranged into equation 3 (below) to solve for C3 (the allowable concentration at the end of the mixing zone). Solving for C3 demonstrates how the 10 mg/L limit for nitrate (as N) at the end of the mixing zone corresponds to the 10.3 mg/L concentration at MW-1 and MW-2. Therefore, the 10.3 mg/L ground water compliance limit is the value that would result in a concentration of 10 mg/L (back-calculated) at the end of the mixing zone.

$$C_3 = \frac{(C_2)(Q_2) + C_1 Q_1}{(Q_1 + Q_2)} \qquad \textit{(eqn. 3)}$$

Solving for C3 at the end of the 400-foot mixing zone provides 10 mg/L (the value for C_2, 14.6 mg/L, is the allowable TIN discharge concentration to ground water as calculated in Part V. D. of this SOB):

$$C_{3(\text{mixing zone})} = \frac{(14.6\ \text{mg/L})(50{,}000\ \text{ft}^3/\text{d}) + (4.04\ \text{mg/L})(38{,}394\ \text{ft}^3/\text{d})}{(38{,}394\ \text{ft}^3/\text{d} + 50{,}000\ \text{ft}^3/\text{day})}$$

$$C_{3(\text{mixing zone})} = 10\ \text{mg/L}$$

Using the same values as above except for changing Q_1 (volume of ground water mixing with the discharge) to account for the smaller amount of ground water mixing at MW-1 and MW-2 provides 10.3 mg/L:

$$C_{3(\text{MW-1/MW-2})} = \frac{(14.6\ \text{mg/L})(50{,}000\ \text{ft}^3/\text{d}) + (4.04\ \text{mg/L})(34{,}039\ \text{ft}^3/\text{d})}{(34{,}039\ \text{ft}^3/\text{d} + 50{,}000\ \text{ft}^3/\text{day})}$$

$$C_{3(\text{MW-1/MW-2})} = 10.3\ \text{mg/L}$$

D. <u>Compliance Schedules</u>

Due to the history of consistent exceedences of the nitrate and pathogen ground water compliance limits in the permit the following compliance schedule applies to this facility. This compliance schedule is in place to protect the quality of the ground water beneath and downgradient of the wastewater discharge.

- NITROGEN
  Based on existing ground water monitoring data, the wastewater treatment and disposal system in its current configuration consistently causes exceedances of the nitrate (as N) limit in Table 9. Therefore, upon the effective date of the permit the permittee will be required to comply with the following compliance schedule to meet the TIN effluent limit (see Table 5) and the nitrate (as N) ground water compliance limit (Table 9):
  - On or before August 15, 2011, secure funding sources for the wastewater system improvements and submit report to the DEQ outlining the funding sources.
  - On or before July 15, 2012 submit to the DEQ plans and specifications for modifications designed to reduce the effluent TIN concentration to below the effluent limits and reduce the nitrate (as N) concentration to below the ground water compliance limits at MW-1 and MW-2.

- On or before December 1, 2012 have plans and specifications for those modifications reviewed and approved by the DEQ.
- On or before October 1, 2013 have all of the modifications installed and fully operational.

- ESCHERICHIA COLIFORM (E-COLI) BACTERIA
  Based on existing ground water monitoring data, the wastewater treatment and disposal system in its current configuration will cause exceedances of the e-coli bacteria limit in Table 9. Therefore, upon the effective date of the permit the permittee will be required to comply with the following compliance schedule to meet the e-coli bacteria ground water compliance limit (Table 9):
  - On or before August 15, 2011, secure funding sources for the wastewater system improvements and submit report to the DEQ outlining the funding sources.
  - On or before July 15, 2012 submit to the DEQ plans and specifications for modifications designed to reduce the e-coli bacteria concentrations to below the ground water compliance limits at MW-1 and MW-2.
  - On or before December 1, 2012 have plans and specifications for those modifications reviewed and approved by the DEQ.
  - On or before October 1, 2013 have all of the modifications installed and fully operational.

- $CBOD_5$
  Based on existing effluent data, the wastewater treatment system in its current configuration has consistently exceeded the secondary treatment standard for BOD_5. Therefore, upon the effective date of the permit the permittee will be required to comply with the following compliance schedule to meet the $CBOD_5$ effluent limit (Table 5):
  - On or before August 15, 2011, secure funding sources for the wastewater system improvements and submit report to the DEQ outlining the funding sources.
  - On or before July 15, 2012 submit to the DEQ plans and specifications for modifications designed to reduce the effluent $CBOD_5$ concentration to below the effluent limits.
  - On or before December 1, 2012 have plans and specifications for those modifications reviewed and approved by the DEQ.
  - On or before October 1, 2013 have all of the modifications installed and fully operational.

VIII. NONDEGRADATION SIGNIFICANCE DETERMINATION

The Department has determined that this discharge does not constitute a new source for the purpose of the Montana Nondegradation Policy [75-5-303, MCA; ARM 17.30.702(18)] because this facility was originally approved by the Department prior to April 29, 1993.

IX. INFORMATION SOURCES

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS) Standards

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality.

Bauman, B.J. and W.M. Schafer, (1984), Estimating ground-water quality impacts from on-site sewage treatment systems, proceedings of the 4th National Symposium on Individual and Small Community Sewage Systems, New Orleans, ASAE.

Circular DEQ-7 – Montana Numeric Water Quality Standards, February 2008.

Custer, S.G.. 1994. Hydrology for the Belgrade Waste Water Facility Plan, 23 pp.

Hackett, O.M., Visher, F.N., McMurtrey, R.G. and Steinhulber, W.W., 1960. Geology and Ground-Water Resources of the Gallatin Valley, Gallatin County, Montana. U.S. Geological Survey Water Supply Paper 1482, 282 p.

Harkin, John M., Charles J. Fitzgerald, Colin P. Duffy, and David G. Kroll. 1979. Evaluation of Mound Systems for Purification of Septic Tank Effluent. University of Wisconsin, Madison. Tech. Report WIS WRC 79-05.

USEPA, Office of Water 4304, Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, October 1996.

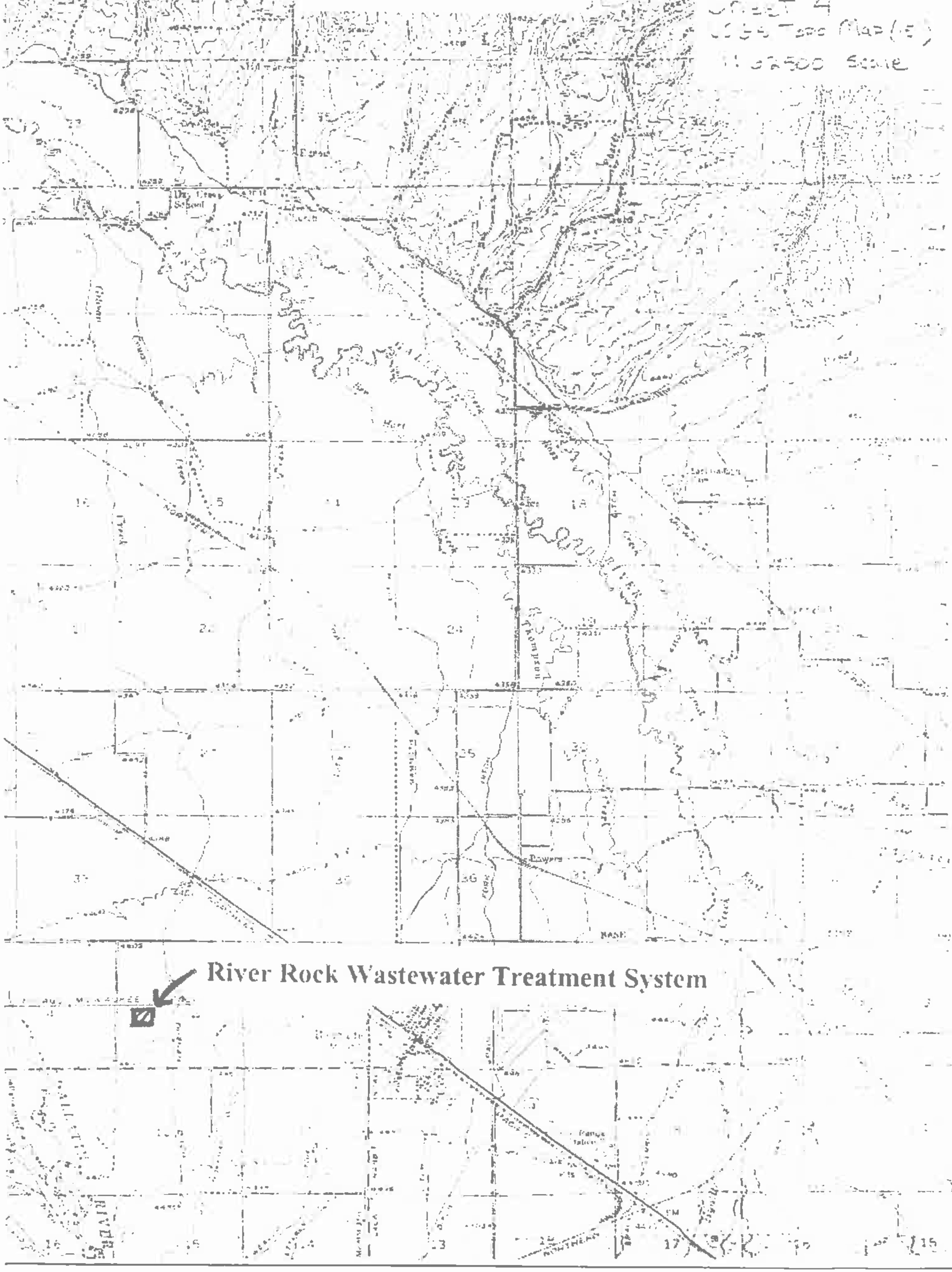
USEPA, Manual: Guidelines for Water Reuse, EPA/625/R-92/004, September 1992.

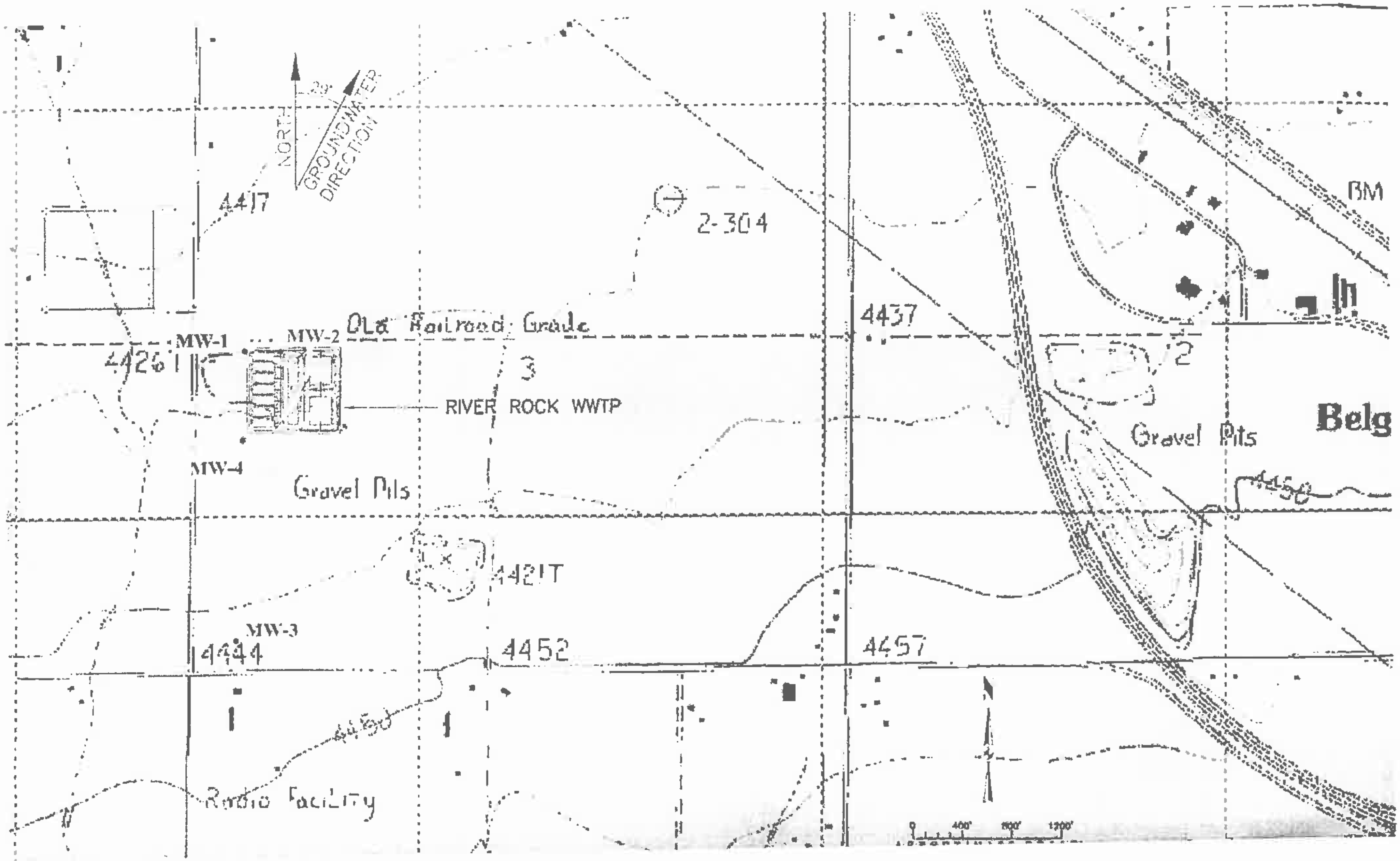
USEPA, Onsite Wastewater Treatment Systems Manual, February 2002.

Woessner, Wm. W., Thomas, Troy, Ball, Pat and DeBorde, Dan C., (April 1998), Virus Transport in the Capture Zone of a Well Penetrating a High Hydraulic Conductivity Aquifer Containing a Preferential Flow Zone: Challenges to Natural Disinfection. University of Montana, Missoula, Montana.

Prepared by: Eric Regensburger **Date :** September 2009

ATTACHMENT 1





NORTH
29°
GROUNDWATER DIRECTION
4417
2-304
4437
BM
Old Railroad Grade
MW-1
MW-2
4426
3
2
RIVER ROCK WWTP
Belg
Gravel Pits
MW-4
Gravel Pits
4450
4421T
MW-3
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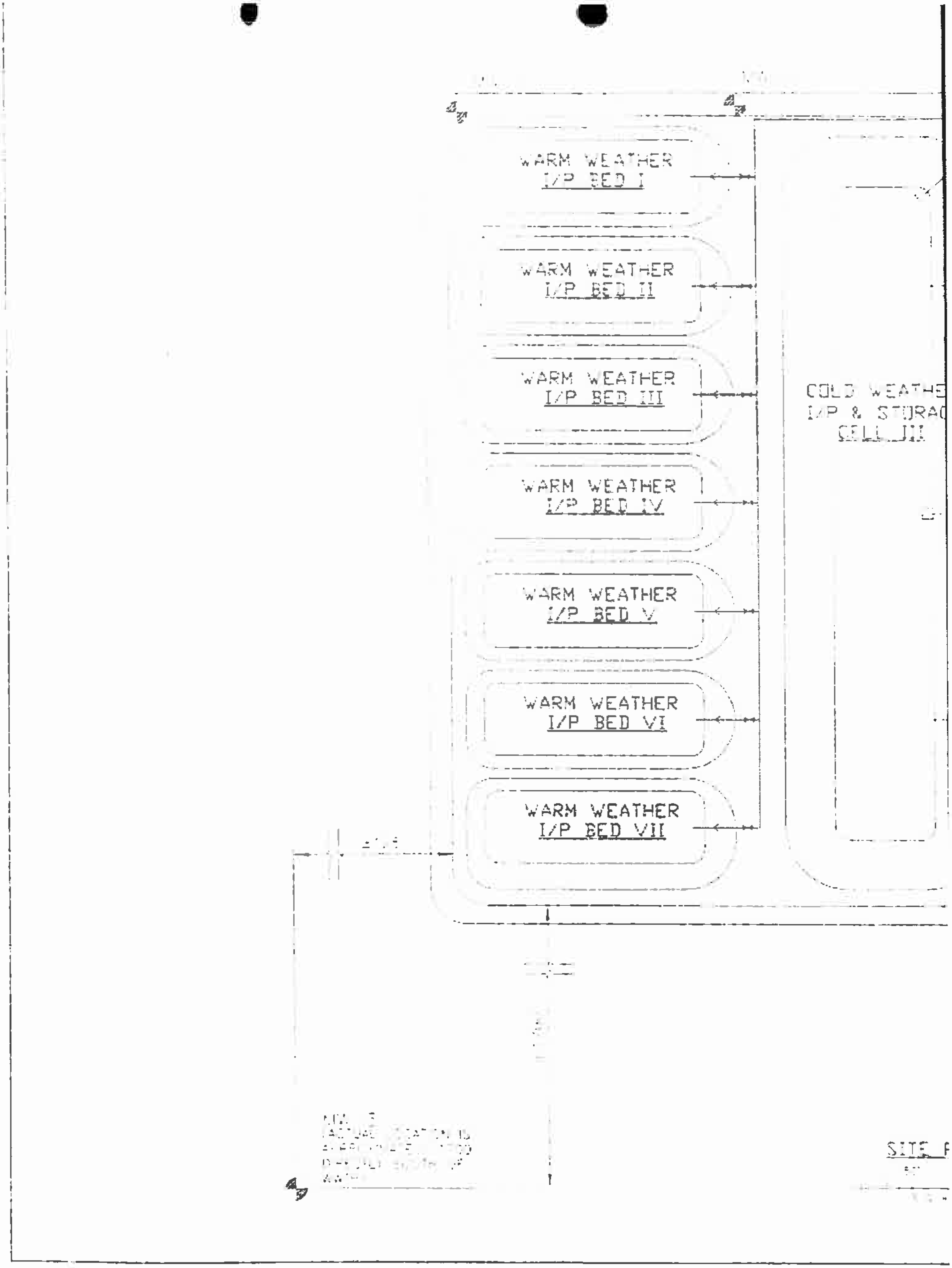
4452
4457
4450
Radio Facility
0
400'
800'
1200'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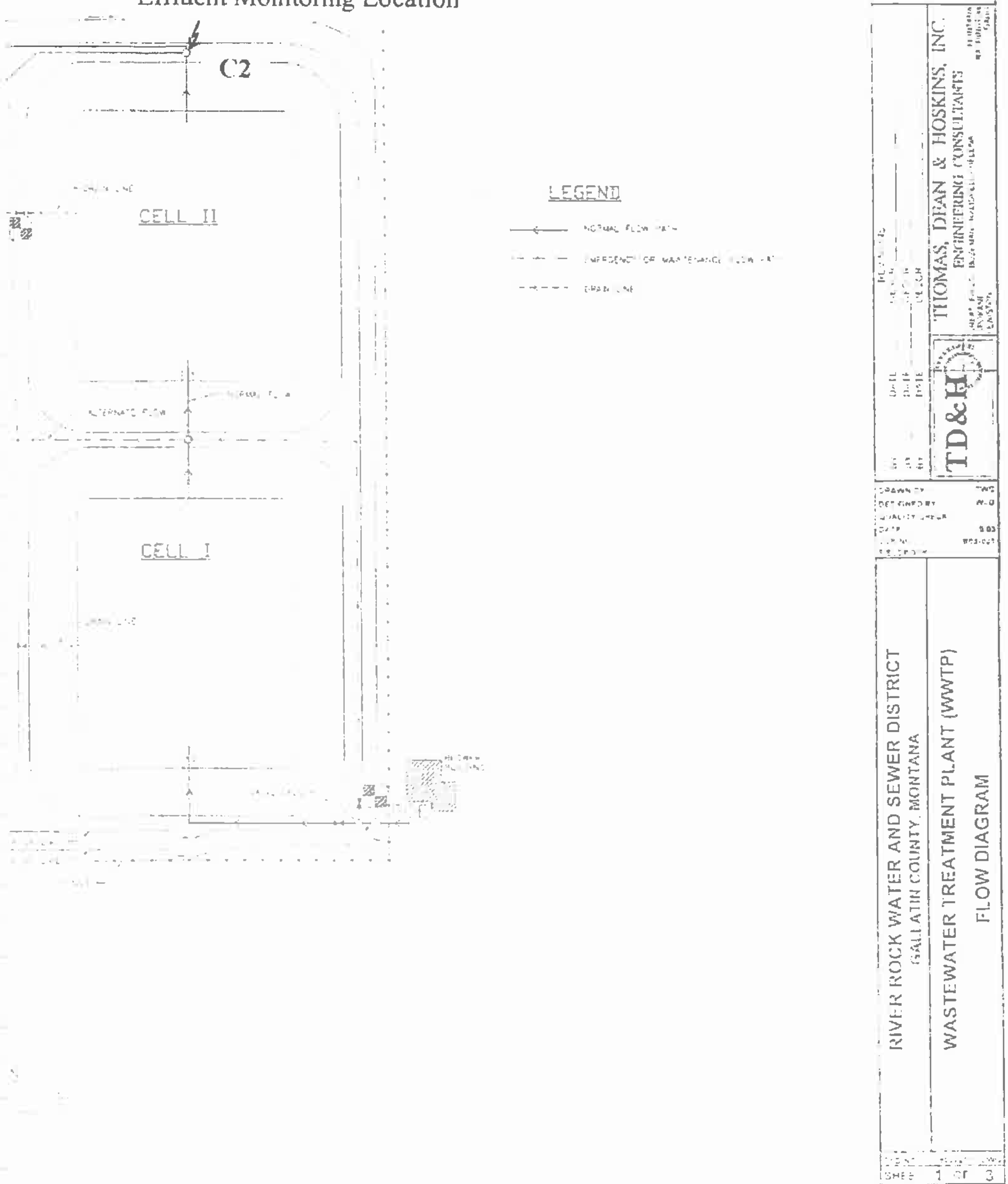
WARM WEATHER I/P BED II
WARM WEATHER I/P BED III
WARM WEATHER I/P BED IV
WARM WEATHER I/P BED V
WARM WEATHER I/P BED VI
WARM WEATHER I/P BED VII
COLD WEATHE
I/P & STORA
CELL III
SITE

ATTACHMENT 2B

Effluent Monitoring Location



ATTACHMENT 3

RIVER ROCK MONITORING WELL DATA

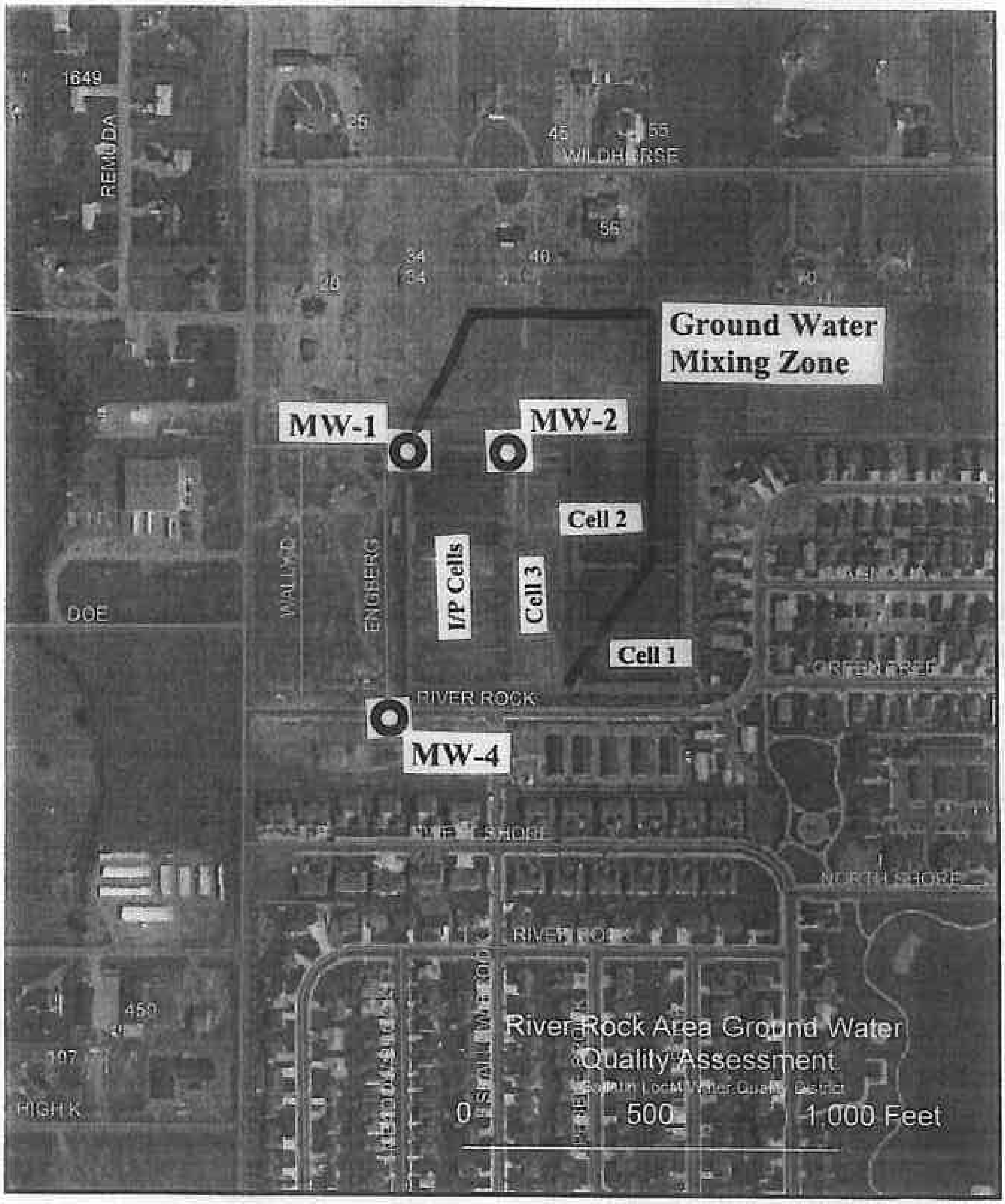
Date	MW-1 Nitrate+Nitrite (mg/L)	MW-1 Chloride (mg/L)	MW-1 E-coli Bacteria	MW-1 Fecal Coliform	MW-2 Nitrate+Nitrite (mg/L)	MW-2 Chloride (mg/L)	MW-2 E-coli Bacteria	MW-2 Fecal coliform	MW-3 Nitrate+Nitrite (mg/L)	MW-3 Chloride (mg/L)	MW-3 E-coli Bacteria	MW-3 Fecal coliform	MW-4 Nitrate+Nitrite (mg/L)	MW-4 Chloride (mg/L)	MW-4 E coli Bacteria
Mar-99	3.70	6.80			3.10	5.60			3.70	6.20					
Mar-00	1.04	5.00			1.25	4.00			1.44	4.00					
Jun-00	1.54	4.00			1.10	4.00			0.72	2.00					
Oct-00	0.95	3.00			0.84	4.00			1.00	3.00					
Jan-01	0.98	4.00			1.03	5.00			1.47	3.00					
Apr-01	1.02	3.00			1.22	8.00			1.44	3.00					
Jun-01	1.28	4.00			2.14	18.00			1.04	2.00					
Oct-01	0.84	3.00			2.00	16.00			1.47	4.00					
Jan-02	1.00	4.00			2.13	21.00			2.07	4.00					
Apr-02	1.50	6.00			2.21	16.00			2.44	3.00					
Jul-02	2.54	7.00			3.02	22.00			7.28	6.00					
Oct-02	1.96	5.00			4.18	26.00			1.98	4.00					
Jan-03	2.00	6.00			3.43	26.00			2.39	4.96					
May-03	2.17			0	2.33			0	4.11			0			
Aug-03	3.34			0	4.94			0	8.10			0			
Sep-03	2.98	7.00		0	10.00	42.00		0	2.66	4.00		0			
Dec-03	2.59	6.00		0	7.09	58.00		0	3.45	4.00		0			
Sep-04	2.07	64.00		1	5.74	27.00		1	5.41	9.00		1			
Oct-04	5.58	65.00		0	5.10	38.00		0	6.66	11.00		0			
Dec-04	9.82	78.00		0	8.06	47.00		0	7.00	10.00		0			
Mar-05	2.43	73.00		1	5.16	70.00		0	3.65	6.00		0			
Jun-05	8.72	71.00		0	8.09	72.00		0	5.97	8.00		0			
Sep-05	5.35	65.00		0	3.09	64.00		0	1.45	4.00		1			
Jan-06	14.80	79.00			2.68	77.00			1.62	4.00					
Jul-06	8.64	29.00		11	49.00	66.00		12	5.62	18.00					
Dec-06	8.34	45.00			9.91	67.00			3.27	8.20					
Mar-07	3.95	31.00			1.24	66.00			3.04	7.00					
Jun-07	30.00	62.00			20.10	68.00			4.25	14.00					
Aug-07	28.70	71.00		160	17.10			3							
Sep-07	10.60	68.00		140	10.20	61.00		140	3.24	6.00		0			
Oct-07	16.50	67.00		57	13.80	64.00		26							
Nov-07	9.32	58.00			10.00	65.00			5.65	5.60					
Dec-07	12.30	61.00		610	14.60	66.00		270	5.93	11.00		0			
Mar-08	2.02	50.70		0	5.96	64.90		1	3.90	8.14		0	3.16	5.45	
Jun-08	12.50	39.20		1	5.53	62.30		2	1.82	3.12		0	4.12	7.46	
Sep-08	12.50	65.20	38		5.94	62.70	3		1.86	4.12	0		3.22	4.91	0
Nov-08	11.20	60.90	818		7.70	59.30	74		2.22	4.59	0		2.78	4.23	0
Mar-09	5.09	56.50	0		3.85	66.50	0		3.39	5.32	0		4.40	18.10	0
Apr-09	4.60	55.10	0		3.31	68.60	5								
May-09	18.40	68.60	0		21.00	67.60	0		2.73	4.43	0		2.77	5.58	0
Jun-09	19.20	74.60	0		28.70	74.00	0								
Jul-09	11.70	79.90	0		18.60	80.70	0								
AVERAGE	7.32	41.31			8.09	46.18			3.43	5.81			3.41	7.82	
AVG 3/99-4/02	1.45	4.28			1.71	10.18			1.77	3.42			N/A	N/A	
AVG 7/02-7/09	9.15	53.66			10.09	58.57			4.04	8.77			N/A	N/A	

