FEI ENGINEERS

Preliminary Engineering Report for the USDA RUS Water and Waste Disposal Program

May 2017

THE VILLAGE OF Taos Ski Valley

Village of Taos Ski Valley

Wastewater Treatment Plant Expansion

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Preliminary Engineering Report for the USDA RUS Water and Waste Disposal Program

MAY 2017

VILLAGE OF TAOS SKI VALLEY

TAOS, NEW MEXICO

I hereby certify that this document was prepared by me or under my direct supervision, and that I am a duly registered Engineer under the laws of the State of New Mexico.

PATRICK J. O'BRIEN
NEW MEXICO
17575
PROFESSIONAL ENGINEER
5/30/17

Prepared by:

FEI ENGINEERS

1485 Florida Road #206C
Durango, CO 81301
Ph: 970-247-0724

FEI PROJECT NO.: VTSV-16-0220

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1. PROJECT PLANNING

This Preliminary Engineering Report (PER) was developed in accordance with the United States Department of Agriculture (USDA) Rural Utilities Service (RUS) Bulletin 1780-2.

The PER was prepared for the proposed facility upgrade and increase the existing wastewater treatment facility (WWTF) hydraulic capacity to 0.31 million gallons per day (MGD). The Village of Taos Ski Valley (Village) owns and has operated the existing wastewater treatment facility since acquiring the facility in 2001 after dissolving the Twining Water and Sanitation District.

The existing facility was upgraded in 2005, resulting in a permitted capacity of 0.2 MGD; however, the plant capacity was de-rated to 0.167 MGD in the 2011 permit renewal. This upgrade modified the existing conventional activated sludge process to add secondary treatment capacity and biologic nutrient removal (BNR) capacity. The facility utilizes an integrated fixed film (IFAS) activated sludge process along with a Modified Ludzack-Ettinger (MLE) internal recycle for biological treatment and removal of organics and nitrogen from the wastewater. However, the facilities ability to meet the currently-permitted strict nitrogen effluent discharge standards and the projected future more-stringent nitrogen and phosphorus limits is challenged due to cold influent wastewater temperatures, highly variable flows and loadings, and treatment equipment/unit process capacity limitations.

1.1. LOCATION

The Village of Taos Ski Valley (Village) is located in Taos County, in the north central part of New Mexico. It is located approximately 20 miles northeast of Taos, and approximately 90 miles northeast of Santa Fe. The WWTF is located at 38 Ocean Boulevard.

The existing service area includes both residential and commercial activities, and minimal industrial activities. The service area is concentrated to the east of the WWTF, with the main branch contributing from the southeast.

The project planning area is the existing service area, comprised of the Base Village, Intermediate Zone, and Kachina Village. Amizette is another area within the incorporated area of the Village; it is anticipated that Amizette will be added to the WWTF service area following installation of a sewer collection system at some point in the future. At present, the Amizette wastewater flows are disposed of using holding vaults and individual septic systems.

Figure 1 shown on the following page is the existing service areas and Amizette.

The topography of the existing service area is a high mountain valley; a combination of steep grades and gently sloping terrain. Most of the collection system conveys wastewater to the existing WWTF by gravity, there is 1 lift station in the collection system. The collection system will remain intact, except for minor improvements adjacent to the influent to the headworks building.

The WWTF is located on a 4.89-acre parcel of U.S. Forest Service (Forest Service) land that is currently under review for a transfer in ownership to the Village. This land has been developed as a WWTF since prior to 1982. The WWTF is located approximately 140 feet north of the Rio Hondo within Section 4 of Township 27 North, Range 14 East. The WWTF is bordered to the north and west by State Highway 150 (paved); to the east by a Taos Ski Valley, Inc. vehicle maintenance facility; and to the south by Ocean Boulevard (gravel) and the Rio Hondo.

SCALE: 1"=1200'

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VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
CURRENT AND FUTURE SERVICE AREA

FIGURE No. 1

W:\VTSV-S14-0132 - WWTP\PER FIGURES\FIGURE 1 LAST SAVED:1/14/2016 4:41 PM LAST PLOTTED: 1/20/2016 4:40 PM BY: KEITH

1.2. ENVIRONMENTAL RESOURCES PRESENT

The Environmental Report, prepared by SE Group, indicates that there are no known archeological or historic properties; threatened and endangered species and habitat are not present; construction and operation of the WWTF is not expected to impact migratory bird habitat; the following summarized descriptions are fully defined in the Environmental Report.

1.2.1. CLIMATE

The climate of the Village area is typical of northern New Mexico high mountain terrain; characteristic features include low relative humidity, abundant sunshine, seasonal rain and snow, moderate wind movement, and a large daily and seasonal range in temperatures.

1.2.2. WETLANDS

A wetland field survey was completed for the Project Area on September 29, 2015 (RME, 2015a). A total of 0.027 acres of wetlands associated with the Rio Hondo were delineated in the southeastern and southwestern corners of the Project Area; however, these areas are located outside of the Area of Potential Effects (APE), on the opposite side of Ocean Boulevard. The U.S. Army Corps of Engineers (USACE) was provided with details of the Proposed Project and invited to comment; no response was received. As no wetlands are present within the APE and the APE is separated from the wetlands by an existing road, impacts to wetlands by the project are not anticipated.

1.2.3. OTHER ENVIRONMENTAL IMPACT

The proposed site for the upgrades are adjacent to, and integral with, the existing WWTF. The footprint of the proposed upgrade is minor, and will have a minimal environmental impact.

1.2.4. 100-YEAR & 500-YEAR FLOODPLAINS

The floodplain data shows that the existing conditions for the WWTF are outside both the 100-year and 500-year floodplain as indicated in the Environmental Report.

1.3. POPULATION TRENDS

1.3.1. POPULATION

The Village of Taos Ski Valley was incorporated in 1996 and has participated in two U.S. Censuses for the years 2000 and 2010.

From 2000 to 2010, the population increased 23% from 59 to 69 permanent residents (Source: U.S. Census Bureau); however, current data indicates that the permanent population will remain flat, while the seasonal winter population is expected to increase substantially as new rental housing and lodging units become available due to planned development.

Table 1. Census Data

Population of Taos Ski Valley*	
2000	59
2010	69

*Source: U.S. Census Bureau

"Taos Ski Valley is a substantial generator of economic activity in Taos County, attracting approximately 275,000 visitors on an annual basis, and generating total economic output of 41.7million." (Source: 2nd Revised Economic Impact Analysis for: Taos Ski Valley (TSVI) Presented to: New Mexico State Board of Finance By: Doug Kennedy Advisors Date: January 7, 2014)

The treatment plant service area is expected to expand due to several currently proposed new residential developments both within the Core Village and throughout the Village boundary. The proposed wastewater treatment plant must be designed to accommodate a level of growth consistent with local population trends and anticipated land uses. The service area for the proposed plant will be designed to serve the maximum seasonal population. This design population will ensure that the plant is sized to handle potential population under a range of growth scenarios, as well as the typically high increased seasonal population from tourists and other non-permanent residents.

1.3.2. SKIER DAYS: 2006-2016

Year-after-year for the past decade, Taos Ski Valley, Inc. has seen an overall trend of increased skier days, which reflects a growing seasonal population (it is estimated that 70% of skiers stay in Taos Ski Valley, with 30% lodging in the Town of Taos). Although numbers for the 2016-2017 season are not yet available, David Norden, CEO of Taos Ski Valley, Inc., stated that the resort experienced record single-day skier numbers during Spring Break 2017. With ongoing development and infrastructure improvements to the ski area, TSVI has implemented a strategic business plan that shows numbers are expected to increase each year for the next ten to fifteen years.

Table 2. Anticipated Skier Days

Taos Ski Valley Skier Days*	
2015-2016	251,304
2014-2015	241,182
2013-2014	215,181
2012-2013	219,789
2011-2012	239,382
2010-2011	193,716
2009-2010	256,879
2008-2009	241,115
2007-2008	219,002
2006-2007	208,187

*Source: Taos Ski Valley, Inc.

1.4. COMMUNITY ENGAGEMENT

The Village has presented information concerning the ongoing WWTF planning at several Village Council meetings and will continue to provide updated information at these Monthly meetings as milestone schedule targets are developed. The Village Council meets on the second Tuesday of every month and the meetings are open to the public.

The informal scoping comment period was open on September 8, 2016, and 18 responses were received prior to January 1, 2017. Of the 18 responses, 33 percent (six comments) were submitted via email, 61 percent (eleven comments) were submitted via letter, and 5 percent (one comment) was submitted in person at the public scoping meeting.

A Stakeholder Meeting for the local acequia associations was held at the location, date, and time as indicated below:

- El Prado, NM: Quail Ridge Resort, 88 State Road 150, October 12, 2016, 11:00 a.m. to 2:00 p.m. This meeting was attended by three individuals and seven project team members.

A Public Scoping Meeting was held at the location, date, and time as indicated below:

- Taos Ski Valley, NM: The Looking Glass, TSV Resort Center, 116 Sutton Place, October 26, 2016, 6:00 p.m. to 8:00 p.m. This meeting was attended by thirty individuals and thirteen project team members.

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2. EXISTING FACILITIES

2.1. LOCATION MAP

The existing WWTF is located at the lower end of the parking lot of the ski area on land that has been leased from the U.S. Forest Service. Under terms included in the Town Site Act passed by Congress in the Spring of 2015, the parcel is being transferred from the U.S. Forest Service to the Village.

Figure 1 identifies the existing service areas and Amizette area.

2.2. HISTORY

In 2001, the Village acquired ownership and management of the WWTF from the previous entity, Twining Water and Sanitation District. Currently, the WWTF serves most of the incorporated Village area; the exception is the Amizette area. The Amizette area is at a lower elevation than the rest of the Village and is currently served by holding tanks or septic systems. If this area is served by the WWTF in the future, a lift station would be required. The WWTF effluent discharges into the Rio Hondo River, which runs west down the valley to the Rio Grande River.

An outline of the WWTF history is as follows:

- 1982 - Existing facility was expanded and upgraded. Plant capacity 95,000 gal/day.
- 1996 – Louis Bacon purchases the base-area property of the ski valley and begins to develop a master plan for the ski area and Village.
- 2000 – NPDES Permit No. NM0022101.
- 2001 - The owning and managing entity, Twining Water and Sanitation District, was dissolved and the Village of Taos Ski Valley became the owning and managing entity.
- 2004/2005 – The existing facility was again upgraded. Plant capacity 200,000 gal/day.
- 2006 – NPDES Permit No. NM0022101 supersedes and replaces previous permit. Effective April 1, 2006 to March 31, 2011.
- 2011 – Plant capacity downgraded to 167,000 gal/day.
- 2011 – Preliminary Engineering Report for Expansion/Upgrade of the WWTF prepared by McLaughlin Water Engineers, Ltd. The original PER was dated August 2011. A Supplement to the PER and letter dated August 29, 2011 were also submitted to the NMED. The NMED in a letter dated September 16, 2011 and signed by Andrea Telmo of the Construction Programs Bureau recommended approval of the PER to the NMFA.
- 2011 – A new NPDES permit is issued effective October 1, 2011 and expires on September 30, 2016.
- 2012 – The United States Forest Service (USFS) approves the Taos Ski Valley expansion plan.
- 2013- The long time Taos Ski Valley ownership family, the Blake family, sells the Ski Valley to Louis Bacon, whom already owns the base-area.
- 2014– The Village recognizes the need to re-evaluate the WWTF capacity and the ability to serve long term expansion and growth plans. FEI completes a Comprehensive Performance Evaluation of the WWTF.
- 2015 – The Village received $500,000 in loan and grant funding from the NMED Construction

Programs Bureau for WWTF planning and preliminary engineering.

- 2016 – Interim wastewater improvements are constructed to temporarily add operational flexibility.

2.3. CONDITION OF EXISTING FACILITIES

2.3.1. WASTEWATER TREATMENT PLANT – OVERVIEW

The existing WWTF is permitted to discharge 0.167 MGD of treated effluent to the Rio Hondo, under National Pollution Discharge Elimination System (NPDES) Permit Number NM0022101, located in the Rio Grande Basin (Waterbody Segment Code No 20.6.4.129). The segment is classified as Category 2 and the designated uses of this receiving water are domestic water supply, high quality cold water aquatic life, irrigation and wildlife habitat. The Rio Hondo Basin is a sub-basin of the Upper Rio Grande.

The existing facility has a design capacity of 0.167 MGD and utilizes an integrated fixed film (IFAS) activated sludge process along with an MLE internal recycle for biological treatment and removal of organics and nitrogen from the wastewater.

Refer to Appendix B for the existing treatment plant site plan and flow schematic.

The VTSV is currently in the process of developing an asset management plan/system; it is expected to take several years to complete the process.

2.3.2. UNIT PROCESS DESCRIPTIONS

The following information summarizes individual treatment system processes.

2.3.2.1. HEADWORKS

The Headworks process area includes the following processes and equipment:

A. Influent Channels,
B. Screenings Removal System,
C. Grit Removal System,
D. Flow Metering, and
E. Air Handling System.

The Headworks building consists of two levels; the upper level at grade and the lower level below grade. Influent wastewater enters the building via buried collection piping. At the main level of the building, influent is screened through a mechanical screen and grit is removed by a vortex grit chamber. Influent wastewater then flows to a Parshall Flume with flume effluent passing to a 12″ ductile iron pipe that conveys screened influent to the secondary treatment process. A summary follows:

A. Cylindrical Bar Screen:
    - Type: .... Mechanical ¼″ screen
    - Number: 1
    - Capacity: .... 1.0 MGD (Note: actual capacity reduced to 0.5 MGD due to 3″ Parshall Flume size)
    - Bypass:................ Manual ¼″ bar screen

B. Vortex Grit Removal:
- Type: .... Vortex with grit classifier
- Number: 1
- Capacity: .... 1.0 MGD

C. Headworks - Influent Flow Measurement
- Flume Type: .... 3" Parshall
- Sensor Type: .... Ultrasonic
- Capacity: .... 0.75 MGD

2.3.2.2. EQUALIZATION BASIN

A. Circular steel tank:
- Size: .... 60 feet Diameter, 12 feet deep
- Working volume: .... 220,000 gallons
- Used intermittently during high flows

B. Rectangular Concrete tank
- Size: .... 65' x 17' x 16.5' deep
- Working volume: .... 83,000 gallons

2.3.2.3. BIOLOGICAL/AERATION BASINS (IFAS / MLE)

Screened, equalized flow is combined with RAS in the Anoxic Basin 1 which then flows to the Aerobic Basins 2, 3 and 4A. The Village IFAS activated sludge process is operated as an MLE process which incorporates a recycle stream of mixed liquor from the oxic zone to the anoxic zone with the recycle flow rate varied to attain the desired denitrification. Mixed liquor suspended solids (MLSS) leaving the aerobic basins flows to Anoxic Basin 4B and then to the clarifiers. Selector pumps in Anoxic Basin 4B pump the recycle flow to Basin 1.

A. Basins – 5 total; 2 anoxic and 3 aeration

B. Basin Dimensions (15 ft)

1. Anoxic Basin 1 (Basin #1) – 15 ft x 15 ft; 25,245 gallons
    a. Preliminary effluent (screened and degritted wastewater)
    b. Return activated sludge
    c. Recycled mixed liquor
    d. Chemicals for alkalinity addition and phosphorus removal
2. Aerobic Basin 1 (Basin #2) – 15 ft x 15 ft; 25,245 gallons
    a. 65 % fill ratio IFAS media
    b. Coarse bubble diffusers
3. Aerobic Basin 2 (Basin #3) – 15 ft x 15 ft; 25,245 gallons
    a. No IFAS media
    b. Coarse bubble diffusers

4. Aerobic Basin 3 (Basin #4) – 15ft x 10ft; 16,830 gallons
    a. DO depletion zone
5. Anoxic Basin 2 (Basin #5) – 15ft x 4ft; 6,732 gallons
    a. Final denitrification zone and mixed liquor return pump suction

2.3.2.4. CLARIFIERS

The secondary clarifiers are each 15-foot diameter steel tanks with an 11-foot side water depth and inboard effluent troughs and v-notch weirs. The clarifiers are each fitted with a circular sludge collection mechanism. Due to the current poor sludge settling characteristics, the clarifiers are limited in the solids flux that they can handle and operations staff indicate that clarifier bulking occurs at peak period flows of approximately 0.120 MGD.

A. Number of clarifiers: 2
B. I.D: .... 15′-0″
C. Side Water Depth: .... 12′-0″

2.3.2.5. TERTIARY FILTRATION

Two (2), 4-foot diameter multimedia pressure vessels, piped in parallel, are used to filter the clarified effluent. Clarified effluent is typically in the range of 3 mg/l TSS. Two (2), 12 HP submersible pumps take suction from the filter wet well and convey through the pressure filters and the UV disinfection reactors.

A. Number of Filters: .... 2 pressure filters
    1. Dimension:.......................... 6′-10″ ID
    2. Design flux rate: .... 4 gpm/sq.ft
    3. Capacity: ....400,000 gpd, ea
B. Number feed pumps: ....2 pumps
    1. Capacity: .... 600 gpm, ea
    2. Design head:.......................... 29 feet

2.3.2.6. UV DISINFECTION

Secondary clarifier effluent is disinfected using a low pressure - high intensity ultraviolet (UV) system with two pressurized reactors operated in series.

A. Number of Reactors: .. 2 pressure vessel reactors; retrofitted with new bulbs, ballasts, wiring, and power supply in 2015.
B. Capacity: .... 300 gpm

2.3.2.7. WASTE SLUDGE

A. WAS Pump
    1. Model:1- Seepex progressive cavity pump
    2. Installed: .... Fall 2015
    3. Capacity: .... 20 gpm

B. Sludge Holding tank

1. Dimension:.... 2, 20 feet diameter tank
2. Capacity: .... 52,000 gallons each

C. Dewatering equipment

1. Centrifuge

2.3.2.8. CURRENT OVERALL ENERGY CONSUMPTION ESTIMATE FOR THE EXISTING FACILITY

Estimated energy consumption of the existing WWTF is presented in a table in Appendix F. Equipment motor size (or equipment equivalent kW), operating load, annual run time, and estimated annual power cost is presented in tablular format. The estimated annual energy consumption cost is approximately $68,000 annually.

2.3.3. EXISTING WWTF USEFUL LIFE

A significant WWTF upgrade was completed in 2005 resulting in a previously permitted capacity of 0.2 MGD, modifying the existing conventional activated sludge process to add secondary treatment capacity and biologic nutrient removal (BNR) capacity. Plant operations data indicate the facility's capability becomes challenged at peak flows of approximately 0.120 MGD, and due to observed capacity limitations, the permitted capacity was reduced to 0.167 MGD in the current permit. The existing concrete tanks are in good condition and are believed to have an additional 20 years of useful life (this will be verified during design phase). The existing metal building components, except for the steel columns and beams, are near the end of useful life. Most of the remaining major equipment is generally in good condition with an estimated 10 years of useful life remaining.

2.3.4. WASTEWATER FLOWS

2.3.4.1. OPERATIONAL PARAMETERS

Operational parameters are discussed below. Table 3 provides a summary of effluent permit limits for the existing WWTF taken from the existing 2011 NPDES Discharge Permit.

Table 3. 2011 NPDES Discharge Permit

	30-day Avg. lbs/day	Daily Max. lbs/day	7-day Avg. lbs/day	30-day Avg. mg/L	Daily Max. mg/L	7-day Avg. mg/L
Biological Oxygen Demand (BOD), 5-day						
Nov. 1-April 30	23.8	N/A	35.7	30	N/A	45
May 1 - Oct 31	23.8	N/A	35.7	30	N/A	45
Total Suspended Solids (TSS)						
Nov. 1-April 30	23.8	N/A	35.7	30	N/A	45
May 1 - Oct 31	23.8	N/A	35.7	30	N/A	45
E. Coli Bacteria	N/A	N/A	N/A	126	235	N/A
Fecal Coliform Bacteria	N/A	N/A	N/A	200	400	N/A
Total Residual Chlorine	N/A	N/A	N/A	N/A	19 ug/L	N/A
Ammonia-Nitrogen						

	30-day Avg. lbs/day	Daily Max. lbs/day	7-day Avg. lbs/day	30-day Avg. mg/L	Daily Max. mg/L	7-day Avg. mg/L
Nov. 1-April 30	5.34	N/A	5.34	3.2	N/A	3.2
May 1 - Oct 31	5.34	N/A	5.34	3.2	N/A	3.2
Total Nitrogen						
Nov. 1-April 30	13.65	N/A	20.5	8.2	N/A	12.3
May 1 - June 30	46.55	N/A	68.8	27.9	N/A	41.2
July 1 - August 31	27.7	N/A	41.6	16.6	N/A	24.9
Sept 1 - Oct 31	21.1	N/A	31.7	12.7	N/A	19
Total Phosphorous						
Nov. 1-April 30	0.8	N/A	1.2	0.5	N/A	0.75
May 1 - June 30	1.6	N/A	2.4	1	N/A	1.5
July 1 - August 31	1.2	N/A	1.8	1.5	N/A	2.25
Sept 1 - Oct 31	0.8	N/A	1.2	2.5	N/A	3.75
pH	8.8					

2.3.5. INFLOW AND INFILTRATION / EXFILTRATION

Since most of the Village population is tied to skier visits/second homes and condominiums the peak period flow occurs with the influx of skiers/visitors during the Christmas season (late December-early January) and spring break (March) periods. Historical data from 2010-2014 flow occurring for consecutive days and above 0.09 MGD was averaged to determine historical peak period flow, which occurs for a period of approximately two to four weeks at a time. The current peak flows approach 0.110 to approximately 0.120 MGD, which stresses the operation of the secondary clarifiers, as evidenced by the potential for solids carryover and decreased performance.