ATTACHMENT 4

LEGEND

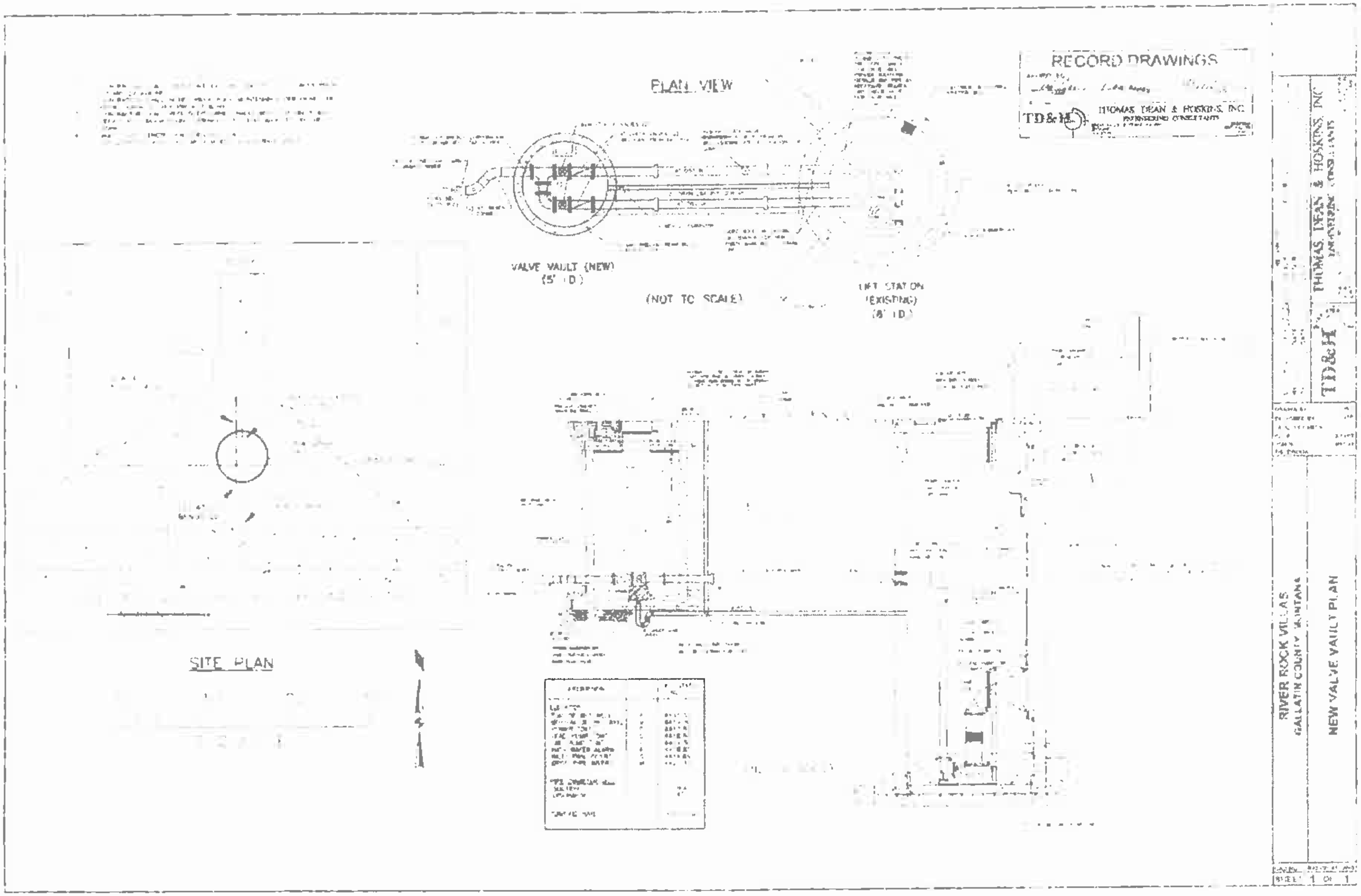
(domestic well

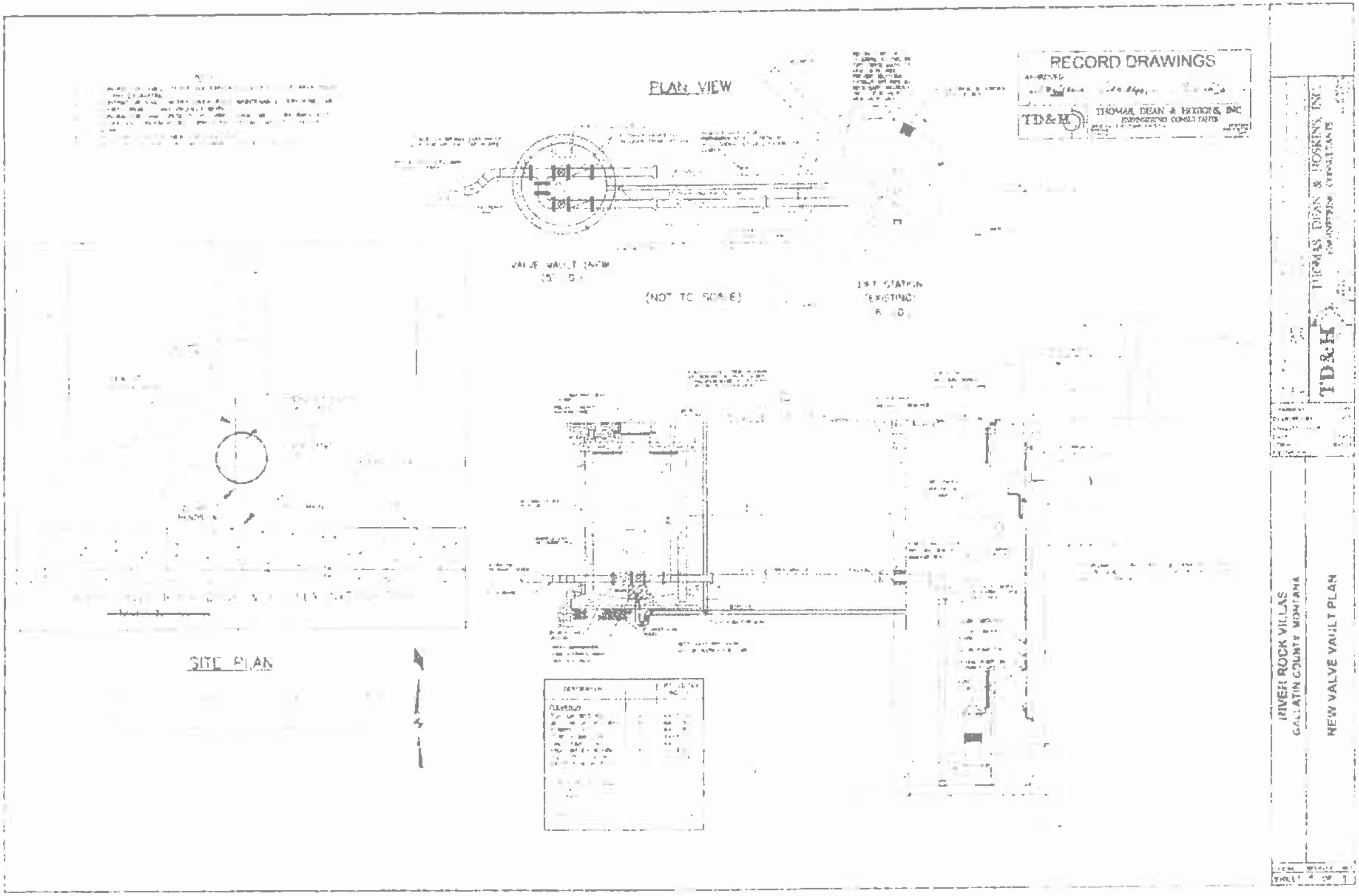
monitoring well

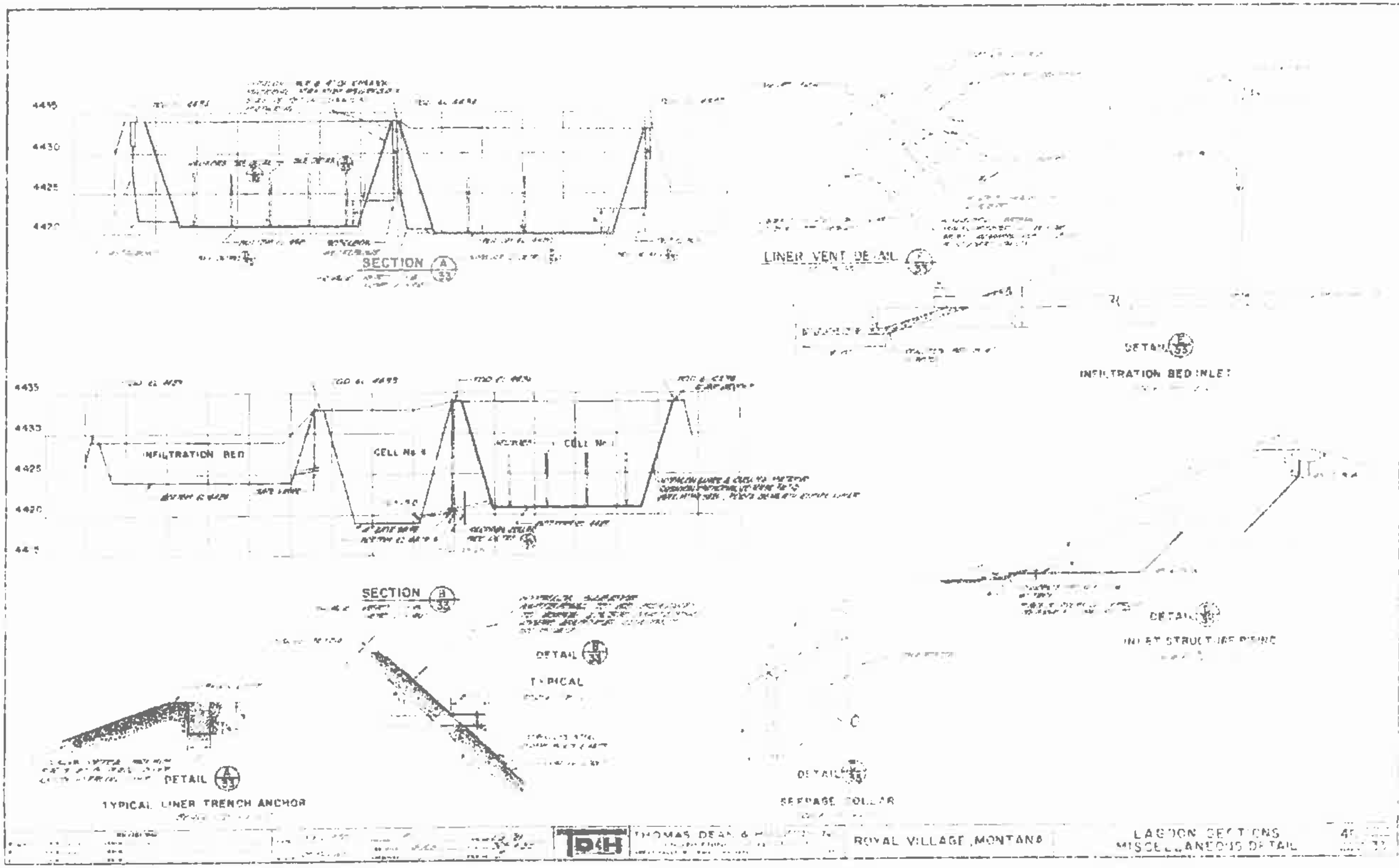


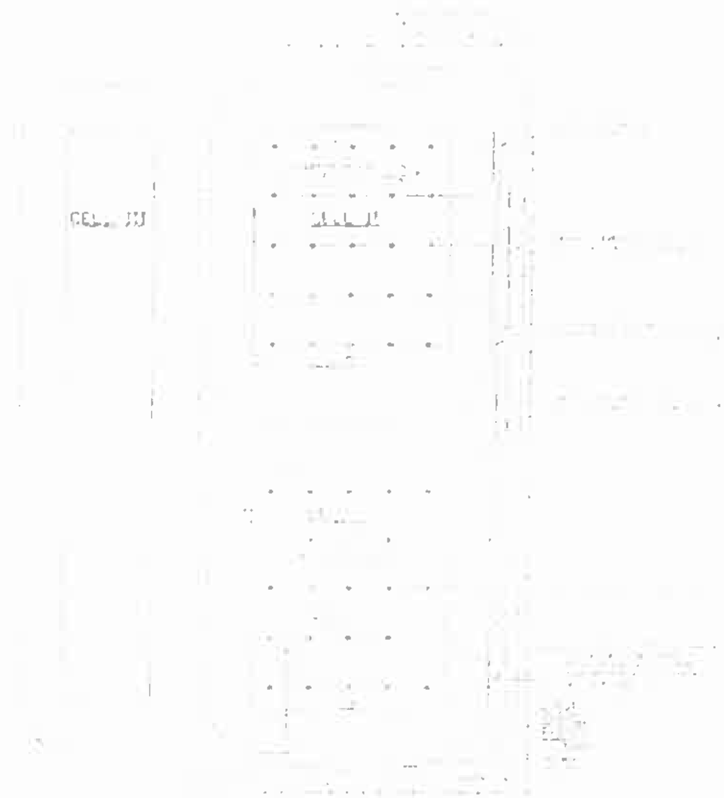
Appendix B

Record Drawings of the Existing Facility


RECORD DRAWINGS
TD&H
THOMAS DEAN & HOSKINS, INC
ENGINEERING CONSULTANTS
PLAN VIEW
VALVE VAULT (NEW)
(5' I.D.)
(NOT TO SCALE)
LIFT STATION
(EXISTING)
(8' I.D.)
SITE PLAN
THOMAS DEAN & HOSKINS, INC
ENGINEERING CONSULTANTS
RIVER ROCK VILLAS
GALLATIN COUNTY, MONTANA
NEW VALVE VAULT PLAN
SHEET 1 OF 1


RECORD DRAWINGS
TD&H
THOMAS, DEAN & HOSKINS, INC.
ENGINEERING CONSULTANTS
PLAN VIEW
VALVE VAULT (NEW)
(NOT TO SCALE)
LIFT STATION (EXISTING)
SITE PLAN
TD&H
THOMAS, DEAN & HOSKINS, INC.
ENGINEERING CONSULTANTS
RIVER ROCK VILLAS
GALLATIN COUNTY, MONTANA
NEW VALVE VAULT PLAN


4435
4430
4425
4420
SECTION A 33
4435
4430
4425
4420
INFILTRATION BED
CELL No. 1
SECTION B 33
LINER VENT DETAIL F 33
DETAIL E 33
INFILTRATION BED INLET
DETAIL D 33
INLET STRUCTURE PIPING
DETAIL A 33
TYPICAL LINER TRENCH ANCHOR
DETAIL B 33
TYPICAL
DETAIL C 33
SEEPAGE COLLAR
TD&H
THOMAS, DEAN & HOSKINS
ROYAL VILLAGE, MONTANA
LAGOON SECTIONS
MISCELLANEOUS DETAIL

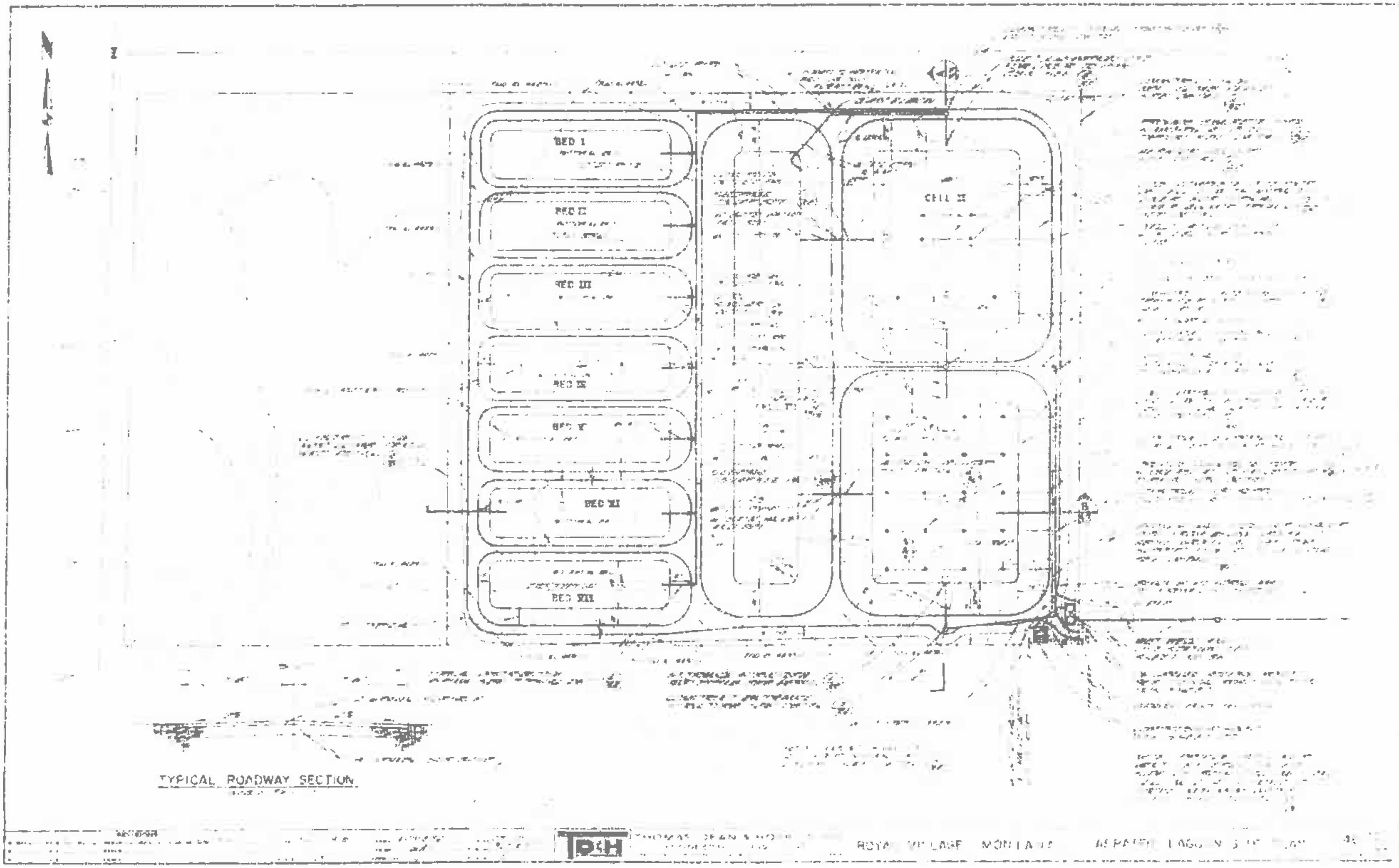


SITE PLAN

RECORD DRAWINGS

THOMAS DEAN & HOSKINS, INC.

TD&H THOMAS DEAN & HOSKINS INC


BED I
BED II
BED III
BED IV
BED V
BED VI
BED VII
CELL II
TYPICAL ROADWAY SECTION
ROYAL VILLAGE MONTANA

Appendix C

Detailed Cost Estimates

Treatment Alternative C-2: Send Wastewater to Belgrade (Amsterdam Road Route)

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Sewer Connection							
10" Sewer Forcemain	14,2[illegible]	LF	$ 46	$ [illegible]	incl	$ 653,200	
10" Fittings	15	EA	$ [illegible]	$ [illegible]		$ 10,500	
10" Valves	6	EA	$ 1,200	$ [illegible]		$ 7,200	
Bore and Jack	200	LF	$ [illegible]	$ [illegible]		$ 130,000	
Lift Station	[illegible]	LS	$ 140,000	$ [illegible]		$ 140,000	
Auxiliary Lift Station Power	1	LS	$ 40,000	$ [illegible]		$ 40,000	
Corridor Restoration	14,200	LF	$ [illegible]	$ [illegible]		$ 42,600	
							$ 1,02[illegible]
Electrical and Instrumentation	1	LS	$ [illegible]	$ 75,000		$ 75,000	
SUBTOTAL						$ 1,096,500	
Contingency	20%					$ 220,000	
Engineering, Legal and Administration	20%					$ 263,700	$ 1,31[illegible],300
City of Belgrade Sewer Impact Fee (1,200 sf units at $1,469/unit)	1	LS	$ 1,7[illegible]0,800	$ 1,760,[illegible]		$ 1,787,0[illegible]	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ [illegible]

River Rock Alternative Analysis - Design Flow of 374,000 gpd
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Treatment Alternative C-2: Send Wastewater to Belgrade (Amsterdam Road Route)

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Sewer Connection							
12" Sewer Forcemain	[illegible]	LF	$ 50	$ [illegible]10,000	incl	$ [illegible]	
12" Fittings	[illegible]	EA	$ [illegible]	$ 1[illegible],000		$ [illegible]	
12" Valves	[illegible]	EA	$ 1,5[illegible]	$ 9,000		$ [illegible]	
Bore and Jack	[illegible]	LF	$ 650	$ 130,000		$ [illegible]	
Lift Station	1	LS	$ 150,000	$ 150,000		$ [illegible]	
Auxiliary Lift Station Power	1	LS	$ 40,000	$ 40,000		$ [illegible]	
Corridor Restoration	14,[illegible]	LF	$ 3	$ 42,600		$ 42,600	
							$ 1,[illegible]
Electrical and Instrumentation	1	LS	$ 75,000	$ 75,000		$ [illegible]	
SUBTOTAL						$ 1,1[illegible]	
Contingency[1]	[illegible]%					$ [illegible]	
Engineering, Legal and Administration	[illegible]%					$ [illegible]	$ 1,[illegible]2,460
City of Belgrade Sewer Impact Fee (1,2[illegible] sf units at $1,469/unit)	1	LS	$ 1,780,800	$ 1,780,800		$ 1,[illegible]	
PROBABLE CONSTRUCTION COST ([illegible] dollars)							$ 3,17[illegible]

River Rock Alternative Analysis - Design Flow of 200 000 gpd
Opinion of Probable Construction Cost
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Treatment Alternative C-3 Land Application of Wastewater (Sections 32, 33, T1N, R4E)

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Pipeline to Storage Lagoon							
10" Sewer Forcemain	4,900	LF	$ 40	$ 225,400	Incl	$ 225,400	
12" Fittings	3	EA	$ 700	$ 2,100		$ 2,100	
10" Valves	2	EA	$ 1,200	$ 2,400		$ 2,100	
Lift Station	1	LS	$ 140,000	$ 140,000		$ 140,000	
Auxilary Lift Station Power	1	LS	$ 40,000	$ 40,000		$ 40,000	
Corridor Restoration	4,900	LF	$ 3	$ 14,700		$ 14,700	
							$ 424,600
Effluent Irrigation							
12" Sewer Forcemain	3,830	LF	$ 50	$ 191,500	Incl	$ 191,500	
12" Fittings	3	EA	$ 800	$ 2,400		$ 2,400	
12" Valves	8	EA	$ 1,500	$ 12,000		$ 12,000	
Irrigation Pump Station	1	LS	$ 100,000	$ 100,000		$ 100,000	
Storage Pond Liner	522,720	SF	$ 1	$ 522,720		$ 522,720	
Storage Pond Site Grading	15,000	CY	$ 3	$ 45,000		$ 45,000	
Irrigation Equipment	1	LS	$ 25,000	$ 25,000		$ 25,000	
Corridor Restoration	3,830	LF	$ 3	$ 11,490		$ 11,490	
UV Disinfection	1	LS	$ 10,000	$ 40,000	$ 10,000	$ 50,000	
							$ 960,110
Electrical and Instrumentation	1	LS	$ 125,000	$ 125,000		$ 125,000	
SUBTOTAL						$ 1,509,710	
Contingency	20%					$ 302,000	
Engineering, Legal and Administration	20%					$ 362,342	$ 1,811,658
20 acres for Effluent Storage (Gallatin City) (20 acres at $15,000/acre	20	AC	$ 15,000	$ 300,000		$ 300,000	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 2,474,000

Treatment Alternative C-3. Land Application of Wastewater (Section 8, T1S R4E)

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Pipeline to Storage Lagoon							
10" Sewer Forcemain	[illegible]	LF	$ 46	$ [illegible]	incl	$ 225,4[illegible]	
10" Fittings	3	EA	$ [illegible]	$ 2,100		$ 2,100	
10" Valves	[illegible]	EA	$ [illegible]	$ 2,400		$ 2,400	
Lift Station	1	LS	$ [illegible]	$ [illegible]		$ 140,000	
Auxiliary Lift Station Power	1	LS	$ 40,000	$ 40,000		$ 40,000	
Corridor Restoration	1,900	LF	$ [illegible]	$ 14,700		$ 14,700	
							$ 424,600
Effluent Irrigation							
12" Sewer Forcemain	15,300	LF	$ 50	$ 765,000	incl	$ 765,000	
12" Fittings	12	EA	$ 800	$ 9,600		$ 9,600	
12" Valves	8	EA	$ [illegible]	$ 12,000		$ 12,000	
Bore and Jack	400	LF	$ [illegible]	$ 260,000		$ 260,000	
Irrigation Pump Station	1	LS	$ [illegible]	$ 100,000		$ 100,000	
Storage Pond Liner	522,720	SF	$ 1	$ 522,720		$ 522,720	
Storage Pond Site Grading	15,000	CY	$ 3	$ 45,000		$ 45,000	
Irrigation Equipment	1	LS	$ [illegible]	$ 100,000		$ 100,000	
Corridor Restoration	15,300	LF	$ 3	$ 45,900		$ 45,900	
							$ 1,860,220
Electrical and Instrumentation	1	LS	$ 125,000	$ 125,000		$ 125,000	
SUBTOTAL						$ 2,409,820	
Contingency	20%					$ 482,000	
Engineering, Legal and Administration	20%					$ 578,364	$ [illegible]
20 acres for Effluent Storage (Gallatin Co.) (20 acres at $15,000/acre)	20	AC	$ 15,000	$ 300,000		$ 300,000	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 3,770,000

River Rock Alternative Analysis - Design Flow of 374,000 gpd
Opinion of Probable Construction Cost
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Treatment Alternative C-3: Land Application of Wastewater (Sections 11 T1S R4E)

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Pipeline to Storage Lagoon							
12" Sewer Forcemain	4,2[illegible]	LF	$ [illegible]0	$ 211,150	incl	$ [illegible]	
12" Fittings	3	EA	$ 8[illegible]	$ 2,400		$ 2,[illegible]	
12" Valves	[illegible]	EA	$ [illegible]	$ 3,000		$ [illegible]	
Lift Station	1	LS	$ [illegible],000	$ 150,000		$ 150,[illegible]	
Auxiliary Lift Station Power	1	LS	$ 40,000	$ 40,000		$ [illegible]	
Corridor Restoration	4,2[illegible]	LF	$ 3	$ 12,669		$ 12,[illegible]	
							$ [illegible]
Effluent Irrigation							
12" Sewer Forcemain	17,930	LF	$ 50	$ 896,500	incl	$ 896,50[illegible]	
12" Fittings	7	EA	$ 800	$ 5,600		$ 5,600	
12" Valves	7	EA	$ 1,500	$ 10,500		$ 10,500	
Irrigation Pump Station	1	LS	$ 100,000	$ 100,000		$ 100,000	
Storage Pond Liner	522,720	SF	$ 1	$ 522,720		$ 522,720	
Storage Pond Site Grading	15,000	CY	$ 3	$ 45,000		$ 45,000	
Irrigation Equipment	1	LS	$ 25,000	$ 25,000		$ 25,000	
Corridor Restoration	17,930	LF	$ 3	$ 53,790		$ 53,790	
UV Disinfection	1	LS	$ 40,000	$ 40,000	$ 10,000	$ 50,000	
							$ 1,[illegible]
Electrical and Instrumentation	1	LS	$ 125,000	$ 125,000		$ 125,[illegible]	
SUBTOTAL						$ 2,2[illegible]	
Contingency[1]	20%					$ 45[illegible]	
Engineering, Legal and Administration	20%					$ 540,86[illegible]	$ [illegible]704,[illegible]
20 acres for Effluent Storage (Gallatin Co.) (20 acres at $15,000/acre)	20	AC	$ 15,000	$ 300,000		$ 300,000	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ [illegible]

River Rock Alternative Analysis - Design Flow of 200,000 gpd
Opinion of Probable Construction Cost
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Treatment Alternative C-4: Covered Aerated Lagoons with Post Nitrification, Post Denitrification, Ultrafiltration, UV Disinfection and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Equipment Building							
New Process Building (40 x60')	[illegible]	sf	$ 115	$ 276,000	[illegible]	$ [illegible]	
Backfill	[illegible]	CY	$ 15	$ 20,000		$ [illegible]	
Concrete	9[illegible]	CY	$ 750	$ 67,500		$ 67,[illegible]	
							$ [illegible]3,500
Lagoon Modifications							
Covers Cells No. 1	[illegible]	LS	$ 175,000	$ 175,000	$ [illegible]	$ [illegible]	
							$ 228,000
Nitrification Polishing Reactor							
Backfill with Compaction	[illegible]	CY	$ 15	$ 6,912		$ 6,912	
Concrete	[illegible]	CY	$ 750	$ 19,200		$ 19,200	
Attached Growth Media	[illegible]	LS	$ 103,200	$ 103,200	$ 30,[illegible]	$ 1[illegible]	
							$ [illegible]0,000
Denitrification Reactor							
Package Skid System all inclusive (2[illegible])	1	LS	$ 175,875	$ 175,875	$ 52,76[illegible]	$ [illegible]	
Backfill with Compaction	205	CY	$ 15	$ 3,060		$ 3,060	
Concrete	14	CY	$ 750	$ 10,267		$ 10,267	
							$ [illegible]42,000
Ultrafiltration Membrane Filter							
Skid Mounted Ultrafiltration Membrane	1	LS	$ 308,000	$ 308,000	$ [illegible]	$ [illegible]	
							$ [illegible]
Auxiliary Power Generator	1	LS	$ 100,000	$ 100,000	$ 20,000	$ 120,000	
							$ 12[illegible],000
Disinfection							
UV Disinfection	1	LS	$ 40,000	$ 40,000	$ 10,000	$ 50,000	
							$ 50,000
Civil Cost							
Site Work (6.5%)	1	LS	$ 100,000	$ 100,000		$ 100,000	
Yard Piping (5.5%)	1	LS	$ 84,000	$ 84,000		$ 84,000	
Fencing	[illegible]	LF	$ 15	$ 3,000		$ 4,000	
							$ 168,000
Electrical and Instrumentation (7%)	1	LS	$ 107,000	$ 107,000		$ 1[illegible]0 000	
SUBTOTAL						$ 1,628,1[illegible]0	
General Conditions	7%					$ 1[illegible]6,000	
Contingency	2[illegible]%					$ 366,000	
							$ 2,[illegible]22,580
Engineering, Legal and Administration	20%					$ [illegible]64,420	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 2,[illegible]57,000