Inflow and infiltration (I&I) flows are typically at a maximum in late spring. During this time period, the plant flow rates including I&I flows are estimated to be approximately 0.080 MGD. At present, flow meter data for the main collection lines (basins) has not been developed; however, the Village has instituted a collection system maintenance and repair program which will likely result in a reduction in I&I flows over the next several years and will evaluate the need to develop a collection system flow study dependent on the results of the maintenance and repair program.

2.3.6. COMPLIANCE WITH CLEAN WATER ACT AND STATE REQUIREMENTS

A review of operations data and available permitting correspondence with NMED and EPA indicate the compliance history has been very good since the 2005 WWTF improvements project. The very limited violations have been primarily limited to ammonia exceedances during peak loading periods.

Plant operations data indicate the clarifiers become overloaded at approximately 0.120 MGD with the potential for solids carry-over when flows approach this level. Typically, both the peak hydraulic loading, which approaches 0.110 to 0.120 MGD, and the peak organic loading occur simultaneously during the ski season peak organic loading periods. The peak period loading conditions for this facility occur as a result of peak skier/visitor timeframes; such as, the Holidays and Spring Break.

The Village is expecting planned re-development and new development in its wastewater service area will further challenge the performance of the current WWTF. Village staff estimate planned development in the service area would add approximately 0.072 MGD of peak day wastewater flow by the year 2020. Additionally, with the ambitious future growth and present construction, it is estimated the design flow of 0.31 MGD will be reached by approximately 2040.

2.4. FINANCIAL STATUS OF ANY EXISTING FACILITIES

2.4.1. OVERVIEW

The Village of Taos Ski Valley receives revenue to support the water and sewer systems by billing each customer. The Village also charges new development system impact fees but typically the revenue from impact fees is earmarked for specific system improvements. The table below details the O&M costs for the sewer system for last fiscal year.

The table below details the O&M costs for the sewer system for the last fiscal year.

Expense		WATER	% of ACTUAL	SEWER	% of ACTUAL
6100 · Salary and Benefits					
6112 · SALARIES - STAFF	242,272.54				
6113 · SALARIES - ELECTED	0.00				
6121 · WORKER'S COMP INSURANCE	0.00				
6122 · HEALTH & LIFE INSURANCE	0.00				
6123 · MPPP PENSION/EMPLOYEE	0.00				
6125 · FICA EMPLOYER'S SHARE	18,021.52				
6126 · WORKMAN'S COMP PERSONAL ASSESS	0.00				
6127 · SUTA STATE UNEMPLOYEMENT	1,554.24				
6128 · PERA Employer Portion	0.00				
6130 · HEALTH INCENTIVE - SKI PASS/GYM	800.00				
6132 · MISC BENEFITS	0.00				
Total 6100 · Salary and Benefits	262,648.30	52,529.66	20%	210,118.64	80%
6220 · OUTSIDE CONTRACTORS	29,001.95				
6230 · LEGAL SERVICES	1,771.73				
6251 · WATER PURCHASE, STORAGE	700.47				
6253 · ELECTRICITY	13,360.23				
6254 · PROPANE	17,624.88				
6256 · TELEPHONE	1,957.12				
6258 · WATER CONSERVATION FEE	349.77				
6270 · LIABILITY & LOSS INSURANCE	16,553.88				
6312 · CHEMICALS & NON DURABLES	41,062.60				
6313 · MATERIAL & SUPPLIES	24,498.61				
6314 · Dues/fees/registration/renewals	1,665.42				
6316 · Software	1,403.03				
6318 · Postage	915.55				
6322 · SMALL EQUIP & TOOL PURCHASES	3,306.38				
6418 · FUEL EXPENSE	726.43				
6432 · TRAVEL & PER DIEM	2,631.65				
6434 · TRAINING	1,593.67				
6560 · Payroll Expenses	-62.44				
6712 · LAB CHEMICALS & NONDURABLES	7,765.44				
6713 · LAB MATERIALS & SUPPLIES	129.67				
6714 · LAB EQUIPMENT REPAIR & PARTS	1,156.00				
6715 · LAB SMALL EQUIP & TOOL PURCHASE	1,954.00				
6716 · LAB TESTING SERVICES	18,115.60				
6720 · LAB OUTSIDE CONTRACTORS	2,355.80				
8325 · EQUIPMENT & TOOL PURCHASE	12,697.70				
Other Expense	203,235.14	20,323.51	10%	182,911.63	90%
6320 · EQUIPMENT REPAIR & PARTS	10,834.97	8,667.98	80%	2,166.99	20%
Total Expense	476,718.41	81,521.15	17%	395,197.26	83%

2.4.2. EXISTING DEBT

The Village received a Clean Water State Revolving Fund loan and grant for $500,000 for the engineering, studies, design, surveying and other required items for design of the proposed WWTF improvements. The funding included $350,000 loan and up to $150,000 in grant funds. The loan will be repaid over a 5-year period at a 3% interest rate. In order to fund construction of the WWTF improvements, the Village will apply for additional funding through the USDA Rural Development Program.

In 2007, The Village received a loan in the amount of $1,641,757 from New Mexico Finance Authority to fund interim WWTF improvements. The loan is being repaid over a 20-year period ending in 2026, at an interest rate of 3%. Annual payments of $110,351 are due each November. Annual debt and replacement reserve payments were required only in the first six years of the loan (2007-2012).

In addition, in FY2016 the Village received a Water Trust Board (WTB) grant in the amount of $1.8 million for construction of the finished water storage tank, the Kachina Tank. With this grant, the Village is required to match 20% of the total grant. The Kachina Tank will be constructed in 2017-2018. In 2015, the Village also applied for WTB funding for the Gunsite Spring Infiltration Gallery for the amount of $640,000.

2.4.3. CURRENT RATE STRUCTURE

The billing rate is based on Equivalent Residential Units (EQRs): One EQR is equal to the assumed monthly usage of a structure of 1,200 square feet, or 1,500 gallons per month. The Village bills all customers monthly at the same rate using the following formula for combined water and sewer billing: Usage (actual gallons metered x rate per gallon) + Fixed (total EQRs x rate per EQR).

There are currently a total of 202 connections with 160 billable customers: of those customers, 26 are commercial and the remaining 134 customers are residential. However, commercial customers comprise 95% of total system revenues and residential users account for 5%. For the twelve months from February 1, 2016, through March 31, 2017, 13,197,735 total gallons were billed equaling $1,031,439 in revenues (or $979,867 from commercial accounts and $51,572 from residential accounts).

The latest rate schedule is included below:

A. Fiscal Year 2016:
   1. Price Per Gallon: $0.0437
   2. Fixed Charge (per EQR):.......$54.6300

B. Fiscal Year 2017 (Proposed 4% increase):
   1. Price Per Gallon: $0.0454
   2. Fixed Charge (per EQR):.......$56.8200

2.5. WATER/ENERGY/WASTE AUDITS

A WWTF audit was completed in the form of a Comprehensive Performance Evaluation (CPE) that consisted of a two-day onsite evaluation of the performance and capacity of the unit processes and equipment. The CPE was completed by FEI Engineers on behalf of the Village in September 2014, the capacity summary and recommendations are presented below.

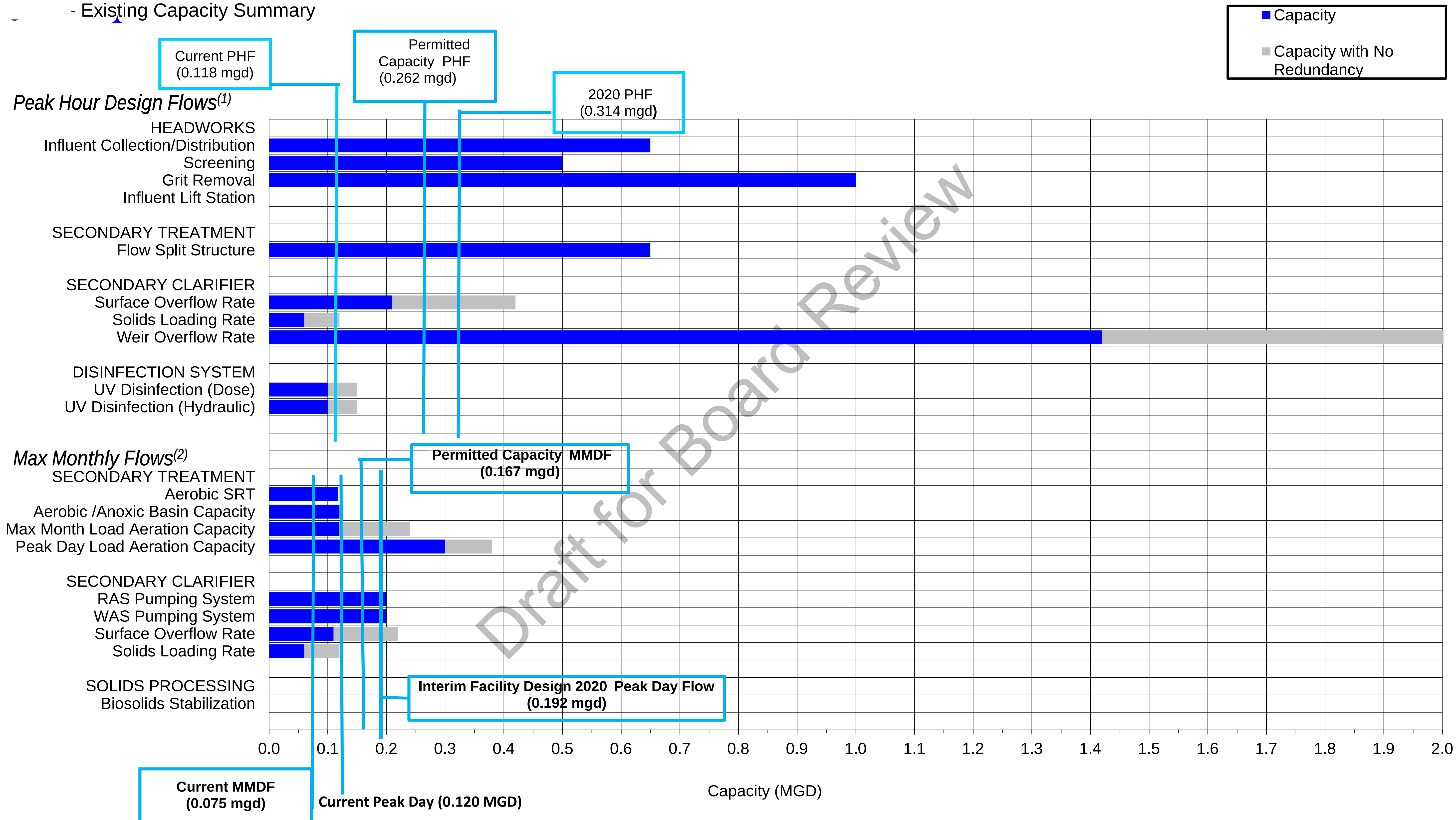
Figure 2 presents a summary of the equivalent hydraulic capacity of each major process area. Both peak hour flow capacity and maximum month flow capacity are shown. The graph also includes reference flows to allow comparison of the rated unit process capacities with these flows. Reference flows are included for the current conditions, as well as projected facility design flows.

Table 4 summarizes the capacity of the WWTF's major process and equipment systems.

Table 4. Major Process Capacity Summary

Component	Capacity (MGD)	Basis / Notes
Headworks		
Influent Sewer	0.65	Conditional flow rate based on flow depth
Concrete Channels	0.65	Limited by allowable level upstream of screen
Screening System	0.5	Peak Flow
Grit Removal System	1.0	Removal efficiency decreases with flow
Influent Flow Metering	0.65	Limited by allowable level upstream of screen
Secondary Treatment		
Influent Flow Splitter	>0.65	Full-pipe, submerged outlet
Aerobic/Anoxic Basins	0.12	SRT of 15.4 days; MLSS of 3975 mg/l
Aeration Supply – Peak	0.38	MMADF – 0.30 is firm capacity;
Secondary Clarifiers - Peak	0.12	Peak Flow; limited by solids flux
Secondary Clarifiers - Avg	0.12	MMADF; limited by solids flux
RAS Pumps	0.2	Capacity based on 0.4 – 1.5 ratio
WAS Pumps	0.2	Capacity to waste continuously to sludge holding tanks
Disinfection		
Required Dose/ Hydraulics	0.1 – 0.2 est.	Total capacity is estimated due to lack of available system documentation
Effluent Flow Metering and Outfall		
Flume/Outfall	NA	Capacity not evaluated as part of this study
Solids Processing		
Sludge Holding Tanks/Centrifuge	NA	Capacity not evaluated as part of this study

- Existing Capacity Summary



Notes:
(1) Unit process hydraulic capacity compared with observed Peak Hour Flow (PHF) and peak instantaneous flow (PIF) values.
(2) Unit process treatment capacity estimated on Max Month average daily flow (MMDF).

3. NEED FOR PROJECT

3.1. HEALTH, SANITATION, AND SECURITY

The following sections discuss the current and projected permit conditions and WWTF performance in terms of the health and sanitation criteria. Due to the fairly well-controlled access points to the existing facility the security is not a project needs driver.

The high-level need for completion of this project is to protect both the local community health and sanitation and downstream Rio Hondo River uses through completion of the proposed treatment plant improvements project. The two primary purposes for this project are as follows:

A. Replace and upgrade the existing WWTF equipment and processes to allow compliance with the facility discharge permit during the Village service area peak period flow and loading time periods experienced during both the ski seasons; Christmas/New Year Holiday and Spring Break, approximately two to four week time periods; and

B. Provide a 0.16 MGD increase in the Village WWTF capacity sufficient to accommodate the current, ongoing ski corporation base/core area available dwelling unit's construction, current Village service area population growth expansion and the projected 20 year anticipated service area population growth.

3.1.1. DISCHARGE PERMIT COMPLIANCE

The VTSV WWTF is authorized to discharge to the Rio Hondo, National Pollution Discharge Elimination System (NPDES) permit No. NM0022101, located in the Rio Grande Basin, Waterbody Segment Code No 20.6.4.129.

The segment is classified as Category 2 and the designated uses of this receiving water are domestic water supply, high quality cold water aquatic life, irrigation and wildlife habitat. The Rio Hondo Basin is a sub-basin of the Upper Rio Grande. The current VTSV NPDES discharge permit became effective on October 1, 2011, with an expiration date of September 30, 2016. This 2011 permit superseded the pre-existing April 1, 2006 permit and the design capacity of the WWTF was de-rated from 0.2 MGD in 2006 to 0.167 MGD in 2011.

The 2011 permit also contained both total phosphorus and total nitrogen seasonal 30-day average (lbs/day), 30-day average (mg/L), and 7-day average (mg/L) limits. The limits vary by season and are summarized in Table 2 above.

A review of operations data, and available permitting correspondence with NMED and EPA, indicate the compliance history has been very good since the 2005 WWTF Improvements Project. The very limited violations have been primarily limited to ammonia exceedances during peak loading periods.

3.1.2. SECURITY

Currently, the majority of the treatment equipment and all controls are located within an area that has access-control, locked buildings and is accessed by authorized personal only. The occurrence of petty crime and vandalism in the Village is typically minimal.

3.2. AGING INFRASTRUCTURE

In addition to the significant operations challenges associated with extreme variations in flows, excessive flows due to infiltration and inflow (I&I), limited typically to May and June which are low flow and loading months, cold temperatures and inadequately sized processes, the plant operation is also constrained by the following:

A. Peak period loading of the clarifiers that can translate into solids carryover and total phosphorus exceedances;

B. Lack of load equalization for peak period ammonia spikes;

C. Lack of facility instrumentation and automation;

D. Inadequate space for necessary laboratory facilities including inadequate office and operations meeting room space;

E. Questionable backup power supply (used emergency generator); and

F. Aging infrastructure nearing end of useful life.

3.3. REASONABLE GROWTH

With new ownership at the Taos Ski Valley Resort, there is already expansion and re-development of the resort and base Village underway. The new owner has long-term plans for additional growth. Currently, the WWTF's capacity is limited by the existing secondary clarifiers to flow rates of approximately 0.12 MGD.

The plant and operators are under stress to maintain compliance during the peak holidays, spring break resort skier visits and extensive infiltration periods during late spring and early summer. The proposed improvements are sized for growth over the next 25 years with peak period flow reaching 0.44 MGD by the year 2040.

As stated in Section 1, residential growth is expected to remain flat while commercial connections/usage is expected to increase. With the new Blake Hotel coming on-line during the 2016/2017 ski season, water usage increased by approximately6 % as compared with the 2015/2016 ski season.

4. ALTERNATIVES CONSIDERED

4.1. GENERAL INFORMATION FOR ALTERNATIVES CONSIDERED

To meet short-term and long-term flow demand and to meet more stringent effluent requirements, upgrades to the existing WWTF are necessary.

A. The treatment technologies considered for upgrading the Village WWTF are:

1. Integrated Fixed Film Activated Sludge (IFAS) with tertiary treatment;
2. Sequencing Batch Reactor (SBR) with tertiary treatment; and
3. Membrane Bioreactor (MBR).

B. The following alternatives were not considered:

1. Optimizing the current facilities (without upgrade): Optimization and interim measures have taken place in 2015. Additional optimization without significant infrastructure and/or process upgrades would not be able to meet the future demand and effluent quality requirements.
2. Interconnecting with another existing system: Due to the remote location of the Village, it is not practical to connect with other systems.
3. Small cluster or individual facilities: The Village is located in a small, narrow valley surrounded by steep terrain. Currently, the sewer collection system conveys the majority of the Village wastewater to the existing wastewater treatment plant. Since the Village land position is limited to small, clustered parcels of land, it is most practical to maintain one central treatment facility in the existing treatment location.

C. Overall Design Criteria

Tables 5 and 6 present a summary of the overall basis of design for the proposed Village WWTF improvements. Each evaluated alternative is sized and configured to meet this design criteria.

Table 5. Overall Design Criteria

Design Flows, MGD		
Maximum Month Average Daily Flow (MMDF)		0.31
Annual Average Daily Flow (AADF)		0.2
Peak Period Flow. (PPF)		0.44
Design Concentrations and Loadings		
	mg/L	lbs./day
BOD5	350	911
Total Phosphorus (TP)	12	31
Ammonia	45	117
Total Kjeldahl Nitrogen (TKN)	66	172
Other Design parameters		
Temperature, Min/ Max (degree Celsius)		8/20
Alkalinity, mg/L		150
Elevation, ft		9260

Table 6. Effluent Requirements at Design Flow

Effluent Requirements at Design Flow, 30 - Day Average1		
Parameter	mg/L	lbs./day
BOD5	9.1	23.8
TSS	9.1	23.8
Ammonia - Nitrogen	2.1	5.34
Total Nitrogen	5.2	13.65
Total Phosphorus	0.31	0.8
E. Coli (#/100 ml)	126	
Fecal Coliform (#/100 ml)	200	
Total Residual Chlorine, µg/L, Daily Max	19	

1) Existing TMDL based NPDES permit. Loadings expected to remain the same for future permit.

It should be noted that these limits are very stringent and, when considered in combination with the large variation in plant flows and the cold influent flow temperature, these limits are extremely challenging for a treatment facility; requiring implementation of advanced treatment technology that is significantly upgraded from a conventional activated sludge treatment process.

D. Common Elements for Treatment Alternatives Evaluation

The Village WWTF improvements focus on upgrades to the secondary and tertiary treatment processes. Other aspects of the WWTF will generally remain the same regardless of the secondary and tertiary treatment process chosen. The common elements applicable to each alternative are described below. If any changes to a common project element are unique to a specific alternative, these modifications are noted in the alternative description.

E. Development of Operations and Maintenance Costs Net Present Value

For each evaluated alternative, the operational and maintenance cost is summarized as the 20 year net present value. This is calculated by estimating operational costs at the annual average daily flow over an entire year of operation, using today's operational costs, and a real discount rate of 0.5 percent over 20 years.

F. Preliminary Treatment / Headworks Improvements

The existing headworks consist of a mechanical fine screen with manual screen bypass, grit removal system and Parshall flume. As described, the hydraulic capacity of the screen is reduced from 1.0 MGD to 0.5 MGD by the 3" flume downstream of the screen. However, the screen capacity can be regained by upsizing the flume. Noting the current capacity limitation of the screen, the existing equipment has adequate capacity and is in useable condition. All evaluated alternatives will reuse the existing bar screen and grit removal system with upgrades to the existing air handling unit including repair/replace the existing exhaust fan system to allow for attainment of the required minimum air change outs. The MBR alternative will also require the addition of a new 3mm fine screen.

G. Influent Equalization Tank

The existing WWTF has two influent equalization tanks: a circular steel tank and a rectangular concrete tank. The steel tank roof is believed to be structurally compromised and the tank is not routinely in use. The rectangular concrete tank was retrofitted in 2015-2016 to be utilized as an anoxic reactor/influent equalization tank. For all evaluated alternatives, the rectangular concrete tank will be kept in service pending an analysis of structural integrity, which is recommended during the design phase. The tank will be utilized as an influent load equalization tank instead of flow equalization only. The change will help attenuate shock loads of ammonia to the treatment process during peak period flows.

H. Biosolids Handling

At present, the sludge from the clarifier is pumped to the aerated sludge holding tanks. Sludge is dewatered by centrifuge, stored in uncovered drying beds and then hauled to landfill. The sludge holding tanks are at the end of their useful life and the biosolids area needs covering. These upgrades are included in each alternative. The existing dewatering centrifuge equipment does have adequate capacity to meet future demand. Although upgrades to the dewatering system are desired to reduce operational costs, these upgrades will be postponed until additional funding is available. At that time, the dewatering options should be evaluated more fully. For this PER, all evaluated alternatives include new sludge holding tanks, new roofing over the biosolids storage area, and use of the existing centrifuge.

I. Disinfection

Ultraviolet (UV) disinfection is utilized to meet permitted limits for E. Coli and Fecal Coliform. In 2014-2015, the Village retrofitted the existing UV units; replacing bulbs, ballasts, wiring and power panels; these units are in good condition. For all evaluated alternatives, the existing units will be utilized and two new units will be added to provide required redundancy during peak period flow.

4.2. TREATMENT PROCESS ALTERNATIVE 1: INTEGRATED FIXED FILM ACTIVATED SLUDGE (IFAS)

4.2.1. DESCRIPTION

Integrated Fixed Film Activated Sludge (IFAS) includes utilization and re-configuration of the existing process train (Train #1 - 0.1 MGD capacity) and construction of seven new partially-buried, covered process tanks (Train #2 – 0.34 MGD capacity). In addition, Alternative No. 1-IFAS includes new clarifiers, new tertiary filtration units, upgrades to the UV disinfection, a new operations building housing the new process equipment, reuse of the existing influent equalization tank, reuse of the existing sludge holding tank, reuse of the existing centrifuge, new electrical and controls, new aeration blowers and site work. Overall, the treatment technology and process equipment is similar in nature to the existing WWTF treatment process.

Alternative No. 1 would use the IFAS process with an MLE internal recycle. The process would include the following treatment zones in series: a pre-anaerobic selector, two pre–anoxic tanks, two aerobic tanks, a post-anoxic zone and a post-aerobic zone. The process is followed by secondary clarification for settling of the activated sludge in the mixed liquor. Some of the settled activated sludge is pumped out of the clarifier for wasting and a portion of sludge is pumped back to the head of the secondary treatment process.

The MLE process will incorporate the IFAS media in the aerobic (oxic) zones and will be followed by an oxygen depletion zone. This is to reduce the amount of air being introduced to the pre-anoxic zone. The mixed liquor will be pumped from the depletion zone to first pre-anoxic zone at a higher rate, usually 2Q to 4Q where Q is the influent flow rate.

The combination of anoxic and oxic zones will result in treatment and removal of total nitrogen in the wastewater. The secondary effluent in the secondary clarifier will be pumped to the tertiary filters. The tertiary filters depend on chemical addition, usually alum or ferric, for coagulation and removal of phosphorus.

The upflow sand filter tertiary filtration process consists of metal salt addition, pH adjustment and conditioning, and conveyance of the conditioned process water to the upflow sand filter. Process water flows upward though a sand media bed (usually 60 to 80" deep) at typical hydraulic loading rates ranging from 3 – 6 gpm/ft2. Insoluble metal phosphates are trapped by the filter media and thus, removed from the filter effluent. During filtration, sand is continuously pumped from the bottom of the filter using an air-lift pump and washed in a wash box located at the top of the filter. The clean sand falls back down onto the top of the media bed. A continuous reject steam from the sand wash/separation box is returned to the facility headworks or secondary clarifier inlet. Moving bed sand filters can be configured in either concrete tanks or packaged steel tank systems. Moving bed filter technology may be applied as a conventional upflow sand bed such as Parkson Corporation's Dynasand; or alternately as a reactive iron-coated sand filter bed using a proprietary chemical pre-reaction process and media. The reactive bed technology variation combines co-precipitation and sorption to remove both particulate and soluble phosphorus. Ferric chloride is mixed into the process water, which coats the sand particles, forming a hydrous ferric oxide. The reactive sand process variation is offered solely by Blue Water Technologies, Inc., under the trade name Blue PRO (www.blueH20.net).

Figure 3 shows a typical IFAS media supplied by AnoxKaldness, which is similar to the media in the existing treatment plant.

Figure 3 - IFAS Media Photo

Table 7 presents a summary description of the facility components included with this alternative. Manufacturer literature further describing the IFAS process is included in the Appendix C2. Figures 4 and 5 present a Preliminary Site Schematic and Process Flow Diagram.

Table 7. IFAS Alternative Components

Process Area	Description of Included Components
Headworks Improvements	▪ Reuse the existing bar screen and the grit removal system ▪ Refurbish the existing air handling unit
IFAS Process Tanks	▪ Existing process tanks re-configuration (Train #1 – 0.1 MGD capacity) ▪ Partially-buried, covered, new concrete tanks (Train #2 – 0.33 MGD capacity) ▪ Influent flow splitter box and MLSS diversion box ▪ Dedicated anoxic, IFAS media and post aeration tanks
Tertiary Filtration	▪ Moving bed upflow sand filters; utilizing new tanks
Equipment & Process Piping	▪ Aeration system (blowers, aeration piping, and diffusers) ▪ Submersible mixers and Internal MLSS recycle pumps ▪ Waste activated sludge pumps ▪ Biomass carrier media and media retention screens ▪ PLC- based control system
Equipment and Operations Building	▪ 7100 SF (Process tanks+ Clarifiers + Tertiary Filters) ▪ House blowers, pumps, electrical / MCC, mechanical chemical storage
Biosolids Storage	▪ Replace sludge storage tanks ▪ Reuse the existing centrifuge
Disinfection	▪ Continue to use existing UV units ▪ Add new units to provide redundancy at PPF
Site Work	▪ Yard piping
Electrical and Controls	▪ New electrical service, equipment, and an additional generator

4.2.2. DESIGN CRITERIA

Preliminary sizing and evaluation of this alternative has been performed to satisfy the design criteria for flow, loading and effluent quality. The preliminary sizing is summarized in Table 8.

Table 8. IFAS Alternative Design Criteria

Design Parameter	Value
Total Basin Volume	285,000 gallons
Bulk Volume of Biofilm Carrier	4,545 ft3
Fixed Media	27,374 ft3
IFAS Reactor-Biofilm Carrier Fill Ratio	60%
Design MLSS	2,500 to 3,000 mg/L
Equivalent Design SRT (total)	>30 days

4.2.3. MAP

Refer to Figure 4 above for the IFAS alternative schematic layout.

4.2.4. ENVIRONMENTAL IMPACTS

The IFAS alternative is contained entirely within the existing site. There are no environmental impacts identified or expected.

4.2.5. LAND REQUIREMENTS

The current WWTF site has sufficient area and no additional land is needed.

4.2.6. POTENTIAL CONSTRUCTION PROBLEMS

Within the Village WWTF property parcel, the subsurface conditions likely include large cobbles, boulders and possibly bedrock. The presence of large boulders and rock may increase construction excavation costs. Additionally, because the area required for this alternative is large and the slope layback areas would be extensive, access to maintain and operate the existing facility would be difficult.

SCALE: 1"=40'

IMPROVEMENT NOTES:

1. EXISTING EQ TANK TO BE REUSED AS LOAD EQ.
2. TRAIN 1 (0.1 MGD): USE OF EXISTING TANKS
   - A. ANAEROBIC SELECTOR FROM EXISTING ANOXIC / EQ TANK.
   - B. 4 EXISTING AERATION BASINS
   - C. CONVERT EXISTING SECONDARY CLARIFIERS TO AEROBIC A/S REACTORS, POST-ANOXIC REACTOR AND UTILIZE EXISTING OZONE CONTACT TANK FOR RE-AERATION.
3. NEW 30' SECONDARY CLARIFIERS (2 TOTAL).
4. NEW TERTIARY FILTER (4 TOTAL).
5. NEW PRE-FABRICATED BUILDING METAL BUILDING TO HOST NEW TREATMENT TRAIN, CLARIFIERS, TERTIARY FILTERS, PUMPS, BLOWERS, LABORATORY, OPERATIONS, CONTROL ROOM, SHOWER, AND RESTROOM.
6. TRAIN 2 (0.34 MGD): NEW TANKAGE

GENERAL NOTES:

1. UNDERGROUND UTILITIES ARE APPROXIMATE ONLY. CONTRACTOR SHALL FIELD LOCATE EXISTING UTILITIES PRIOR TO COMMENCING WORK.
2. TERTIARY FILTRATION BUILDING BASED ON BLUE-PRO FILTER VENDOR GENERAL ARRANGEMENT DRAWING.

W:\VTSV-S14-0132 - WWTP\PER FIGURES\FIGURE 3 LAST SAVED:1/20/2016 4:41 PM LAST PLOTTED: 1/20/2016 4:41 PM BY: KEITH

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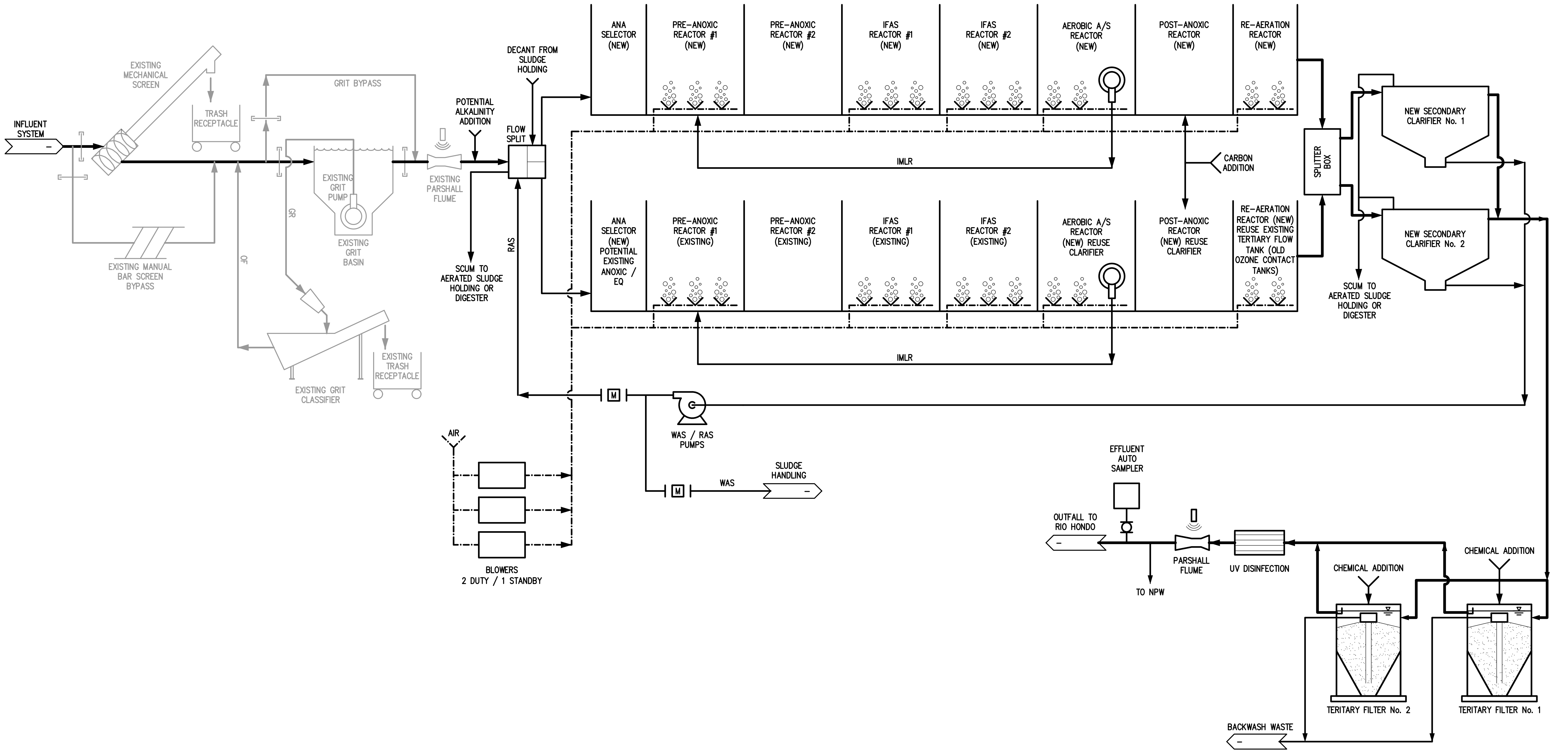
VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
IFAS WITH MLE SCHEMATIC SITE PLAN

FIGURE No. 4



VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
IFAS WITH MLE PROCESS FLOW DIAGRAM

FIGURE No. 5

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4.2.7. OPERATIONAL ASPECTS

The IFAS alternative is similar in nature to the current IFAS process at the Village WWTF. The tertiary filters for phosphorus removal proposed in this alternative will be moving bed upflow sand filters; different from the existing pressure filters used at the WWTF. Operators will need training on operations and maintenance of the tertiary filter proposed with this alternative.

4.2.8. COMPARATIVE OPINION OF PROBABLE CONSTRUCTION COST

A summary of the project costs for this alternative is shown in Table 9. The cost estimate includes the treatment equipment, installation of equipment, civil site work, concrete work and a pre-engineered building. Annual O&M costs were based on chemical and labor costs for diffuser replacement and annual plant O&M.

Table 9. IFAS Alternative Cost

Net Present Worth Cost Inputs	Amount
Construction Cost[1]	$6,958,300
Engineering Cost[2]	$1,450,725
Non Construction Cost[2]	$162,944
Total Capital Cost	$8,572,000
Annual O&M Cost[3]	$250,642
Energy Cost (Note: included in Annual O&M Cost)	$68,000
20 Year Present Worth of Annual O&M Costs[4]	$4,760,000
20 Year Present Worth of Salvage Value	-$582,000
Total 20 Year Present Worth Cost	$12,750,000

1) Includes CSI 16 Divisions costs, Contractor OH&P, Bonds and Insurance and Contingency, refer to Appendix D.
2) Includes engineering cost for final design, construction phase engineering services, and RPR service. Non construction costs include legal, financial, interest, etc.
3) Includes labor cost, energy cost, and chemical cost.
4) Based on 20 year life cycle, and discount rate of 0.5%.

4.2.9. ADVANTAGES/DISADVANTAGES

The IFAS alternative can produce high-quality effluent that meets the required effluent requirements. The hybrid, fixed-film/suspended growth BNR process is capable of reliably meeting the ammonia and total nitrogen effluent requirements. The Village's very cold wastewater temperatures result in slow nitrifier growth rates and long required solids retention (SRT). With the IFAS process, the combined biomass from mixed liquor suspended solids (MLSS) and attached to the biofilm carriers result in an efficient and stable nitrification process. Much of the nitrifier population is retained in the basins on the biomass carriers with a resultant high nitrification rate.

Due to the effluent phosphorus limits for the Village WWTF, Alternative No. 1-IFAS requires additional tertiary filters to be added to the treatment process.

Construction of new aeration basins and anoxic basins, a new clarifier, the addition of new tertiary sand filters and a new building to enclose all the above improvements contributes to the highest capital cost of all the three alternatives considered.

The IFAS alternative is structured to meet the Village's needs for the proposed WWTF improvements project. However, since the costs are higher than the other alternatives, the debt payment burden would be significantly higher. This alternative is also capable of meeting the anticipated discharge permit limits and both the environmental and public concerns; however, the IFAS alternative has an overall slightly lower operational margin of safety as compared to the MBR alternative, primarily due to the clarification step, which requires constant fine control of factors which control sludge settleability. The MBR alternative uses a membrane filtration step so that sludge settleability is not an operational issue.

4.3. TREATMENT PROCESS ALTERNATIVE 2: SEQUENCING BATCH REACTOR (SBR)

A sequencing batch reactor (SBR) is a modified, activated sludge wastewater treatment process that treats batches of wastewater via a "fill and draw" strategy within a single reactor (or reactor train), including the clarification process. A typical SBR includes two parallel trains that operate on opposite time phases to provide constant treatment. The SBR process is well suited for BNR since alternating aerobic and anoxic conditions can be programmed into operating cycle phases.

The BNR operation strategy generally includes the following phases: Fill, React with Anoxic conditions followed by Aeration, Settling and Decant. Due to the sequence of operations, multiple processes take place in a single basin and therefore, SBRs generally have a smaller and more efficient overall footprint than conventional activated sludge systems with separate aeration basins and clarifiers. Effluent equalization is typically required to attenuate the high decant rates used in SBRs and reduce the hydraulic throughput required for downstream processes, such as disinfection or advanced wastewater treatment.

In addition to the SBR process, tertiary filtration will be required for phosphorus removal. The proposed tertiary filtration process is an upflow sand filter process, which includes metal salt addition, pH adjustment and conveyance of the conditioned process water to the upflow sand filter. Please refer to the upflow sand filter process description included in Treatment Alternative No. 1.

The SBR alternative includes: new partially-buried, covered SBR process tanks, a new effluent equalization tank, new tertiary filtration units, upgrades to the UV disinfection, a new operations building housing the new process equipment, reuse of existing influent equalization tank, reuse of existing sludge holding tank, reuse of existing centrifuge, new electrical and controls, new aeration blowers and site work.

Two different SBR process configurations were considered for this project:

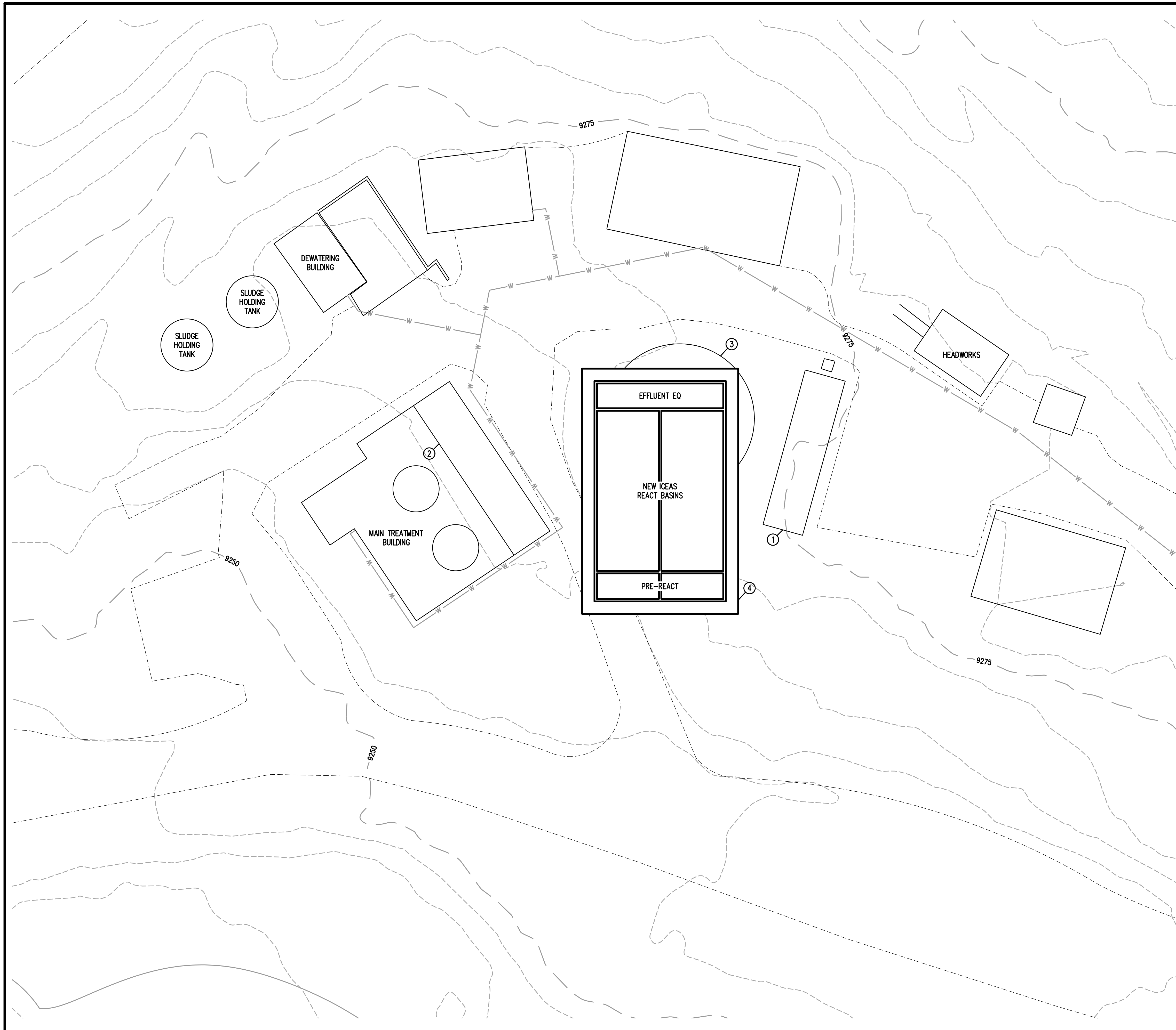
1. Intermittent Cycle Extended Aeration System (ICEAS) SBR; and
2. Integrated Surge Anoxic Mix (ISAMTM) SBR

A description of the ICEAS SBR and ISAM SBR is presented in the following sections and manufacturer literature describing the process is included in the Appendix C1. The ICEAS SBR configuration was used for the evaluation of Alternative No. 2.