River Rock Alternative Analysis - Design Flow of 374,000 gpd
Opinion of Probable Construction Cost
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Treatment Alternative C-4: Covered Aerated Lagoons with Post Nitrification, Post Denitrification, Ultrafiltration, UV Disinfection, and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Equipment Building							
New Process Building (60'x60')	3,600	sf	$ 115	$ 414,000	incl	$ 414,000	
Backfill	2,000	CY	$ 15	$ 30,000		$ 30,000	
Concrete	133	CY	$ [illegible]	$ 99,750		$ 99,750	
							$ 543,750
Lagoon Modifications							
Covers Cells No. 1 and No. 2	1	LS	$ 275,000	$ 275,000	$ 55,000	$ 330,000	
							$ 330,000
Nitrification Polishing Reactor (24'x48')							
Backfill with Compaction	768	CY	$ 15	$ 11,520		$ 11,520	
Concrete	43	CY	$ 750	$ 32,000		$ 32,000	
Attached Growth Media	1	LS	$ 137,600	$ 137,600	$ 41,280	$ 178,880	
							$ 222,000
Denitrification Reactor							
Package Skid System all inclusive (22'x28')	1	LS	$ 175,875	$ 175,875	$ 52,763	$ 228,638	
Backfill with Compaction	342	CY	$ 15	$ 5,133		$ 5,133	
Concrete	23	CY	$ 750	$ 17,111		$ 17,111	
							$ 251,000
Ultrafiltration Membrane Filter							
Skid Mounted Ultrafiltration Membrane	1	LS	$ 580,000	$ 580,000	$ 116,000	$ 696,000	
							$ 696,000
Auxiliary Power Generator	1	LS	$ 100,000	$ 100,000	$ 20,000	$ 120,000	
							$ 120,000
Disinfection							
UV Disinfection	1	LS	$ 40,000	$ 40,000	$ 10,000	$ 50,000	
							$ 50,000
Civil Cost							
Site Work (6.5%)	1	LS	$ 144,000	$ 144,000		$ 144,000	
Yard Piping (5.5%)	1	LS	$ 122,000	$ 122,000		$ 122,000	
Fencing	320	LF	$ 15	$ 4,800		$ 5,000	
							$ 271,000
Electrical and Instrumentation (7%)	1	LS	$ 155,000	$ 155,000		$ 155,000	
SUBTOTAL						$ 2,638,750	
General Conditions	7%					$ 185,000	
Contingency	20%					$ 528,000	
							$ 3,351,650
Engineering, Legal and Administration	20%					$ 670,350	
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 4,022,000

River Rock Alternative Analysis - Design Flow of 200 000 gpd
Opinion of Probable Construction Cost
April 07 2010

Treatment Alternative C-5: Screening, Oxidation Ditch , Ultrafiltration, UV Disinfection and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Equipment Building							
New Process Building (50'x60')	3,000	SF	$ 115	$ 345,000	incl	$ 345,000	
Backfill	1667	CY	$ 15	$ 25,000	$ 7,500	$ 32,500	
Concrete	111	CY	$ 750	$ 83,000		$ 83,000	
							$ [illegible]
Headworks							
2MM Fine Screen with Washer/Compactor	1	LS	$ 62,250	$ 62,250	$ 18,675	$ 80,925	
Manually Cleaned Back-Up Screen	1	LS	$ 18,750	$ 18,750	$ 5,625	$ 24,375	
Vortex Grit Chamber, Classifier and Related	1	LS	$ 82,500	$ 82,500	$ 24,750	$ 107,250	
							$ 21[illegible],550
Oxidation Ditch Equipment							
Excavation (3 foot assumed)	800	CY	$ 5	$ 4,000	$ 1,200	$ 5,200	
Backfill	2400	CY	$ 15	$ 36,000	$ 10,800	$ 46,800	
Oxidation Ditch Equipment	1	LS	$ 131,250	$ 131,250	$ 39,375	$ 170,625	
Concrete	379	CY	$ 750	$ 284,000	$ 85,200	$ 369,200	$ [illegible]
Secondary Clarifiers and Splitter Box							
Backfill	558	CY	$ 15	$ 8,373		$ 8,373	
Concrete	291	CY	$ 750	$ 218,492		$ 218,492	
Gates	2	EA	$ 4,000	$ 8,000	$ 2,400	$ 10,400	
Clarifier Equipment	2	EA	$ 80,000	$ 160,000	$ 48,000	$ 208,000	
Scum Pump Wet Well	1	LS	$ 8,000	$ 8,000	$ 2,400	$ 10,400	
Scum Pumps, RAS, and WAS Pumps	6	EA	$ 7,500	$ 45,000	$ 13,500	$ 58,500	
							$ [illegible]
Lagoon Modifications							
New/Modified Aeration Equipment for Sludge Lagoon Aerated Cap	1	LS	$ 25,000	$ 25,000	$ 7,500	$ 32,500	
							$ [illegible]
Ultrafilltration Membrane Filter							
Skid Mounted Ultrafiltration Membrane	1	LS	$ 308,000	$ 308,000	$ 61,600	$ 369,600	
							$ [illegible]
Auxiliary Power Generator	1	LS	$ 100,000	$ 100,000	$ 20,000	$ 120,000	
							$ 120,000
Disinfection							
UV Disinfection	1	LS	$ 10,000	$ 40,000	$ 10,000	$ 50,000	
							$ 50,000
Civil Cost							
Site Work (6.5%)	1	LS	$ 153,000	$ 153,000		$ 153,000	
Yard Piping (5.5%)	1	LS	$ 129,000	$ 129,000		$ 129,000	
Fencing	320	LF	$ 15	$ 4,800		$ 5,000	$ [illegible]87,000
Electrical and Instrumentation (7%)	1	LS	$ 185,000	$ 185,000		$ 185,000	
SUBTOTAL						$ 2,523,640	
General Conditions	7%					$ 198,000	
Contingency	20%					$ 505,000	
Engineering, Legal and Administration	20%					$ 717,328	$ [illegible]
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 4,[illegible]

River Rock Alternative Analysis - Design Flow of 374,000 gpd
Opinion of Probable Construction Cost
April 07, 2010

Treatment Alternative C-5. Screening, Oxidation Ditch Ultrafiltration, UV Disinfection and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Equipment Building							
New Process Building (80'x60')	[illegible]	sf	$ 115	$ 552,000	incl	$ [illegible]	
Backfill	[illegible]	CY	$ 15	$ 40,000	$ 12,000	$ [illegible]	
Concrete	178	CY	$ 750	$ 133,000		$ [illegible]	
							$ [illegible]
Headworks							
6MM Fine Screen with Washer Compactor	1.0	LS	$ 83,000	$ 83,000	$ 24,900	$ [illegible]	
Manually Cleaned Back-Up Screen	1.0	LS	$ 25,000	$ 25,000	$ [illegible]	$ [illegible]	
Vortex Grit Chamber, Classifier and Related	1.0	LS	$ 110,000	$ 110,000	$ 33,000	$ [illegible]	
							$ [illegible]
Oxidation Ditch Equipment							
Excavation (3 foot assumed)	1000	CY	$ 5	$ 5,000	$ 1,500	$ 6,500	
Backfill	4000	CY	$ 15	$ 60,000	$ 18,000	$ 78,000	
Oxidation Ditch Equipment	1	LS	$ 175,000	$ 175,000	$ 52,500	$ 227,500	
Concrete	632	CY	$ 750	$ 474,000	$ 142,200	$ [illegible]	$ [illegible]
Secondary Clarifiers and Splitter Box							
Backfill	707	CY	$ 15	$ 10,598		$ [illegible]	
Concrete	298	CY	$ 750	$ 223,725		$ [illegible]	
Gates	2	EA	$ 4,000	$ 8,000	$ [illegible]	$ [illegible]	
Clarifier Equipment	2	EA	$ 80,000	$ 160,000	$ 48,000	$ [illegible]	
Scum Pump Wet Well	1	LS	$ 8,000	$ 8,000	$ 2,400	$ 10,400	
Scum Pumps, RAS, and WAS Pumps	[illegible]	EA	$ 7,500	$ 45,000	$ 13,500	$ 58,500	
							$ [illegible]
Lagoon Modifications							
New/Modified Aeration Equipment for Sludge Lagoon Aerated Cap	1	LS	$ 25,000	$ 25,000	$ 7,500	$ [illegible]	
							$ [illegible]
Ultrafilltration Membrane Filter							
Skid Mounted Ultrafiltration Membrane	1	LS	$ 580,000	$ 580,000	$ 116,000	$ 696,000	
							$ [illegible]
Auxiliary Power Generator	1	LS	$ 100,000	$ 100,000	$ 20,000	$ 120,000	
							$ 120,000
Disinfection							
UV Disinfection	1	LS	$ 40,000	$ 40,000	$ 10,000	$ 50,000	
							$ 50,000
Civil Cost							
Site Work (6.5%)	1	LS	$ 219,000	$ 219,000		$ 219,000	
Yard Piping (5.5%)	1	LS	$ 185,000	$ 185,000		$ 185,000	
Fencing	320	LF	$ 15	$ 4,800		$ 5,000	$ 409,000
Electrical and Instrumentation (7%)	1	LS	$ 264,000	$ 264,000		$ 264,000	
SUBTOTAL						$ [illegible]	
General Conditions	7%					$ 283,000	
Contingency	20%					$ [illegible]	
Engineering, Legal and Administration	20%					$ [illegible]	$ [illegible]
PROBABLE CONSTRUCTION COST (2010 dollars)							$ [illegible]

River Rock Alternative Analysis - Design Flow of 200,000 gpd
Opinion of Probable Construction Cost
April 07, 2010

Treatment Alternative C-6: Fine Screening, Grit Removal, MBR, UV Disinfection, and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Headworks							
New Process Building [illegible]	2,000	sf	$ 11[illegible]	$ [illegible]	n/a	$ 23[illegible]	
Backfill	741	CY	$ 15	$ 11,111	$ [illegible]333	$ 14,444	
Concrete	74	CY	$ 750	$ 55,556		$ 55,556	
2MM Fine Screen	2	(included in Package MBR Quote Below)					
Washer Compactor	1	(included in Package MBR Quote Below)					
Vortex Grit Chamber [illegible] and Related	1	(included in Package MBR Quote Below)					
							$ [illegible]00,000
Lagoon Modifications							
Lagoon Aeration [illegible]	1	LS	$ 25,000	$ 25,000	$ 7,500	$ 32,500	
							$ 33,000
Package MBR System							
All Encompassing Quotation: Membranes, Pum[illegible]	1	LS	$561,765	$ 561,765	$ 112,353	$ 674,118	
Concrete	250	CY	$ 750	$ 187,500		$ 187,500	
EQ Basin	50	CY	$ 750	$ 37,500		$ 750	
							$ 862,368
Auxiliary Power Generator	1	LS	$ 100,000	$ 100,000	$ 20,000	$ 120,000	
							$ 120,000
Disinfection							
UV Disinfection	1	LS	$ 40,000	$ 40,000	$ 10,000	$ 50,000	
							$ 50,000
Civil Cost							
Site Work (6.5%)	1	LS	$ 89,000	$ 89,000		$ 89,000	
Yard Piping (5.5%)	1	LS	$ 75,000	$ 75,000		$ 75,000	
Fencing	320	LF	$ 15	$ 4,800		$ 5,000	
							$ 169,000
Electrical and Instrumentation (7%)	1	LS	$ 96,000	$ 96,000		$ 96,000	
SUBTOTAL						$ 1,630,368	
General Conditions	7%					$ 114,000	
Contingency	20%					$ 326,000	
Engineering, Legal and Administration	20%					$ 414,074	2,069,926
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 2,484,000

River Rock Alternative Analysis - Design Flow of 374,000 gpd
Opinion of Probable Construction Cost
April 07, 2010

Treatment Alternative C-6: Fine Screening, Grit Removal, MBR, UV Disinfection, and Discharge to IP Cells

Item	Number	Units	Unit Cost ($)	Sub-total ($)	Installation Cost ($)	Total Cost ($)	
Headworks							
New Process Building (80x80)	6,400	[illegible]	$ 115	$ 736,000	Inc.	$ [illegible]36,000	
Backfill	2,370	CY	$ 15	$ 35,550	$ 10,667	$ [illegible]	
Concrete	237	CY	$ 600	$ 142,222		$ 142,[illegible]	
1MM Fine Screen	2	(Included in Package MBR Quote Below)					
Washer/Compactor	1	(Included in Package MBR Quote Below)					
Vortex Grit Chamber, Classifier and Related	1	(Included in Package MBR Quote Below)					
							$ [illegible]14,444
Lagoon Modifications							
Lagoon Aerated Cap	1	LS	$ 25,000	$ 25,000	$ 7,500	$ 32,500	
							$ 32,[illegible]
Package MBR System							
All Encompassing Quotation: Membranes, Pum	1	LS	$ 1,025,000	$ 1,025,000	$ 205,000	$ 1,230,000	
Concrete	320	CY	$ 750	$ 240,000		$ 240,000	
EQ Basin	1	LS	$ [illegible],000			$ 50,000	
							$ 1,520,[illegible]
Auxiliary Power Generator	1	LS	$ [illegible]0,000	$ 100,000	$ 20,000	$ 120,000	
							$ 120,[illegible]
Disinfection							
UV Disinfection	1	LS	$ [illegible]0,000	$ 80,000	$ 20,000	$ 100,000	
							$ 100,[illegible]
Civil Cost							
Site Work (6.5%)	1	LS	$ 175,000	$ 175,000		$ 175,000	
Yard Piping (5.5%)	1	LS	$ 148,000	$ 148,000		$ 148,000	
Fencing	320	LF	$ 15	$ 4,800		$ 5,000	
							$ [illegible]
Electrical and Instrumentation (7%)	1	LS	$ 189,000	$ 189,000		$ 189,000	
SUBTOTAL						$ 3,214,444	
General Conditions	7%					$ 225,000	
Contingency[1]	20%					$ 643,000	
Engineering, Legal and Administration	20%					$ 816,489	$ 4,[illegible]
PROBABLE CONSTRUCTION COST (2010 dollars)							$ 4,[illegible]9,000

Appendix D

Vendor Quotes

MBR – Enviroquip
MBR- BioBrane
MBR – Smith and Loveless
Ultrafiltration - Alta Filter - Westech
Oxidation Ditch and accessories - Westech
Denitrification Filter – Blue Pro
Covered Lagoons with Nitrification Filter - Lemna

Design Summary

River Rock, MT (MMF 0.45 MGD)

[illegible]				
Parameter	Flow	Temperature	Typical Event Duration	Design Durations
Average Annual Flow (AAF)	0.37 MGD *	15 °C *	9 consecutive months	9.0 months *
Max Month Flow (MMF)	0.45 MGD *	10 °C *	3 consecutive months	3.0 months *
Peak Week Flow (PWF) **	0.54 MGD *	10 °C *	3 non-consecutive weeks	3.0 weeks *
Peak Day Flow (PDF) **	0.90 MGD *	10 °C *	8 non-consecutive days	8.0 days *
Peak Hourly Flow (PHF) **	1.00 MGD *	10 °C *	4 hrs with 24 hrs between PHF	2.0 hours *

Parameter	Influent	Effluent Limits
BOD	264 mg/L *	< 5 mg/L *
TSS	300 mg/L *	< 5 mg/L *
TKN	41 mg/L *	< 3 mg/L *
NH_3	29 mg/L *	< 1 mg/L *
TP	9 mg/L *	< 2 mg/L *
TN	41 mg/L *	< 10 mg/L *
Alkalinity	300 mg/L *	< 75 mg/L *
Maximum Wastewater Temperature	25 °C *	
Elevation	1,200 ft *	

* Value assumed by Enviroquip, to be verified by consulting engineer.

** Peak values assumed to occur during MMF, to be verified by consulting engineer.

MBR Zone (Membrane) Design		
Parameter	Value	Notes
No. of Membrane Basins	2	
No. of Membrane Units per Basin	3	6 units total
Membrane Unit Type	RW-400	cartridge: 515HP
No. of Cartridges per Unit	400	2,400 membrane cartridges total
Surface Area per Cartridge	15.60 ft2/cartridge	
Flux @ 0.37 MGD (AAF)	9.99 gal/(ft2 x day)	
Flux @ 0.45 MGD (MMF)	12.02 gal/(ft2 x day)	
Flux @ 0.54 MGD (PWF)	14.42 gal/(ft2 x day)	
Flux @ 0.90 MGD (PDF)	24.04 gal/(ft2 x day)	
Flux @ 1.00 MGD (PHF)	26.71 gal/(ft2 x day)	
Membrane Basin Volume	19,536 gal/basin	14ft x 11.7ft x 16ft SWD
Membrane Air Scour Rate for Sizing	81 scfm/unit	@ 7.7 PSIG discharge
AOR Supplied by Air Scour	324 lb O2/day	TMP Ranges from .5 - 3.0 PSI
MBR Basin MLSS	10,000 mg/l	

Anoxic Zone Design		
Parameter	Value	Notes
Basin Volume	29,437 gal/basin	58,874 gal total
Basin Dimensions	22.5ft x 11.7ft x 15ft SWD	
Anoxic MLSS	8,293 mg/L	
Recycle Rate	4.9 Q	From MBR to Anoxic Basin

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Design Summary
River Rock, MT (MMF 0.45 MGD)

Pre-Aeration Zone Design		
Parameter	Value	Notes
Basin Volume	65,242 gal/basin	130,484 gal total
Basin Dimensions	44ft x 11.78 x 17ft SWD	
Pre-Aeration MLSS	8,293 mg/L	
Fine Bubble Diffuser AOR	1,219 lb O2/day	

MBR Waste Activated Sludge Production Parameters		
Parameter	Value	Notes
WAS Sludge Production	729	
Chemical Sludge Production	79	Based on Chem-P process
Total Sludge Production	808	
Sludge Concentration	1.00%	
Sludge Flow	9,684	
WAS Volatile Fraction	75%	Assumed

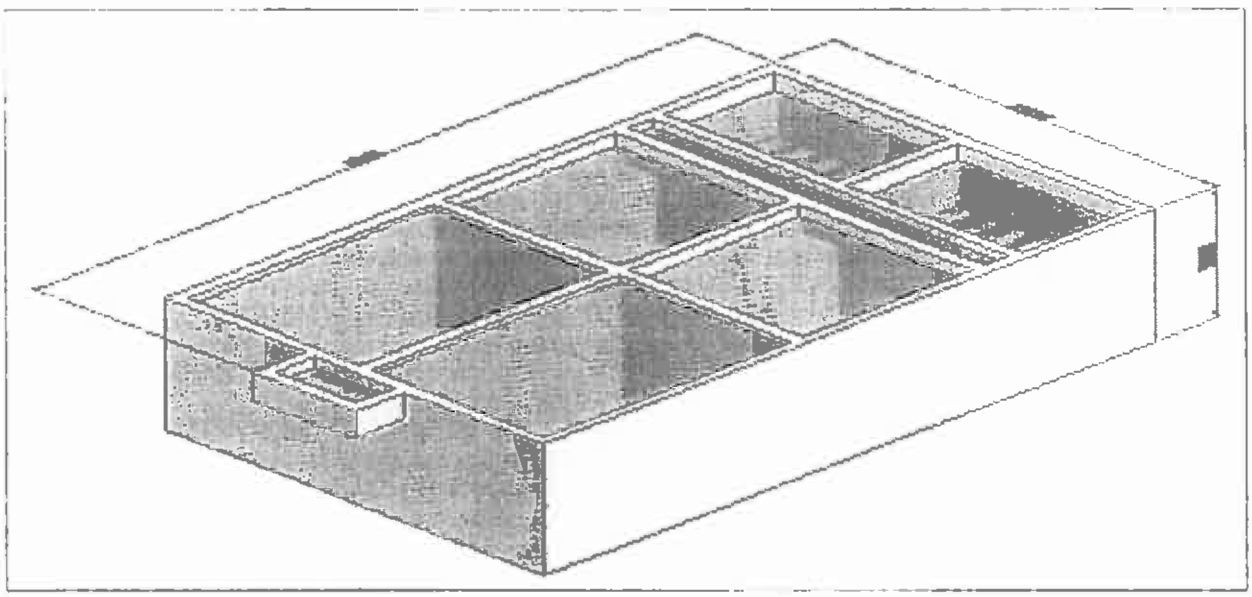
System Design Parameters		
Parameter	Value	Notes
Plant HRT	11.2 hrs	
Design Plant SRT	21 days	
F:M ratio	0.06	

FEED FORWARD Pump Design		
Parameter	Value	Notes
FEED FORWARD Pumps	4	2 Duty, 2 Stdby
Type	SUBMERSIBLE	
Unit Capacity	915 GPM	
TDH	15.0 ft	

Permeate Pump Design		
Parameter	Value	Notes
Permeate Pumps	3	2 Duty, 1 Stdby
Type	CENTRIFUGAL	Pump-Assisted Gravity Design
Permeate Capacity @ MMF	347 GPM	Flow = 0.45 MGD * (Capacity Includes Relax)
Permeate Capacity @ PDF	694 GPM	Flow = 0.90 MGD * (Capacity Includes Relax)
Max Permeate Capacity	772 GPM	Flow = 1.00 MGD * (Capacity Includes Relax)
TDH	25.0 ft	

Blower Design		
Parameter	Value	Notes
MBR Blowers	3	2 duty, 1 Stdby
Type	POSITIVE DISPLACEMENT	
Unit MBR Blower Capacity	267 SCFM	
MBR Blower Discharge Pressure	7.65 PSIG discharge	
Pre-Aeration (PA) Blowers	3	2 duty, 1 Stdby
Type	POSITIVE DISPLACEMENT	
Unit PA Blower Capacity	186 SCFM	
PA Blower Discharge Pressure	8.8 PSIG discharge	

Chemical Cleaning Design		
Parameter	Value	Notes
Cleaning chemical (organic fouling)	Sodium Hypochlorite	2 times/yr
Typical Cleaning Schedule	1-2	cleanings/basin/yr
Volume per Membrane	1.5 gal/cartridge	
Volume of Cleaning Solution	1,836 gal/basin	
Cleaning Solution Concentration	0.3%	
Volume of 12.5% Stock solution	37 gal/basin/cleaning	
Cleaning chemical (inorganic fouling)	Oxalic Acid	2 times/yr
Typical Cleaning Schedule	1-2	cleanings/basin/yr
Volume per Membrane	1.5 gal/cartridge	
Volume of Cleaning Solution	1,836 gal/basin	
Cleaning Solution Concentration	1.0%	
Volume of 100.0% Stock solution	18 gal/basin/cleaning	



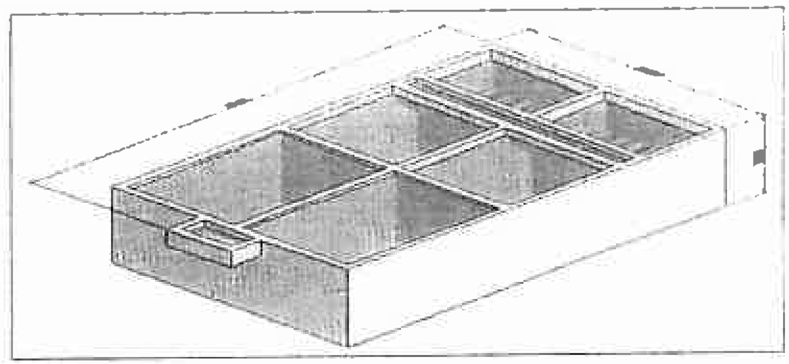
Parameter name	Equation	Unit
Basin_Wall_thickness	18	in
Basin_height	19.0	ft
Basin_MBx	14.0	ft
Basin_MBy	11.7	ft
MBR_water_height	16.0	ft
Number_of_SMUS	6	units
Number_of_SMUS_per_basin	3	units
Number_of_Diffusers	0	units
Number_of_Diffusers_per_basin	0	units
Spacing_of_SMUS	40	in
PAx	44.0	ft
PAy	11.7	ft
PA_water_height	17.0	ft
AXx	22.5	ft
AXy	11.7	ft
AX_water_height	15.0	ft
AXPx	0.0	ft
AXPy	0.0	ft
AXP_water_height	0.0	ft
ANx	0.0	ft
ANy	0.0	ft
AN_water_height	0.0	ft
EQx	0.0	ft
EQy	0.0	ft
EQ_water_height	0.0	ft
WASx	0.0	ft
WASy	0.0	ft
WAS_water_height	0.0	ft
Feed_channel_FCx	36.0	in
Feed_channel_depth	36.0	in
FC_water_height	18.0	in
SB_SBy	6.0	ft
SB_SBx	3.0	ft
SB_water_height	2.0	ft
SB_wall_height	3.0	ft

River Rock, MT (MMF 0.45 MGD)

SB*	AN	AX	PA	AXP	MB	Double Pass
1	0	2	2	0	2 =	

PLANTy PLANTx MBy MBx

SMU = RW-400
Number of SMUs per basin = 3
UNR Level = 1
Permeate Design = PA3
English units
Title Block = River Rock, MT (MMF 0.45 MGD)



River Rock, MT Layout Name: 0-2-2-0-2-PARA-RW-400-3

*Note that the splitter box and feed channel are not included in the layout name

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Scope of Supply
River Rock, MT (MMF 0.45 MGD)

HEADWORKS GENERAL EQUIPMENT INFORMATION

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
SCREENING	FINE SCREEN	BAR SCREEN	[illegible]	gpm	STAINLESS STEEL	[illegible]	FM 1400	0.25	2
INFLUENT FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	6.0	inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W?? [illegible]	N/A	1
PLANT WATER ISOLATION	AUTOMATED VALVE	SOLENOID (WITH CW?)	1.0	inch	N/A	N/A	N/A	N/A	1
PLANT WATER ISOLATION	VALVE	BALL	2.0	inch	PVC	ASAHI	1001 020	N/A	1
[illegible]	CONVEYOR WASHER COMPACTOR	SCREW	100	gpm	N/A	ENVIROQUIP	N/A	N/A	1
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	2900B1??	N/A	3

ANOXIC ZONE GENERAL EQUIPMENT INFORMATION

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
BASIN MIXING	MIXER	SUBMERSIBLE	28,5??	gallons	STAINLESS STEEL	ABS	RW?031A22?	4.10	2
MIXER SUPPORT	MIXER SUPPORT HARDWARE & GUIDE RAIL	RAIL MOUNT	SS	N/A	N/A	N/A	N/A	N/A	2
LEVEL MEASUREMENT	LEVEL TRANSMITTER	HYDROSTATIC	23	feet	SS	[illegible]	[illegible]	N/A	2
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	POLYURETHANE	CONERY	N/A	N/A	4

INTERNAL RECYCLE GENERAL EQUIPMENT INFORMATION

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
FEED FORWARD	PUMP	SUBMERSIBLE	5?5	gpm	CAST IRON	ABS	1541M46 4?	6.20	4
PUMP ISOLATION	VALVE	PLUG	6.0	inch	CAST IRON	PRATT	PBPV 060	N/A	8
FLOW DIRECTION	VALVE	SWING CHECK	6.0	inch	CAST IRON	KEYSTONE	236 610	N/A	4
FEED FORWARD FLOW METER	FLOW METER	ELECTROMAGNETIC	6.0	inch	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W1F-[illegible]	N/A	[illegible]
MBR BASIN ISOLATION	VALVE	PLUG	6.0	inch	CAST IRON	PRATT	PBPV-060	N/A	2

PRE-AERATION ZONE GENERAL EQUIPMENT INFORMATION

Function	Name	Type	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	QTY
BASIN MIXING	MIXER	SUBMERSIBLE	[illegible]	gallons	STAINLESS STEEL	ABS	RW?40?2A??	4.10	2
MIXER SUPPORT	MIXER SUPPORT HARDWARE & GUIDE RAIL	RAIL MOUNT	SS	N/A	N/A	N/A	N/A	N/A	2
AERATION	DIFFUSER	FINE BUBBLE	185	SCFM [illegible]	N/A	EDI	N/A	N/A	2
[illegible] MEASUREMENT	DO PROBE	LDO	[illegible]	mg/L DO	SS	HACH	[illegible]	N/A	2
DO TRANSMITTER	ANALOG TRANSMITTER	SC100	N/A	N/A	N/A	HACH	[illegible]	N/A	2

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Scope of Supply
River Rock, MT (MMF 0.45 MGD)

MBR ZONE GENERAL EQUIPMENT INFORMATION									
[illegible]	[illegible]	Type	[illegible]	[illegible]	[illegible]	Manufacturer	[illegible]	[illegible]	[illegible]
MEMBRANE FILTRATION	SUBMERGED MEMBRANE UNIT	FLAT PLATE	N/A	N/A	[illegible]304	KUBOTA	RW 400	N/A	[illegible]
VIBRATION ISOLATION	DIFFUSER EXPANSION JOINT	BULB	[illegible]	[illegible]	SYNTHETIC RUBBER / SST	API	AM[illegible]	N/A	[illegible]
DIFFUSER INLET ISOLATION	VALVE	BUTTERFLY	[illegible]	[illegible]	[illegible]	KEYSTONE	221 030	N/A	[illegible]
DIFFUSER OUTLET ISOLATION	VALVE	PLUG	[illegible]	[illegible]	CAST IRON	PRATT	PePV-030	N/A	[illegible]
PERMEATE BRANCH ISOLATION	VALVE	BALL	[illegible]	[illegible]	PVC	ASAHI	1602 030	N/A	[illegible]
LEVEL MEASUREMENT	LEVEL SWITCH	FLOAT	N/A	N/A	[illegible]URETHANE	CONERY	N/A	N/A	4
DIFFUSER CLEANING	AUTOMATED VALVE	2 POSITION PLUG	[illegible]	[illegible]	CAST IRON	PRATT / BETTIS	PEPV-060 / EM630 [illegible]	N/A	[illegible]
CHEMICAL CLEANING ISOLATION	VALVE	BALL	[illegible]	[illegible]	PVC	ASAHI	1601 02[illegible]	N/A	5
[illegible] RETURN	TELESCOPING VALVE	[illegible] TUBE + Hand Wheel ASSY	[illegible]	[illegible]	[illegible]	ENVIROQUIP	[illegible]	N/A	[illegible]
PERMEATE HEADER ISOLATION	VALVE	BALL	4.0	[illegible]	PVC	ASAHI	1602 040	N/A	4
FABRICATION	FASTENERS	N/A	N/A	N/A	N/A	ENVIROQUIP	N/A	N/A	[illegible]
FABRICATION	STRUCTURAL GUIDES & STABILIZER PIPES	N/A	N/A	N/A	N/A	ENVIROQUIP	N/A	N/A	[illegible]
FABRICATION	IN BASIN PIPING & SUPPORTS	N/A	N/A	N/A	SS	ENVIROQUIP	N/A	N/A	[illegible]
FABRICATION	IN BASIN PIPING & SUPPORTS	N/A	N/A	N/A	PVC	ENVIROQUIP	N/A	N/A	6