Table 10 presents a summary description of the facility components included with this alternative. Figures 6 and 7 present a Preliminary Site Schematic and Process Flow Diagram.

Table 10. SBR Alternative Components

Process Area	Description of Included Components
Headworks Improvements	▪ Reuse the existing bar screen and the grit removal system ▪ Refurbish the existing air handling unit
SBR Process Tanks	▪ Partially buried, dual train concrete tanks ▪ Influent flow splitter box; Dedicated anoxic, sequencing batch reactor, and post-EQ tanks
SBR Equipment and Process Piping	▪ Aeration system (blowers, aeration piping, and diffusers) ▪ Submersible mixers and Internal MLSS recycle pumps ▪ Waste activated sludge pumps ▪ Solids-excluding decanter ▪ PLC- based control system ▪ Process piping and valves ▪ New effluent EQ pumps
Equipment and Operations Building	▪ 5000 SF (Building on top of partially-buried, covered SBR tanks) ▪ House blowers, pumps, electrical/ MCC, mechanical chemical storage
Tertiary Filters	▪ Moving bed upflow sand filters; Retrofit of the existing aeration basins.
Disinfection	▪ Continue to use existing UV units ▪ Add new units to provide redundancy at PPF
Biosolids Storage	▪ Replace the existing sludge storage tanks ▪ Reuse the existing centrifuge
Site Work	▪ Yard piping
Electrical and Controls	▪ New electrical service, equipment, and an additional generator



SCALE: 1"=40'

NOTES:

1. EXISTING EQ TANK TO BE REUSED AS LOAD EQ TANK.
2. EXISTING AERATION BASINS TO BE RETROFITTED TO HOIST TERTIARY PHOSPHOROUS FILTERS.
3. EXISTING STEEL EQ TO BE DEMOLISHED.
4. PROPOSED PREFABRICATED METAL BUILDING.

GENERAL NOTES:

1. UNDERGROUND UTILITIES ARE APPROXIMATE ONLY. CONTRACTOR SHALL FIELD LOCATE EXISTING UTILITIES PRIOR TO COMMENCING WORK.
2. TERTIARY FILTERS BASED ON BLUE-PRO FILTER VENDOR GENERAL ARRANGEMENT DRAWING.

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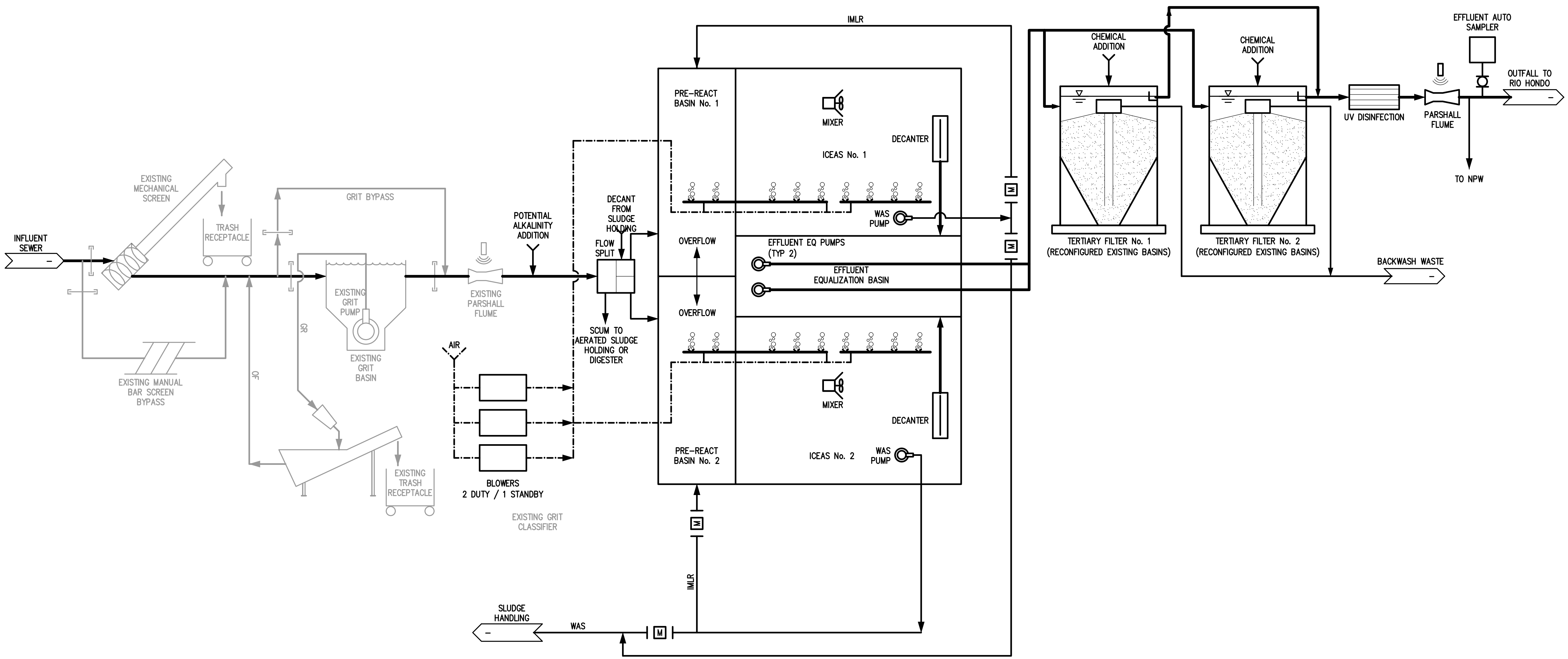
VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
ICEAS SBR BASINS SCHEMATIC SITE PLAN

FIGURE No. 6



W:\VTSV-S14-0132 - WWTP\PER FIGURES\FIGURE 6 LAST SAVED:1/15/2016 8:38 AM LAST PLOTTED: 1/20/2016 4:42 PM BY: KEITH

FEI ENGINEERS

VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
ICEAS SBR BASINS PROCESS FLOW DIAGRAM

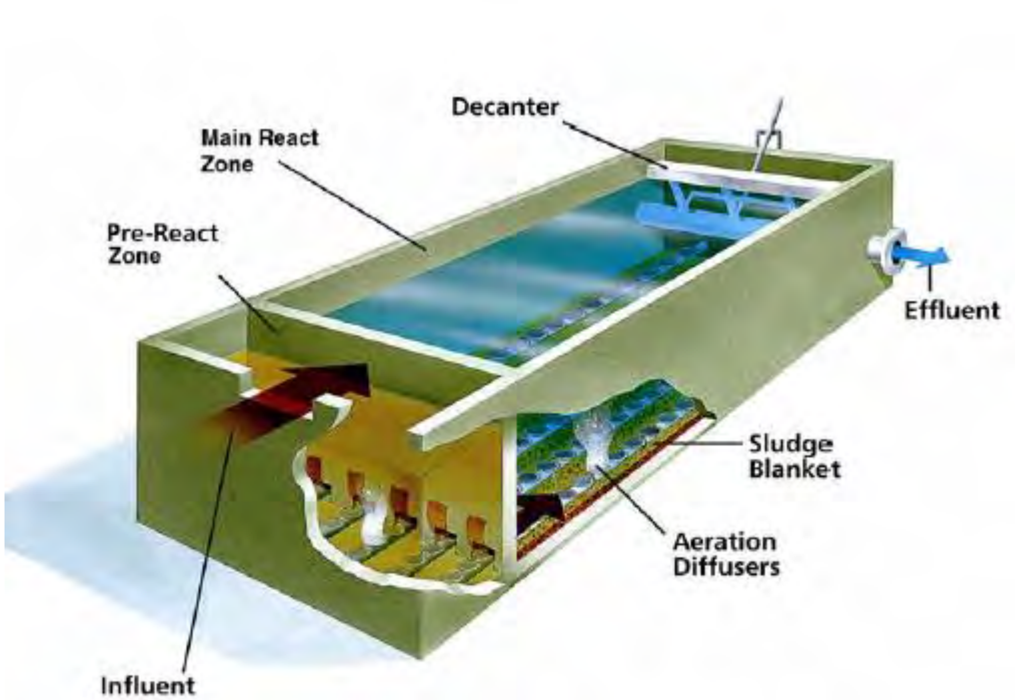
FIGURE No. 7

4.3.1. DESCRIPTION- SANITAIRE ICEAS SBR

The ICEAS SBR is an advanced version of conventional SBR and allows continuous inflow of wastewater to the basins. Influent flow to the ICEAS basins is not interrupted during the settle and decant phases or at any time during the operating cycle.

The ICEAS basins are divided into two zones; the pre-react zone and the main react zone as shown in Figure 8. The influent flows continuously into the pre-react zone and is directed down through engineered orifice openings at the bottom of the baffle wall into the main react zone. The pre-react wall baffles the incoming flow and prevents short-circuiting.

FIGURE 8 - ICEAS Basin



Within the SBR reactors, three level and/or time-based cycles occur to biologically treat the mixed liquor and discharge treated effluent.

A brief description of each SBR cycle is included below in their chronological order of occurrence:

1. Fill/ React Phase: During this phase, raw wastewater flows into the pre-react zone and to the main react zone to react with the mixed liquor suspended solids for simultaneous biological oxidation/reduction reactions that provide biological treatment of the wastewater.
2. Settle Phase: At the onset of the "settle" phase, the basin mixing is stopped. The SBR becomes quiescent to provide appropriate conditions for clarification. Gravity sedimentation causes MLSS to separate with more dense solids on the SBR tank bottom and lighter supernatant at the surface.
3. Decant Phase: Upon completion of the timer-based settle phase, the decant phase begins and supernatant flows through a fixed solids-excluding decanter. The decanter is fitted with a motor and multiple limit switches that monitor and adjust the position of the decanter

throughout the SBR processes (fill, react and settle).

The process can be operated in three different cycles based on the influent flowrate. They are: normal operation cycle, storm cycle/intermediate cycle and second storm cycle.

4.3.2. DESIGN CRITERIA

Preliminary sizing and evaluation of this alternative has been performed in order to satisfy the design criteria for flow, loading and effluent quality. The preliminary sizing is summarized in Table 11 below.

Table 11. SBR Alternative Design Criteria

Parameter	Value
Total Basin Volume	511,600 gallons
Cycle Time	4.8 hours
Cycles per day (at MMF)	5
Design MLSS	4,500 to 5,500 mg/L
Design HRT, total	>24 hours
Design SRT, total	28 days
Design SBR Basin DO residual	2 mg/L

4.3.3. MAP

Refer to Figures 6 and 7 for ICEAS SBR alternative schematic layout and process flow diagram

4.3.4. ENVIRONMENTAL IMPACTS

The alternative is contained entirely within the existing site. There are no environmental impacts identified or expected

4.3.5. LAND REQUIREMENTS

The current WWTF site has sufficient area. No additional land is needed for this alternative.

4.3.6. POTENTIAL CONSTRUCTION PROBLEMS

The larger size and foot print required for this alternative will make winter construction difficult. Within the Village WWTF property parcel, the subsurface conditions likely include large cobbles, boulders and possibly bedrock. The presence of large boulders and rock may increase construction excavation costs. During late Spring and early Summer, the ground is often saturated with melting snow and runoff.

4.3.7. OPERATIONAL ASPECTS

Operation and process control of an SBR is similar to other activated sludge processes designed for BNR. Critical operational variables include: control of solids inventory (biomass) to maintain the target SRT, dissolved oxygen monitoring and aeration system control, and optimization of the required internal recycle rate. The SBR operation is a time-based process that treats wastewater in batches which is contrasted with constant level and continuous flow processes, such as the IFAS and MBR processes.

4.3.8. COMPARATIVE OPINION OF PROBABLE CONSTRUCTION COST

A summary of the project costs for this alternative is shown in Table 12. The annual O&M cost was based on chemical and labor costs for diffuser replacement and for annual plant O&M.

Table 12. SBR Alternative Costs

Net Present Worth Cost Inputs	Amount
Construction Cost[1]	$6,651,200
Engineering Cost[2]	$1,450,725
Non Construction Costs[2]	$162,944
Total Capital Cost	$8,265,000
Annual O&M Cost[3]	$242,242
Energy Cost (Note: included in Annual O&M Cost)	$59,600
20 Year Present Worth of Annual O&M Costs[4]	$4,600,000
20 Year Present Worth of Salvage Value	-$699,000
Total 20 Year Present Worth Cost	$12,166,000

1) Includes CSI 16 Divisions costs, Contractor OH&P, Bonds and Insurance, and Contingency, refer to Appendix D
2) Includes engineering cost for final design, construction phase engineering services, and RPR service. Non construction costs include legal, financial, interest, etc.
3) Includes labor cost, energy cost, and chemical cost
4) Based on 20 year life cycle, and discount rate of 0.5%.

4.3.9. ADVANTAGES/DISADVANTAGES

SBR's are flexible and adaptable to treat the seasonally variable flows by adjusting cycle times. However, to fully nitrify at the Village's very cold wastewater temperatures, a long SRT is required. Additionally, the ability of the SBR process to reliably attain the stringent TN and TP limits is questionable, and thus, a tertiary treatment process (such as an upflow, continuously-regenerating tertiary sand filter) is required for the removal of both nitrate/nitrate and phosphorus.

Since the SBR is solely a suspended growth process, the MLSS concentration must be limited to allow for effective gravity settling during the "settle" phase. These design conditions result in large basins and long hydraulic retention times for the SBR Alternative. Further noted, the SBR alternative will need to equalize the decanted effluent prior to tertiary filtration and disinfection, and the effluent equalization basin required for SBR's is significantly larger.

Due to the strict effluent phosphorus limits for the Village WWTF, the SBR technology will also require additional tertiary filters to be added to the treatment process.

The capital cost for SBR alternative is lower than IFAS alternative due to reduced foot print for the new building and the reuse of existing aeration tanks in SBR alternative for tertiary filters.

The SBR alternative is structured to meet the Village's needs for the proposed WWTF improvements project. However, the costs are higher than the MBR alternative and the debt payment burden would be impacted correspondingly. This alternative is also capable of meeting the anticipated discharge permit limits and both the environmental and public concerns; however, the SBR alternative has an overall slightly lower operational margin of safety as compared to the MBR alternative, primarily due to the sludge settling and disengagement required in the SBR operational cycles, which requires constant fine control of factors which control sludge settleability. The MBR alternative uses a membrane filtration step so that sludge settleability is not an operational issue.

4.4. TREATMENT PROCESS ALTERNATIVE 3: MEMBRANE BIOREACTOR (MBR)

4.4.1. DESCRIPTION

A membrane bioreactor (MBR) is a modification of a standard activated sludge process that incorporates an engineered membrane barrier to separate solids and liquid instead of using a clarifier. The MBR process produces reuse-quality effluent and allows the biological treatment process to be operated at high MLSS concentrations that can range from approximately 8,000 to 12,000 mg/L. High mixed-liquors allow for a reduction in the size of treatment tankage, making the process well-suited for retrofits and facility upgrades.

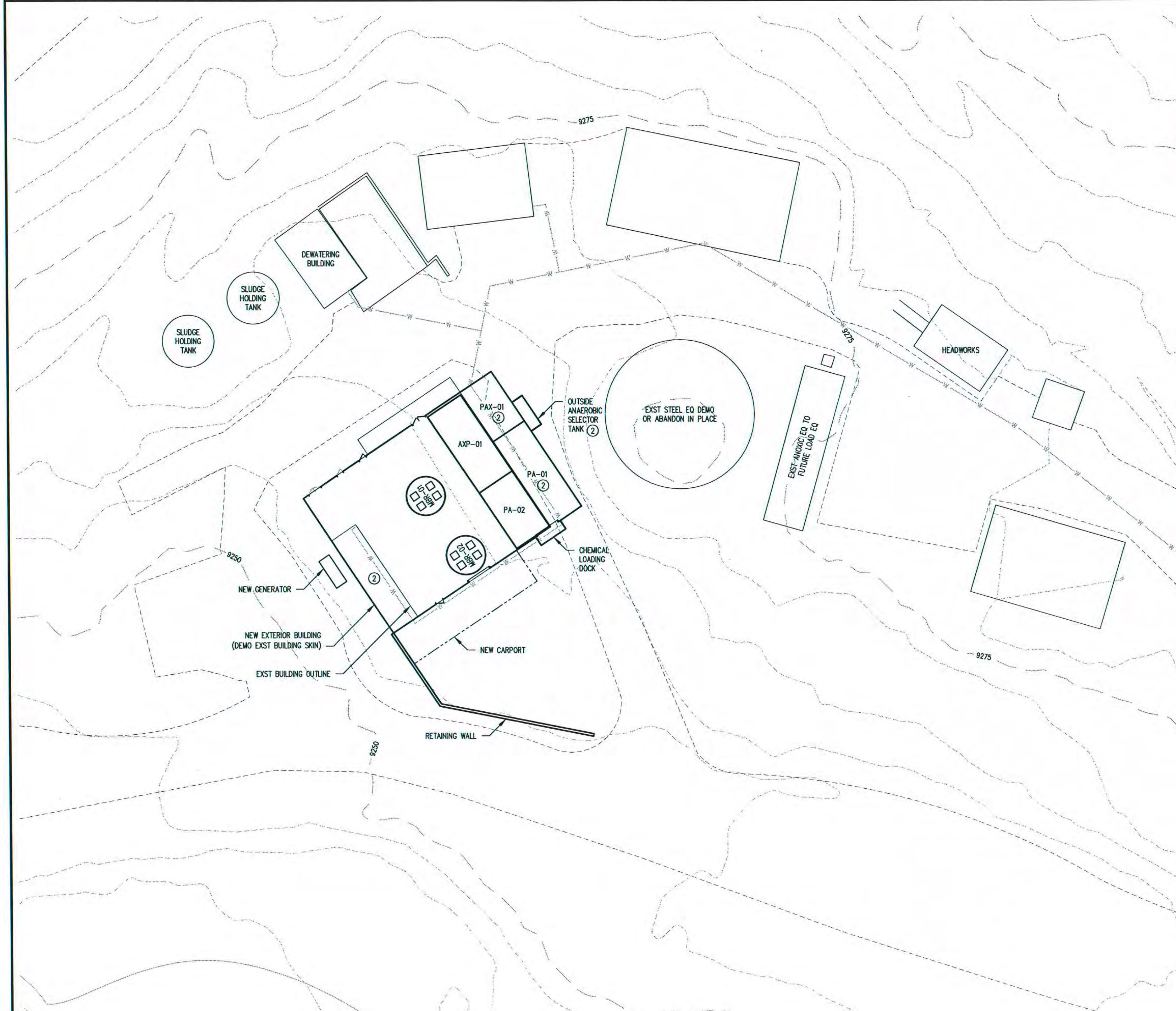
There are two basic configuration for the membranes; hollow fiber and flat sheet membrane packaging. Regardless of the configuration chosen, the membranes are assembled in a frame typically referred to as a cassette. These cassettes are lowered into an existing aeration tank (to increase the capacity of the treatment train) or in a single tank. For the purpose of this PER, the flat sheet membranes will be used for the evaluation of Alternative No. 3.