PERMEATE CONTROL GENERAL EQUIPMENT INFORMATION									
Function	Name	Type	Size of Unit [illegible]	[illegible]	Material	Manufacturer	Model or Specification	Motor HP	Qty
TMP MEASUREMENT	PRESSURE TRANSMITTER	DIAPHRAGM	[illegible]	[illegible]	N/A	ENDRESS & HAUSER	CERABAR T PMC 131 A22F1V5N [illegible]	N/A	[illegible]
PERMEATE PUMP	PUMP	CENTRIFUGAL	346	[illegible]	GRAY IRON	GORMAN RUPP	14A2S-B 5HP	5.00	[illegible]
VIBRATION ISOLATION	EXPANSION JOINT	BULB	4.0	[illegible]	SYNTHETIC RUBBER / SS	API	AM5204	N/A	6
PUMP ISOLATION	VALVE	BALL	4.0	[illegible]	PVC	ASAHI	1602-040	N/A	[illegible]
VENT	VALVE	SOLENOID	1.0	[illegible]	[illegible]	[illegible]		N/A	[illegible]
PUMP INLET PRESSURE	GAUGE	COMPOUND	[illegible]	[illegible]	SS	MCDANIEL	MPB SCA [illegible]	N/A	[illegible]
PUMP OUTLET PRESSURE	GAUGE	PRESSURE	0-15 [illegible]	[illegible]	SS	MCDANIEL	MPBSCU [illegible]	N/A	[illegible]
FLOW DIRECTION (PUMPED)	VALVE	BALL CHECK	4.0	[illegible]	PVC	ASAHI	1210 040	N/A	[illegible]
FLOW DIRECTION (GRAVITY)	VALVE	BALL CHECK	4.0	[illegible]	PVC	ASAHI	1210 040	N/A	[illegible]
ON/OFF	VALVE	NEEDLE	[illegible]	[illegible]	POLYPROPYLENE	ASAHI	5313 002	N/A	1
FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	4.0	[illegible]	[illegible]URETHANE	ENDRESS & HAUSER	PROMAG 10W[illegible] UL[illegible]AAA	N/A	[illegible]
FLOW CONTROL	AUTOMATED VALVE	MODULATING BALL	4.0	[illegible]	PVC	ASAHI / BETTIS	1621 040 / EM600[illegible] 100	N/A	[illegible]
TURBIDITY MEASUREMENT	TURBIDITY METER	OPTICAL	[illegible]	NTU	N/A	HACH	60101 01	N/A	1
TURBIDITY / pH TRANSMITTER	ANALOG TRANSMITTER	SC100	N/A	N/A	N/A	HACH	[illegible]	N/A	[illegible]

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Scope of Supply
River Rock, MT (MMF 0.45 MGD)

MBR AERATION GENERAL EQUIPMENT INFORMATION									
Function	[illegible]	[illegible]	Size or Unit Capacity	Value	Material	Manufacturer	[illegible]	[illegible]	[illegible]
MBR BLOWER	BLOWER	POSITIVE DISPLACEMENT	[illegible]	SCFM	CAST IRON	KAESER	[illegible]	[illegible]	[illegible]
MBR NOISE SUPPRESSION	SOUND ENCLOSURE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER TEMP	TEMPERATURE GAUGE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER PRESSURE	PRESSURE GAUGE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER TEMP SWITCH	TEMPERATURE SWITCH	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER FLOW CONTROL	VALVE	CHECK (WITH BLOWER)	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER PRESSURE RELIEF	VALVE	PRESSURE RELIEF (WITH BLOWER)	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
MBR BLOWER PRESSURE	PRESSURE TRANSMITTER	DIAPHRAGM	[illegible]-+15	PSI	N/A	ENDRESS & HAUSER	[illegible]	N/A	[illegible]
MBR AIR ISOLATION	VALVE	BUTTERFLY	[illegible]	inch	CAST IRON	KEYSTONE	[illegible]	N/A	[illegible]
MBR AIR FLOW MEASUREMENT	FLOW METER	MASS AIR FLOW	6.0	Inch	SS	ENDRESS & HAUSER	65[illegible]	N/A	[illegible]

PA AIR SUPPLY GENERAL EQUIPMENT INFORMATION									
Function	[illegible]	[illegible]	Size or Unit Capacity	Value	Material	Manufacturer	Model or Specification	Motor HP	[illegible]
PA BLOWER	BLOWER	POSITIVE DISPLACEMENT	19[illegible]	SCFM	CAST IRON	KAESER	[illegible]	[illegible]	[illegible]
PA NOISE SUPPRESSION	SOUND ENCLOSURE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	3
PA BLOWER TEMP	TEMPERATURE GAUGE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
PA BLOWER PRESSURE	PRESSURE GAUGE	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
PA BLOWER TEMP SWITCH	TEMPERATURE SWITCH	WITH BLOWER	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
PA BLOWER FLOW CONTROL	VALVE	CHECK (WITH BLOWER)	N/A	N/A	N/A	KAESER	N/A	N/A	3
PA BLOWER PRESSURE RELIEF	VALVE	PRESSURE RELIEF (WITH BLOWER)	N/A	N/A	N/A	KAESER	N/A	N/A	[illegible]
PA BLOWER PRESSURE	PRESSURE TRANSMITTER	DIAPHRAGM	-15-+15	PSI	N/A	ENDRESS & HAUSER	[illegible]	N/A	[illegible]
PA AIR ISOLATION	VALVE	BUTTERFLY	4.0	Inch	CAST IRON	KEYSTONE	221 [illegible]	N/A	[illegible]

COAGULANT DOSING GENERAL EQUIPMENT INFORMATION									
Function	[illegible]	[illegible]	Size or Unit Capacity	Value	Material	Manufacturer	[illegible]	[illegible]	[illegible]
ALUM METERING PUMP	PUMP	DIAPHRAGM	34	gpd	PVDF	LMI	[illegible]	N/A	[illegible]

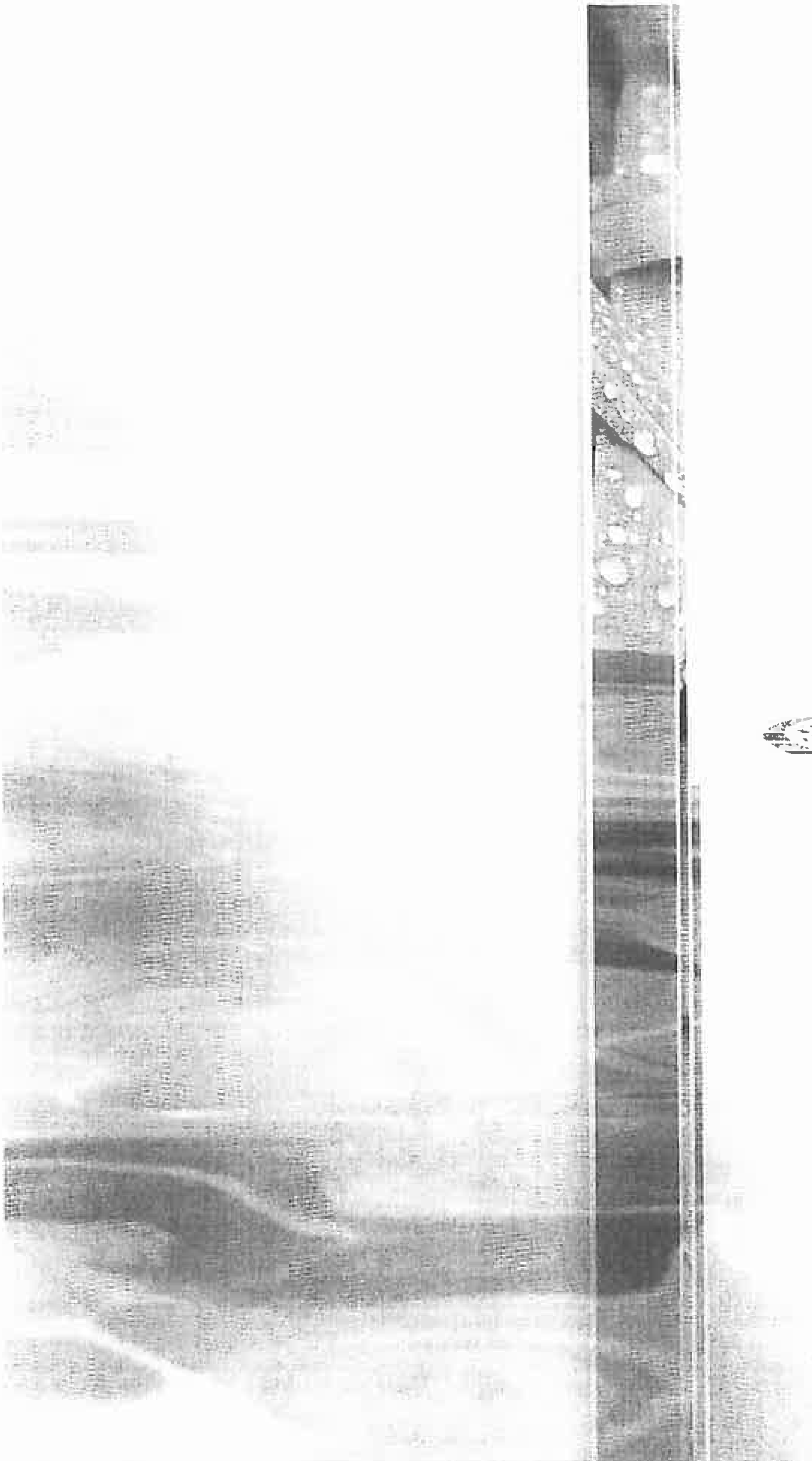
SMU CIP GENERAL EQUIPMENT INFORMATION									
Function	[illegible]	[illegible]	Size or Unit Capacity	Value	Material	Manufacturer	[illegible]	[illegible]	[illegible]
MAZZIE INJECTOR	INJECTOR	VENTURI	2.0	inch	POLYPROPYLENE	MAZZEI INJECTOR CORP	[illegible]	N/A	1
WATER SUPPLY VALVE	AUTOMATIC VALVE	2 POSITION BALL	2.0	Inch	PVC	ASAHI BETTIS	[illegible]	N/A	[illegible]
CIP THROTTLING	VALVE	BALL	[illegible]	inch	PVC	N/A	N/A	N/A	[illegible]

Enviroquip

a division of Eimco Water Technologies

Scope of Supply
River Rock, MT (MMF 0.45 MGD)

INJECTOR PRESSURE	VALVE	PRESSURE	[illegible]	[illegible]	[illegible]	MCDANIEL	[illegible]	N/A	
DRAIN	VALVE	BALL [illegible]	[illegible]	[illegible]	PVC	ASAHI	[illegible]	N/A	
CHEMICAL ISOLATION	VALVE	BALL	[illegible]	[illegible]	[illegible]	ASAHI	[illegible]	N/A	1
PRESSURE CONTROL	VALVE	[illegible]	[illegible]	[illegible]	N/A	WILKINS	600DUC	N/A	[illegible]
CHEMICAL FLOW	FLOW METER	ROTOMETER	[illegible]	[illegible]	[illegible]	KOBOLD	KSM [illegible]	N/A	1
FLOW MEASUREMENT	FLOW METER	ELECTROMAGNETIC	[illegible]	IN	POLYURETHANE	ENDRESS & HAUSER	PROMAG 10W50 [illegible]	N/A	
INJECTOR ASSEMBLY	PIPE SPOOL	SUCTION	N/A	N/A	N/A	ENVIROQUIP	N/A	N/A	1
CHEMICAL TRANSFER TO MSR	HOSE	SUCTION	1.0	inch	[illegible]	TIGERFLEX	W100	N/A	1
CONTROLS GENERAL EQUIPMENT INFORMATION									
Function	Name	Type	[illegible]	[illegible]	Material	**Manufacturer**	**Model or Specification**	Motor HP	Qty
PLANT CONTROL	SCADA	SOFTWARE	N/A	N/A	N/A	WONDERWARE	N/A	N/A	1
PLANT CONTROL	HMI	PANEL MOUNT PC	N/A	N/A	N/A	N/A	N/A	N/A	1
PLANT CONTROL	PLC PANEL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
MISCELLANEOUS GENERAL EQUIPMENT INFORMATION									
Function	Name	Type	[illegible]	[illegible]	Material	Manufacturer	Model or Specification	Motor HP	[illegible]
PROJECT KICKOFF MEETING	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
MECHANICAL INSPECTION	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
START-UP / COMMISSIONING	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	[illegible]
TRAINING	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	[illegible]
OPERATION & MAINTENANCE MANUALS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	[illegible]
SM FREIGHT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
EQUIPMENT FREIGHT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1



Enviroquip

OF AUSTIN TEXAS

Submerged
Membrane Bioreactor
(MBR) System

Enviroquip,
A Division of Eimco Water Technologies

A GLV COMPANY

THE BEST AVAILABLE SYSTEMS FOR WASTEWATER TREATMENT AND REUSE

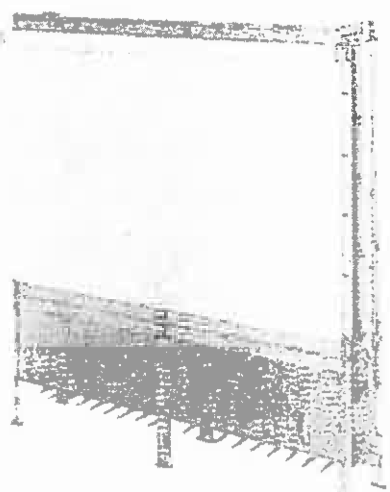
STARTING WITH PROVEN RELIABLE HEADWORKS TECHNOLOGIES AND ENDING WITH MEMBRANE BASED SOLIDS SEPARATION SYSTEMS, ENVIROQUIP CAN PROVIDE SINGLE SOURCE RESPONSIBILITY (SSR) FOR YOUR MBR SYSTEM. SSR ENSURES PROMPT COMPREHENSIVE SUPPORT AS PART OF THE INDUSTRY'S BEST WARRANTY PLAN.

SINCE THE 1980's, Membrane [illegible] (MBRs) have been successfully used to treat [illegible] industrial wastewaters for discharge [illegible]. Today, with thousands of installations operating [illegible] MBR technology [illegible] the way we [illegible] conservation in the US and [illegible].

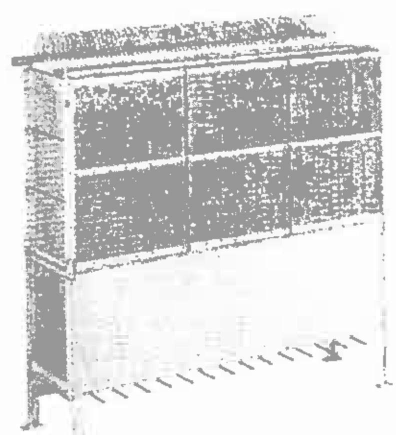
[illegible] in each MBR are [illegible] pathogens and other [illegible] the biological process that [illegible] contaminants such as biochemical oxygen demand (BOD) [illegible] and phosphorus. As such, MBRs are generally only [illegible] of a system that is designed to biologically treat [illegible].

As a provider of complete [illegible] plant (WWTP) since 1966, Enviroquip, Inc. [illegible] components must be [illegible]. That is why we have partnered [illegible] the most robust and operator-friendly [illegible] membrane unit (SMU) available [illegible]. It is also the reason why we provide complete MBR [illegible] membrane equipment.

At Enviroquip, our multidisciplinary staff [illegible] years of experience to integrate [illegible] with custom plants or [illegible] (MBR) to maximize energy efficiency [illegible] membrane equipment. Our [illegible] our customers with comprehensive solutions [illegible] wastewater problems.



SMU USING [illegible]
TYPE 510 CARTRIDGE



SMU USING [illegible]
TYPE 515 CARTRIDGE

THE HIGHEST QUALITY EFFLUENT

[illegible] HEART OF AN ENVIROQUIP MBR System [illegible] process that virtually eliminates pollutants [illegible] oxygen demand (BOD), nitrogen and phosphorus [illegible] kills and algae growth (eutrophication).

[illegible] that are created during biological [illegible] are filtered through multiple [illegible] generally not detectable by standard [illegible] concentrations are normally non-detectable [illegible] post disinfection, as compared [illegible] secondary effluent.

PERMEATE QUALITY

PARAMETERS	TYPICAL VALUES	ACHIEVABLE VALUES
BOD	<2.0 mg/l	Non-Detect
Ammonia	<1.0 mg/l	Non-Detect
Total Nitrogen	<10.0 mg/l	<3.0 mg/l
Phosphorus	<1.0 mg/l	<0.03 mg/l
TSS	<2.0 mg/l	Non-Detect
Turbidity	<0.1 NTU	<0.05 NTU
Fecal Coliform	<2.2 CFU/100ml	Non-Detect
SDI	<3	<2

[illegible]

THE UNR™ PROCESS

[illegible] technologies together, [illegible] the Ultimate Nutrient Removal (UNR™) process [illegible] to meet the most stringent nutrient limits. [illegible] treatment levels are shown below along with typical effluent [illegible]

TYPICAL GUARANTY LIMITS[a,b]

UNR LEVEL	BOD	AMMONIA	TOTAL NITROGEN	PHOSPHORUS
1	<5.0 mg/l	<1.0 mg/l	<10.0 mg/l	<1.0 mg/l
2	<5.0 mg/l	<1.0 mg/l	<7.0 mg/l	<0.5 mg/l
3	<5.0 mg/l	<1.0 mg/l	<3.0 mg/l	<0.1 mg/l

[illegible]

THE CLEAR ADVANTAGE

EASIER TO OPERATE

- Gravity Filtration
- Fine Screening of Feed Only
- True Clean-in-Place Membranes
- No Backpulsing Equipment
- Simple Piping Design
- Completely Automated (Optional)
- Optical Process Measurements

MORE FLEXIBLE

- Proven performance at MLSS concentrations from 8,000 mg/l–18,000 mg/l
- Superior performance at colder temperatures
- Industry leading hydraulic peaking capabilities to handle storm flows

MORE RELIABLE

- Over 1,000,000 membrane cartridges produced since 1989
- Over 40 years of experience in complete plant design and supply
- Single Source Responsibility
- Comprehensive technical support
- Title 22 Approved

MORE COST EFFECTIVE

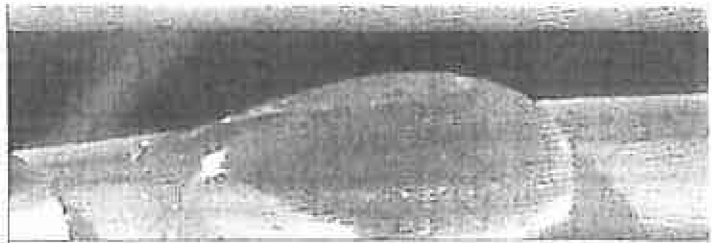
- Up to 75% more compact than conventional systems
- Up to 50% less automation than comparable MBR systems
- Overhead cranes or other lifting equipment (optional)
- Up to 40% less sludge production at long residence times
- Costly tank liners not required as for other MBR systems
- Pre-thickened or Class B solids production (optional)

THE ENVIROQUIP MBR SYSTEM

[illegible] Enviroquip MBR System [illegible] multiple technologies in proven designs that [illegible] flexible and adaptable operation. The ability of an [illegible] MBR to operate over a range of conditions generally [illegible] overall system performance as compared to [illegible] treatment processes and MBRs that utilize hollow fiber [illegible]. Some of the advantages of an Enviroquip MBR [illegible] over other technologies are listed below.

VERSUS TYPICAL CONVENTIONAL PROCESS
- More robust biological process
- Easier to operate
- Less maintenance
- Smaller footprint
- Smaller UV dosage requirement
- Superior water quality

VERSUS TYPICAL HOLLOW FIBER MBR PROCESS
- Better process control
- Easier to operate
- Smaller footprint
- No side-stream screening
- Fewer recycle streams
- Less maintenance
- Higher peaking capabilities



ENVIROQUIP MBR SYSTEMS CAN INCLUDE:

HEADWORKS
Complete packages including roughing [illegible] and grit removal.

PROVEN MEMBRANE TECHNOLOGY
Kubota Submerged Membrane Units [illegible] in more MBR plants around the world [illegible] MBR technology.

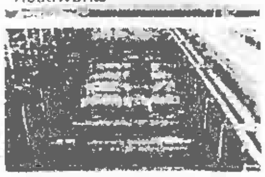
BIO-MONITORING TECHNOLOGY
Low maintenance optical process technology [illegible] the most stringent nutrient limits under [illegible]

DIGESTION/THICKENING
Membrane based systems designed [illegible] to clean waste activated sludge. Optional [illegible] available.

ANCILLARY PROCESS EQUIPMENT
A full complement of proven components [illegible] MBR System including pumps, blowers, [illegible]

INTEGRATION & CONTROLS
Supervisory Control and Data Acquisition [illegible] to reduce energy costs, maximize [illegible] and allow for remote plant control.

Headworks

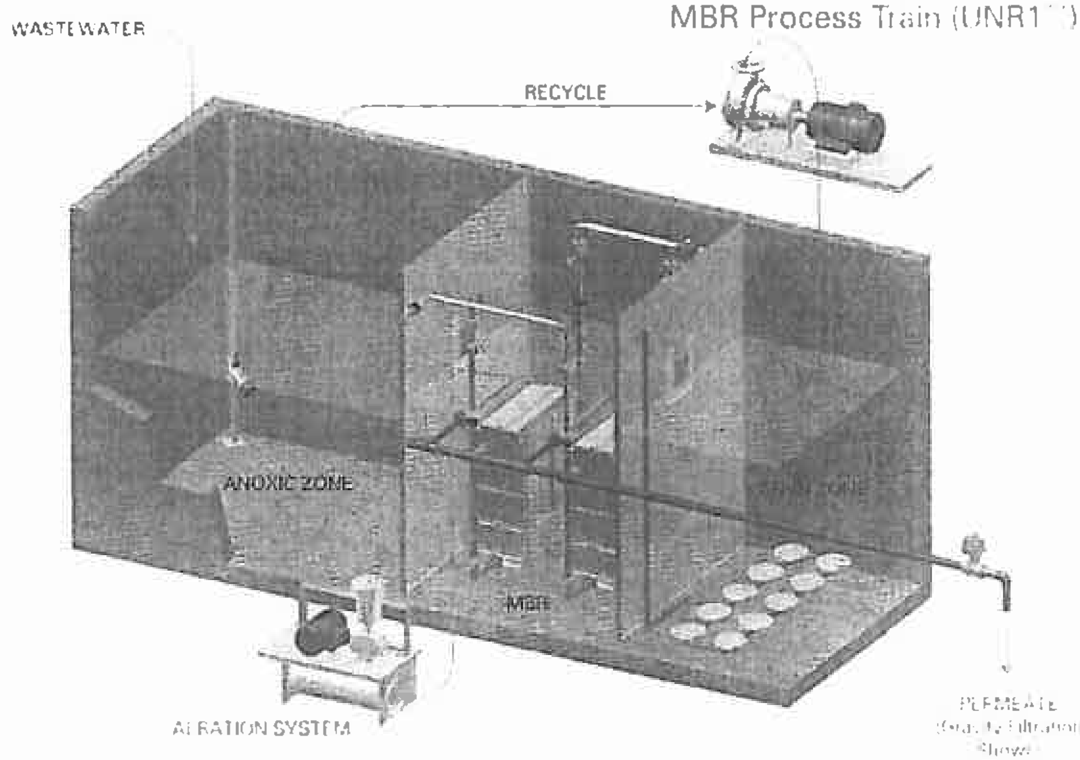


Membrane Equipment

Ancillary Process Equipment

Integration and Controls

MBR Process Train (UNR1 [illegible])



THE MEMBRANE BIOREACTOR

A MBR IS AN ACTIVATED SLUDGE PROCESS that uses membranes to filter out suspended solids, including harmful microorganisms such as viruses, bacteria and cysts.

THE MBR

In a MBR, one or more [illegible] connected to a common permeate, air supply and [illegible] pipes.

THE SUBMERGED MEMBRANE UNIT (SMU)

Each SMU is comprised of [illegible] air diffuser assembly and one or two membrane [illegible]. The air diffuser provides air for scouring, mixing and [illegible] activity. A membrane cassette contains between 25 and 200 membrane cartridges that are connected to [illegible] permeate manifold. Multiple SMUs are connected [illegible] in each MBR.

THE MEMBRANE CARTRIDGE

Each membrane cartridge [illegible] ultrasonically welding a sheet of thin poly[illegible] the back and front of a support panel. Between the panel and the membrane material is a porous spacer material that distributes water to a series of grooves that channel [illegible] water to the top of the cartridge.

MULTIPLE BARRIERS

In an Enviroquip MBR [illegible] membranes are used to filter a concentrated mixture of microorganisms commonly referred to as mixed liquor. [illegible] consume BOD, nutrients and [illegible] compounds such as NDMA. In addition, they attach themselves to the membrane surface to form a thin [illegible].

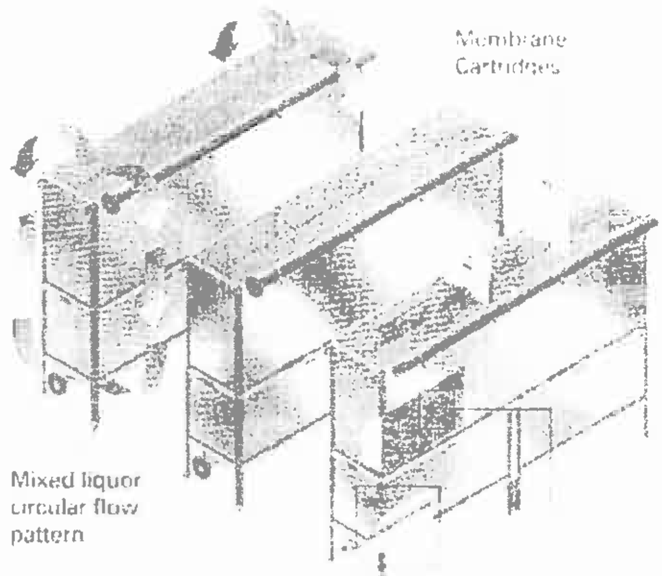
Within seconds, cells begin to form a biofilm that functions like a dynamic membrane. [illegible] maintained, the biofilm protects membrane material from fouling and creates a second densely packed barrier to pathogen breakthrough.

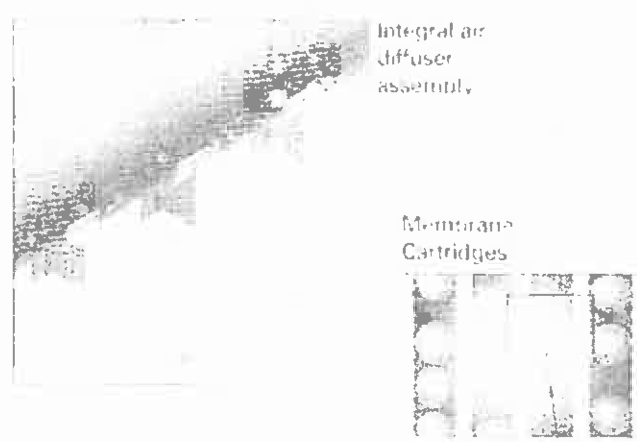
BIOHYDRAULICS

Irrespective of the type [illegible] membrane, biofilms do most of the filtering and create the most resistance to water flow. Maintaining [illegible] porosity through effective air scouring and proper biological process control is the key to optimizing the hydraulic performance of any submerged membrane [illegible] in MBR applications. The link between biological [illegible] conditions and membrane hydraulics is referred to as biohydraulics.

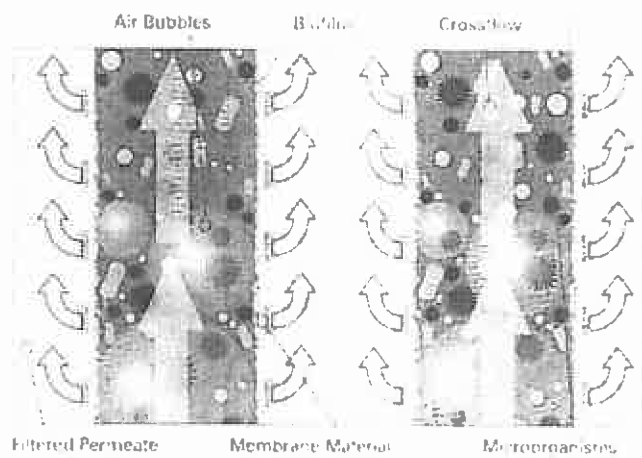
Kubota SMUs are engineered to maximize air scouring efficiency and eliminate [illegible] for hair and debris to accumulate. Efficient [illegible] air scouring dramatically reduces the pressure [illegible] to filter solids from treated wastewater, often referred to as transmembrane pressure (TMP). [illegible] TMP reduces the propensity for membrane [illegible] eliminates the need for weekly chemical cleaning [illegible] common to other technologies.

SUBMERGED MEMBRANE UNITS





MULTIPLE BARRIERS



WHY DO KUBOTA FLAT-PLATE MEMBRANES LAST LONGER THAN OTHER TECHNOLOGIES?

- [illegible] and effective [illegible]
- Low transmembrane pressure [illegible]
- No backpulsing [illegible]
- Infrequent chemical cleaning
- [illegible]

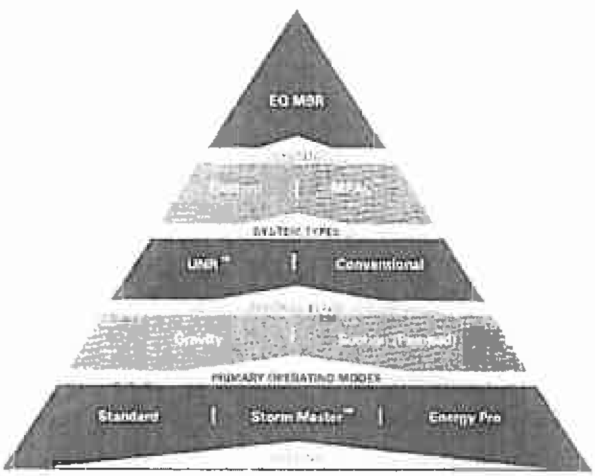
THE ENVIROQUIP APPROACH

OUR SERVICES

Enviroquip realizes that our continued success depends on customer satisfaction and ultimately, plant performance. We take great pride in providing superior design support during the engineering and construction phases of a project, and most importantly, in [illegible] after sale support. Using advanced remote [illegible] technologies, Enviroquip stays in constant contact with [illegible]. Moreover, Enviroquip offers ongoing technical [illegible] workshops and site visits to continuously update our customers and transfer new technical information. At Enviroquip, [illegible] built on providing quality service and innovative [illegible]

THE SYSTEM

[illegible] easy to operate, an Enviroquip MBR [illegible] the benefits of membrane technology without the [illegible] package plants (see MBAC [illegible]) [illegible] installations, Enviroquip has designed [illegible] over 100 MBR facilities. Our experienced staff [illegible] to help you customize your plant [illegible] as shown in the diagram below.



STORM MASTER™

[illegible] provides a cost effective means of handling [illegible] and significantly reduces solids handling costs. This option [illegible] of the Energy Pro configuration.

ENERGY PRO

[illegible] slide gates and specific plant [illegible] plant capacity online to match demand [illegible]

UNR™

[illegible] technology, UNR™ [illegible] performance while [illegible]

STANDARD

[illegible]

MBR APPLICATIONS

MUNICIPAL

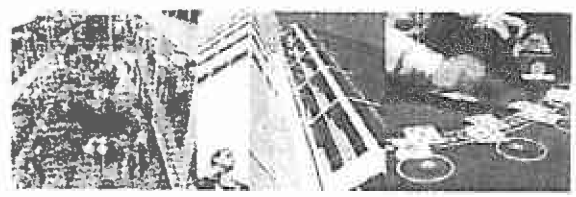
[illegible] Retrofits
[illegible] Thickening

SATELLITE PLANTS

[illegible] Developments, Resorts,
[illegible], Rest Stops, Parks

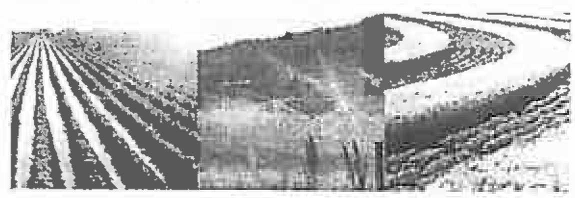
COMMERCIAL

[illegible] Centers, Office Buildings,
[illegible] Restaurants



RECLAMATION

[illegible] Stream Augmentation, Aquifer Recharge
[illegible] Mining, RO Pre-Treatment



INDUSTRIAL

Food Processing, Pharmaceutical, Manufacturing

OPERATOR APPROVED

"There's just not a lot of [illegible] Enviroquip MBR System. It's a lot more [illegible] than my SBR [illegible] and [illegible] activated sludge systems."

Charlie Evans
Operator
Environmental Management Services

"It's amazing how easy it is to start up and [illegible] of these MBR plants."

Warren Felton
Superintendent
The Bandon Dunes WRF, OR

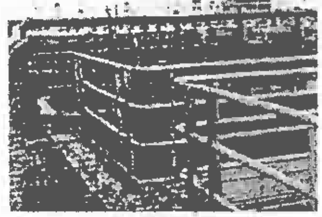
"During the snow melt, my MBR system [illegible] higher than design [illegible] expected temperatures [illegible] When it counted, the system performed."

Kevin Maughan
Lead Operator/Assistant Fire Chief
The Hyrum WRF, UT

MISSION STATEMENT

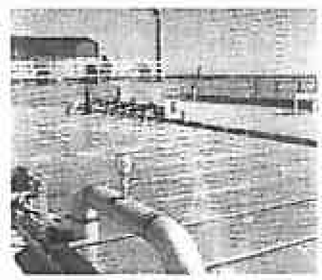
[illegible]

ENVIROQUIP MBR INSTALLATIONS

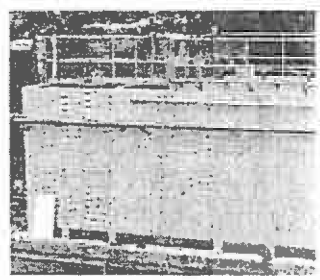


The Hyrum City WRF
Rated Capacity: [illegible]
Operating Mode: [illegible]
SMU Type: Double [illegible]

The Hamptons WRF
Rated Capacity: [illegible]
Operating Mode: [illegible]
SMU Type: [illegible]



The Rolling Hills WRF
Rated Capacity: [illegible]
Operating Mode: [illegible]
SMU Type: [illegible]



The Skyline Ranch WWTP
Rated Capacity: [illegible]
Operating Mode: [illegible]
SMU Type: [illegible]

April 12, 2010

Mr. Craig Henrikson, P.E., C.S.P.
Morrison-Maierle, Inc
1 Engineering Place
Helena, MT 59602

Re: 200,000 GPD Bio-Brane™ Wastewater Treatment Plant – River Rock

Dear Mr. Henrikson:

We are pleased to present our proposal for a complete **Bio-Brane™ Wastewater Treatment System.** The **Bio-Brane™** combines the advantages of fixed film and activated sludge processes with a flat plate membrane in one biological reactor to provide a cost effective, easy to operate system of wastewater treatment.

Based on the information furnished, we have completed sizing of this 200,000 GPD wastewater treatment plant to be located River Rock, Montana at an elevation of 4200 feet ASL. The design criteria are as follows:

	INFLUENT	EFFLUENT
Flow (ADF)	200,000 GPD	
BOD_5	220 mg/L	<5 mg/L
TSS	250 mg/L	<2 mg/L
TKN	34 mg/L	No limit
NH_3-N	25 mg/L	<1 mg/L
N_{Total}		<5 mg/L
TP	7.6 mg/L	<0.2 mg/L

The **Bio-Wheel™ System** will be provided as components to be installed in locally constructed concrete tanks.

Based on the given criteria, we will require two BW 21 x 5.0 **Bio-Wheels™** to obtain the required treatment. A sketch drawing of the proposed wastewater treatment plant layout showing the layout and dimensions.

Wastewater Technology, Inc. will provide the equipment and services described below.

1. One (1) Stainless steel fully automatic bar screen Model FS 800 with 2 mm bar spacing, 0.20HP with one (1) 304 SS screenings basket.

2. Two (2) BW 21 x 5.0 **Bio-Wheels™**, each with 10 HP SEW Eurodrive gear motor, chain guard, drive chain and bearings, with VFD's for varying the speed of the gearmotors and control panel. Wheels may be removed from the tank without dewatering.

3. Six (6) Toray Model TMS 140-200 flat plate membrane cassettes, with stainless steel frames, air headers and piping.

4. One (1) equalization tank aeration system with one Kaeser 5.0 HP blower , piping and diffusers.

5. One (1) influent pump system, consisting of two Goulds submersible vortex pumps with guide rail assemblies and control panel with level control transducers and panel.

6. Two (2) 3 HP Gorman-Rupp Model 12B20 RAS pumps.

7. Two (2) 3 HP ABS Model RW2022 submersible mixers for denitrification tank.

8. One (1) stainless steel NEMA 4X control panel with PLC control, HMI interface, alarms for wheels and pumps, and variable speed control of the wheels.

9. One (1) membrane cleaning system with one (1) 100 gallon poly tank with one (1) shaft type mixer, two (2) 10 gallon poly header tanks, and one (1) ½ HP centrifugal feed pump.

10. Assistance during installation of equipment and startup to include equipment drawings, operating and maintenance manuals, and operator training. Two round-trips to the job site and five days of field services are included.

Equipment price **$625,000.00**

Price us F.O.B. factory, freight allowed to job site, off loading and installation by others. A freight allowance of $10,000 is included in the equipment price. Delivery is 14-16 weeks after receipt of order and approval of shop drawings.

Our equipment is manufactured by **Wastewater Technology, Inc.** The **Bio-Wheels™** will be galvanized and motors and pumps will have manufacturers' standard coatings. This proposal does not include installation, Federal, state or local sales or use taxes, permits or fees.

Total power for full flow operation is less than 15 kW/hour. At a power cost of $0.07 per kWh, this amounts to slightly more than $750.00 per month in electrical cost.

The **Bio-Wheel™ System** has many operational and cost advantages over other wastewater treatment plants:

- State-of-the-art treatment with projected effluent quality exceeding that of most any area wastewater plant, benefiting streams/wildlife and demonstrating environmental commitment
- Effluent quality allows reuse of wastewater for site or area irrigation, thus reducing potable water demand while saving pumping energy
- Modular construction reduces the cost and schedule for onsite construction.
- The process electrical panel is very simple and only contains position switches, annunciator lights and a PLC to control the membrane and aeration rates.
- Yard piping and yard electrical are greatly reduced via the use of prefabricated treatment compartments integrated into full treatment modules.
- There are no primary treatment blowers. Blowers are utilized only for membrane aeration and scouring. Total connected horsepower is significantly less than equivalent plants using blowers as the primary means for biological aeration. Electrical power consumption is 1/3 or less than with other advanced treatment or MBR plants.
- Sludge generation is 1/3 to 1/2 less than with other activated sludge processes due to the fixed film characteristics of the Bio-Wheel in combination with activated sludge process.

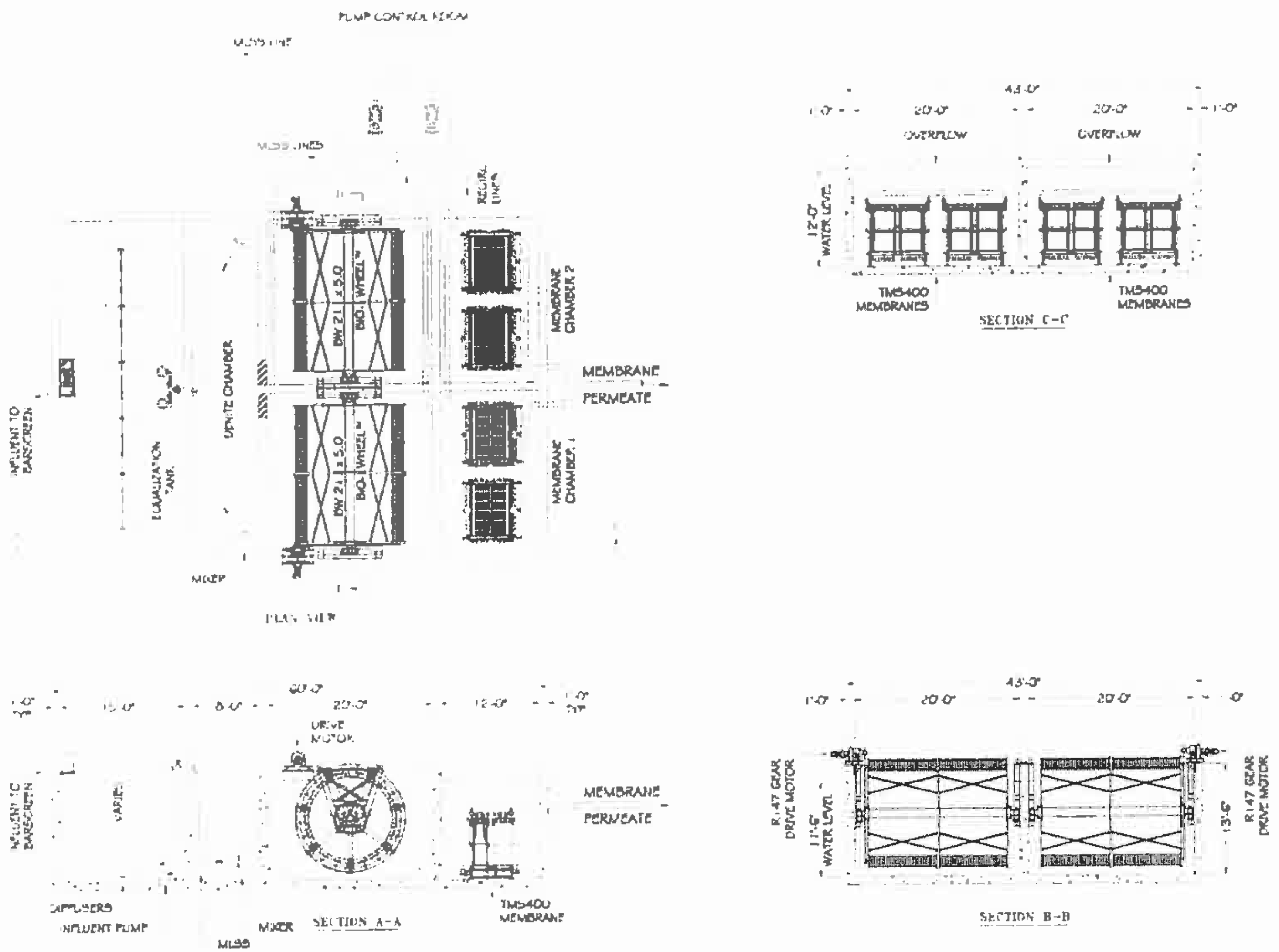
We have over seventy five **Bio-Wheel™** wastewater treatment systems in the US and overseas, and you are welcome to visit any of these facilities and speak with the owners and operators about the low cost and ease of operation.

Our 400,000 GPD facility in operation at Manhattan, Montana recently was given the "Outstanding Project Award" by the American Council of Engineering Companies.

We are very interested in working with you on this project and believe that the **Bio-Brane**™ **System** will provide an outstanding product which will fully meet your client's needs. If you have any questions, please call me at (800) 741-8941, or our representative, Mr. Mark Sampson of Water Control Corporation at (303) 477-1970.

Sincerely,
Wastewater Technology, Inc.
A H2O Innovation, Inc. Company

Donald D. Ricketts, P.E.
Vice President – Wastewater Technologies
Encl: Sketch Drawing
DDR/ka 1347.093



PATENT NO. US D452,295; PATENT NO. US 6,572,774; PATENT NO. US 6,613,229 AND PATENT NO. US 7,276,155 AND OTHER US AND FOREIGN PATENTS PENDING

PLOT DATE	04-07-10
DRAWING NAME	Tank Arrangement
PREPARED BY	JR
APPROVED BY	DDR

(2) BW 21 x 5.0
200,000 GPD
RIVER ROCK
Wastewater Treatment Plant

H2O INNOVATION INC.
P.O. BOX 737
MONTEREY, VIRGINIA 24465
PH: 1 (800) 741 5941 FAX (540) 468 3129

h2O
BIO-WHEEL™

U-08192
DRAWING NUMBER 2150-1347-000-003

MEMBRANE TREATMENT SYSTEM - TITAN MBR™
River Rock Subdivision – Belgrade, MT
March 16, 2010

1.0 GENERAL DESCRIPTION

The influent design parameters to the Smith & Loveless, Inc. **TITAN MBR™** plants, are summarized below. These are assumptions used by S&L to determine the system design and should be confirmed by the engineer. The plant will be designed as follows:

1.01 Influent Design Parameters

Design Flow ....250,000 gpd
BOD Design Concentration ....220 mg/L
TSS Design Concentration...250 mg/L
TKN Design Concentration ....34 mg/L

1.02 Effluent Design Parameters

BOD Design (less than) ....5 mg/L
TSS Design (less than)..5 mg/L
Total Nitrogen (less than) ....5 mg/L

2.0 PROCESS/EQUIPMENT DESCRIPTION

2.01 WASTEWATER TREATMENT SYSTEM

Each plant will be constructed in a factory built design to minimize field erection labor and operate as a single train.

The entire 250,000 GPD flow will need to pass a 3mm fine screen prior to being split between two separate 125,000 GPD factory built **TITAN MBR™** units.

Each plant will contain three (3) sections. The first section will be the flow equalization zone. This section will contain a 4" **MINI-JECT®** and coarse bubble diffusers. The **MINI-JECT®** provides constant distribution into the dual anoxic zone (second zone) with mixers. Following the anoxic zone, the wastewater will gravity feed into the membrane treatment system inside the aeration zone (third zone). The MBR/aeration tank will include coarse bubble diffusers underneath the membranes to provide constant air scouring and aeration. Gravity will be used to pass flow through the membranes into the discharge piping.

The entire system will have the air supply distribution pipes inside each tank.

The approximate dimensions of each 125,000 GPD plant are:

Tank Height ....11'-6"
Tank Width ....12'-0"
Total Length..120'-2"

The approximate volumes are:
Equalization Zone .... 34,590 gallons
Anoxic Zone ....40,900 gallons
Aeration Zone ....31,000 gallons

2.02 Air Blowers
Each plant will include two (2) main blowers, one (1) blower will be duty and the other will be stand-by.

Each plant will also include one (1) blower for the flow equalization section

2.03 Controls
Each plant will have one NEMA 4 control panel provided with PLC controls and HMI.

2.04 Scope of Supply
1. Factory Built, epoxy coated tanks
2. Membrane Bio Reactor modules
3. Coarse bubble diffusers
4. Air header attached to the tank
5. Air piping to Membrane Bio Reactor modules within tank
6. Flow equalization 4" **MINI-JECT®** ejector and associated discharge piping
7. Anoxic Mixers
8. Recycle pump
9. Valves (diffuser drop pipes, diffuser cleaning, effluent control, etc.)
10. Flow equalization blower and main plant blowers
11. NEMA 4 Control Panel, including steel support stand and mounting hardware
12. PLC controls with HMI
13. VFDs for main blowers
14. Required instrumentation (level transmitters, DO, pH, temperature, etc.)
15. Flow meter
16. Sludge wasting airlift
17. Clean in place system (constant head chemical tank, chemical mixing tank and pump, spent chemical tank and pump)
18. Chemical feed pump (for Methanol)
19. Title 22 compliant membranes

3.0 DELIVERY, TERMS, BUDGET PRICING

3.01 Delivery
Submittal drawings and other technical engineering details are expected to be complete in 6-8 weeks after receipt of a purchase order. Once Smith & Loveless receives approved drawings, manufacturing would take 18-20 weeks.

3.02 Payment Terms
To be determined.

3.03 Summary

Two (2) 125,000 GPD TITAN MBR™ (steel tanks included) $1,740,000

Air Blowers .... Included

Flow Equalization components .... Included

Controls .... Included

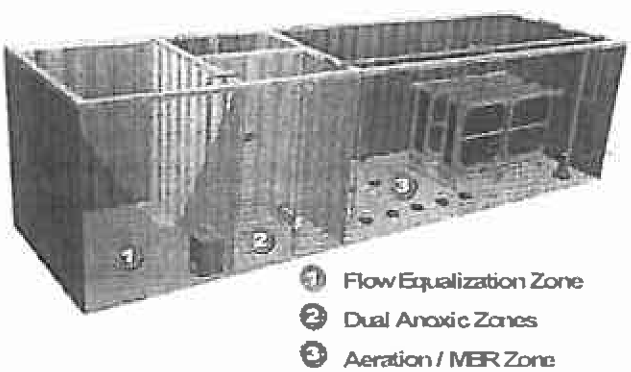
Freight & Startup Services .... Included

Fine Screen (for both plants) $60,000

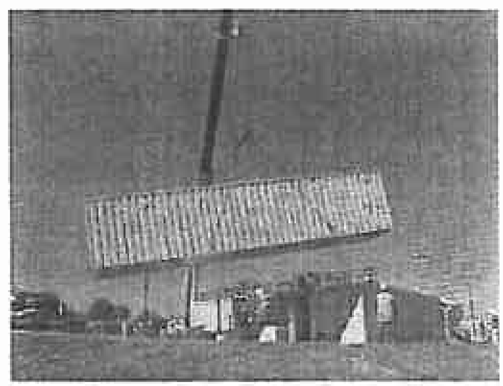
3.04 Items Not Included

- Interconnecting piping and wiring
- Any civil work
- Any lighting of the site
- Excavation
- Any landscaping roads around the plant
- Blower building if required
- Sludge storage zone

3.05 TITAN MBR™ shown below



Multiple units can be installed to meet higher flow requirements



WesTech
an employee-owned company

Proposal For:
River Rock, Montana

Equipment:
Vortex Grit Chamber Mechanism
Gritt Mitt™ Shaftless Classifier
Advanced Biological Nutrient Removal System
COP™ Clarifiers
AltaFilter™ Ultrafiltration Membrane System

Engineer:
Morrison Maierle

Represented By:
Goble Sampson Associates
3500 South Main, Suite 200
Salt Lake City, UT 84115
Contact: Rob Young
Phone: (801) 268-8790
Fax: (801) 268-8792
ryoung@goblesampson.com

Furnished By:
WesTech Engineering, Inc.
Salt Lake City, UT 84115
Phone: (801) 265-1000
Fax: (801) 265-1080

WesTech Proposal: 1060133
March 15, 2010

WESTECH

ITEM: "A" - One (1) 6' Vortex Grit Chamber Mechanism Model GVR6

EACH UNIT FURNISHED COMPLETE WITH THE FOLLOWING FEATURES AND COMPONENTS:

BASIS OF DESIGN

Application.	Domestic Sewage
Peak Design Flow.	1.31 MGD
Rated Capacity	1 50 MGD
Grit Capture Rating:	95% of grit >50 mesh in size 85% of grit 50-70 mesh in size 65% of grit 70-100 mesh in size
Chamber Diameter:	6 ft
Inlet Width:	12 inches
Effluent Width:	24 inches
Orientation	270°

VORTEX UNIT

- Vortex drive mechanism composed of a fabricated steel housing, helical gear reducer, pinion gear. and forged spur gear assembly with precision bearing.
- Drive unit includes 1/2 HP motor suitable for 460/3/60 electrical supply.
- Grit storage hopper floor plate, type A36 carbon steel.
- Torque tube, 10", type A36 carbon steel.
- Impeller and collar. type A36 carbon steel
- Water scour piping, 1-1/2" type A36 carbon steel.
- Grit lift piping, type A36 carbon steel.
- Inlet baffle, type A36 carbon steel
- Drive supplied with paint system.
- All carbon steel parts Hot Dip Galvanized.
- One (1) 1-1/2" brass body ball valve.

GRIT REMOVAL PUMP

- One (1) Grit pumps, recessed impeller type 7.5 HP, 460/3/60, 200-250 gpm @ 5-8 psig.

CONTROLS AND ELECTRICAL DEVICES

- One (1) NEMA 4X stainless steel main control panel suitable for 480/3/60 electrical supply. Control panel shall contain the following devices for operation of the vortex unit:
    1. Step down control transformer and through door disconnect with handle
    2. Branch circuit protection.
    3. Vortex and pump drive motor starters.
    4. Emergency stop pushbutton.
    5. Vortex On-Off switch

6 Water scour line and pump HOA switches
7 Cycle start pushbutton.
8. Hour meter for each motor.
9. Control power and run indicating lights
10 Alarm lights indicating starter overload.
11. Alarm reset button.
12 Programmable control relay for control logic functions
13. Run and alarm auxiliary output contacts.

- One (1) NEMA 4X 120V solenoid valve to control scour water functions.

SPARE PARTS
- None

FIELD SERVICE
- One (1) trip(s) and one (1) day(s) for installation inspection, start up, and instruction of plant personnel.

CLARIFICATIONS/COMMENTS
- Unit anchorage designed around RedHead A7 adhesive system. Adhesive and applicator by others.
- The recommended minimum undisturbed inlet length to the vortex is 18' from the center of the vortex chamber

OPTIONAL ITEMS
- None.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

ITEMS NOT BY WESTECH
Electrical wiring, conduit or electrical equipment, piping, valves, or fittings, lubricating oil or grease, shop or field painting, field welding, erection, hand rail, performance testing, shop fabrication drawings, unloading, storage, concrete work, field service, (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue:
By: _Todd Campbell_____________ Date: March 15, 2010

ITEM "B" One (1) Gritt Mitt™ Shaftless Classifier Model GSF31

BASIS OF DESIGN

Application:	Grit dewatering
Slurry Feed Rate to Hydrocyclone:	200-250 gpm
Underflow to Classifier:	20-30 gpm
Solids Throughput Capacity (grit):	25 cfh
Spiral OD:	11" [280mm]
Cyclone Inlet Connection	4" flanged
Cyclone Overflow Connection:	6" flanged
Classifier Overflow Connection	6" flanged

EACH UNIT FURNISHED COMPLETE BY WESTECH WITH THE FOLLOWING COMPONENTS:

GRITT MITT™ CLASSIFIER EQUIPMENT DESCRIPTION

- Flared settling tank constructed from type 304 stainless steel.
- Tank supplied with overflow pipe stub with entrance weir.
- Tank supplied with covers from type 304 stainless steel.
- Integral trough from type 304 stainless steel with wear bars from stainless steel The trough shall be supplied with a discharge and mounting flange for the spiral drive. A 2" drain coupling is provided at the base of the conveyor trough
- Conveyor trough angle of inclination 25°.
- Shaftless spiral screw from high strength carbon steel with protective primer coating. A welded coupling plate shall be supplied at the drive end.
- Carbon steel drive shaft with mating coupling plate. The drive shaft shall bolt to the spiral and mount directly to the spiral drive hollow shaft reducer
- Spiral drive unit with 1/2 Hp motor suitable for 460/3/60 electrical supply.
- Integral supports for the tank and conveyor tube from type 304 stainless steel.

HYDROCYCLONE EQUIPMENT DESCRIPTION

- Krebs hydrocyclone model D10LB. Cyclone housing constructed from steel with aluminum apex, neoprene liner and Nihard vortex finder.
- Underflow connection with 3" neoprene elbow for gravity discharge to the grit washer.
- Inlet pressure gauge.
- Support stand from type 304 stainless steel.

HARDWARE

- Assembly fasteners and anchor rods from type 18-8 stainless steel

CONTROLS AND ELECTRICAL DEVICES

- The following devices will be added to the grit removal control panel to operate the classifier unit:
    1. Drive motor starters.
    2. Branch circuit protection.
    3. Grit discharge spiral HOA switch

4. Current monitor for overload protection of the discharge spiral.
5. Hour meter for each motor
6. Run indicating lights
7. Alarm lights indicating overcurrent and starter overload.
8. Run and alarm auxiliary output contacts.

- One (1) NEMA 4X local Emergency Stop pushbutton for field mounting at the unit.

SPARE PARTS
- None

FIELD SERVICE.
- Included with vortex mechanism

CLARIFICATIONS/COMMENTS
- Unit anchorage designed around RedHead A7 adhesive system. Adhesive and applicator by others.

OPTIONAL ITEMS
- None.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS:

ITEMS NOT BY WESTECH
Electrical wiring, conduit or electrical equipment, piping, valves, or fittings, shimming material, lubricating oil or grease, shop or field painting, field welding, erection, detail shop fabrication drawings, performance testing, unloading, storage, concrete work, hoist or lifting apparatus, grating, platforms, stairs, handrailing, or field service (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue.
By: Todd Campbell Date: March 15, 2010

ITEM: "C" - One (1) Advanced Biological Nutrient Removal System
WesTech Model AES2B3

The Biological Treatment Equipment will be complete with two (2) slow speed surface aerators, one (1) anoxic zone mixer, and one (1) flow control gate for the OxyStream™ Ditch. WesTech has also included fasteners, drawings, startup service, warrantees and O&M manuals

*** Two (2) Mechanical Surface Aerators

EACH AERATOR FURNISHED COMPLETE WITH THE FOLLOWING COMPONENTS

A 25 HP TEFC, inverter duty, drive motor suitable for 460 volt, 3 phase, 60 hertz supply power, 1800 rpm with a service factor of 1.15 on the VFD power. The motor will be rated at 40 degrees C ambient with class F insulation and shall comply with the applicable provision of NEMA with a minimum of B-10 bearing life of 100,000 hours Each motor will be supplied with a thermostatic heat protection device and a space heater operating on 110 volts.

A high efficiency helical gear type reducer sized with a minimum service factor of 2.5 times the motor HP, equipped with a dry well, oil immersion heater, and low oil flow cutout switch. All bearings will have a minimum B-10 bearing life of 100,000 hours (250,000 output shaft)

An open type vaned impeller with equally spaced blades of ¼" minimum steel plate The impeller shall be of sufficient size to with stand the design torque and hydraulic loading and to develop the minimum channel velocity required and specified oxygen transfer efficiency.

An impeller shaft with cast iron impeller coupling for attachment to the gear reducer

Four (4) zinc plated jack studs will be provided for a minimum of 6" adjustment of aerator.

A steel baseplate for mounting the reducer.

*** One (1) 1.5 HP Direct Drive Submersible Mixer for use in the Anoxic Zone

EACH MIXER FURNISHED COMPLETE WITH THE FOLLOWING COMPONENTS

Each mixer includes a stainless steel propeller, 30' power/control cable, 304 stainless steel support arm, and submersible motor. Motor will be suitable for 3 phase, 460 V 60 Hz power. Unit will include a relay for monitoring seal leakage and motor temperature

One (1) mixer guide mast assemblies will be supplied in all 304 stainless steel construction Each mast includes an integral mounting socket for portable lifting hoist. Top bracket, intermediate brackets and floor bracket are included.

WESTECH

*** One (1) Manually Operated Flow Control Cate

A hand wheel driven worm gear reducer that allows 112½ degrees of travel in the forward and reverse direction. The unit will include 20" hand wheel, stand, gear reducer, rotating shaft, positioning plate/arm and lock pin, guide bearings, flow vane, stops, material of construction to be 304 stainless steel with 304 stainless steel fasteners and anchor bolts.

304 stainless steel anchor bolts and assembly fasteners will be provided.

All non stainless steel items to be shop blasted per SSPC-SP10 and given one coat of Tnemec 161-1211 primer (3-5 mils) and one (1) coat of Tnemec 161 top coat (3-5 mils). The motors and gear reducers will be supplied with manufacturers standard surface preparation and primer.

SPARE PARTS:
Aerators: One (1) oil sensing cutout switch
One (1) flexible motor coupling

TOTAL SERVICE:
To include two (2) trips and four (4) days for inspection, startup, and instruction of plant personnel.

CLARIFICATIONS/COMMENTS:
Electrical controls, PLC panels, PLC programming, effluent weir, VFD's and DO probes are not included.

OPTIONAL ITEMS:
None.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

ITEMS NOT BY WESTECH:
Electrical wiring, conduit or electrical equipment, piping, valves, or fittings, lubricating oil or grease, shop or field painting, field welding, erection, performance testing, unloading, storage, concrete work, field service, (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue:
By: Ryan Spanton Date March 15, 2010

WESTECH

ITEM. "D" - Two (2) 30' Dia. x 12'-6" SWD Shaft Drive COP™ Clarifier Mechanisms
WesTech Equipment Model COPS1

EACH UNIT FURNISHED COMPLETE WITH THE FOLLOWING COMPONENTS:

DRIVE UNIT
WesTech's premium D25 gearless drive unit with alloy steel precision bearing rated for a minimum 3,200 ft-lbs torque, with cycloidal or helical speed reducer direct connected to a 1/2 HP TEFC motor suitable for 230/460 volt, 3 phase, 60 hertz power.