The MBR alternative includes: new partially-buried, covered MBR process tanks, a new effluent equalization tank, upgrades to the UV disinfection, a new operations building housing the new process equipment, reuse of existing influent equalization tank, reuse of existing headworks with the addition of a 3mm fine screen, reuse of existing sludge holding tank, reuse of existing centrifuge, new electrical and controls, new aeration blowers and site work.

With MBR options, tertiary filtration is not required as a separate treatment process since the membrane filtration operation removes coagulated metal phosphates following chemical addition.

Selected excerpts of the representative MBR manufacturer's literature is included in the Appendix C3.

Figures 9 and 10 on the following pages, present a Preliminary Site Schematic and Process Flow Diagram.



SCALE: 1"=40'

GENERAL NOTES:

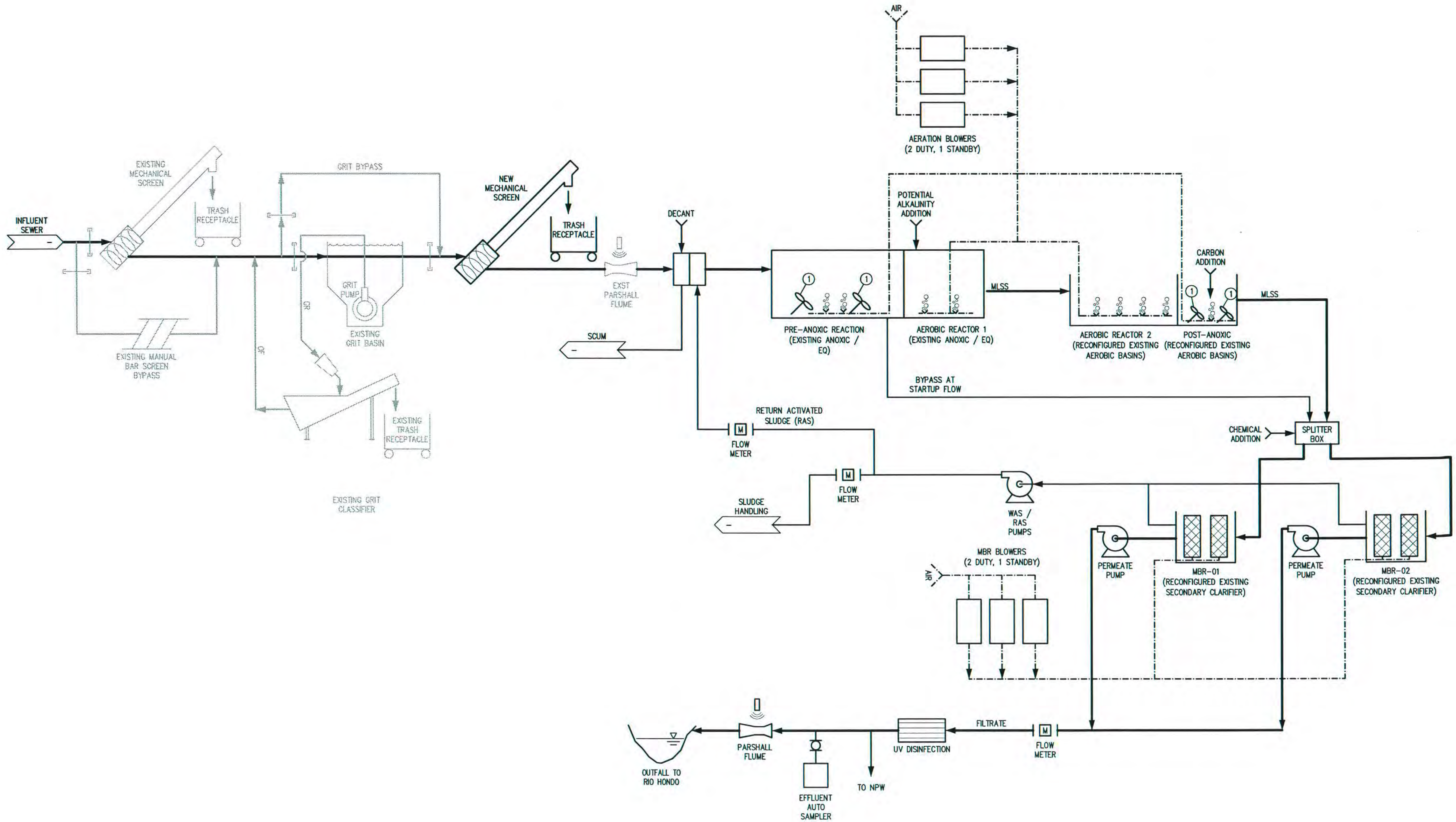
1. NEW BUILDING SIZE 91'-10"x65'-6"
2. EXTENSION OF EXISTING BUILDING.

FEI ENGINEERS

VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
MEMBRANE BIOREACTOR SCHEMATIC SITE PLAN

FIGURE No. 9

W:\VTSV-S14-0132 - WWTP\PER FIGURES\FIGURE 9 LAST SAVED:1/15/2016 8:39 AM LAST PLOTTED: 1/20/2016 4:43 PM BY: KEITH



VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
MEMBRANE BIOREACTOR PROCESS FLOW DIAGRAM

FIGURE No. 10

FEI ENGINEERS

W:\VTSV-514-0132 - WWTP\PER FIGURES\FIGURE 10 LAST SAVED:1/15/2016 8:39 AM LAST PLOTTED: 1/20/2016 4:43 PM BY: KEITH

Table 13 below presents a summary description of the MBR alternative facility components.

Table 13. MBR Alternative Components

Process Area	Description of Included Components
Headworks Improvements	▪ Reuse existing fine screen with 6 mm openings ▪ New fine screen with 3mm openings within the existing headworks building downstream existing grit removal system ▪ Construction of new channel within the existing headworks building for the new screen. ▪ Reuse existing grit removal system downstream of existing fine screen ▪ Refurbish the existing air handling unit
Anoxic and Pre-Air	▪ New partially-buried, covered tanks adjacent to the existing treatment plant building for anaerobic basin, pre-anoxic and aeration tanks. ▪ New aeration piping, diffusers and divider walls in the existing aeration tanks ▪ Reuse existing aeration tanks as aeration and post- anoxic tanks.
MBR Tanks	▪ Reuse the existing two- secondary clarifiers as MBR tanks
Equipment & Process Piping	▪ Aeration system (blowers, aeration piping, and diffusers) ▪ Submersible mixers and Internal recycle system ▪ Waste activated sludge pumps ▪ Membrane modules, sized for cold temp flux ▪ Permeate pumps/ backpulse pumps ▪ Membrane chemical cleaning system ▪ Overhead monorail ▪ PLC- based control system
Equipment and Operations Building	▪ Add new tankage to the east side of the existing building. ▪ 6100 SF existing building expansion and replacement: Replace steel support members/steel walls / metal roof with new metal building or pre-stressed concrete engineered composite walls and concrete double-T roof ▪ Reconfigure the upper level of the existing building to include blower, electrical/MCC, and mechanical rooms chemical storage; office/lab/shower/bathroom; and the lower level new tankage)
Biosolids Storage (aerated)	▪ Replace the existing sludge storage tanks ▪ Reuse the existing centrifuge
Disinfection	▪ Continue to use existing UV units ▪ Add new units to account for redundancy at PPF
Site Work	▪ Yard piping
Electrical and Controls	▪ New electrical service, equipment, and generator

4.4.2. DESIGN CRITERIA

In addition to the overall design criteria applicable to all alternatives, the preliminary sizing and evaluation for this alternative are based on the criteria shown in Table 14. Note, the system design is based on suspended growth MLSS kinetics, membrane flux rates and cleaning requirements (aeration required for air scour).

Table 14. MBR Alternative Design Criteria

Design Parameter	Value
Total Basin Volume	247,900 gals
Membrane Flux at 8° C	7.5 gal/sf/day
Design MLSS	8000 to 10,000 mg/L
Design HRT (total) at MMF	18 hours
Design SRT (total)	24 days

4.4.3. MAP

Refer to Figures 9 and 10 for the MBR alternative schematic layout and process flow diagram

4.4.4. ENVIRONMENTAL IMPACTS

The MBR alternative is contained entirely within the existing site. There are no environmental impacts identified or expected.

4.4.5. LAND REQUIREMENTS

This alternative would result in the relatively small footprint. The current WWTF site has sufficient area and no additional land is needed.

4.4.6. POTENTIAL CONSTRUCTION PROBLEMS

No construction problems specifically related to this alternative are envisioned.

4.4.7. OPERATIONAL ASPECTS

Operation and process control of an MBR is like other activated sludge processes designed for BNR, with the additional need to monitor membrane flux rates and air flow for membrane cleaning (air scour). However, since an MBR relies on a membrane process for solids separation, there is no requirement for any process adjustments to obtain good sludge settling properties, as is required for operating any other activated sludge process. From an operations perspective, this is a substantial advantage for the MBR process. Critical operational variables include: control of solids inventory (biomass) to maintain the target SRT, dissolved oxygen monitoring and aeration system control, and optimization if the required internal recycle rate. In addition, since the system hydraulic throughput is controlled by permeate pumps, automated basin levels and pump flow controls are required. The PLC/SCADA based process control system provides an effective operator interface to minimize the operational complexity compared to the SBR and IFAS alternatives. Similar to the SBR-Alternative No. 2, some additional operations training would be needed for this technology. In addition, this alternative requires periodic chemical cleaning and membrane backpulsing.

4.4.8. COMPARATIVE OPINION OF PROBABLE CONSTRUCTION COST

A summary of the project costs for this alternative is shown in Table 15 below. The cost estimate includes: civil site work, concrete, equipment and pre-engineered building. This cost does not take into account cost for electrical, HVAC, engineering, construction management, contractor fee, overhead and profit, permitting cost and any cost that is not mentioned in the cost estimate item list. Annual O&M cost was based on chemical and labor costs for diffuser replacement and for annual plant O&M.

Table 15. MBR Alternative Costs

Net Present Worth Cost Inputs	Amount
Construction Cost[1]	$6,340,000
Engineering Cost[2]	$1,450,725
Non Construction Cost[2]	$162,944
Total Capital Cost	$7,954,000
Annual O&M Cost[3]	$232,442
Energy Cost (Note: included in Annual O&M Cost)	$57,700
20 Year Present Worth of Annual O&M Costs4	$4,414,000
20 Year Present Worth of Salvage Value	-$347,000
Total 20 Year Present Worth Cost	$12,021,000

1) Includes CSI 16 Divisions costs, Contractor OH&P, Bonds and Insurance, and Contingency, refer to Appendix D
2) Includes engineering cost for final design, construction phase engineering services, and RPR service. Non construction costs include legal, financial, interest, etc.
3) Includes labor cost, energy cost, and chemical cost.
4) Based on 20 year life cycle, and discount rate of 0.5%.

4.4.9. ADVANTAGES/DISADVANTAGES

The MBR alternative can produce a very high-quality effluent that meets the project's strict effluent requirements. Due to the use of a membrane for solids–liquid separation and the relatively high MLSS concentrations, the process is reliable and, because sludge settling characteristics are removed as an operations factor, the process is more operationally-robust than either the IFAS or SBR processes over a wide range of influent loading and process operating conditions. With chemical addition, the MBR process is also capable of removing phosphorus to the required effluent levels. The alternative has the lowest capital cost due to maximum reuse of existing tankage and reduction in new tank construction.

The MBR alternative is structured to meet the Village's needs for the proposed WWTF improvements project. Also, the costs are lowest for the MBR alternative and the debt payment burden would be lower than the other alternatives. This alternative is also capable of meeting the anticipated discharge permit limits, and both the environmental and public concerns with a higher margin of safety as compared to the other alternatives. Since the MBR alternative incorporates a membrane filtration step, this alternative has several process advantages that are beneficial when applied to the proposed Village WWTF improvements project. The membrane filtration provides a positive filtration barrier, removing the operational concerns regarding sludge settleability and results in a single membrane filtration process step that removes sludge to produce TSS in the effluent lower than either the IFAS or SBR alternatives. It also filters precipitated phosphorus and removes a high percentage of the E. coli and Fecal bacteria across the membrane.

5. SELECTION OF AN ALTERNATIVE

5.1. LIFE CYCLE COST ANALYSIS

Table 16 presents the life cycle cost analysis, using the following criteria: capital cost, operations and maintenance cost, ease of operations, site requirements, and flexibility for future improvements.

Table 16. Present Worth (Life Cycle) Cost Analysis for Treatment Process Alternatives

	IFAS Alternative	SBR Alternative	MBR Alternative
Capital Cost	$8,572,000	$8,265,000	$7,954,000
O&M Annual Costs			
Year 1	$249,395	$241,036	$231,285
Year 2	$248,154	$239,837	$230,134
Year 3	$246,919	$238,644	$228,989
Year 4	$245,691	$237,457	$227,850
Year 5	$244,468	$236,275	$226,717
Year 6	$243,252	$235,100	$225,589
Year 7	$242,042	$233,930	$224,466
Year 8	$240,838	$232,766	$223,350
Year 9	$239,640	$231,608	$222,238
Year 10	$238,447	$230,456	$221,133
Year 11	$237,261	$229,309	$220,033
Year 12	$236,081	$228,169	$218,938
Year 13	$234,906	$227,033	$217,849
Year 14	$233,737	$225,904	$216,765
Year 15	$232,575	$224,780	$215,686
Year 16	$231,417	$223,662	$214,613
Year 17	$230,266	$222,549	$213,546
Year 18	$229,120	$221,442	$212,483
Year 19	$227,981	$220,340	$211,426
Year 20	$226,846	$219,244	$210,374
	$4,760,000	$4,600,000	$4,414,000
Salvage Value	($582,000)	($699,000)	($347,000)
Net Present Value (NPV)	$12,750,000	$12,166,000	$12,021,000

Calculation utilizes the Real Discount Rate of 0.5% for 20-Year horizon per OMB Circular No. A-94, Appendix C, effective for 2017.

5.2. NON-MONETARY FACTORS

All the BNR alternatives would allow the Village to comply with current and pending regulatory requirements. However, the BNR alternatives differ regarding other criteria and considerations such as: cost, operations, facility aesthetics/footprint, process reliability and treatment effectiveness.

Table 17 presents an alternatives comparison summary using an evaluation matrix that considers relative importance (weight) for the identified criteria and calculates a "score" for each alternative. Cost criteria considers annual estimated energy cost for each of the alternatives. The alternative with the highest score is considered the "best" alternative.

Table 17. BNR Alternatives Comparison Matrix

Selection Criteria	Weight	SBR		IFAS		MBR	
		Rating	Score	Rating	Score	Rating	Score
Aesthetics / Footprint	10%	2	4	4	8	5	10
Cost	25%	4	20	3	15	5	25
Implementation	10%	3	6	4	8	5	10
Reliability	20%	3	12	4	16	5	20
Operations	15%	4	12	4	12	4	12
Treatment Effectiveness	20%	1	4	4	16	5	20
Total	100%	--	58	--	75	--	97

From Table 17, the lower capital cost and the treatment effectiveness of MBR process resulted in a higher score due to site-specific factors described above that make the application of the MBR technology the best-fit for the proposed Village WWTF improvements project.

6. PROPOSED PROJECT (RECOMMENDED ALTERNATIVE)

Based on the alternatives analysis that considered both cost and non-cost evaluation criteria, and environmental impacts and benefits, the selected alternative is to replace and upgrade the Village's existing WWTF at the existing site with Membrane Bio Reactor (MBR) process for Biological Nutrient Removal to produce high-quality effluent.

The proposed improvements will provide enhanced BOD5 and TSS removal, and Total Nitrogen (TN) and phosphorus control to comply with the facility's current and pending discharge permits, and protect and improve the quality of Rio Hondo and downstream drinking water supplies.

6.1. PROJECT DESIGN

This section presents a summary of the Village's selected alternative, the MBR, for a WWTF rated at 0.31 MGD and 911 lbs/day BOD5 to meet the wastewater treatment needs of the projected population growth over the 20 year planning period. The justification for selecting this alternative and the related preliminary opinion of probable capital and O&M costs are presented in the following sections. In addition, Appendix B presents Preliminary Design Drawings including:

1. General Notes and Major Equipment Design Criteria;
2. Process Flow Diagram;
3. Schematic Site Plan;
4. Process Overview- Operations Building, Upper and Lower Level Plans; and
5. Section of Operations building.

6.1.1. COLLECTION SYSTEM / RECLAIMED WATER SYSTEM LAYOUT

The existing wastewater collection system is shown in Figure 1. Minor improvements immediately prior to the headworks are the only anticipated improvements to the collection system.

Repairs to the existing collection system are ongoing; infiltration and inflow loading reduces as the system in improved. Additional system improvements will include continued reduction in the infiltration and inflow, and upsizing lines to address capacity issues.

6.1.2. PUMPING STATIONS

The wastewater collection system will maintain the 1 existing lift station. Aside from process pumping systems within the proposed wastewater treatment facility, no additional pump stations will be required.

6.1.3. STORAGE

The proposed wastewater treatment facility will reuse the existing influent equalization basin located immediately downstream of the headworks facilities. The equalization basin will "level" anticipated peak flow periods; for example, during Spring Break.

6.1.4. TREATMENT

6.1.4.1. TECHNICAL DESCRIPTION

There are two types of membranes; hollow fiber and flat sheet membranes. Regardless of the configuration chosen, the membranes are assembled in a frame typically referred to as cassette and these cassettes are installed in an existing aeration tank (to increase the capacity of the treatment train) or in a standalone tank.

Figure 11 shows a typical flat sheet membrane. Figure 12 shows a typical hollow fiber membrane

Figure 11 - Flat Sheet Membrane

Figure 12 - Hollow Fiber Membrane.

Figure 13 illustrates a module, its location in a cassette and cassette in a treatment basin. This is a typical cassette assembly in a treatment train.

Figure 13 - Typical cassette assembly in a treatment train

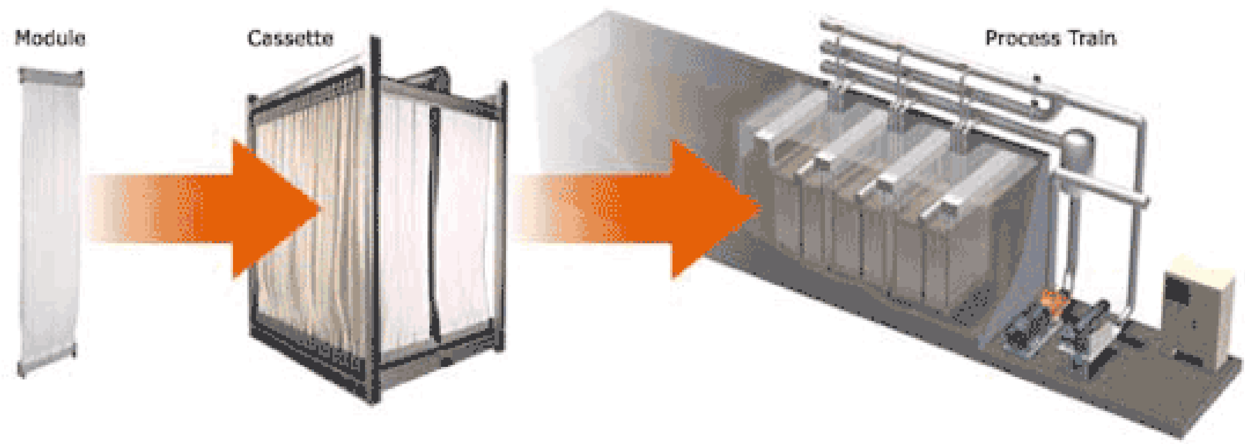
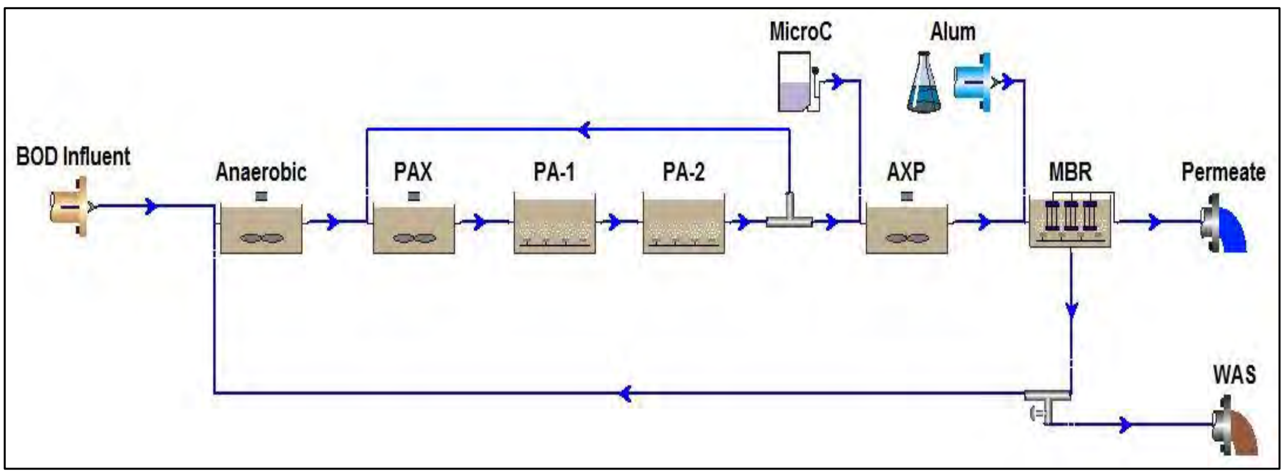


Figure 14 shows a BioWin model with various treatment basins considered for the proposed MBR for the Village WWTF.