OVERLOAD PROTECTION
A WesTech Torkmatic overload control with two (2) adjustable switches for alarm and motor cutout.

CENTER SHAFT
A 6" dia. steel pipe center shaft to transmit torque from the drive unit to the rake arms.

ENERGY DISSIPATING INLET (EDI)
A circular Energy Dissipating 3'-0" dia. Inlet of 3/16" steel plate, with full bottom and multiple tangential diffuser gates designed to reduce influent energy and introduce it into the flocculating feedwell in a horizontal spiral flow pattern.

FLOCCULATING FEEDWELL
A circular flocculating feedwell 8'-0" dia. of 3/16" steel plate, designed to promote flocculation of the influent, while preventing short-circuiting and sludge blanket scour

RAKE ARMS
Two (2) steel rake arms, each with continuous spiral rake blades and adjustable 304 stainless steel squeegees. Blades shall taper from a minimum at the tank wall to a maximum at the tank center, and shall be sized to effectively transport the required sludge volume.

SLUDGE WITHDRAWAL RING
A steel sludge ring at the center of the tank, with multiple large withdrawal orifices spaced evenly around the periphery for uniform sludge withdrawal.

SURFACE SKIMMER
Two (2) scum skimming mechanisms with steel skimmer blades, recessed aluminum hinged wiper assemblies, one (1) 2'-6" wide steel scum box with steel supports and scum flushing valve.

WALKWAY
A steel beam type mechanism support bridge spanning the tank diameter, with 36" wide access walkway extending from one wall to the center platform. The walkway shall consist of 1-1/4" aluminum grating, with 2-rail 1-1/2" diameter aluminum handrails with kickplate along both sides. A center platform with 1/4" aluminum checkered plate with 2-rail 1-1/2" diameter aluminum handrails with kickplate along both sides.

INFLUENT PIPE
A steel influent pipe. 8" dia Sch. 20 with steel supports

HARDWARE
304 stainless steel anchor bolts and assembly fasteners.

FIELD SERVICE
Two (2) trips and two (2) days for inspection startup. instruction of plant personnel. and observation of torque testing.

CLARIFICATIONS/COMMENTS:
The information provided above is for budgetary purposes only. The equipment sizes listed may vary depending on the design criteria and plant flows.

The sludge withdrawal ring as employed in this proposal is covered under U.S. Patent and Trademark Office Number RE35668. The owner will require proof of a fully paid license to operate the sludge withdrawal ring within 90 days of award of prime contract. WesTech Engineering of Salt Lake City. Utah is the exclusive licensee of the patents with rights to sub-license. The clarifier manufacturer will include the Patent License fee in their bid.

All steel items, with the exception of the drive mechanism. will be shipped to the jobsite bare metal with no surface blasting for complete preparation and painting in the field in order to insure unit responsibility. The drive mechanism will be finish painted in the shop with the manufacturer's recommended paint system. An option for shop blast and prime for the steel items is listed below under "Optional Items".

Clarifier electrical control panel, lubricants, FRP weirs, scum baffle, scum baffle supports, steel preparation, steel priming, and steel painting are not included in WesTech's scope of supply.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS.

OPTIONAL ITEMS:
"D-1" - WEIRS AND BAFFLE
FRP effluent weirs and scum baffles with FRP supports and 304 stainless steel anchorage. The weirs will be 1/4" thick x 9" with 2 1/2 deep v-notches on 6" centers. The baffle will be 1/4" thick x 12".

"D-2" - SURFACE PREPARATION AND COATING
All non-submerged ferrous components to be prepared per SSPC-SP6 and given one (1) coat Tnemec N140-1255. 3-7 mils. Submerged ferrous components to be prepared per SSPC-SP10 and given one (1) coat Tnemec N140-1255. 3-7 mils.

WesTech

ITEMS NOT BY WESTECH. Electrical wiring, conduit, or electrical equipment, piping valves, or fittings, shimming material, lubricating oil or grease, shop or field painting, field welding, erection, assembly of component handrail, detail shop fabrication drawings, performance testing, unloading, storage, concrete work, or field service (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue.
By: Ronald Jones Date. March 15, 2010

ITEM "E" - One (1) 0.45 MGD AltaFilter™ Ultrafiltration Membrane System
WesTech Model UFA61A

We are pleased to offer the following information on the WesTech AltaFilter™ Ultrafiltration Membrane System. The basic concept is to provide two (2) treatment trains each containing sixteen (16) ultrafiltration membrane modules. Depending on the feed water characteristics, the system will be capable of producing a peak monthly flow rate of 0.45 MGD with a moderate flux rate. To account for the peak hourly flow of 3.5 times the average day, it is anticipated that an equalization basin prior to the membrane system will be used, so that the membranes will treat a constant water supply. Each membrane train has its own pre-filter and marshalling panel and is backwashed and cleaned independently of the other train. The AltaFilter™ ultrafiltration modules have a pore size of 0.01 micron and successfully filter out turbidity, suspended solids, bacteria, and even virus sized particles to produce a very high quality effluent.

The AltaFilter™ ultrafiltration system proposed has been designed to ensure reliable and simple operation and is completely automated, including start/stop operation, backwashing, and daily integrity checks. WesTech has designed the system utilizing the concept of skid mounted packages to minimize field assembly. In addition, the skid assembly is completely tested in WesTech's shop prior to transportation to the job-site, ensuring that installation and commissioning activities are efficient.

GENERAL OPERATION

Following clarification pre-treatment, the raw water is fed by the feed pump to the inlet of the pre-filter and screened to remove any debris larger than 130 micron which might damage the hollow fiber membrane. The screened raw water flows through the ultrafiltration modules in an outside/in flow pattern to effectively remove particulates and pathogens from the water. The WesTech Ultrafiltration package utilizes the Polymem™ Ultrafiltration Hollow Fiber modules which have demonstrated over 5.5 log removal of Cryptosporidium and Giardia, and have been given 4 log removal credit for Cryptosporidium and Giardia and 1.5 log removal credit for virus through independent evaluation in the State of California. The membrane pore size is 0.01 micron, which classifies it as an ultrafilter. As the level of fouling increases across the membranes, the feed pump speed is increased by the VFD to maintain the flow setpoint. Periodic backwash intervals, typically 35-60 minutes, are used to flush the filtered material from the modules and remove the particulate matter that has accumulated on the surface of the hollow fibers. A backwash pump is included which draws from the backwash/ treated water storage tank and provides up to 66 gpm per module.

To smoothly activate the various states of the ultrafiltration package pneumatically actuated valves are used which require compressed air to operate. An automatic Clean-In-Place is operator initiated when the permeability has decreased to a certain level. Chemical cleaning frequencies are anticipated to be 21 days or greater.

PROCESS DESIGN

The system is designed utilizing the following raw water quality data, desired treated water quality, and membrane process design parameters.

Raw Water Quality Data - Following Clarification Pre-Treatment

Temperature Range	2° - 35° C
TSS	< 10 mg/l average
Turbidity	< 10 NTU average
Total Organic Carbon (TOC)	< 3 mg/l
pH	6.5 – 8.5 stnd pH units

*Without Pre-treatment

Treated Water Quality

Turbidity	< 0 1 NTU
Silt Density Index (SDI)	< 2
Giardia Percent Removal	> 99.9999%
Cryptosporidium Percent Removal	> 99.9999%
Virus Log Removal	1.5 log removal

Membrane Process Design Parameters – Peak Month
Two (2) Treatment Trains with Sixteen (16) Modules Each

Design Gross Flow	390 gpm
Design Filtrate Flow	340 gpm
Total Filtrate Production	0.45 MGD
Design Flux Rate at 10°C	14.3 gfd
Backwash Frequency	35 min
CIP Frequency	21 - 30 days
Backwash Waste Flow / Train	Up to 960 gallons/ backwash
Recovery	87 – 92%

STANDARD FEATURES

The skid mounted system shall be supplied shop assembled with all required piping, wiring, instruments and controls for a complete and operable system. The system will be supplied with the following components.

- Two (2) powder coated, welded steel skids
- One (1) bronze fitted cast iron feed pump w/ premium efficiency motor (Goulds or equal)
- Two (2) 130 micron, automatic backwashing prestrainers (Valve and Filter – 1/train)
- Thirty-two (32) ultrafiltration modules with 0.01 micron membrane pore size (Polymem™ – 16/train)

- One (1) 4000 gallon HDPE filtrate / backwash supply tank w/ lid
- One (1) bronze fitted cast iron backwash supply pump w/ premium efficiency motor (Goulds or equal)
- One (1) air compressor with receiver, regulators, filter and dryer (Atlas Copco GX4FF or equal)
- Pneumatically actuated and manual valves (Bray)
- Schedule 80 PVC piping
- One (1) separate skid mounted CIP system which includes:
    - One (1) 310 gallon HDPE CIP circulation tank w/ lid
    - One (1) CIP recirculation pump (March or equal)
    - Three (3) chemical dosing pumps for caustic, sodium hypochlorite, and citric acid (LMI)
    - Three (3)18kW 316 stainless steel immersion heaters
- One (1) UL 508 listed, NEMA 4 electrical control panel wired to receive three phase 480 volt power and including the following:
    - PLC – Allen Bradley Compact Logix
    - Door mounted 8" color touchscreen or Desktop PC
    - Feed and Backwash pump VFDs – Square D Altivar
    - Contactors – ABB
    - Solenoid valve block
    - Ethernet switch
- Process Instrumentation including:
    - Two (2) filtrate / backwash magnetic flow meters w/ transmitters (Siemens 5100 – 1/train)
    - Three (3) level transmitters for raw water supply, backwash tank and CIP tank (Siemens Milltronics Probe, Wika, or equal)
    - Four (4) pressure transmitters per skid (Wika Ecotronic)
    - Five (5) pressure gauges per skid (Wika)
    - One (1) raw water turbidimeter (Hach 1720E)
    - Two (2) filtered water turbidimeters (Hach 1720E – 1/train)
    - One (1) pH sensor for CIP system (GF Signet)
    - Two (2) temperature sensors for raw water and CIP system (Dwyer)

ON-SITE TECHNICAL ASSISTANCE AND TRAINING

WesTech has included on-site technical assistance during construction, pre-commissioning, start-up, and training to ensure the equipment is installed and commissioned per WesTech and sub-suppliers requirements. Four (4) separate trips to include a total of twenty (20) days on-site are included with this offer. In addition to the above noted technical assistance, WesTech provides 24 hour on-call support for its clients

A separate operation, service and maintenance support contract can be provided by WesTech

This proposal section has been reviewed for accuracy and approved for issue:

By: Lindsay Housley Date: March 15, 2010

WESTECH

BUDGET PRICING

ITEM	EQUIPMENT	PRICE (U.S.)
"A"	(1) 6' Vortex Grit Chamber Mechanism Model GVR6	$ 60,000
"B"	(1) Grit Mitt™ Shaftless Classifier Model GSF31	$ 50,000
"C"	(1) Advanced Biological Nutrient Removal System AES2B3	$106,200
"D"	(2) 30' Dia. COP™ Clarifiers Model COPS1	$116,300
"D-1"	Weir and Baffle	$ 10,600
"D-2"	Surface Preparation and Coating	$ 10,900
"E"	(1) 0.45 MGD AltaFilter™ Ultrafiltration Membrane System	$680,000

The above mentioned equipment was designed according to the information which we received. The dimensions may vary slightly depending on the plant's actual design parameters. Assumed values may have been used, therefore all information shall be verified by the Engineer.

Unless otherwise indicated, prices listed are for equipment only. All optional items will be offered with the purchase of the scoped equipment only. No optional items will be sold separately.

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

Warranty: A written supplier's warranty will be provided for the equipment specified in this section. The warranty will be for a minimum period of (1) year from start-up or 18 months from time of equipment shipment, whichever comes first. Such warranty will cover all defects or failures of materials or workmanship which occurs as the result of normal operation and service except for normal wear parts (i.e. squeegees, skimmer wipers, etc.)

Terms: Terms are net **30 days** from shipment with no retentions allowed.

Sales Tax: No sales taxes, use taxes, or duties have been included in our pricing.

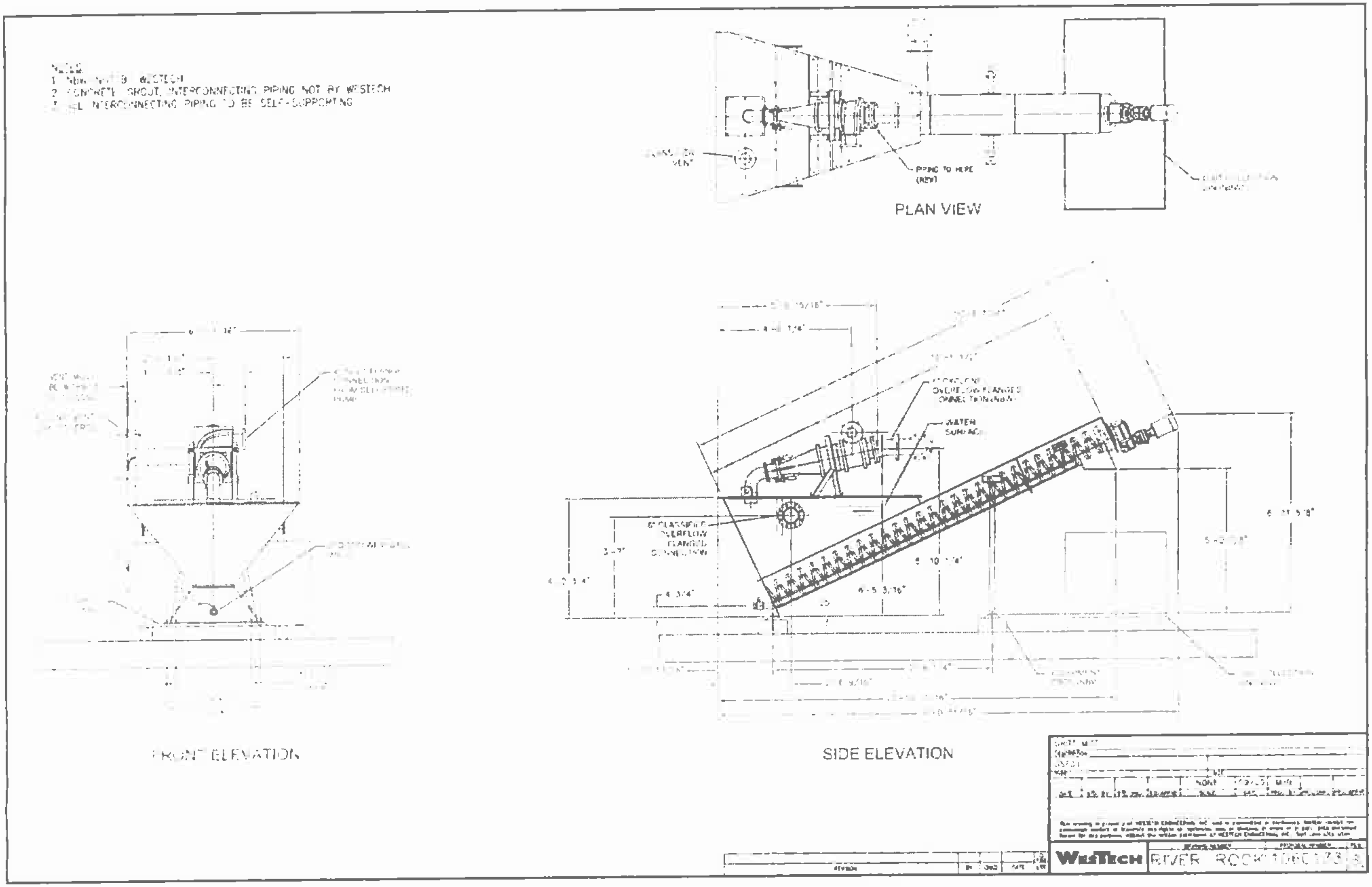
Freight: Prices quoted are **F.O.B. shipping point** with freight allowed to a readily accessible location nearest to jobsite. All claims for damage or loss in shipment shall be initiated by purchaser.

Submittals: Shop drawing submittals will be made approximately **6 to 8 weeks** after purchase order is received in our office.

Shipment: Estimated shipment time is **18 to 20 weeks** after approved shop drawings are received in our office.

Field Service: Prices do not include field service unless noted in equipment description. Additional field service is available at $960.00 per day plus expenses.

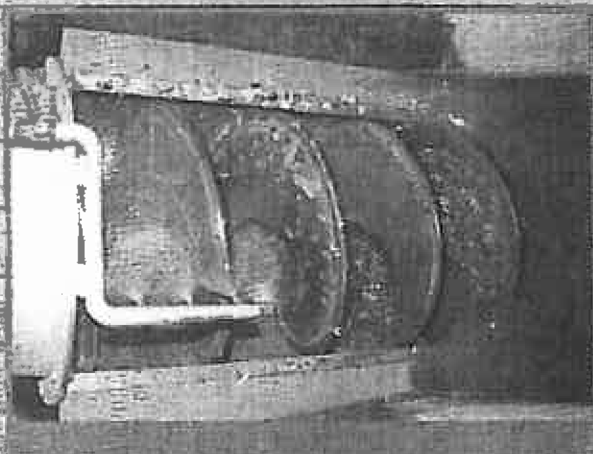
Paint: If your equipment has paint included in the price, please take note of the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30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

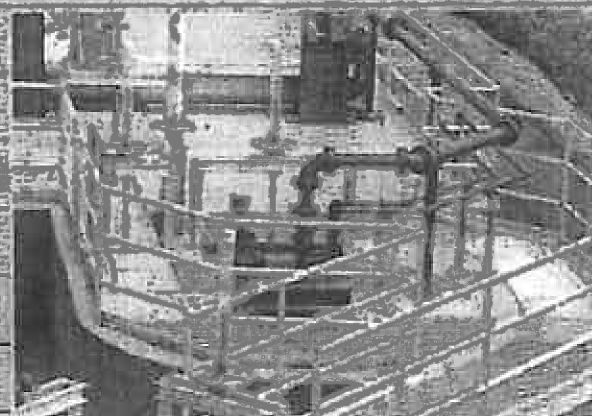

PLAN VIEW
PIPING TO HERE (REV)
VENT
8" CLASSIFIER OVERFLOW FLANGED CONNECTION
WATER SURFACE
SIDE ELEVATION
FRONT ELEVATION
WESTECH
RIVER ROCK

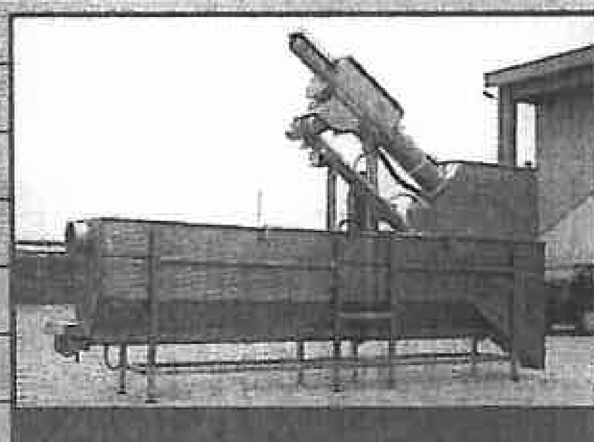
WesTech

ISO 9001 WesTech CERTIFIED QUALITY SYSTEM

Headworks Equipment



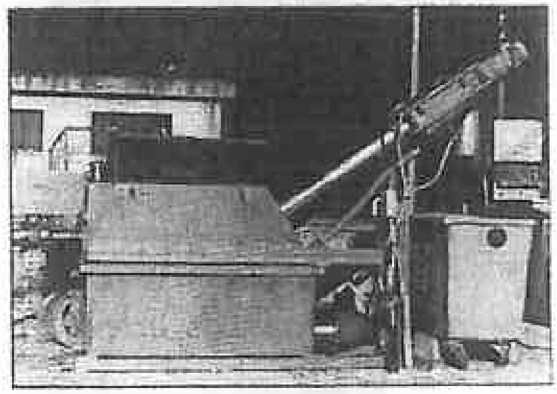




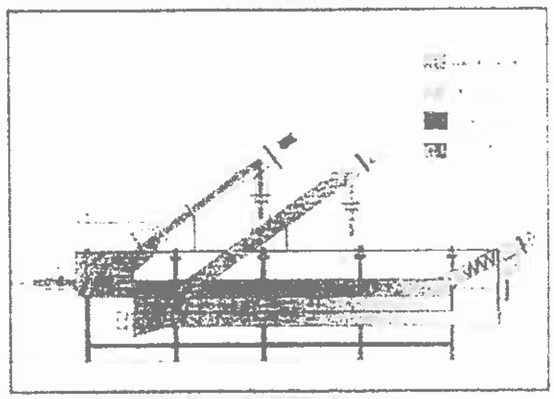
Screening & Grit Removal

Wastemaster™

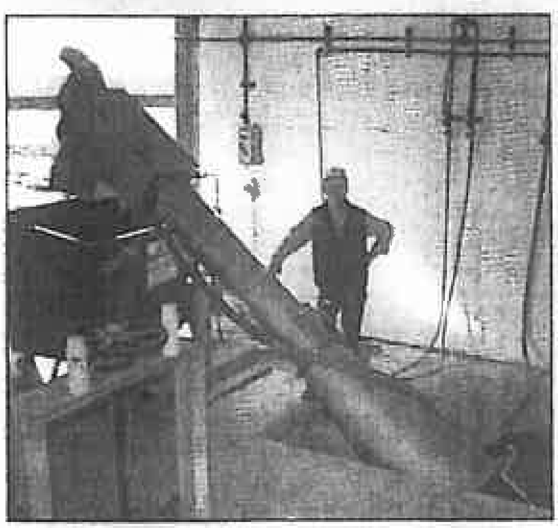
A WASTEMASTER system can be ordered to address screening, grit removal, grease removal, or any combination of these functions. It can be installed as a septage receiving station or headworks pre-treatment station. The full combination WASTEMASTER is an "all-in-one" Shaftless Screw system. It screens, washes, separates grit, dewaters and compacts solid materials.



It addresses limited space requirements and has no mechanical parts in contact with the wastewater or solid material to be treated. It combines both low maintenance and low operating costs. WASTEMASTER is inexpensive and easy to install. The system features *Shaftless Screw* Conveyors constructed of high strength hardened steel with a stainless steel tank and covers.

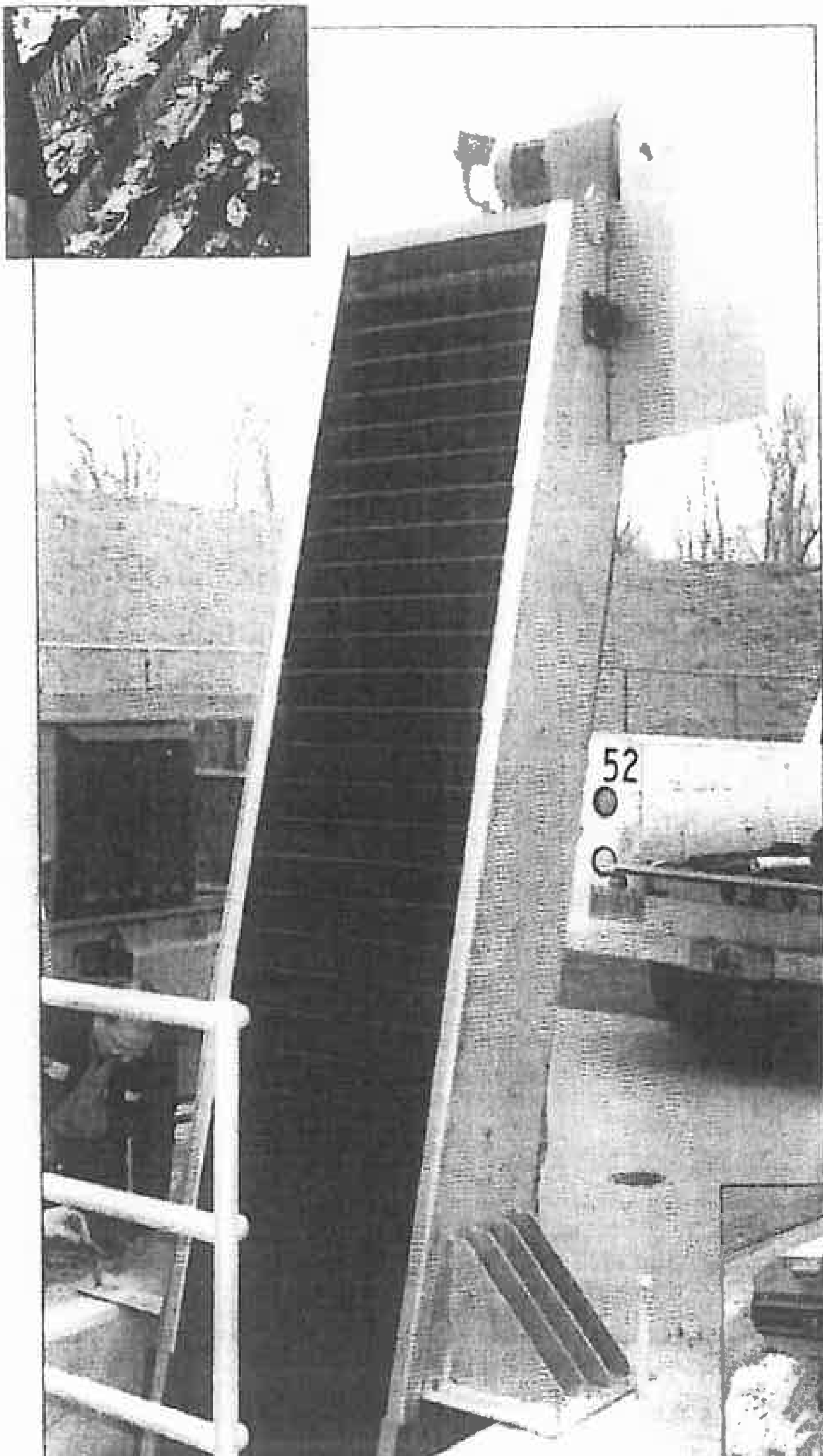


Channel Mitt™



The Channel Mitt Fine Screen washes and dewaters screenings in one simple unit. It can handle up to 8 MGD and swings up and out of the channel for easy maintenance. The drive unit features a low HP, energy-efficient motor with a direct coupled reducer - no chains or sprockets to maintain. The *Shaftless Screw Conveyor*, constructed of high strength hardened steel has no lower bearings to maintain. It features replaceable brushes on the trailing edge for longer life. The brushes are easily replaced in 180-degree sections without removal of the screw. The brushes clean the screen with each rotation and an optional spray wash further cleans the screenings while returning organics. The compaction zone increases dewatering capabilities, has a liquid return line, and hinged cover plate with a motor safety cut-out switch. The entire housing is stainless steel

CleanFlo™ Continuous Screening



The CleanFlo™ is a continuous belt-type finger screen designed to remove debris from water and waste-water. With capacities to 100 MGD and discharge heights exceeding 50 feet, CleanFlo™ screens can handle the most demanding applications. These units are designed and built to customer specifications and are easily customized for particular needs. Retrofit installations involving deep or wide channels present no difficulty for the CleanFlo™.

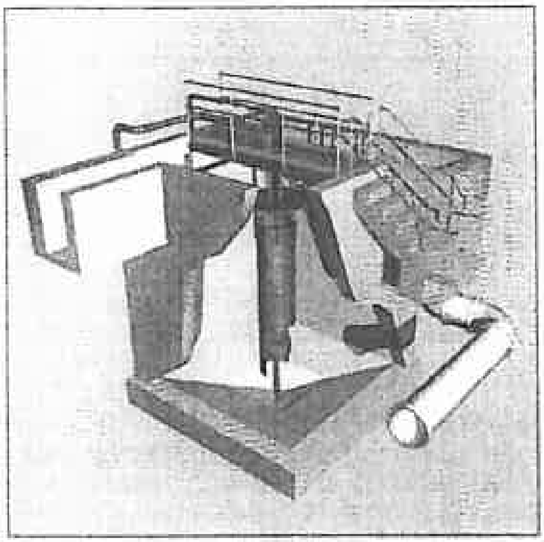
The filter elements are molded of long lasting ABS plastic. Filtration capabilities range from 0.02"-1.2". The screen frame, rollers, and shafts are of machined stainless steel construction.

The self-cleaning design of the CleanFlo™ retracts the ABS fingers between each other cleaning the screen belt as it advances back down into the channel. A rotating neoprene wiper blade, located at the discharge, cleans any remaining debris from the finger elements.

CleanFlo™ units are supplied with ultrasonic level sensors which allow for intermittent operation. The screen is activated only when captured debris causes the water level to rise, resulting in decreased operational costs and lower maintenance requirements.

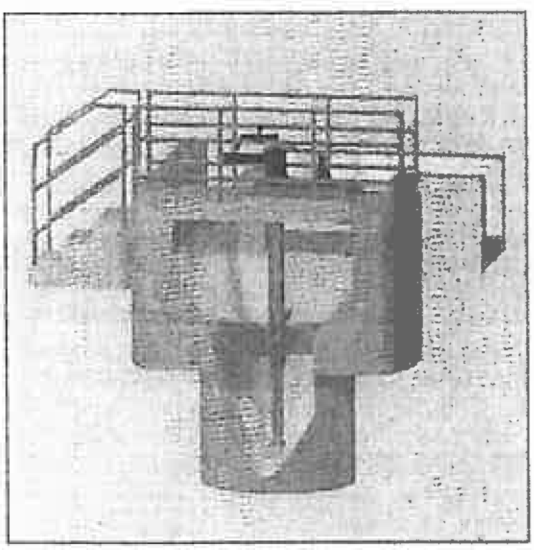
CleanFlo™ screens are designed for easy maintenance and years of trouble free service. They are easily customized to application requirements.

WesTech Engineering offers two types of grit chambers for your headworks applications. The first utilizes an air flow system; the other an induced vortex system.