Figure 14 - BioWin Model of The MBR Process



The improvements to the existing WWTF will include the following new or upgraded facilities and processes:

1. Headworks improvements with addition of new mechanical fine screen downstream of existing grit chamber;
2. Refurbishment of headworks mechanical air handling unit;
3. Conversion of newly retrofitted Anoxic/equalization tank to influent load equalization tank;
4. Construction of two new tanks as an add-on to the existing treatment plant. One of the tank will be operated as pre-anoxic tank while the other will operated as aeration tank;
5. Conversion of existing aeration basins into post anoxic by constructing a new divider wall and

installation of new fine bubble diffusers in the aeration basin;

6. Convert existing secondary clarifiers to 2 new MBR basins;
7. Installation of additional UV disinfection units as a redundancy to the existing UV disinfection units;
8. Installation of new aeration blowers and permeate pumps;
9. New chemical storage and feed system for process needs;
10. Replacing the existing building with new building to include the new add-on aeration tanks;
11. Upgraded facility electrical service and motor control center, including a new emergency generator;
12. Upgraded facility instrumentation and controls, including SCADA;
13. Site grading and landscaping; and,
14. Miscellaneous improvements.

6.1.4.2. DESCRIPTION OF MAJOR FACILITY COMPONENTS

The following Table 18 describes the major unit processes and features of the project. In addition, refer to Appendix B for Preliminary Design Drawings including:

1. General Notes and Major Equipment Design Criteria;
2. Process Flow Diagram;
3. Schematic Site Plan;
4. Process Overview- Operations Building, Upper and Lower Level Plans;
5. Section of Operations building.

Table 18. WWTF Improvements Description

Process Area	Description
Headworks Improvements	▪ New Mechanical fine Screen (3 mm opening) to be used in conjunction with the existing screen and install it within the existing Headworks building. ▪ Refurbish the existing mechanical air handling unit
Equalization Tank	▪ Reuse the existing influent/anoxic equalization tank as influent load equalization tank
MBR Process Tanks	▪ New partially-buried, covered anaerobic, pre-anoxic and aeration tank ▪ Reuse the existing aeration tanks, partially as aeration tanks and rest as post-anoxic tank ▪ Convert existing 2 secondary clarifiers into 2 new MBR basins
MBR Equipment & Process Piping	▪ Aeration system blowers, aeration piping, and fine bubble diffusers ▪ Submersible mixers, permeate pumps, backpulse pumps, chemical feed pumps and Internal MLSS recycle pumps ▪ Membrane cassettes and associated permeate pump piping.

Process Area	Description
Equipment & Operations Building	▪ 6100 SF existing building expansion and replacement: Replace steel support members/steel walls / metal roof with pre-stressed concrete engineered composite walls and concrete double-T roof ▪ Lower level: pump and piping gallery for RAS/WAS, ▪ First level: Permeate pumps, UV disinfection, electrical/ MCC room, operations room, and break room ▪ Second Level: HVAC room, aeration blowers, chemical storage and feed equipment
Biosolids Handling	▪ Replace the existing sludge storage tanks ▪ Reuse the existing centrifuge
Disinfection	▪ Continue to use existing UV units ▪ Add new units to account for redundancy at PPF
Site Work	▪ Yard piping ▪ Convert south side of the building into a new carport and construct new retaining wall. ▪ Construct new loading dock adjacent to the carport
Electrical/Controls	▪ New 3-phase-480 V electrical service, equipment, MCC and emergency generator ▪ New process instrumentation including DO/ ORP probes, RAS and MLSS recycle flow meters; SCADA
(Bid Alternate) New Biosolids Holding Tanks and Dewatering building upgrades	▪ Construct new aerated biosolids holding tanks in place of the abandoned steel equalization tank, upgrade dewatering equipment and install new cover for drying bed.

6.1.4.3. HYDRAULIC CALCULATIONS

Detailed calculations including hydraulic calculations and construction of a hydraulic profile will be developed in the preliminary design phase. Preliminary process parameters for the selected alternative were developed using BioWin wastewater treatment software to simulate the MBR treatment process.

Refer to Appendix E for preliminary process calculations and to Table 19 for process parameters used in the design.

Table 19. Process Design Parameters

Design Parameter	Value
MMF, MGD	0.31
Total Basin Volume	247,900 gals
Membrane Flux at 8° C	7.5 gal/sf/day
Design MLSS	8000 to 10,000 mg/L
Design HRT (total) at MMF	18 hours
Design SRT (total)	24 days

6.2. PROJECT SCHEDULE

The anticipated project milestones include:

A. USDA RUS Application Approval .... May 2017
B. USDA RUS and NMED Design Approval .... November 2017
C. Advertisement for Bids .... December 2017
D. Contract Award .... January 2018
E. Initiation of Construction Phase .... March 2018
F. Substantial Completion .... August 2019
G. Final Completion .... October 2019
H. Initiation of Operation .... November 2019

Land acquisition (ownership transfer) from the USFS in is progress.

6.3. PERMIT REQUIREMENTS

Permitting required for the project will include: NM CID permitting and the revised discharge permit.

6.4. SUSTAINABILITY CONSIDERATIONS

Sustainability considerations are not applicable.

6.5. TOTAL PROJECT COST ESTIMATE **(ENGINEER'S OPINION** OF PROBABLE COST)

Table 20 presents the preliminary estimates of probable cost by Division. A detailed presentation of estimated costs by Division is presented in Appendix D.

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Table 20. MBR Process – Preliminary Estimate of Probable Cost

Division	Description	Cost
1	General Condition	$100,000
2	Civil / Site Work	$110,900
3	Concrete	$637,300
4	Masonry	$25,800
5	Metals	$22,800
6	Wood and Plastic	$2,100
7	Thermal and Moisture Protection	$30,900
8	Doors and Windows	$38,000
9	Finishes	$80,500
10	Specialties	$6,300
11	Equipment	$1,770,500
12	Furnishings	$5,000
13	Special Construction	$503,100
14	Hoists and Cranes	$62,500
15	Mechanical / HVAC	$196,500
16	Electrical and Instrumentation & Controls	$641,500
	Subtotal	$4,233,700
10% Construction Prorates		$423,400
15% Contractor's Overhead and Profit		$635,100
	Subtotal	$5,292,200
10% Construction Contingency		$529,300
	Subtotal	$5,821,500
NMGRT	8.9125%	$518,900
	Total Construction	$6,340,400
Engineering Services		
PER and Environmental		$95,000
Basic Services		$925,000
Full Time RPR Services		$340,000
Additional Services		$0
Reimbursables		$20,000
	Subtotal Engineering Services	$1,380,000
NMGRT	5.125%	$70,725
	Total Engineering Services	$1,450,725
Non Construction Costs		
Local Attorney Services		$15,000
Financial Advisor		$100,000
Filing Fees/Reimbursables		$25,000
Bond Counsel		$15,000
	Subtotal Legal/Administrative Services	$155,000
NMGRT	5.125%	$7,944
	Total Legal/Administrative Services	$162,944
	Total Project Funding	$7,954,000

6.6. ANNUAL OPERATING BUDGET

The projected O&M costs include energy, chemical and labor costs. The energy cost is based on kWh/day which is provided by the vendor and used in the cost analysis at a cost of nine cents per kWh. The labor cost is based on estimated man hours from the vendor at a cost of $25 per hour. The chemical cost is based on estimated chemical usage for membrane clean-in-place from the vendors for phosphorus removal and external carbon dosing. In summary, the projected annual O&M cost for the new WWTF is $232,442. Refer to Appendix D for MBR cost estimation including: total O&M costs, and line items for chemicals, energy, salary/benefits, administrative, management/legal, insurance, testing, professional services, residuals disposal, short lived assets, and salvage costs.

6.6.1. INCOME

Income projections for the Water/Sewer Department are made using historical water usage income (sales), with adjustments based on observed trends. The 2017 budgeting cycle used a figure of 10,679,615 gallons for projected water usage and included a 4% increase to both fixed and per gallon rates. For Fiscal Year 2018, the Village is projecting the same gallons of usage and has again increased fixed and gallon rates by 4%.

The Water/Sewer Department revenue consists of the "Combined Utility Billing Sales" category which includes water and sewer monthly billings. The "Combined Utility Billing Sales" FY2016Budget was $$716,087 and the "Combined Utility Billing Sales" FY2017Budget was $823,101. Additional detail is presented in Appendix F.

The Village has enacted the Hold Harmless Gross Receipts tax option to assist with debt payments and building reserves for the water/sewer department. Annual income for this additional revenue is projected to be $190,000.

6.6.2. ANNUAL O&M COSTS

Annual O&M projections for the Water/Sewer Department are made using historical information with adjustments tied to changed conditions. The "Total Expenses" FY2016 Budget was $ $706,113 and the "Total Expenses" FY2017 Budget was $880,508. Additional detail is presented in Appendix F.

6.6.3. DEBT REPAYMENTS

The remaining balance on an existing CWSRF loan for the planning engineering studies associated with the proposed WWTF improvements was $315,000 at the close of 2016.

Assuming a bond is obtained for approximately $6.8 million for construction of the WWTF, the annual debt service is estimated to be $417,818 with a 25 year maturity or $383,578 with a 30 year maturity, and $294,600 with a 40 year maturity.

6.6.4. RESERVES

The 2016 year end reserve account totals were $136,142 for the Water Depreciation Reserve and $196,684 for the Sewer Depreciation Reserve. The 2016 budgeting cycle (projecting for 2017) set aside the following into reserve accounts: $60,000 for Water, $75,000 for Sewer.

6.6.4.1. DEBT SERVICE RESERVE

Required reserves for the Village's current debt total $193,654. With the addition of a 40-year $7,000,000 USDA loan at 3.375%, the required debt reserve will increase to $488,654.

6.6.4.2. SHORT LIVED ASSET RESERVE

The Village's sewer infrastructure has been largely upgraded over the last five years due to stresses placed on old lines and components by private development. Therefore, other than the WWTF expansion, the Village does not foresee substantial replacement costs over the next 15 years.

A. 0-5 Years

Due to pending redevelopment of the ski area, sewer infrastructure will be replaced in the immediate future (e.g., 2017-2018) on the Strawberry Hill area of the ski resort. These improvements include replacement of three manholes and upgrading 600 linear feet of 6-inch slip-line HDPE to thicker-walled 8-inch HDPE. The total cost for this project will be approximately $210,500; however, it is anticipated that the Tax Increment Development District will cover these public improvements and that the Village will not need to seek funding sources to complete the work.

B. 5-10 Years

Other than several manhole replacements totaling approximately $10,000, no significant replacement of sewer infrastructure is planned in the five- to ten-year range.

C. 10-15 Years

In the 10-15 year range, the Village anticipates additional manhole replacements totaling approximately $16,000 and a 600-linear foot sewer line replacement from Lake Fork to Ernie Blake Road totaling $350,000.

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7. CONCLUSIONS AND RECOMMENDATIONS

7.1. CONCLUSIONS AND RECOMMENDATIONS

Based on the alternatives analysis that considered both cost and non-cost evaluation criteria, and environmental impacts and benefits, the selected alternative for the Village of Taos WWTF improvements is to replace the existing IFAS/MLE biologic treatment system and clarifiers with Alternative 3 - Membrane Bioreactor (MBR) system. The upgraded facility will be designed to treat a maximum monthly average daily flow of 0.31 MGD, along with an organic loading of 911 lbs/day of BOD5.

The primary factors that drive the selection of the MBR treatment system over the alternate secondary treatment process options are: high effluent quality, reduced footprint, process stability, flexibility and cost effectiveness.

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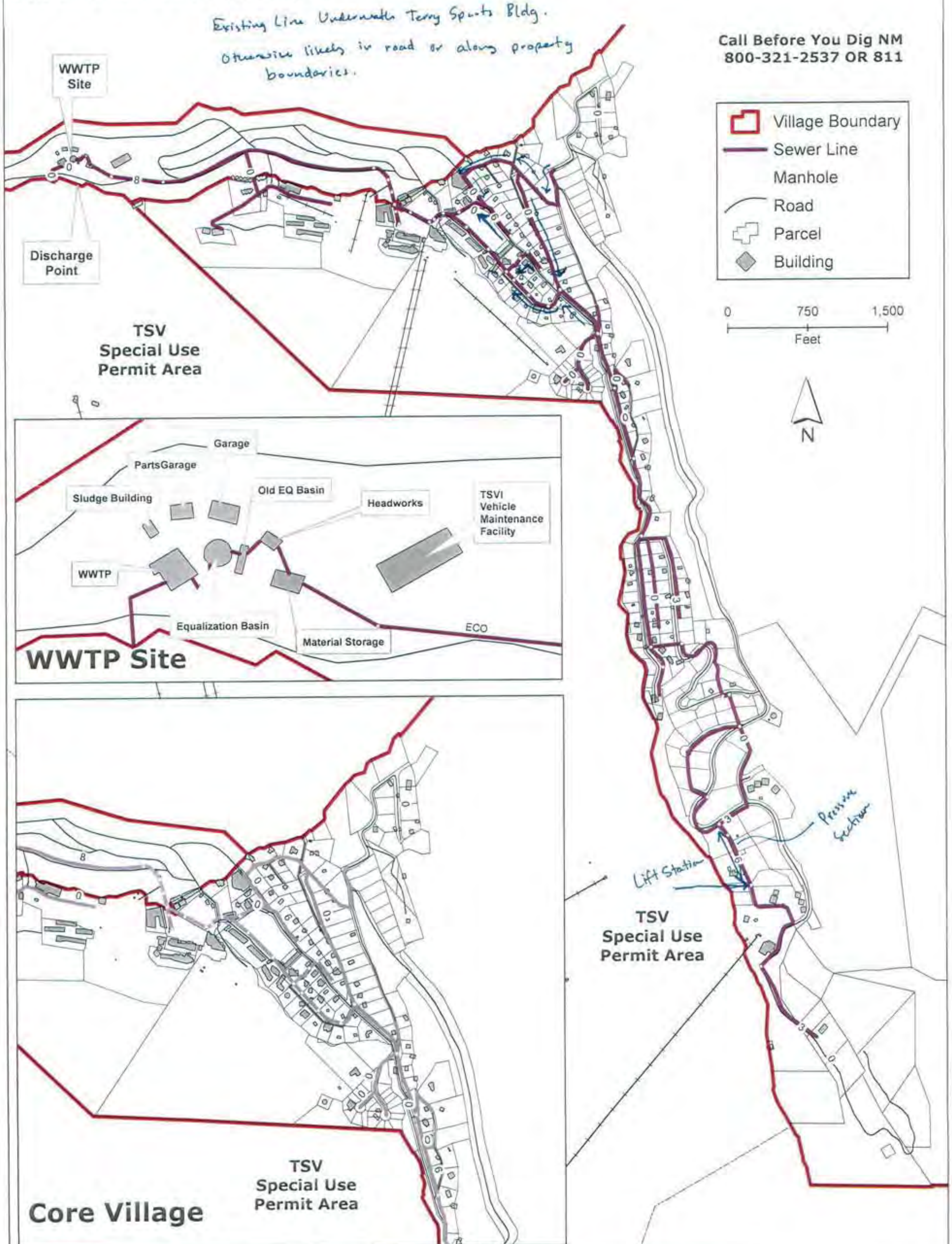
APPENDIX A.1

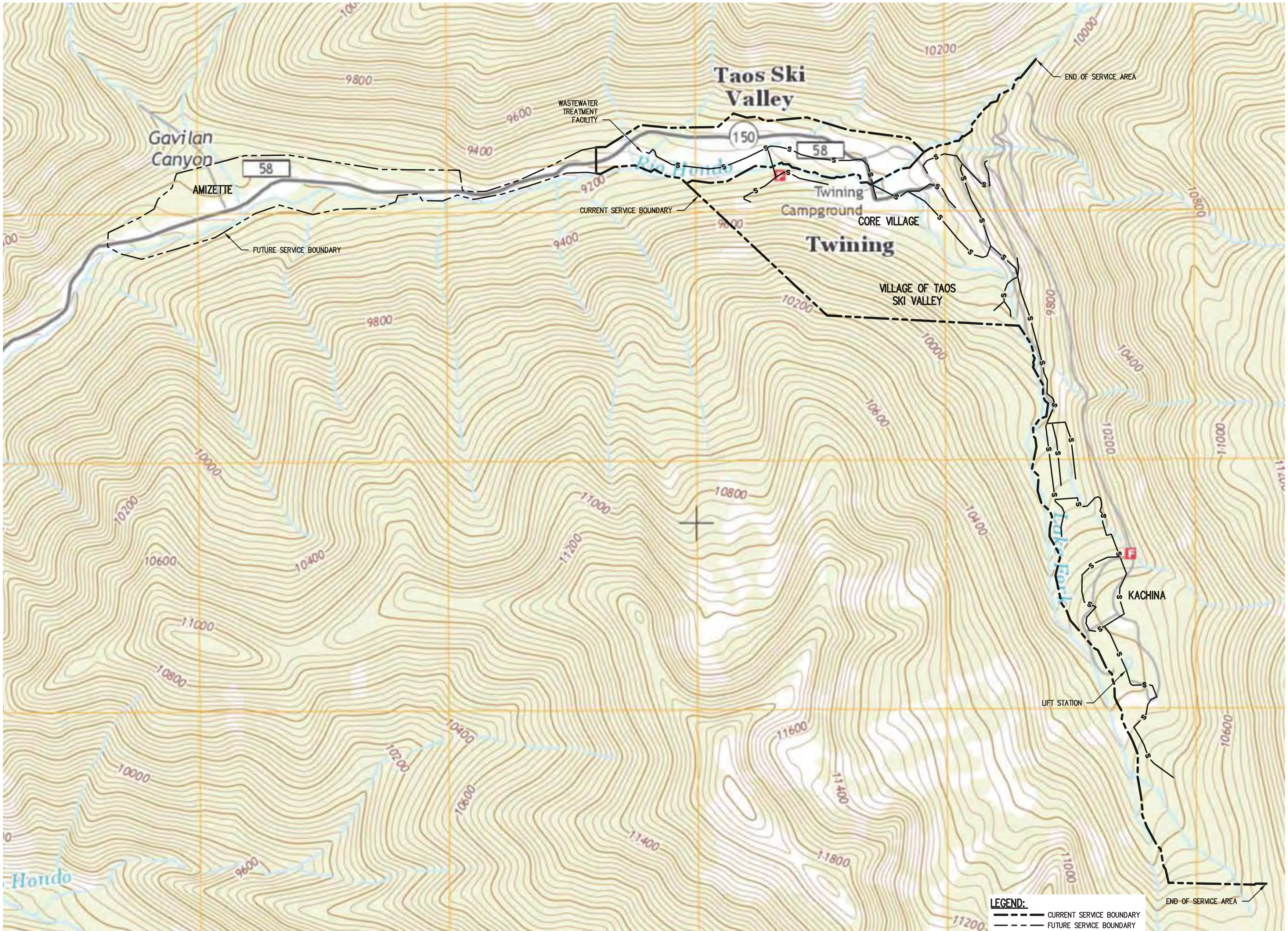
WWTF SERVICE AREA

Sewer Utility - Existing Conditions

The Village operates and maintains the wastewater treatment plant and approximately 3.5 miles of sewer lines. The plant was first constructed in 1982 and improved in 2004 with an intended capacity of 200,000 gallons per day. Maximum daily flow capacity is approximately 115,000 gallons per day (gpd) during the winter ski season. The plant is located on Ocean Boulevard within the US Forest Service Special Permit Area. It uses a conventional activated sludge system with integrated fixed film aeration. Treated water (effluent) is discharged into the Rio Hondo, which is described as a high quality mountain stream, requiring an advanced treatment process to maintain water quality standards. The discharge permit from the New Mexico Environment Department for the discharge of treated wastewater from the plant into the Rio Hondo expires in September, 2016. Discharge permits are renewed every five years. The Village currently transports the solid sludge to the landfill in Rio Rancho.

There are approximately 40 buildings with private septic tanks. All wastewater in Amizette is stored in vaults until it is pumped and trucked to the Town of Taos wastewater treatment plant.



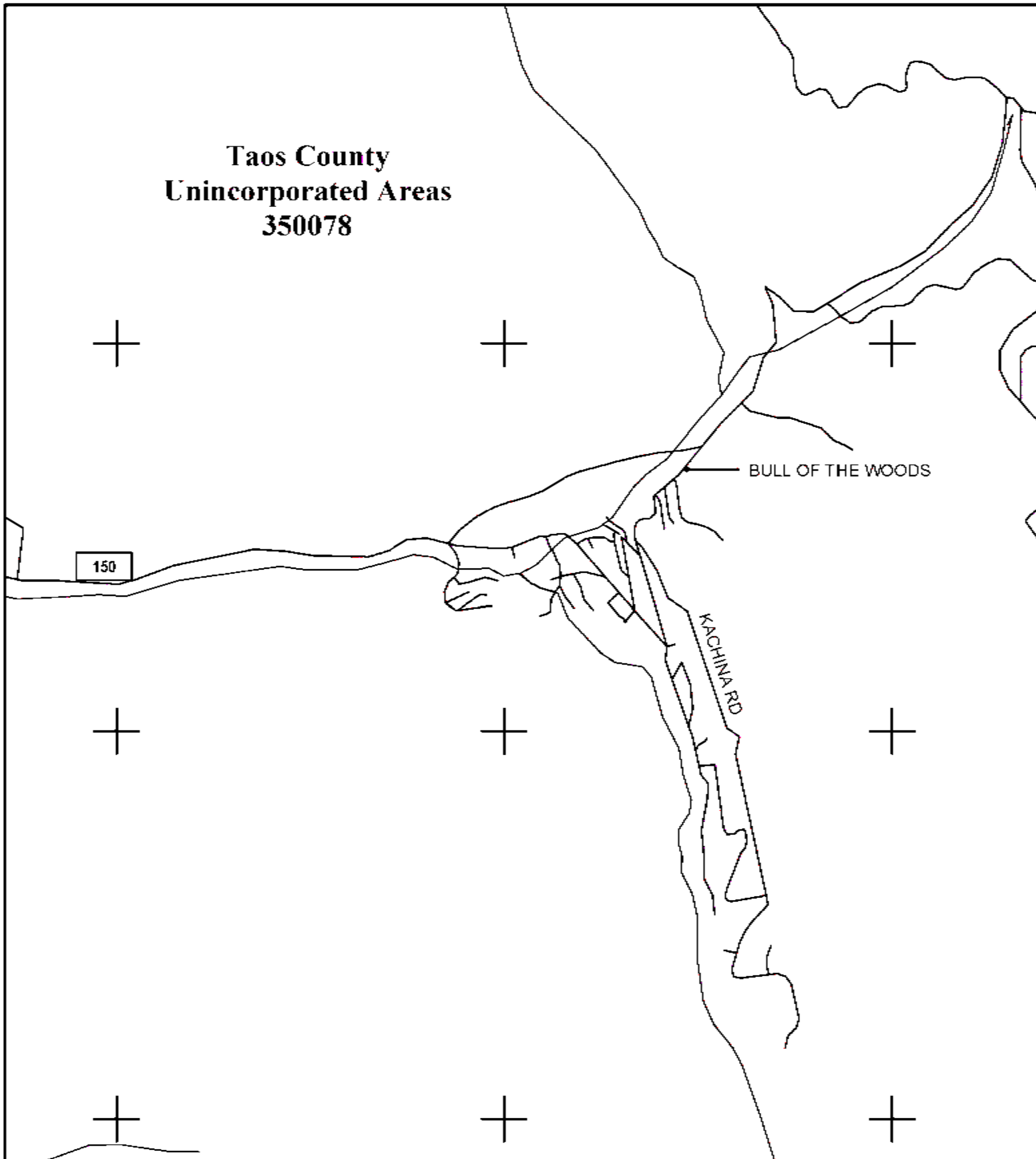


W:\VTSV-S14-0132 – WWTP\PER FIGURES\FIGURE LAST SAVED: 4/12/2016 8:35 AM LAST PLOTTED: 4/12/2016 8:35 AM BY: KEITH

FEI ENGINEERS

VILLAGE OF TAOS SKI AREA
WASTEWATER TREATMENT FACILITY PRELIMINARY ENGINEERING REPORT
CURRENT AND FUTURE SERVICE AREA

APPENDIX A.2
FEMA FIRM



MAP SCALE 1" = 2000'

1000 0 2000 4000

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0675E

FIRM

FLOOD INSURANCE RATE MAP

TAOS COUNTY, NEW MEXICO AND INCORPORATED AREAS

PANEL 675 OF 1250

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
TAOS COUNTY	350078	0675	E
TAOS PUEBLO	350015	0675	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
35055C0675E

EFFECTIVE DATE
OCTOBER 6, 2010

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov


FEMA NFHL
PANEL
35007C0800D
eff. 11/4/2010
PANEL
AREA OF MINIMAL FLOOD HAZARD Zone X
Village of Taos Ski Valley WWTF
150
Ocean Blvd
REFERENCE LAYERS
NFHL Data Available
FIRM Panel Boundary
LOMR Boundary
SPECIAL FLOOD HAZARD AREAS
1% Annual Chance Flood Hazard Zone A, AE, A99, AO, AH, AR, V, VE
Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD
0.2% Annual Chance Flood Hazard Zone X
Future Conditions 1% Annual Chance Flood Hazard Zone X
Area with Reduced Flood Risk due to Levee Zone X
NO SCREEN
Areas Outside the 0.2% Annual Chance Floodplain Zone X
Areas of Undetermined Flood Hazard Zone D
CROSS SECTIONS & BFES
Cross Sections with 1% Annual Chance Water Surface Elevation
Coastal Transect
Coastal Transect Baseline
Profile Baseline
Base Flood Elevation
SUPPORTING INFORMATION
Limit of Study
Jurisdictional Boundary
© 2015 Google
Google earth

APPENDIX A.3
EQUIVALENT RESIDENTIAL UNIT

Kee Venkatapathi

From: Kee Venkatapathi
Sent: Friday, September 25, 2015 2:46 PM
To: 'Don'; Ray Keen; 'mfratrick@vtsv.org'
Cc: 'Mark Dahm (Mark.Dahm@FEIEngineers.com)'; Patrick OBrien
Subject: RE: Parcel D - Water and sewer information needed by Village

Tracking:

Recipient	Delivery
'Don'	
Ray Keen	
'mfratrick@vtsv.org'	
'Mark Dahm (Mark.Dahm@FEIEngineers.com)'	Delivered: 9/25/2015 2:46 PM
Patrick OBrien	Delivered: 9/25/2015 2:46 PM

Don,

Following up on our previous email included below, we wanted to provide you with the methodology we have used to revise the Base Area estimated EQR's to include the new information you have provided for Parcels D and G. Please advise us if VTSV wishes to utilize any alternate estimates of future numbers of units or size of units, or any alternate approach to estimating EQR's from housing unit square footage information.

We developed an estimate of the Parcel D future EQR's using the information you provided in your 9/22/15 email and the EQR/sq. ft. factors from the Multi-Family Residential Unites EQR table included in the 2011 PER – applying the EQR/sq. ft. factors to the projected unit sizes contained in the parcel D data you relayed, and summing those up to a resulting total Parcel D future EQR total of 50.65. Please see the tables below for the supporting information. For Parcel G, we have utilized the projected number of future EQR's that you provided in your 9/9/15 email. The total for Parcel G provided in an attachment to that email was 107.65.

To calculate the total estimated adjustment to the 2011 Base Area EQR estimate of 930, we added the estimated future EQR's for Parcel D and Parcel G to the Base Village, and subtracted the estimated 8.15 EQR's associated with the demolition of facilities replaced by the re-development of Parcels D and G (the estimate of 8.15 EQR's was provide in your 9/9 email)

For the Kachina Village estimate of future EQR's we used the information provided in our meeting of 9/9/15, increasing the Kachina Village EQR to 410 from 300.

In summary, the above-described adjustments to the 2011 EQR estimates, result in an increase of the estimated total EQR's from 1780 to 1990. Please let us know if you concur with our estimation here, or if you have any alternate data or methodology you would like to have us utilize?

Please let us know if you have any questions.

Multi-Family Residential Unit EQR Factors (Source: 2011 PER)	
Up to, sf	EQR
1200	0.65

1500	0.8
1800	1
250	0.2

PARCEL- D EQR				
Bedrooms	Sq. ft	Total units in A and B wing	EQR assigned/unit	EQR
1	1000	9	0.65	5.85
2	1450	27	0.8	21.6
3	1950	14	1.2	16.8
4	2450	4	1.6	6.4
			Total EQR	50.65

Parcel D EQR	Parcel G EQR	Demolition of Skier building EQR
50.65	107.65	8.15

	2011 PER	2015 FEI estimate			
Base Area	930	1080.15		*= 930 +50.65 +107.65 - 8.15*	
Intermediate zone	200	200			
Kachina Village	350	410		*- Based on discussion with Don and Ray*	
Amizette	300	300			
Total, EQR	1780	1990			

Have a Great Day!!!

Thanks,
Kee

www.FEIEngineers.com

Kee Venkatapathi, CWP
Process Engineer
Keerthivasan.Venkatapathi@FEIEngineers.com
5325 S Valentia Way
Greenwood Village, CO 80111
Phone: (303) 300-3464

From: Kee Venkatapathi
Sent: Wednesday, September 23, 2015 11:27 AM
To: Don <dschieber@vtsv.org>
Cc: 'Mark Dahm (Mark.Dahm@FEIEngineers.com)' <Mark.Dahm@FEIEngineers.com>
Subject: RE: Parcel D - Water and sewer information needed by Village

Don,

Good Morning.

Reiterating from Mark's email earlier today, we understand that the projected Kachina and Base Village EQR numbers need to be revised upward from the values discussed in the September 9th meeting (please refer to column two in the following table). Can you please look at the table below and clarify some of the questions we have in the notes below the table.

	Estimated EQR's from September 9th Meeting	**Revisions to Estimated EQR's Identified in September 9th Meeting**	**Comments**
Base Village	930	Increase in EQR	See Note 1
Intermediate Zone	200	200	Meeting notes indicated no change to the estimate of 200
Kachina Village	350	410	From meeting notes following discussion with Don. See Note 2
Amizette	300	300	See Note 3
Total EQR	1780		

1. The estimated Base Village EQR's need to be increased due to redevelopment of Parcel G and Parcel D. The Parcel G EQR is estimated at 107.65 from the attachment in the email sent to Mark on September 9th . In the same email in the attachment "Parcel G EQR pillow count" EQR of 89 is calculated. Is the EQR "89" included as part of the EQR "107.65"?
   a. Both Parcel G and Parcel D are redevelopments, meaning there is a loss in EQR's due to the demolition and gain in EQR's due to the new development.
   b. For the redevelopment of Parcel D can you provide an estimate of the EQR's?
   c. Can the net increase to the Base Village EQR's be calculated as = 930 – demolition EQR's lost + Parcel G + Parcel D
      = 930 – 8.2 + 107.65 + Parcel D

2. Can you confirm the increase in EQR's to 410 for Kachina Village ?

3. Based on our discussion in the September 9th meeting, Amizette does not have space for any significant additional development and the estimate of 300 EAR's is still accurate, correct?

If you have any questions, please let us know.

Have a Great Day!!!

Thanks,
Kee

FEI ENGINEERS
www.FEIEngineers.com

Kee Venkatapathi, CWP
Process Engineer
Keerthivasan.Venkatapathi@FEIEngineers.com

5325 S Valentia Way
Greenwood Village, CO 80111
Phone: (303) 300-3464

Please consider the environment and only print this e-mail if you must. Think Green and Reduce, Reuse, Recycle

---

From: Mark Dahm
Sent: Wednesday, September 23, 2015 8:27 AM
To: Don <dschieber@vtsv.org>
Cc: Kee Venkatapathi <Keerthivasan.Venkatapathi@FEIEngineers.com>
Subject: RE: Parcel D - Water and sewer information needed by Village

Hi Don,

Thank you for the updated data you relayed for tract D. As we have discussed, EQR numbers for the Base Village and Kachina need to be revised from what is shown on the attached. Kee and I may have some additional clarification questions to run by you, and Kee will be following up this email with some of those thoughts.

Mark

FEI ENGINEERS
www.FEIEngineers.com

Mark Dahm, P.E.
Project Manager
Mark.Dahm@FEIEngineers.com
101 West 11th Street #112
Durango, CO 81301
Phone: (970) 247-0724

From: Don [mailto:dschieber@vtsv.org]
Sent: Tuesday, September 22, 2015 1:21 PM
To: patrick.obrian@feiengineers.com
Cc: Mark Dahm <Mark.Dahm@FEIEngineers.com>; Kelly Fearney <kelly.fearney@FEIEngineers.com>
Subject: FW: Parcel D - Water and sewer information needed by Village
Importance: Low

Team:

This is the latest development proposal which can be used for near term eqr analysis for tract D adjacent to the resort center development.

Regards,

Don

From: Drew Chandler [mailto:DrewC@russellpe.com]
Sent: Tuesday, September 22, 2015 11:34 AM
To: Patrick OBrien; Kelly Fearney
Cc: Don; Matt Foster
Subject: FW: Parcel D - Water and sewer information needed by Village
Importance: Low

Patrick and Kelly,

I've attached the most recent data for the proposed Taos Ski Valley Parcel D development. This is the mixed-use development on the north side of the Rio Hondo, across from the Parcel G construction.

Thanks,

Drew

Drew Chandler, P.E.

Project Manager

Russell Planning and Engineering, Inc.

934 Main Avenue, Unit C

Durango, CO 81301

Ph: 970-385-4546 Ext. 24

www.russellpe.com

OLD TSV DAY SKIER BUILDING

	USE					
	LOCATION	STORAGE	RETAIL	OFFICE	MULTI FAMILY	
LEVEL 1	1.1	1130				
	1.2	123				
	1.3	878				
	1.4	239				
	1.5	1279				
	1.6	556				
LEVEL 2	2.1		913			
	2.2		7159			
	2.3	323				
LEVEL 3	3.1		915			
	3.2		5469			
	3.3			634		
	3.4	542				
	3.5	1509				
LEVEL 4	4.1	597				
	4.2				1078	
	4.3				1398	
	TOTAL AREA	7176	14456	634	2476	
FACTOR	1000	0.2	0.3	0.5		
	1200				1	
						TOTAL
	EQR	1.4352	4.3368	0.3170	2.0633	8.1523
	RATE $					TOTAL
SEWER	3,556.00	5,103.57	15,421.66	1,127.25	7,337.21	28,989.70
WATER	4,416.00	6,337.84	19,151.31	1,399.87	9,111.68	36,000.70

program summary

A Wing	1BR 1,000	2BR 1,450	3BR 1,950	4BR 2,450	total units	total sf	Amenity sf	retail sf	Parking sf
basement	1	1	1	0	3	4,400			28,150
1st floor	1	3	0	0	4	5,350	400	7,850	
2nd floor	2	5	1	0	8	11,200			
3rd floor	2	5	1	0	8	11,200			
4th floor	0	2	4	2	8	15,600			
total A	**6**	**16**	**7**	**2**	**31**	**47,750**	**400**	**7,850**	**28,150**
B Wing									
basement	0	0	0	0	0	0			
1st floor	1	1	0	0	2	2,450	3,000	8,550	
2nd floor	1	4	2	0	7	10,700			
3rd floor	1	4	2	0	7	10,700			
4th floor	0	2	3	2	7	13,650			
total B	**3**	**11**	**7**	**2**	**23**	**37,500**	**3,000**	**8,550**	**0**
Grand Total	**9**	**27**	**14**	**4**	**54**				
Percentage	**17%**	**50%**	**26%**	**7%**					
SF	9,000	39,150	27,300	9,800		**85,250**	**3,400**	**16,400**	**28,150**

Total Building Area	**133,200**
Total Bathrooms	**121**
Total Bedrooms	**121**
Parking Spaces Required	**54**
Parking Spaces Provided	***77**

condo bathroom summary

	1 Bed	2 Bed	3 Bed	4 Bed
A Wing	6	16	7	2
B Wing	3	11	7	2
Total Units	**9**	**27**	**14**	**4**
Bathroom(s) Per Unit	**1**	**2**	**3**	**4**
Total Bathroom(s) Per Type	**9**	**54**	**42**	**16**
Total Bathrooms				**121**

condo bedroom summary

	1 Bed	2 Bed	3 Bed	4 Bed
A Wing	6	16	7	2
B Wing	3	11	7	2
Total Bedroom(s) Per Type	**9**	**54**	**42**	**16**
Total Bedrooms				**121**

parking summary

	# Units
A Wing	31
B Wing	23
Total	**54**
Parking Spaces Required	**54**
Parking Spaces Provided	***77**

**includes (4) Accessible Spaces per Code Req.*

PARCEL- D EQR				
Bedrooms	Sq.ft	Total units in A and B wing	EQR assigned/unit	EQR
1	1000	9	0.65	5.85
2	1450	27	0.8	21.6
3	1950	14	1.2	16.8
4	2450	4	1.6	6.4
			Total EQR	50.65

2. Multi-family Residential Units

Apartments, condominiums, town houses with common services, and similar dwellings in the same complex, additional apartments in single family units and small cabins in courts not associated with motels.

II-6

NOTE: Only one kitchen is permitted per unit. A kitchen is defined as any area having facilities for cooking, and associated dishwashing facilities. Includes common laundry facilities or individual laundry hook ups. Swimming pools and hot tubs are additive in accordance with classification D.1.. Common club house facilities are additive in accordance with classification A.2.f..

a. Small unit, having not more than 1,200 sq. ft. of floor area 0.65

b. Medium unit, having not more than 1,500 sq. ft. of floor area 0.80

c. Large unit having not more than 1,800 sq. ft. of floor area 1.00

e. Add for each additional 250 sq. ft. of floor area, or fraction, thereof 0.20

e. Common club house or recreation room facilities, not including commercial classification areas such as banquet rooms, bars or lounges, or customer laundry areas, or swimming pool and hot tub areas (per 1,000 square feet of gross floor area) 0.35

Multi-family residential unit from EQR table	
Upto, sf	EQR
1200	0.65
1500	0.8
1800	1
250	0.2

EQR PARCEL G BASED ON AREA AND FACTORS

LEVEL	PARKING	STOR	RETAIL	BUS	CLUB HOUSE	REST BAR	CIRC	ELEC MECH	HOTEL RM	SUITE CONDO	TOTAL	TOTAL LEVEL
1 E	13,779	2,484					406	1,202			17,871	
1 W	4,998	3,211		3,492							11,701	29,572
2 E		1,015	7,422	1,111	3,842		2,941	219			16,550	
2 W				2,751	535		1,845		3,740	4,990	13,861	30,411
3 E			5,838			4,841	1,325		552		12,556	
3 W			2,441				1,719		4,373	5,163	13,696	26,252
4 E							1,239		4,471	4,507	10,217	
4 W							1,908		6,312	5,231	13,451	23,668
5 E							1,225		4,509	4,567	10,301	
5 W							2,005		6,608	3,100	11,713	22,014
6 E							1,286			9,193	10,479	
6 W							1,933			8,112	10,045	20,524
7 E							272			7,081	7,353	
7 W							311			6,339	6,650	14,003
	18,777	6,710	15,701	7,354	4,377	4,841	18,415	1,421	30,565	58,283	166,444	166,444
1000		0.20	0.30	0.50	0.35				1.00	1.00		
EQR		1.34	4.71	3.68	1.53	4.20			30.57	58.28		104.31
									TOTAL SLEEPING EQR	88.85		

	SF	Depth	Vol ft3	Gallons	Factor	Rate	EQR		
POOL (WATERSURFACE AREA)	780	7	5,460	42,588	1.05	40,000	1.12		1.12
HOT TUBS (WATER SURFACE AREA)	122	4	427	3,331	0.20	300	2		2.22
							Total EQR		107.65

PROPOSED WATER & SEWER FEES

	RATE $	EQR	FEE $
WATER	4,416.00	107.65	475,371.74
SEWER	3,556.00	107.65	382,794.81

IMPACT FEES

"AREA" IS CALCULATED AS GROSS BUILDING AREA MINUS PARKING AREA

RATE $	AREA	FEE $
4.3724	147,667	645,659.19

TIDD @ 75%	-484,244.39
FEE TO VILLAGE AT 25%	161,414.80

APPENDIX A.4

LEONARD RICE MEMO ON PERMITTING

Memorandum

To: Mark Dahm, FEI Engineers

From: Dan DeLaughter & Jojo La, Leonard Rice Engineers

Copy to: Kee Venkatapathi, FEI Engineers

Date: December 4, 2015

Project: Village of Taos Ski Valley Wastewater Treatment Plan Preliminary Evaluation of Effluent Limits (NPDES Permit No. NM0022101)