AERATED GRIT CHAMBER

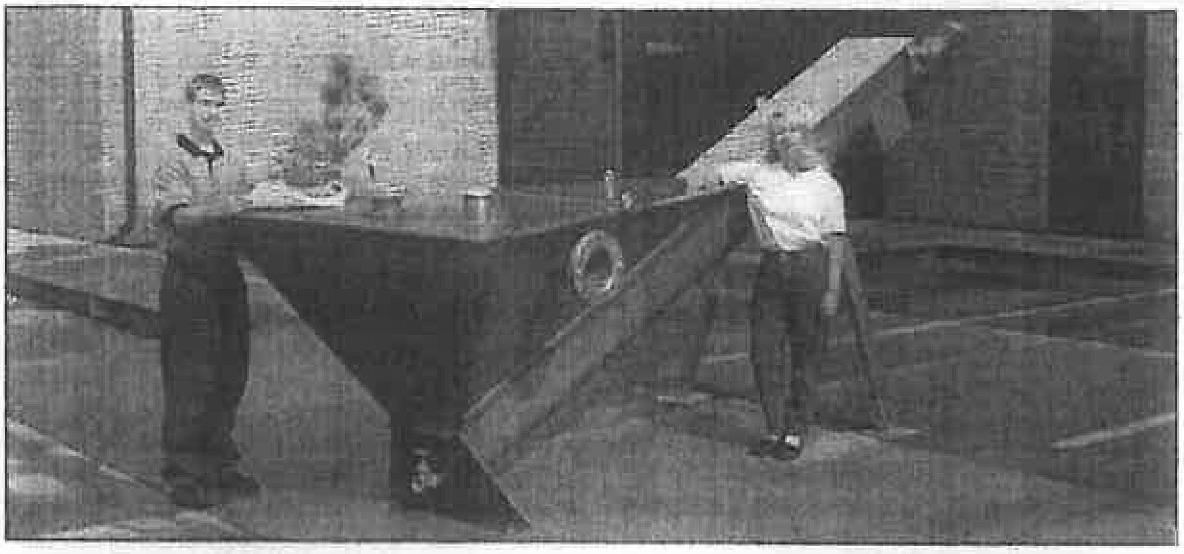
Air is introduced into a large draft tube and creates a rolling action in the chamber. This rolling action suspends the lighter organic materials which are removed through the overflow box. Heavier grit settles to the steep-sloped bottom where it is removed by an airlift pump and transferred to the grit classifier (Gritt Mitt™). WesTech's Aerated Grit Chamber offers a wide flow range, offers low headloss, and improves downstream process through increased dissolved oxygen. The aerating effect means removed grit is generally clean and free of putrescible content.



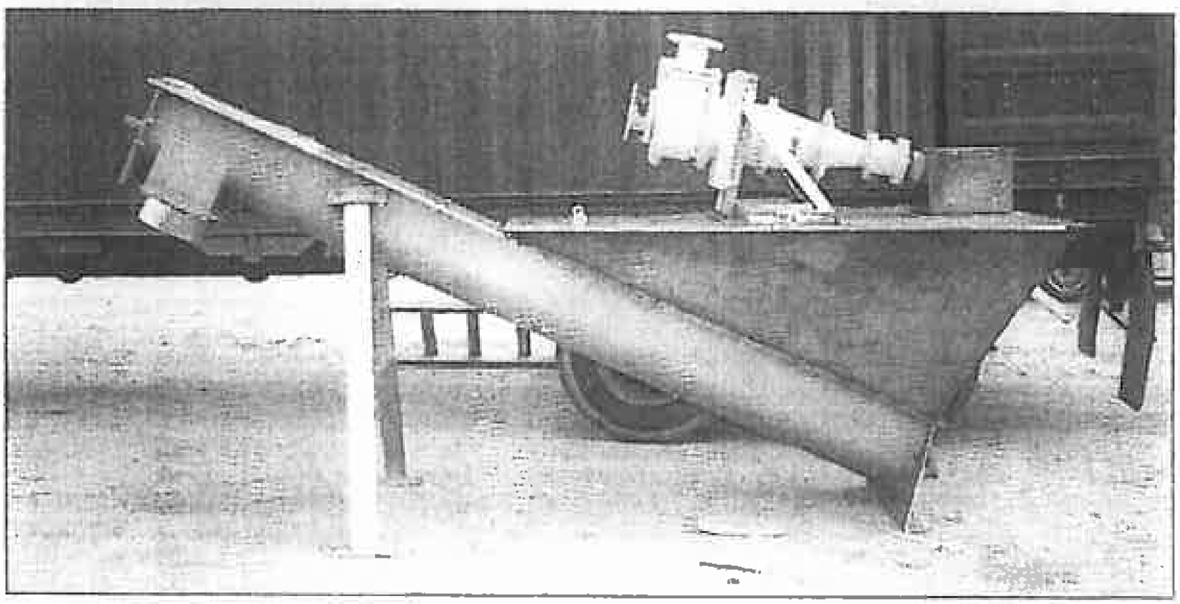
VORTEX GRIT CHAMBER

WesTech's Vortex Grit Chamber use a forced vortex from a tangentially fed influent to drive the denser particles to the center of the tank where they settle out. The vortexing action is aided by rotating paddles which lift the lighter organics. Grit settles in a lower chamber where it is removed by an airlift or mechanical pump and transferred to the grit classifier (Gritt Mitt). The Vortex Grit Chamber features a small footprint, low headloss, and has no submerged mechanical parts. It provides high grit removal efficiencies, even with high flows.

Gritt Mitt™

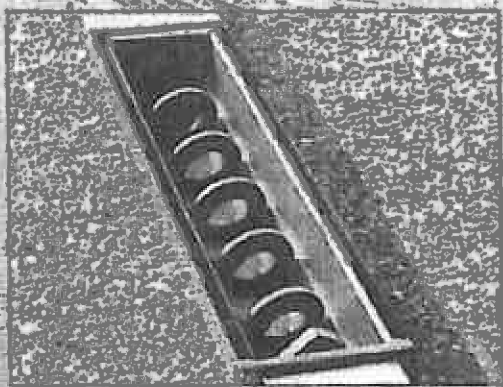


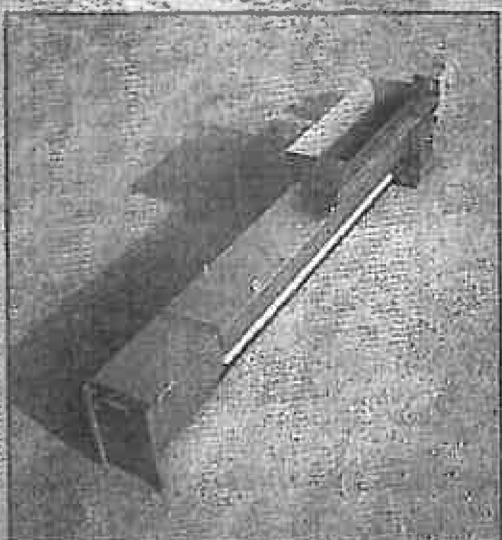
Gritt Mitt is a grit classifier that's a cut above. Its compact design requires a small footprint, but features a wide settling chamber. It has no submerged bearings and uses WesTech's *Shaftless Screw* Conveyor technology for longer life and lower maintenance costs. Gritt Mitt has a flow range from 150 to 440 gpm and no special excavation or concrete work is required, which means a low cost installation. Gritt Mitt's housing is constructed of stainless steel and the conveyor is manufactured from high strength hardened steel running on replaceable stainless steel wear bars.

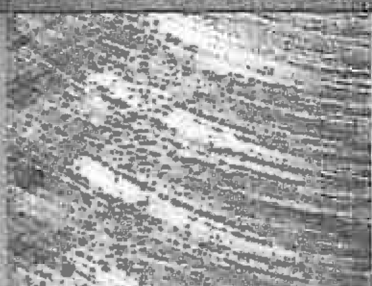


When Gritt Mitt is equipped with an optional cyclone, it will remove 95% of 150 mesh grit and can accomodate much higher flows. The cyclone uses hydraulic forces for separation and has no moving parts for cleaner operation and low maintenance without fouling.

Conveyors & Compactors







WesTech's *Shaftless Screw* Conveyor technology allows design of a conveyor system to fit the exacting needs of each Headworks or for sludge transport. The WesTech conveyor system, which can be hermetically sealed for odor control, is powered with a low HP, energy efficient drive unit and has no shaft or lower bearings to maintain. The screw is constructed of high strength hardened steel which is housed in a stainless steel trough and cover. The conveyors are available in any length and can be driven from either the leading or trailing end. The system conveys any non-abrasive material and utilize UHMW trough liners for longer life. Conveyor systems can be designed for efficient material movement on a horizontal plane or at any incline including totally vertical.

WesTech's Screening Compactor systems are designed for material transport, enhanced dewatering, and compacting material originating from a bar screen or other primary screening device. It can reduce dry-solids volume up to 40%. The system features a hinged cover plate with motor safety cutout switch for easy inspection and a liquid return line. The unit may be equipped with an optional continuous bagging unit for clean and odorless disposal of compacted screenings.

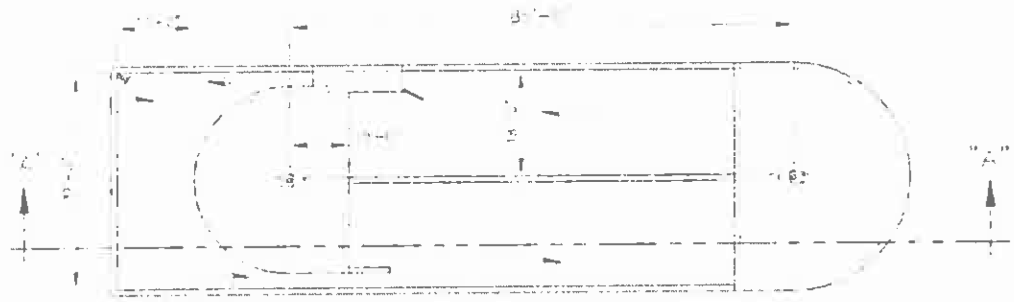
WesTech Products

- Clarifiers
- Digester Covers
- Dissolved Air Flotators
- Erection Services
- Flocculators
- Oil/Water Separators
- Laboratory Test Equipment
- Pilot Plant Equipment
- Polymer Dosing
- Controls
- Pressure Filters
- Rotary Distributors
- Grit Removal Equipment
- Sludge Heating Systems
- Sludge Mixers
- Solids Contact Clarifiers
- Thickeners
- Vacuum Filters
- Sand Filters

Represented by:

WESTECH

P.O. Box 65068 • Salt Lake City, Utah 84165-0068
Phone: 801/265-1000 • Fax 801/265-1080
www.westech-inc.com



SECTION "A-A"

NOTES
1. THE CONFIGURATION AND DATA SHOWN ON THESE DRAWINGS IS FOR INFORMATION PURPOSES ONLY AND SHOULD NOT BE USED WITHOUT FOLLOWING PROPER PROCESS DESIGN CRITERIA
2. CONCRETE SIZES AND REINFORCING SHOULD BE SIZED BASED ON THE EQUIPMENT OPERATING FORCES
3. CONSULT WESTECH FOR FINAL DIMENSIONS AND EQUIPMENT

FOR APPROVAL ONLY
NOT FOR CONSTRUCTION

PREPARED FOR: RIVER ROCK, MT

GENERAL ARRANGEMENT - OXIDATION DITCH

NONE

WesTech

D101

OXYSTREAM PROCESS DESIGN

Project Name	RIVER ROCK	Project Number	1060133
Consulting Engineer	name	Completed By	WRS
Date:	3/15/2010	Checked By	

DESIGN PARAMETERS

INFLUENT WASTESTREAM		EFFLUENT LIMITS	
Q (mgd)	[illegible]	BOD (mg/l)	[illegible]
BOD (mg/l)	[illegible]	TSS (mg/l)	[illegible]
TSS (mg/l)	[illegible]	NH3 (mg/l)	[illegible]
TKN (mg/l)	[illegible]	ORG N (mg/l)	1.0
NO3 (mg/l)	[illegible]	NO3 (mg/l)	[illegible]
TP (mg/l)	[illegible]	TKN (mg/l)	2.0
		TN (mg/l)	10.0

SITE SPECIFIC INFORMATION		DESIGN INFORMATION	
Tmin	[illegible]	SRT (days)	17.0
Tmax	[illegible]	MLSS (mg/l)	[illegible]
Elevation (ft)	[illegible]	Yield (lb/lb)	0.82
Cs temp affect	[illegible]	N ASSIM (%)	5.0
Cs temp/elev affect	7.76	Oxygen coef (lb/lb)	[illegible]
Alpha	0.92	Residual DO (mg/l)	2.0
Beta	0.97	Aerator Type (F or 7)	7
Simultanious nit denit %	[illegible]	Primary Clarifiers (Y or N)	N

AERATION VOLUME CALCULATION

BOD removal = (BODi - BODe) x 8.34 x Flow

BOD removal (lbs/day) 655

Sludge Produced = Waste Activated Sludge = Yield x BOD removed

WAS (lbs/day) 539

System Mass = SRT x Sludge Produced

System Mass (lbs) 9,156

Aeration Volume = System Mass / MLSS x 8.34

Aeration Volume (Mgal) 0.274

HRT = Volume / Flow x 24

HRT (hrs) 17.6

Food to Mass Ratio = Flow x BODi x 8.34 / System Mass

F/M (lb/lb-day) 0.075

Loading Rate = BOD removal / Aeration Volume

Loading Rate (lbs/1000 ft^3) 17.9

OXYSTREAM PROCESS DESIGN

DESIGN CALCULATIONS

N assimilation = 5% x Sludge Production

N assim (lbs/day)	27
N assim (mg/l)	8.6

Oxidized Ammonia = TKNi - NH3e - Org Ne - N assimilated

NH3 oxid (mg/l)	23.4
NH3 oxid (lbs/day)	73

Nitrate Generated = Oxidized Ammonia - NO3e

NO3 to be reduced (mg/l)	15.4
NO3 to be reduced (lbs/day)	48

Simultaneous Nit/Denit (SNdN) = % of Nitrate Removed in Aerobic Tank

NO3 to be reduced (mg/l)	13.8
NO3 to be reduced (lbs/day)	43

AERATOR HP REQUIREMENT

Actual Oxygen Requirement (BOD) = BOD removed x Oxygen Coefficient (BOD)

AORc (lbs/day)	791

Actual Oxygen Requirement (NH3) = NH3 oxidized x Oxygen Coefficient (NH3)

AORn (lbs/day)	335

Actual Oxygen Requirement (total) = AORc + AORn (no denit credit)

AOR no denite credit (lbs/day)	1,126

AOR denitrification credit = NO3 reduced x 2.86 lbs O2 / lbs NO3 reduced

TOTAL AOR DENITE CREDIT (lb/day)	137

Actual Oxygen Requirement (total) = AORc + AORn - AORdenite credit

AOR with denite credit (lbs/day)	989

Standard Oxygen Requirement

SOR no denite credit (lbs/day)	1,98[illegible]
SOR with denite credit (lbs/day)	1,743
TOTAL SOR DENITE CREDIT (lb/day)	244

HP required = SOR / 24 hrs x Aerator Efficiency

Aerator Efficiency (lbs O2 / HP hr)	3.8
HP no denite credit	**22**
HP with denite credit	**19**
TOTAL HP DENITE CREDIT	3

OXYSTREAM PROCESS DESIGN

ANOXIC VOLUME CALCULATION

SDNR = [0.03 x (F/M) + 0.029] x 1.02 ^ (Tmin - 20)
Anoxic Volume = lbs NO3 reduced / (SDNR x MLSS x 8.34)
F/M = (8.34 x Flow x BODin) / (Vax x MLSS x 8.34)
Anoxic Volume = combine and re-write the above equations

$$\frac{(TKNin-NH3out-NO3out-Nassm) \times 8.34 - 0.2504 \times BODin \times 1.02^{(Tmin-20)}) \times Flow}{(0.242 \times MLSS \times 1.02^{(Tmin-20)})}$$

Anoxic Volume (Mgal)	0.033

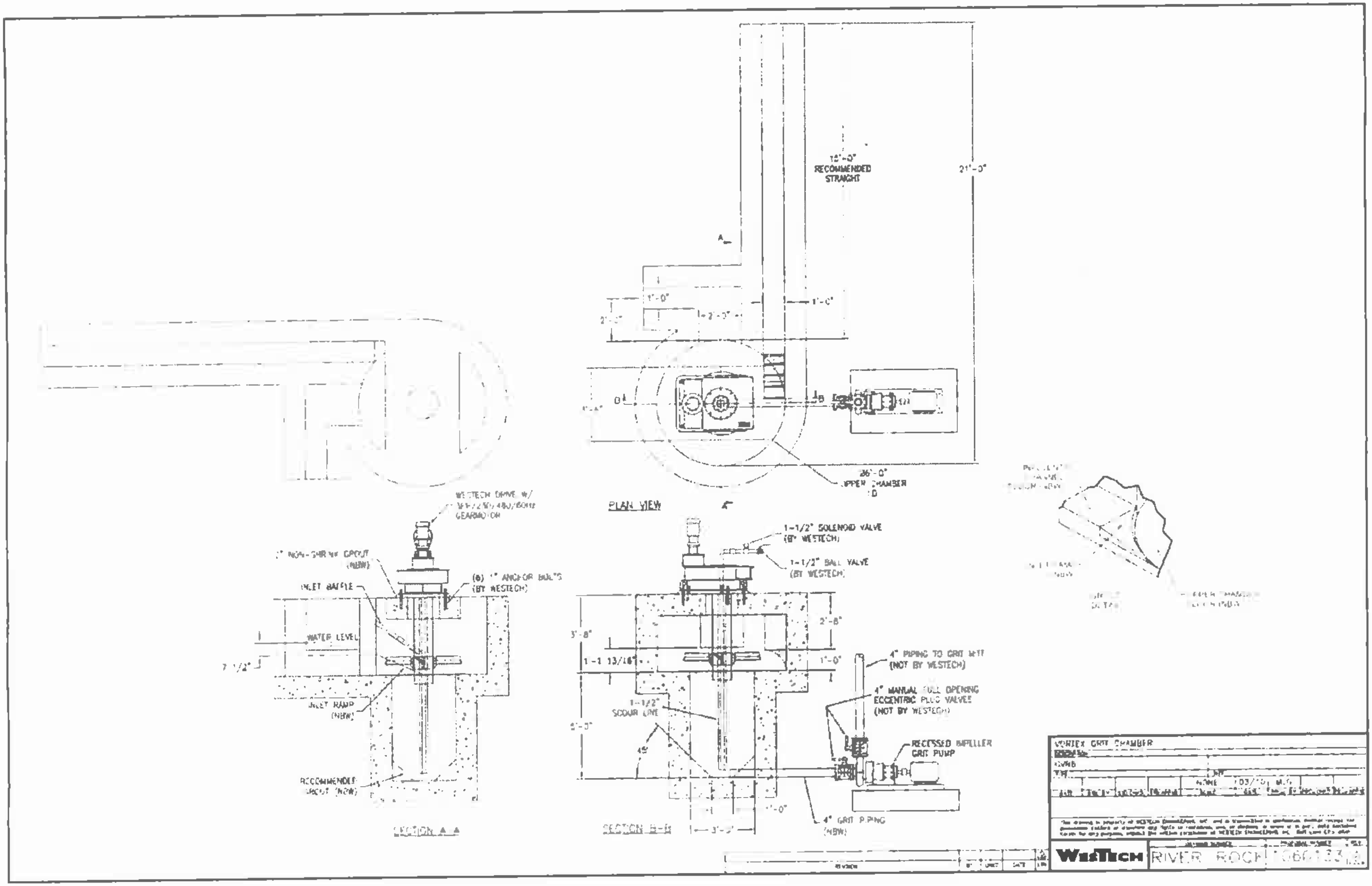
SDNR = TKNin - NH3out - ORGNout - Nassm - NO3out) x Flow / (MLSS x Vol anox)

SDNR (gNO3-N/gTSS-day)	0.043

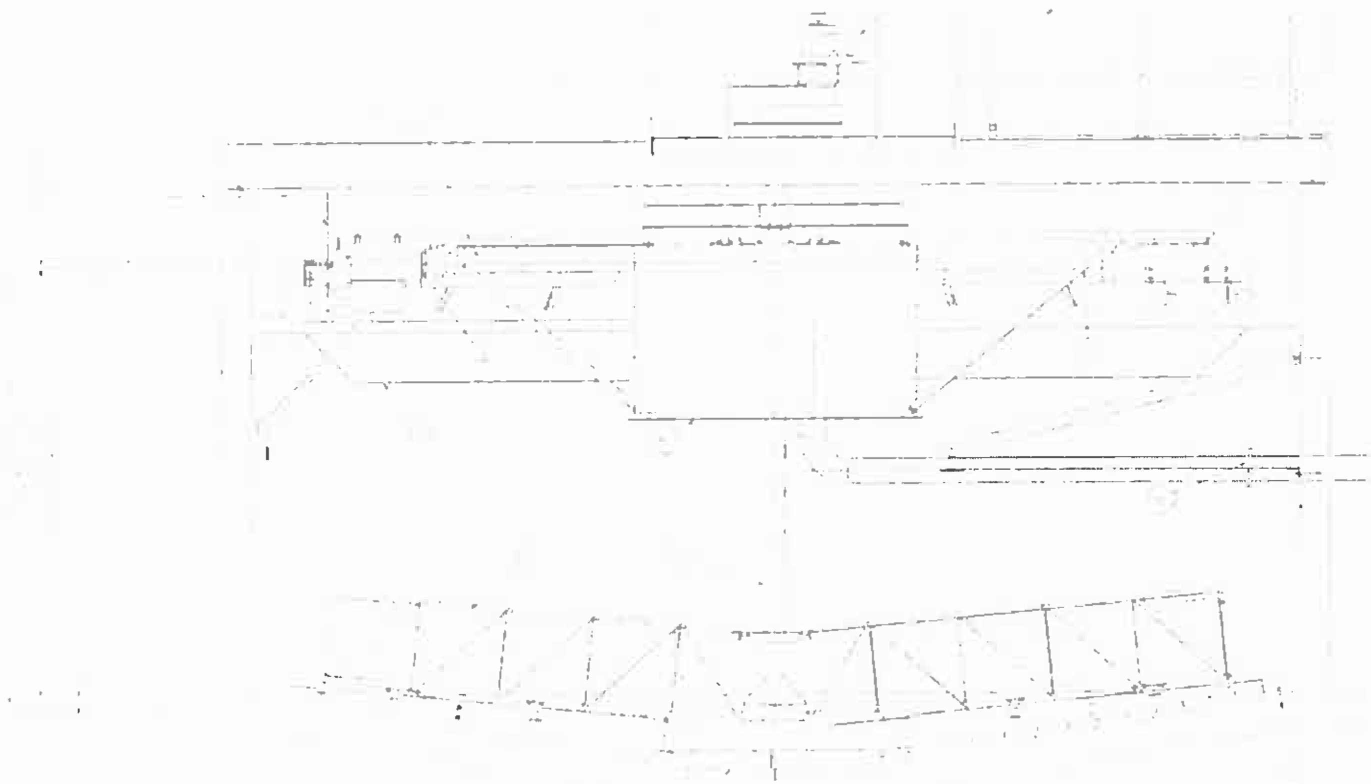
SYSTEM SUMMARY

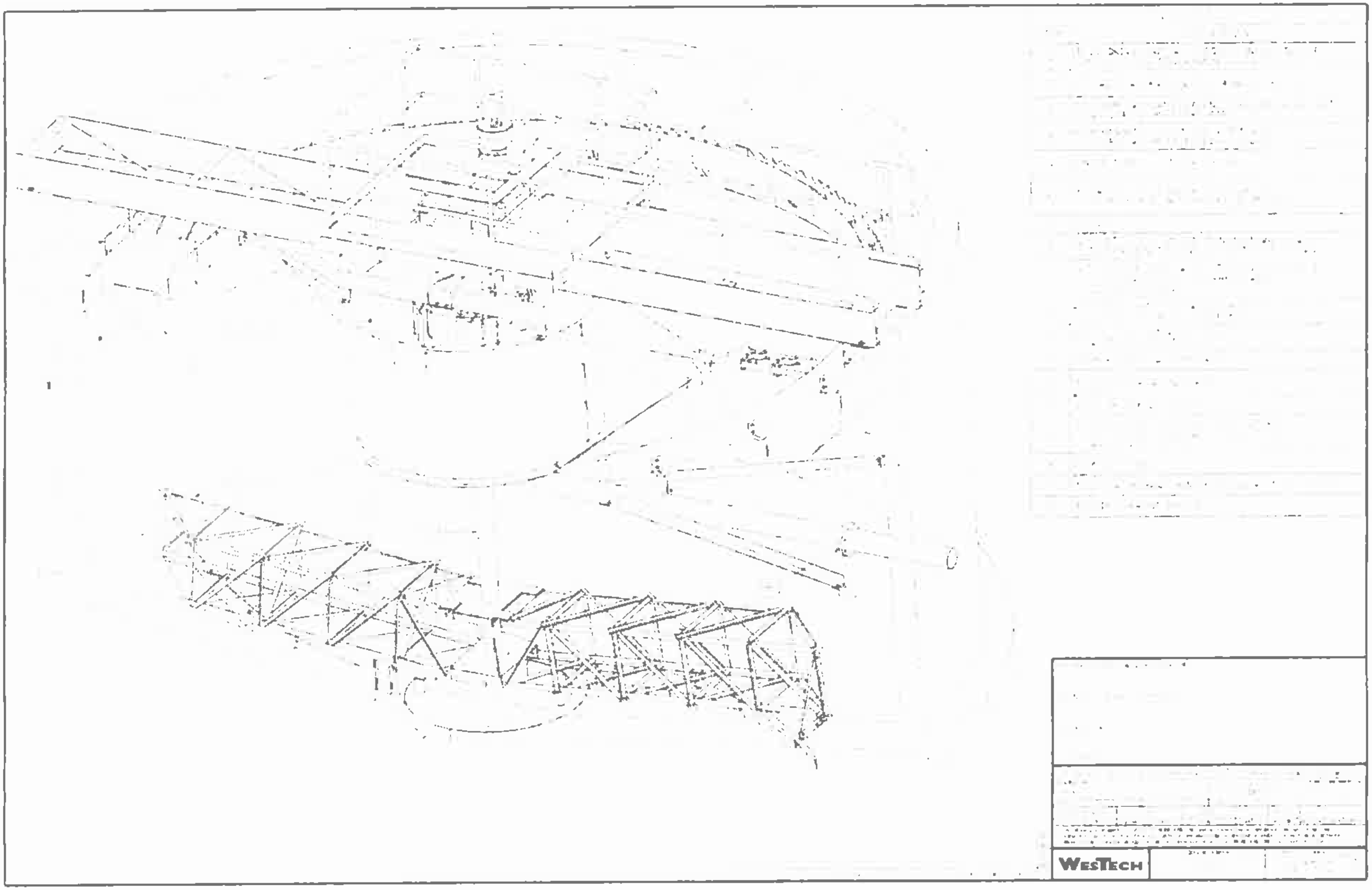
	No. Trains	[illegible]
ANOXIC ZONE		
	No. Anoxic Zones	[illegible]
	Volume per Zone (Mgal)	0.03
	No. Mixers per zone	[illegible]
	Mixer Type	[illegible]
	Mixer HP (nominal)	1.0
	Mixer HP (actual)	
AEROBIC ZONE		
	No. Aerobic Zones	[illegible]
	Volume per Zone (Mgal)	0.2745
	*No. Aerators per zone	[illegible]
	Aerator Type	[illegible]
	Aerator HP (minimum)	9.6
	Aerator HP (actual)	[illegible]

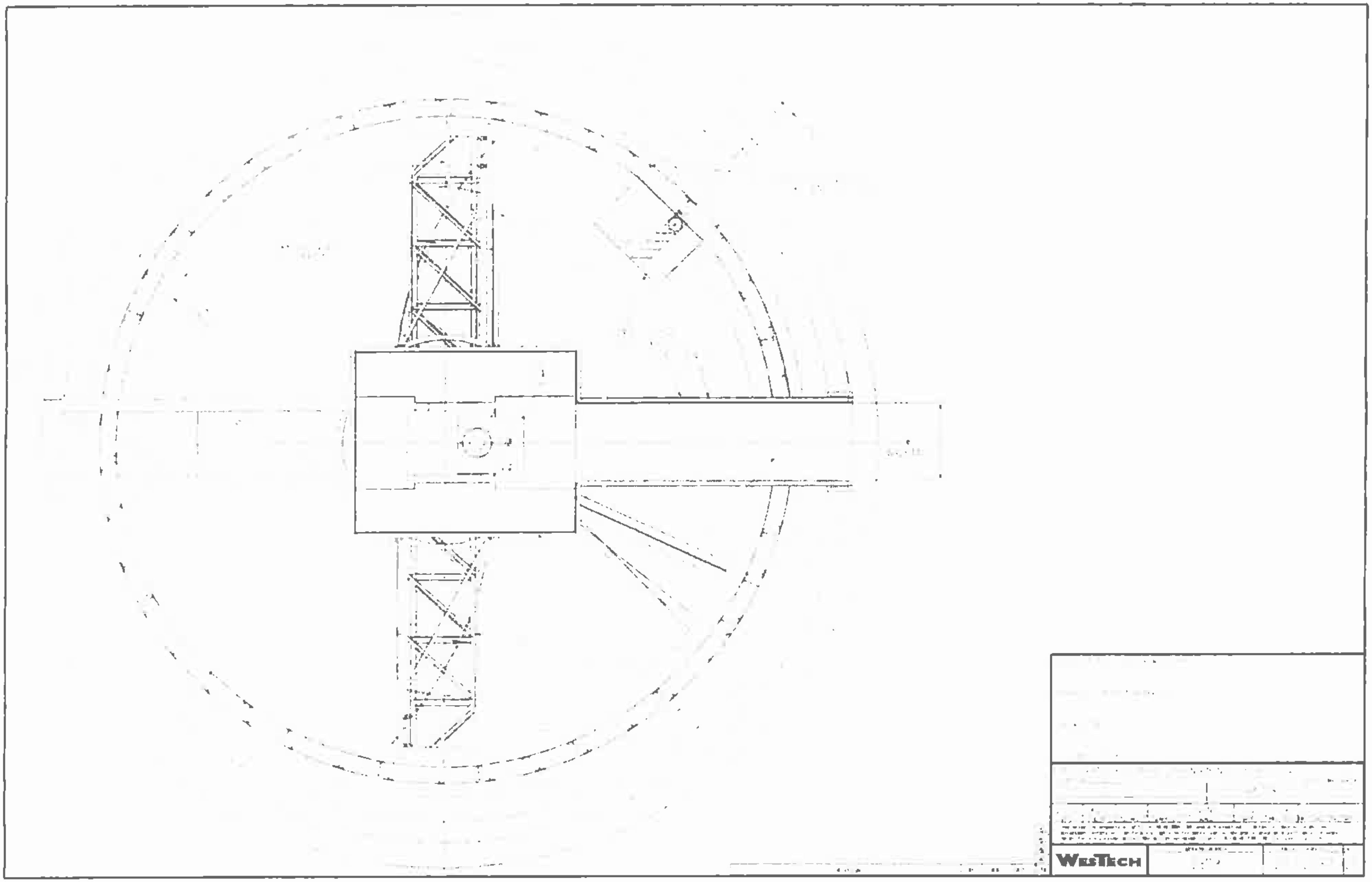
TWO (2) 25 HP SURFACE AERATORS
* ONE (1) AERATOR SERVES AS AN INSTALLED SPARE

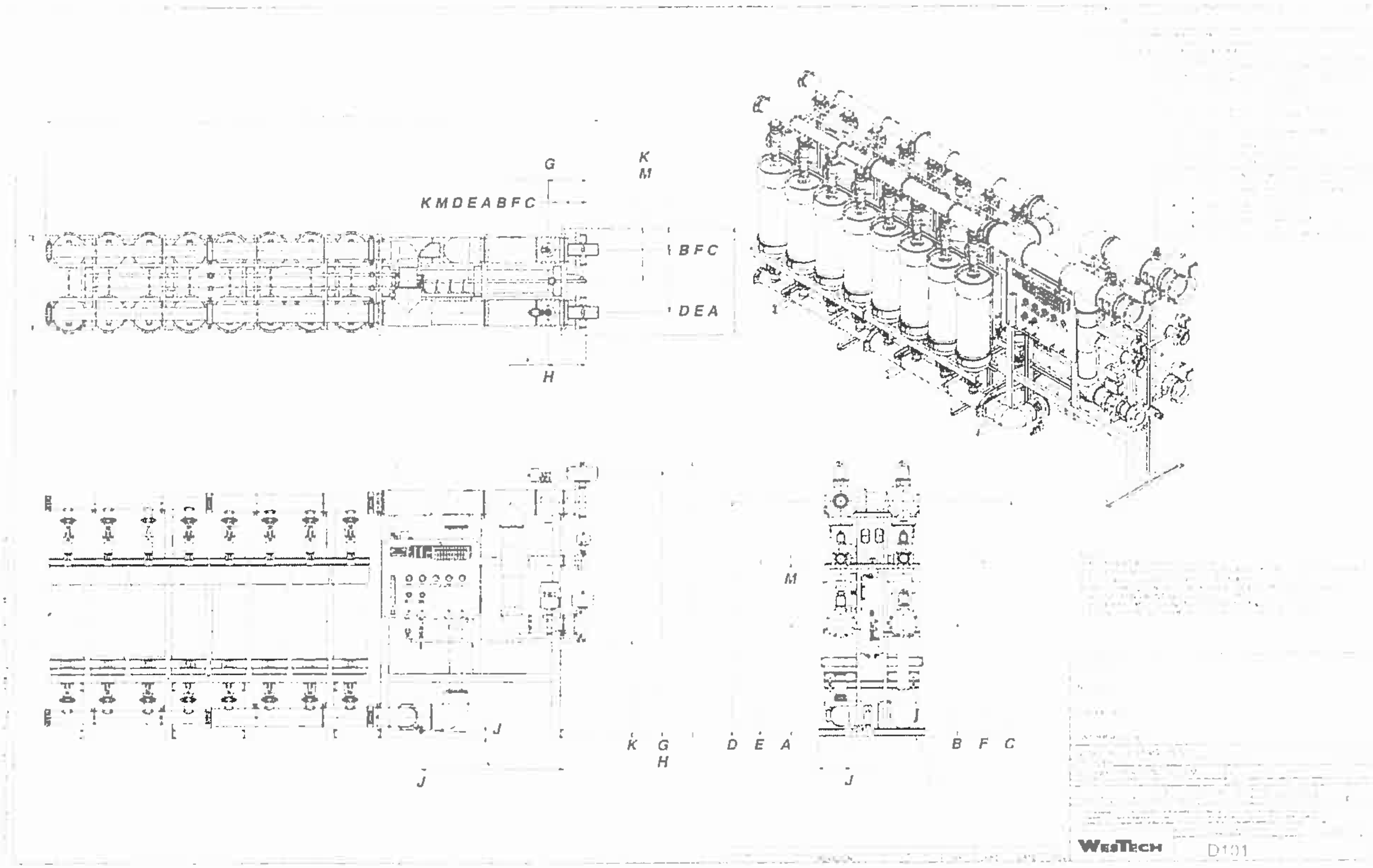


15'-0"
RECOMMENDED
STRAIGHT
21'-0"
1'-0"
2'-0"
1'-0"
PLAN VIEW
36'-0"
UPPER CHAMBER
I.D.
WESTECH DRIVE W/
GEARMOTOR
2" NON-SHRINK GROUT
(NBW)
INLET BAFFLE
(6) 1" ANCHOR BOLTS
(BY WESTECH)
WATER LEVEL
7 1/2"
INLET RAMP
(NBW)
RECOMMENDED
GROUT (NBW)
SECTION A-A
1-1/2" SOLENOID VALVE
(BY WESTECH)
1-1/2" BALL VALVE
(BY WESTECH)
3'-8"
2'-8"
1-1 13/16"
1'-0"
4" PIPING TO GRIT WELL
(NOT BY WESTECH)
4" MANUAL FULL OPENING
ECCENTRIC PLUG VALVES
(NOT BY WESTECH)
1-1/2"
SCOUR LINE
5'-0"
45°
RECESSED IMPELLER
GRIT PUMP
4" GRIT PIPING
(NBW)
1'-0"
3'-0"
SECTION B-B
VORTEX GRIT CHAMBER
NONE
WESTECH
RIVER ROCK




WesTech

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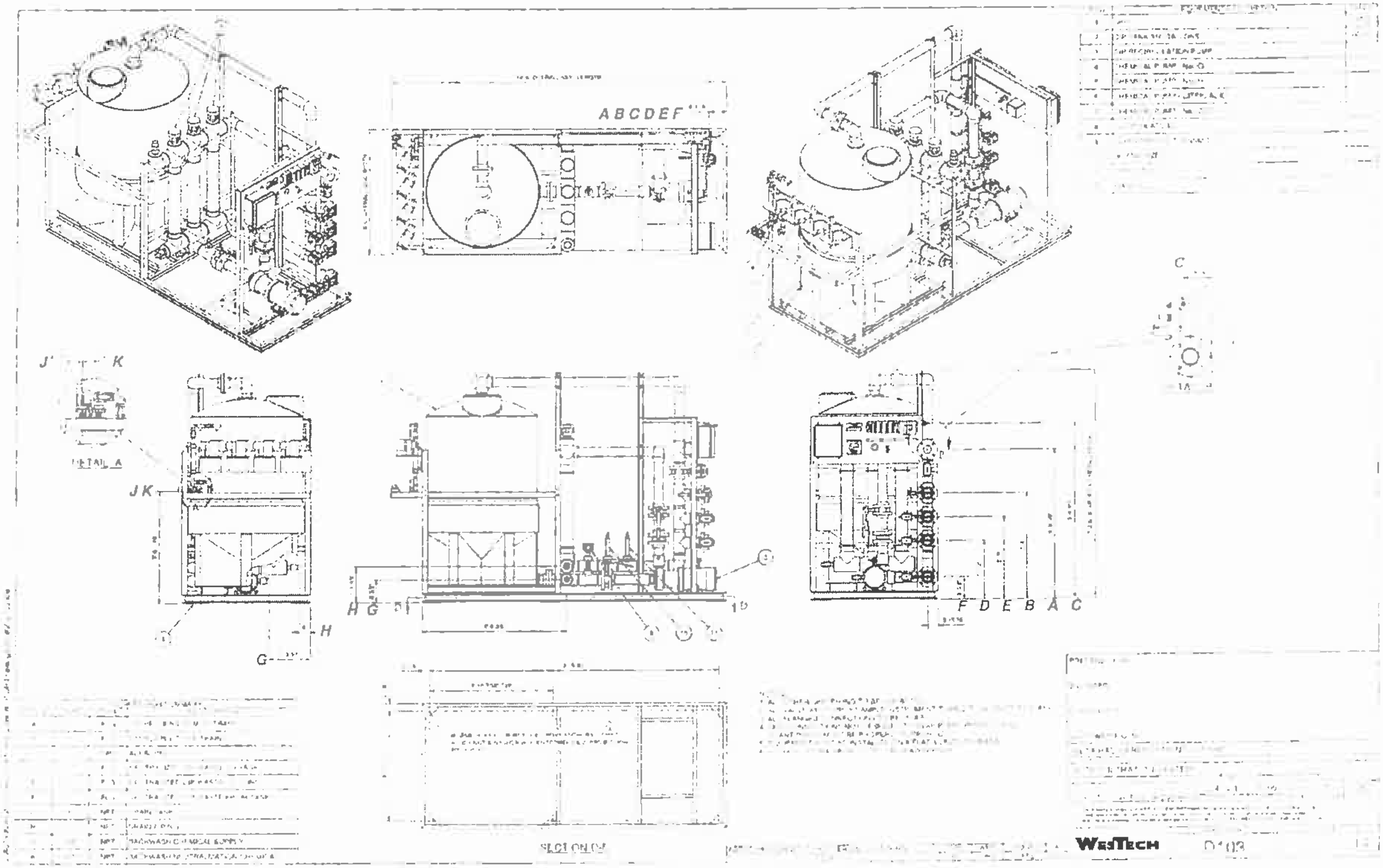
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SECTION
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BLUE WATER

Blue Water Technologies Inc

March 8, 2010

Craig Henrikson, P.E., C.S.P.
Morrison-Maierle, Inc.
1 Engineering Place
Helena, Montana 59602

Subject: **Rock Creek, MT (budgetary estimate)**
< 6.0 mg/L NOx-N
Above Ground Fiberglass Filters
Proposal #100055-1

Dear Mr. Henrikson:

Blue Water Technologies, Inc. (Blue Water) appreciates the opportunity to provide this proposal to you for the above referenced project. Blue Water's core technology is the patent-pending Blue PRO® process, described in scientific literature as "Reactive Filtration". Critical and unique concepts in the reactive filtration patent are the "reactive filter media" and the "continuous regeneration" of that media. Reactive filter media maximizes the efficiency of the filter by promoting adsorption in combination with co-precipitation. Continuously regenerating the reactive filter media is accomplished by using a moving bed filter to constantly grind the surface of the media, creating fresh sites for adsorption. For this reason, no backwashing or exchange of media is necessary, which reduces operations and maintenance hassle and cost.

Nitrogen (N) and phosphorus (P) are both considered nutrients of concern in impacted watersheds. Their potentially harmful effects on environmental quality have let to increased regulatory pressure worldwide. The Blue PRO® technology can be configured to remove nitrogen and phosphorus simultaneously, meeting the most stringent permit limits for each.

The Blue PRO® process was originally designed for phosphorus removal. The process may be adjusted to accomplish denitrification as well (Blue NITE™). Adjustments include the addition of a carbon source, such as methanol, to stimulate denitrifying organisms. There also may be operational parameter changes, such as decreased loading rate. Nitrogen removal is accomplished in a series of steps. Each step is designed to change the form of nitrogen until it finally can be released as N_2, nitrogen gas. Blue NITE™ accomplishes the final stage of this series, denitrification. This step requires that the nitrogen in the feed to the system is in the form of nitrate.

Blue Water offers a broad platform of water treatment technology products, from primary wastewater treatment to advanced effluent polishing steps to environmental remediation processes. Our team strives to meet customers' needs cost-effectively, considering both capital expense and ongoing operations and maintenance costs. Additionally, we keep an eye on the future by looking for sustainability in our technologies, including environmentally-friendly materials and energy conservation.

1.0 Equipment Features and Benefits:

- Unparalleled treatment efficiencies to ultra low levels.

- Total nitrogen reductions to <3 mg/l
- No back flushing or system cycling required, continuous operation. Reject solids can be recycled to the head of the plant and, thus, do not require separate disposal or processing.
- Available in coated carbon steel, stainless steel, fiberglass, or in-ground concrete.
- Advanced washbox design to maximize performance.
- Patented recess chamber minimizes media bridging.
- Dual compressor configuration to minimize downtime and maximize compressor life.
- Safety-minded design focused on easy operator access to filter and filter operation.

1.1 System Design:

The Centra-flo™ process is depicted in Figure 1. Influent wastewater enters at the left of the diagram. A commonly used chemical carbon source (typically methanol) is added to the wastewater in the rapid conditioning zone. This zone allows the proper contact time for the mixture to be optimized for the biological process. The mixture enters the moving bed sand filter through distribution arms at the bottom of the sand bed, and then flows upward through the sand bed. During this stage of the process, the influent stream is filtered by the denitrifying bacteria which form a fixed film on the media converting nitrate to atmospheric nitrogen. After filtration, clean water discharges from the top of the filter on the right. In the filter the sand moves slowly from top to bottom, then returns to the top of the filter via an airlift located in the central assembly. A washbox at the top of the filter separates sand from waste particles. The sand falls back to the top of the bed. The residuals, including excess biomass, TSS, and other contaminants, exit in a separate line and can be routed to the plant's existing solids handling system or recycled to another place in the plant.

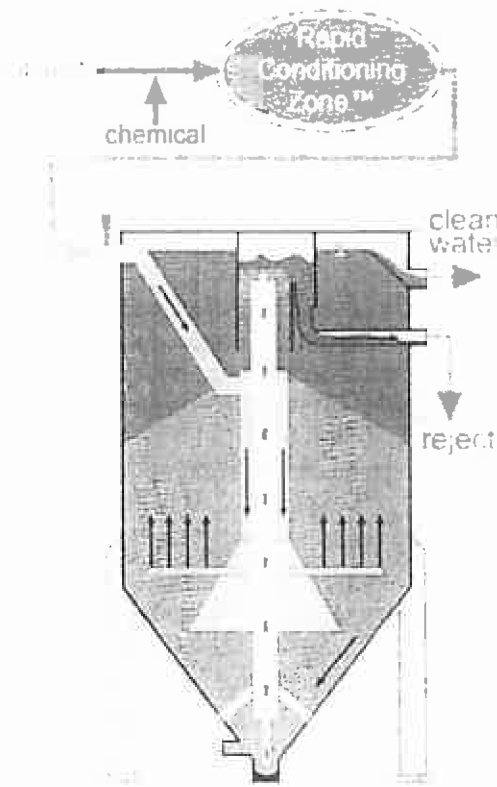

Figure 1

The Centra-flo™ technology provides flexibility to a wastewater treatment plant. The modular system of filters is installed as tertiary treatment, which is located near the end of the plant's treatment train. The Centra-flo™ process has additional advantages beyond denitrification, including suspended solids and turbidity removal.

The Blue NITE™ technology provides flexibility to a wastewater treatment plant. The modular system of filters is installed as tertiary treatment, which is located near the end of the plant's treatment train. They may be configured in parallel or series. Depending on the influent concentration and the targeted permit level, a plant may require one pass through Blue NITE™ or may run the filters in series to attain even lower concentrations.

2.0 Basis of Design:

	Filter Influent*	Effluent*
Average Day Flow	0.374 MGD (260 gpm)	
Peak Month Flow	0.45 MGD (313 gpm)	
Total Suspended Solids (TSS)	< 20 mg/L	< 5.0 mg/L
NOx-N	< 30.0 mg/L	< 6.0 mg/L
DO	< 1.0 mg/L	
pH	5.5 – 8.5	
Temp	> 11°C	
Reject Rate	10-12 gpm/washbox	

* Arithmetic average.

3.0 Proposed Treatment System:

Blue Water is pleased to provide the Blue NITE™ filter system with a total of four (4) Blue NITE™ CF-64UF80" filters in a single pass configuration with associated ancillary equipment to treat the above referenced waste stream. The overall dimensions of each filter are approximately 9' dia x 18' H with a total system footprint (except compressor) of approximately 22' W x 28' L x 18' H above ground (compressors can be mounted where convenient).

All Filters Online:
Combined filter area: 256 square feet
Average loading rate: 1.2 gpm/square feet (including reject)
Peak loading rate: 1.4 gpm/square feet (including reject)
Max loading rate: 3.5 gpm/square feet (50% NOx-N removal)
Filter bed depth: 80 inches
Reject rate: 12 gpm per washbox (48 gpm total)

Redundant Filter Offline:
Combined filter area: 192 square feet
Average loading rate: 1.5 gpm/square feet (including reject)
Peak loading rate: 1.8 gpm/square feet (including reject)
Filter bed depth: 80 inches
Reject rate: 12 gpm per washbox (36 gpm total)

Notes:

- *Loading rates above assumes flow equalization through lagoon system.*
- *60" of head above the water surface elevation of the filter system is required.*

The proposed Blue NITE™ filters system, will be complete and will include the following.

(4) Model CF256UF80" (fiberglass) Blue NITE™ "Reactive Filters"
(4) Washboxes (fiberglass)
(4) Airlift (Type schedule 80 PVC)
(4) Central feed chamber (fiberglass)
(4) Filter covers
(1) Flow splitting box and supports
(1) Air control panels (NEMA 4 enclosure)
(1) Chemical feed system with one redundant pump (non-explosive carbon source)
(1) Air compressor and air system with dryer
(1) Filter control panel (NEMA 4)
(1) Lot stairwayand walkway
(1) Lot filter media delivered in super sac bags

4.0 Equipment Price and Included Field Engineering:

Blue Water budgetary price of components and service for this project is ....**$350,000.00.**

Notes:

- *The above pricing is based on using a non-explosive carbon source. If methanol (explosive) is preferred as a carbon source, there will be a $25,000 adder to comply with chemical feed system standards (NEMA 7).*

Equipment is **F.O.B. factory**. The price does not include any import, sales, use, excise or similar taxes, fees, permits, etc. This proposal is valid for a period of sixty (60) days unless extended in writing by Blue Water.

Proposed Terms:

25% (net 30 days) with purchase order
25% (net 30 days) with approval of drawings and submittals
45% (net 30 days) with delivery of the equipment to the jobsite
5% (net 30 days) payable upon startup not to exceed 45 days from delivery

The price includes an allowance for factory trained **Manufacturer's Services** as noted below.

- Up to nine (9) – eight (8) hour days in up to three (3) trips for start-up and training.

Additional time, if requested by the Owner, shall be invoiced at prevailing rates. Expenses associated with any additional field engineering will be invoiced at actual cost plus 10%.

4.1 Estimated Operating Costs:

Carbon source @ $1.80/gal	$35,000 per year
Power cost at ($0.11 per KWH)	$4,400 per year
Operations ($50/Man Hour)	$3,600 per year

Electrical service 460 VAC/3O/60 Hz 20 Amp

5.0 Estimated Submittal and Shipping Dates:

Blue Water is prepared to ship equipment in approximately twelve (12) to eighteen (18) weeks from the receipt of approved drawings, submittals, and a signed release to proceed. Submittals to be issued within six (6) weeks of countersigned purchase order. While drawings are issued for approval, they are intended for informational purposes only. The drawings will remain Blue Water property and may not be used by others for fabrication.

6.0 Warranty:

Equipment will be warranted against manufacturer's defects in accordance with Blue Water's standard warranty for twelve (12) months from start-up or fourteen (14) months from date of shipment, whichever comes first, when operated at stated conditions and according to the instructions in Blue Water's operations and maintenance manual.

7.0 Work by "Others":

The following items are not included in this **Scope of Supply**, but may be required for these systems:

- Preparation of structural engineering drawings for all concrete work.
- Concrete material and its placement.
- Site preparation, unloading, placement and installation of equipment. Installation of all Blue Water supplied equipment.
- Ancillary tanks (chemical feed tanks, flow equalization tanks, etc.).
- Buildings (if required) and building utilities and HVAC.
- Supply and connection of electrical service to Blue Water supplied control panel. Supply, installation, and connection of interconnecting circuits between Blue Water supplied panels and auxiliary panels and/or instrumentation and/or motorized devices.
- Supply and installation of required drain piping, influent piping, effluent piping, reject piping, all associated valves, required pipe support, and appurtenances to and from the connection point on Blue Water supplied equipment.
- Supply and installation of interconnecting vent, drain, and airlines and their associated valves and appurtenances.
- Reject disposal, handling and/or processing.
- Supply and installation of insulation and heat tracing of any piping or tubing (if required).
- Chemicals required for operation.
- Filter influent flow signal to filter control panel.

Thank you for your consideration on this project. If you have questions or need more information, please feel free or me at (208) 209-0391.

Sincerely,

Mark Lopp
Regional Sales Manager

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PROPOSAL

FOR

RIVER ROCK

MONTANA

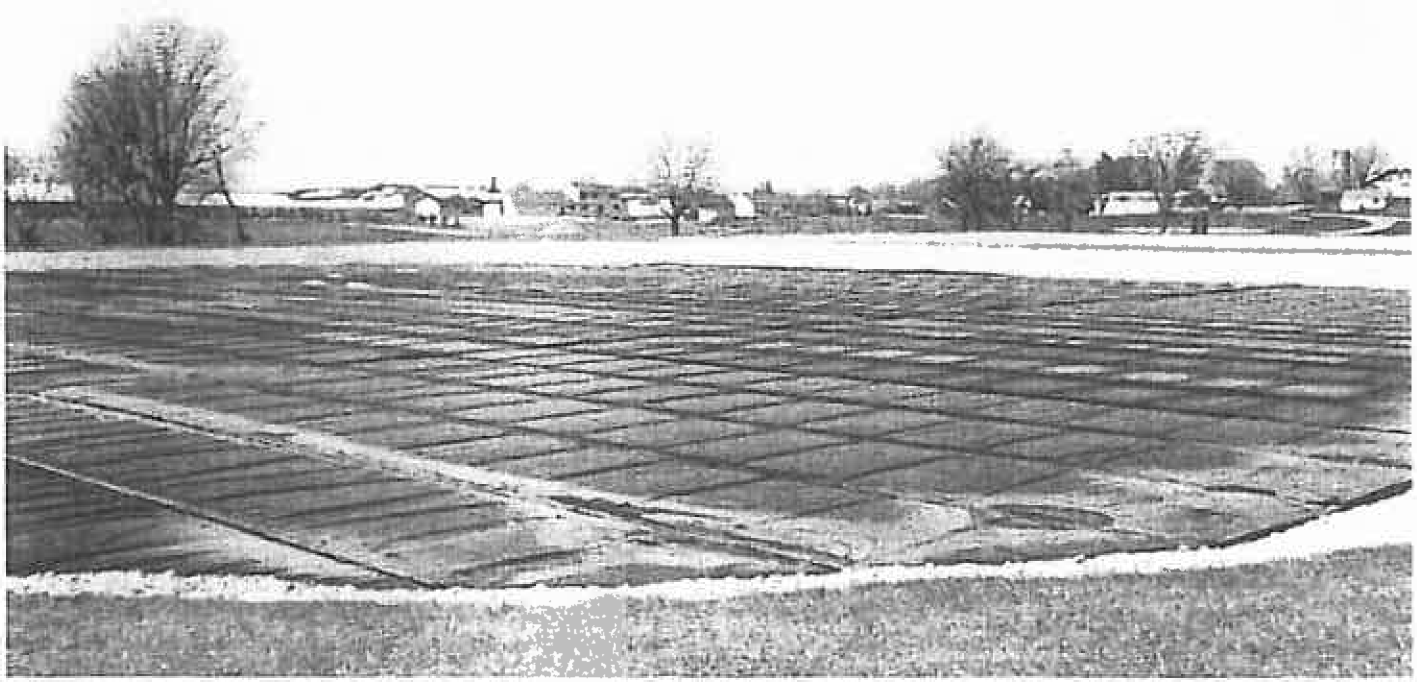
LEMNA
TECHNOLOGIES, INC.
Innovative Wastewater Solutions

PREPARED FOR: CRAIG HENRIKSON, P.E., C.S.P.
MORRISON-MAIELRE, INC.
HELENA, MONTANA

PREPARED BY: JAMES A. MARTIN
REGIONAL SALES MANAGER
LEMNA TECHNOLOGIES, INC.

Proposal Number: 1021
Revision Number: 1
March 24, 2010

LEMTEC™ BIOLOGICAL TREATMENT PROCESS



PROPOSAL

Table of Contents

LEMNA TECHNOLOGIES, INC.
2445 Park Avenue • Minneapolis, MN 55404 • Phone: 612-253-2000 • Fax: 612-253-2003

I. INTRODUCTION

The ***LemTec™ Biological Treatment System***, by Lemna Technologies, Inc., provides the most cost effective solution for most wastewater problems. This innovative, patented process provides treatment in simple, operator-friendly ponds that require little system maintenance, yet deliver effluent quality comparable to sophisticated activated sludge systems.

II. BACKGROUND

This proposal has been prepared for Mr. Craig Henrikson of Morrison-Maierle, who is currently evaluating treatment alternatives for River Rock, Montana. Mr. Henrikson is interested in products/technologies capable of treating higher flows to meet more stringent effluent limits in an efficient and cost effective manner. These criteria have been identified as the basic requirements/standards by which all proposed technologies will be evaluated and ultimately selected.

The existing facility in River Rock has two lagoons that are utilized for the proposed design.

The LemTec™ Biological Treatment System proposed here, achieves the basic requirements as defined by Mr. Henrikson and provides a number of advantages to the end user which are unmatched by alternative technologies.

III. LEMNA DESIGN

See attached design report (Section IX).

IV. PROJECT SUPPLY SCOPE

	Lemna Supply	Others Supply
A Engineering/Technical Services		
1 Lemna System Design Recommendations	X	
2. Lemna System Equipment Details	X	
3. Lemna System Plans and Specifications	X	
4. Regulatory Technical Support	X	
5. Civil Design		X
6. Electrical Design		X
7. Mechanical Design		X
8. Other Design Services (if required)		X
B. Civil Works		
1. Pond De-Sludging*		X
2. Site Work/Improvements		X
3. Concrete Structures		X
4. Yard Piping (out of basin)		X
5. Electrical Service to Site		X
6. Interconnect Wiring (Equipment to Equipment/ Remote Disconnect/MCCs/Control Panels)		X
7. Site Survey (required for cover supply)	X	
C. Equipment Supply		
1. LemTec™ Cover System	X	
2. Lemna Baffle System	X	
3. Lemna Aeration System	X	
4. Lemna Polishing Reactor	X	
5. Screening		X
6. Grit Removal System (if required)		X
7. Disinfection System (if required)		X
8. Other Equipment (if required)		X
D. Installation/Start-Up/Training		
1. Equipment Off-Loading and Storage		X
2. Equipment Installation		X
3. Equipment Installation Supervision (Lemna Equip.)	X	
4. Process Start-Up/Training (Lemna Process)	X	
5. Ongoing Technical Support	X	
E. Miscellaneous		
1. Bonding Fees		X
2. Sales Taxes		X
3. Permits		X
4. Other Construction/Upgrade Items		X

* Removal of pre-existing sludge is required if sludge depths exceed 6".

V. LEMNA PRICING

Lemna Pricing	
Equipment/Services	$902,000
Equipment Freight (estimate)	$ 68,000
Total Proposed Price	**$970,000**

Proposed price is based on available information and is valid for 60 days. Prices are in US funds and do not include any applicable taxes. All sales are subject to Lemna Technologies' standard terms and conditions. Proposed price subject to change based on changes in final design and final scope at time of bid or based on size changes at time of final survey.

Typical equipment lead time is 6-12 weeks after approval of final submittals. Equipment lead time is subject to change based on size of project, complexity of design, customer requirements and shop-loading at time of order.

VI. OPERATIONS AND MAINTENANCE

Lemna systems are regarded as the most operator friendly systems in the industry.

Typical routine maintenance required for Lemna supplied equipment include:

A. Lemna Baffle System: Periodic inspection for hydraulic short-circuiting required.

B. Lemna Aeration System: Routine maintenance of blowers and diffusers required.

C. Lemna Polishing Reactor System: Periodic (annual) air scouring of LPR modules required.

D. Sludge Handling: Periodic de-sludging of settling pond is required.

VII. LIMITED WARRANTY

All Lemna supplied components are warranted against manufacturer's defects for a period of twelve months. This warranty does not cover wear or damage caused by improper installation, operation or maintenance. In the event of a manufacturer's defect, Lemna will repair or replace the damaged component.

A process warranty based on the parameters in the attached design report is included as part of this proposal. This process warranty is contingent upon the full supply by Lemna Technologies of all equipment detailed in this design report.

VIII. LEMTEC™ ADVANTAGE

The LemTec™ Biological Treatment Process offers the following advantages over other pond-based or activated sludge systems.

A. Low Capital Costs: The LBTP most often represents the lowest capital cost option, within certain size and effluent ranges, of any other technology for new construction or upgrades.

B. Low Operational Cost: Due to the absence of sophisticated systems. equipment and daily sludge disposal. the LBTP represents the lowest operational cost option on the market.

C. High Quality Effluent: The LBTP is a proven technology capable of achieving the most stringent effluent standards (comparable to activated sludge).

D. Ease Of Operation: Since there are no complex operating parameters to monitor and adjust and no complicated sludge processing, lower skilled operators are sufficient for effective operations.

E. Reduced Footprint: Due to the accelerated nature of the LBTP, the area required for effective treatment is dramatically reduced. This results in a reduction of land use, basin sizes and overall capital cost.

F. Covered System Advantages: The covered LBTP offers many advantages over other systems including accelerated treatment kinetics due to the maintenance of higher temperature, the ability to nitrify and reduce ammonia year-round, algae reduction, evaporation control and odor control.

G. Reduced Sludge Handling: Since all LBTP systems are designed to accommodate the accumulated sludge, actual sludge disposal is only necessary every five to twelve years (actual time depending upon client requirements). Compared to other systems where daily sludge handling is required, the LBTP is easier and less costly to operate.

H. Flexibility: The LBTP offers a competitive solution for most municipal, industrial, new construction or retrofit applications. The reliability and stability of the process allows for hydraulic loading variations, temperature fluctuations and organic surges more effectively than other technologies.

I. Expandability: Often times, existing LBTP can be expanded in the future to allow for additional population growth (increased flow) or stricter effluent standards with a minimal amount of capital cost. Other systems typically cannot expand without major capital outlays.

LEMTEC™ BIOLOGICAL TREATMENT PROCESS

PRELIMINARY DESIGN REPORT
FOR

RIVER ROCK, MONTANA

Prepared For: Craig Henrikson, P.E., C.S.P.
Morrison-Maierle, Inc.
Helena, Montana

Prepared By: Dorothy Paszek
Design Engineer
Lemna Technologies, Inc.

Date: March 24, 2010