Subject: Permitting Support for Nutrient Limits

In the development of a Preliminary Engineering Report for the improvement/expansion of the Village of Taos Ski Valley (VTSV) Wastewater Treatment Facility (WWTF), Leonard Rice Engineers (LRE) has evaluated the VTSV WWTP National Pollutant Discharge Elimination System (NPDES) effluent nutrient permit limits. The purpose of this memorandum is to document LRE's findings for the following:

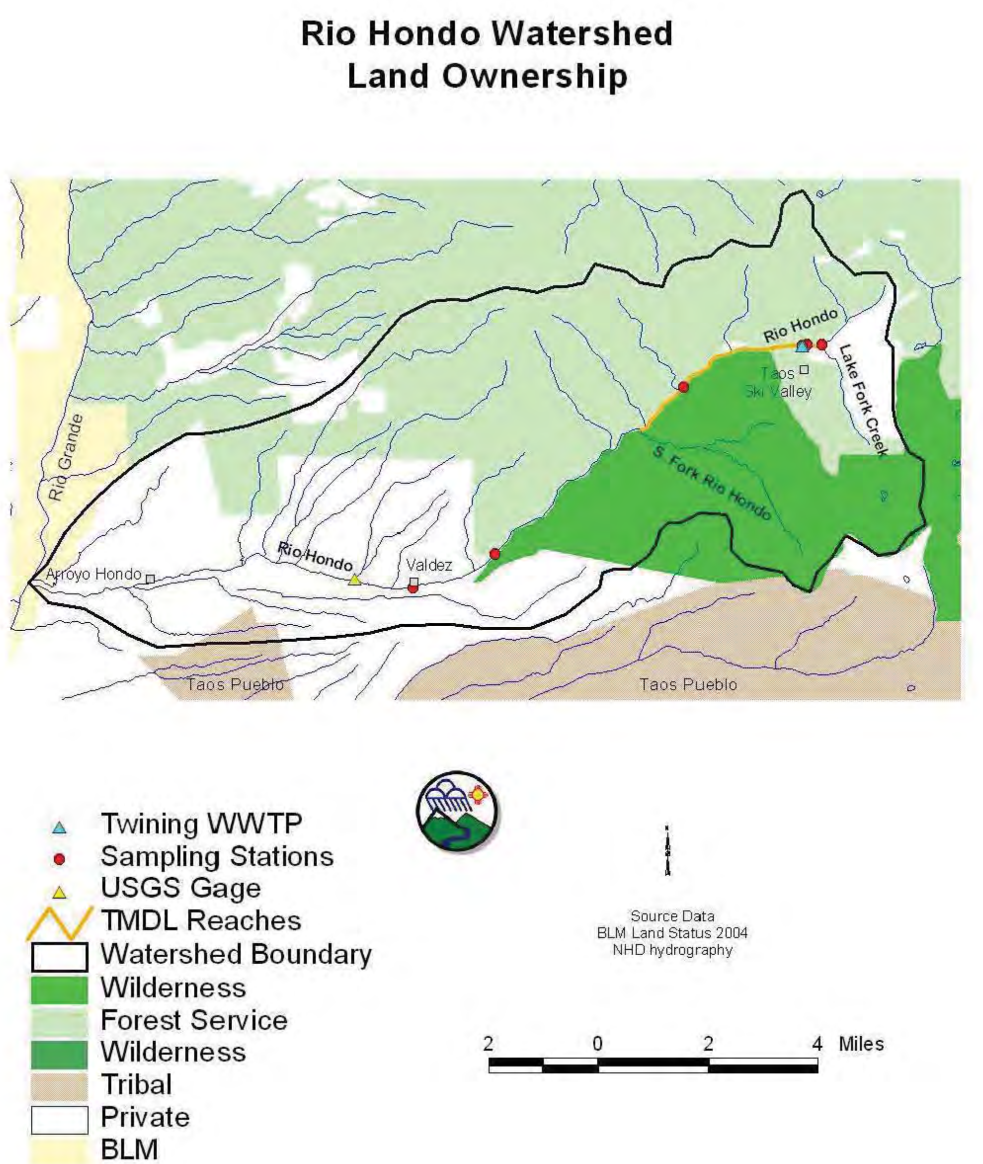
- Evaluation of the proposed new VTSV WWTF flow and loading provided by FEI;
- Evaluation of current permit limitations for nutrients, and evaluation of potential new limits based on the proposed flow and loading, including: TMDL wasteload allocations, water quality-based limits (if applicable), and antidegradation-based limits (if applicable);
- Summary of flexibility provided by potential offset credits from septic tie-ins or other point or non-point sources identified in the TMDL; and
- Identification and scoping of alternate approaches that could potentially be used to modify limits based on Wasteload Allocations.

Introduction

The VTSV WWTF is authorized to discharge to the Rio Hondo, National Pollution Discharge Elimination System (NPDES) permit No. NM0022101, located in the Rio Grande Basin (Waterbody Segment Code No 20.6.4.129). The segment is classified as Category 2, and the designated uses of this receiving water are domestic water supply, high quality coldwater aquatic life, irrigation, and wildlife habitat. The Rio Hondo Basin is a sub-basin of the Upper Rio Grande. The current design capacity of the VTSV WWTF is 0.167 million gallons per day (MGD), serving a population that fluctuates from approximately 500 to 5,000 depending on the season of the year. The current VTSV NPDES discharge permit became effective on October 1, 2011, with an expiration date of September 30, 2016.

Rio Hondo Total Maximum Daily Load

In 2005, the New Mexico Environment Department (NMED) developed a Total Maximum Daily Load (TMDL) for nutrients in the Rio Hondo Basin to document the amount of nutrients a water body can assimilate without violating the State's water quality standards. The TMDL allocated the load capacity to known point sources and nonpoint sources at a given flow. The TMDL identified the VTSV WWTF as the only point source discharge of nutrients in the Rio Hondo Basin. The primary nonpoint discharge of nutrients is from residential and urban areas, septic tank disposal systems, construction sites, recreational activities, ski slope runoff, and atmospheric disposition. The figure below shows the segment location.



<ins>This segment, South Fork of Rio Hondo to Lake Fork Creek, is not currently impaired and is not listed on the 303(d) List of Impaired Waters or the Monitoring and Evaluation List for nutrients (2014 303(d) List).</ins> In addition, previous studies also indicated that the Rio Hondo near the Village of Taos Ski Valley fully supports its designated uses. The 2005 TMDL was developed in anticipation of VTSV WWTF's increase in its capacity and effluent discharge into the Rio Hondo. <ins>The TMDL states that the 2005 TMDL will be used to determine the new nutrient limits for total phosphorus and total nitrogen for the new VTSV WWTF</ins>. Revisions of VTSV's 2006 NPDES permit were part of the implementation of the 2005 TMDL, and are reflected in the VTSV's current discharge permit (2005 TMDL).

Currently, there are no numeric standards applicable to the Rio Hondo for total phosphorus and total nitrogen. The TMDL was based on the narrative standard and suggested stream target concentrations in the 1981 Water Quality Management Plan for the Rio Hondo. In addition, all calculations in development of this TMDL used a plant design capacity of 0.200 MGD to estimate treatment capacity in the future scenario, which was intended to accommodate projected growth through 2020 (2005 TMDL).

Total Phosphorus

The TMDL analysis determined a total phosphorus waste load allocation of 1.47 lbs/day for the VTSV WWTF. However, the 1981 TMDL load allocation was 1.00 lbs/day. The Surface Water Quality Bureau (SQWB) and the VTSV therefore maintained the 1981 TMDL loading in the 2006 VTSV NPDES permit based on the state of New Mexico's antidegradation policy, even though the 2005 TMDL calculated a higher TP waste allocation. Thus, under the 2005 TMDL, the VTSV WWTF could not increase phosphorus loading into the Rio Hondo watershed, since the state cannot "assure that water quality adequate to protect existing uses fully" will be met with increased phosphorus loading. Table 1 below shows the annual VTSV WWTF waste load allocation and TMDL for Rio Hondo (2005 TMDL).

Table 1: VTSV WWTF TP Annual Waste Load Allocation and TMDL for Rio Hondo

Parameter	Time Interval	Streamflow 4Q3[1] (MGD)	WWTF Design Capacity Flow[2] (MGD)	Seasonal WLA[3] (lbs/day)	Calculated Effluent Conc.[4] (mg/L)	Allowable 30-day Av. Conc.[5] (mg/L)	Allowable 7-day Av. Conc.[6] (mg/L)
Total Phosphorus	November through April	3.693	0.200	1.46	0.87	0.8	1.0
	May and June	14.97	0.200	5.80	3.48	3.0	4.5
	July and August	8.559	0.200	3.32	3.98	4.0	6.0
	September and October	6.321	0.200	2.44	7.32	7.0	10

[1] The critical low flow condition in the Rio Hondo is the average low-flow that persists for four consecutive days once every three years, on average (4Q3). The period of record of flow used was from 1936-2002.
[2] Effluent volume is the originally proposed design capacity and/or seasonal effluent volume of VTSV WWTP (in MGD).
[3] Seasonal waste load allocations (in lbs/day) allotted to VTSV.
[4] Maximum allowable effluent concentrations to be protective of the river within the TMDL assessment unit.
[5] The allowable 30-day average was determined by rounding the calculated effluent concentration.
[6] The allowable 7-day average is defined as 1.5 times the allowable 30-day average.

Total Nitrogen

A phased total nitrogen TMDL was developed in the 2005 TMDL. The Target Capacity Loading Analysis conducted in the 2005 TMDL determined that the allowable total nitrogen mass load in the Rio Hondo is 31.9 lbs/day. VTSV has developed a phased plan for a community-wide sewer line extension project to convert all on-site septic systems in the community to the WWTF. If the VTSV converts all septic systems to the WWTF, then the portion of the total nitrogen load allocation that is associated with septic systems (e.g. 5.17 lbs/day) can become a WLA. Table 2 summarizes the results for this phased approach and includes the annual LAs, WLAs, and maximum allowable effluent concentrations (2005 TMDL).

Table 2: VTSV WWTF Total Nitrogen Annual Waste Load Allocation and LAs and TMDL for Rio Hondo

% Conversion	WLA (lbs/day)	LA (lbs/day)	TMDL (lbs/day)	Allowable 30-day Av. Conc.[1] (mg/L)
Phase I – 0% capture	11.0	11.8	31.9	6.5
Phase II – 25% capture	12.3	10.5	31.9	7.0
Phase III – 50% capture	13.6	9.24	31.9	8.0
Phase IV – 75% capture	14.9	7.94	31.9	9.0
Phase V – 100% capture	16.2	6.65	31.9	10.0

[1] Maximum allowable effluent concentration to be protective of the river within this assessment unit given the annual waste load allocation and proposed design capacity for the VTSV WWTF. Value Rounded to the nearest tenth.

New Mexico Antidegradation Policy

The South Fork of the Rio Hondo below the VTSV discharge point is classified as a Tier 2 water for antidegradation for nutrients and is considered a water whose quality is better than necessary to protect the Clean Water Act (CWA) Section 101(a)(2) goals. In Tier 2 waters, limited degradation may be allowed after consideration of several factors, including:

- The discharge's potential to affect existing or designated uses or to interfere with CWA Section 101(a)(2) goals (water quality which provides for the "protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water");
- The need to accommodate important economic and social development in the area in which the water is located; and
- The availability of discharge alternatives, including no discharge, reuse, land disposal, pollution prevention or reduction, and pollutant trading with point and non-point sources.

The state of New Mexico's antidegradation policy (NMAC 20.6.4.8, 2002) states:

> *"…Existing instream uses and the level of water quality necessary to protect the existing uses shall be maintained and protected in all surface waters of the state… Where the quality of a surface water of the state is meeting some or all applicable water quality criteria the existing quality shall be maintained and protected unless the commission finds… that allowing lower water quality is necessary to accommodate important economic and social development in the area in which the water is located. In allowing such degradation or lower water quality the state shall assure water quality adequate to protect existing uses fully."*

The Policy prohibits the degradation of Tier 2 waters by an increased discharge or the renewal of a permit for an existing discharge. However, the Policy does not prohibit an increased discharge or the renewal of a permit for an existing discharge. In special circumstances, a discharge may be allowed if it does not cause degradation or causes only temporary and short-term changes in water quality that do not impair existing uses or if the activity is intended to implement the Section 101(a) objectives of the

CWA. Such special circumstances must undergo antidegradation review (State of New Mexico Continuing Planning Process, Appendix A, Antidegradation Policy Implementation Procedure). If the VTSV increases the loading or concentration limitations in its 2016 discharge permit, VTSV must make a case-by-case demonstration that the increased discharge or the renewal of a permit for an existing discharge will not cause degradation.

For degradation of a Tier 2 water, water quality must be maintained to ensure the protection of existing uses. Water quality also must be maintained to ensure the protection of designated uses unless the designated uses are modified through a use attainability analysis (40 CFR 131.10(j) and 20.6.4.14 NMAC) or adequately protected by segment-specific water quality standards. Finally, water quality must be maintained to ensure the protection of the CWA Section 101(a)(2) uses. VTSV bears the burden of demonstrating the social and economic need for degrading water quality.

A Tier 2 review will be conducted if the increased discharges and the renewal of the permit will cause **significant** degradation of water quality. In rare instances the Water Quality Control Commission may consider revising the TMDL WLA. In this situation two processes come into consideration, the public and commission review of the TMDL and the NMED's review of the TMDL under the antidegradation policy. When this situation occurs, the two processes may for efficiency be held simultaneously or sequentially depending on the specific circumstances of the case. The NMED will evaluate whether the magnitude of the effect on water quality exceeds a specific level on a parameter-by-parameter basis. The evaluation will be conducted using numeric criteria only, because of the impracticability of applying the process to narrative criteria (2010 State of New Mexico Antidegradation Policy Implementation Policy Section IV.B.1).

***De Minimis* Policy**

The following new or increased discharges and the renewal of permits for existing discharges by publicly owned treatment works (POTWs) are considered *de minimis* and are not subject to Tier 2 review provided that the assimilative capacity is more than 10% of the criterion for the parameter of concern and:

- The design capacity of the POTW or the pollutant load (measured on a parameter-by-parameter basis) will increase 10 percent or less in a five-year period, and the exemption is not used for two consecutive permits;
- The design capacity of the POTW will increase by 10 to 25 percent in a five-year period, the POTW demonstrates to the Department's satisfaction that it is implementing a water conservation or wastewater reuse or diversion program designed to reduce the discharge pollutant load by at least 10 percent in that five-year period, and the exemption is not used for two consecutive permits;
- The design capacity of the POTW is 10 percent or less of the critical low flow of the receiving stream (as defined in the water quality standards);
- The POTW demonstrates to the Department's satisfaction that its pollutant load (measured on a parameter-by-parameter basis) will be offset by enforceable reductions by other point or nonpoint sources within the same waterbody segment as the new or increased discharge; or
- The increased discharge or the renewal of a permit for an existing discharge was reviewed in an Environmental Assessment (EA) or Environmental Impact Statement (EIS) that considered water quality impacts and the social and economic development in the area in which the water is located and that was conducted in accordance with federal regulations, and in the case of an EA, the responsible federal agency made a Finding of No Significant Impact (FONSI).

Notwithstanding these *de minimis* activities, the NMED shall conduct Tier 2 review for any increased discharge or the renewal of a permit for an existing discharge by a POTW when the discharge, taken together with all other activities allowed after the baseline water quality is established, would cause a reduction in the available assimilative capacity of 10 percent or more for the parameter of concern (2010 State of New Mexico Antidegradation Policy Implementation Policy Section IV.B.1.a). In order to apply *de minimis*, VTSV would need to establish baseline conditions for determining assimilative capacity.

Review Process for Antidegradation

Reissued permits that will increase wasteload limits, incorporate new wasteload limits (either through new WQBEL's or from TMDLs) are required to go through an antidegradation review process, in accordance with the procedures of the State of New Mexico Statewide Water Quality Management Plan. The process will be instituted by NMED when the application has been received, and the wasteload addition to the receiving water has been determined during review of the application. The review requires the following information:

- An analysis of important social or economic activities and development in the area in which the water is located that may be beneficially impacted by the new or increased discharge or the renewal of a permit for an existing discharge;
- An analysis of important social or economic activities and development in the area in which the water is located that may be adversely impacted by the new or increased discharge or the renewal of a permit for an existing discharge;
- An analysis of the following factors, quantified to the greatest extent possible;
    - employment;
    - production of goods and services;
    - tax base;
    - housing;
    - any other relevant information;
- An analysis of alternative disposal options (including no discharge to a surface water) or discharge reduction options, including any option that would minimize degradation.
- Description of the discharge, including the nature and concentration of pollutants;
- Description of receiving water, existing and designated uses, and applicable criteria;
- Identification of the permit and the facility's permitting and enforcement history;
- Description of treatment or best management practices to be employed and a brief description of alternative disposal options evaluated by the applicant.
- Estimation of the amount of requested degradation and impact on receiving water and existing and designated uses;
- Description and brief discussion of conditions to be imposed upon discharge;
- Effect on existing or expected environmental and public health problems;

The review process also requires a public notice process with a comment period and a public hearing. During the public comment period, any interested person may submit written comments and request a public hearing. The entire review process takes a minimum of 180 days to complete (2010 State of New Mexico Antidegradation Policy Implementation Policy).

Permit Limit History

LRE reviewed the VTSV WWTF 2006 and 2011 NPDES discharge permit, fact sheet, and associated documentation to summarize the history of the current nutrient limits and how the limits were originally developed. The following includes the information compiled by LRE for each permit.

2006 Permit

VTSV WWTF's NPDES discharge permit was reissued on February 27, 2006 with an expiration date of March 31, 2011. This permit superseded the October 20, 2000 permit and became effective on April 1, 2006. The design capacity of the VTSV WWTF in 2006 was 0.095 million gallons per day (MGD). Table 3 in the next section shows the permit 2006 design capacity and design flow used to calculate permit limits. The 2006 permit contained both total phosphorus and total nitrogen seasonal 30-day average (lbs/day), 30-day average (mg/L), and 7-day average (mg/L) limits. The following information and assumptions were used to determine the nutrient limits:

- During the 2006 permit renewal, the total phosphorus limits stayed the same as the 2000 permit.
- The NMED noted that the 2000 discharge permit contained limits for total phosphorus which were based on the Water Quality Management Plan for Rio Hondo. However, the permittee requested that none of the permit's limits be increased. Therefore, the increased phosphorus loading which could have been allowed under the TMDL was not included in the 2006 discharge permit renewal (2006 Permit Fact Sheet).
- For the 30-day average loading limit (lbs/day) for total phosphorus, the 0.095 MGD design flow was used to calculate the loading limits in November through June. However, for July through October, it appears that a scaled down design flow was used. This scaled down design flow may be based on the same methodology used in the TMDL. It may be feasible to revise this calculation methodology based on more accurate average flows during those months. More coordination with the NMED and EPA will be required to refine the flow calculations (see Permitting Alternatives section below).
- For total nitrogen, the permit contained Phase I total nitrogen limits that assumed 0% capture from septic systems. The total nitrogen limits were based on the 2005 TMDL. Table 4 in the next section shows the total phosphorus limits for 2006. Table 5 shows the total nitrogen limits highlighted for 2006.

2011 Permit

VTSV WWTF's NPDES discharge permit was reissued on August 4, 2011 with an expiration date of September 30, 2016. This permit superseded the April 1, 2006 permit and became effective on October 1, 2011. The design capacity of the VTSV WWTF increased in 2011 from 0.095 MGD to 0.167 MGD. Table 3 in the next section shows the permit 2011 design capacity and design flow used to calculate permit limits. The 2011 permit also contained both total phosphorus and total nitrogen seasonal 30-day average (lbs/day), 30-day average (mg/L), and 7-day average (mg/L) limits. The following information and assumptions were used to determine the nutrient limits:

- Per the facility's request, the 2011 permit relied on the previous 2006 design capacity of 0.095 MGD to determine mas loading limitations in lieu of seeking review under New Mexico's antidegradation policy.
- The 2011 permit utilized the 0.095 MGD design capacity and a scaled down seasonal design capacity for permit limit calculations. Therefore, increased phosphorus loading which could have been allowed under the TMDL was not included in the 2011 permit.
- The seasonal mass loading limits of the 2006 permit were used for the 2011 permit. 7-day average mass limits were also added to the 2011 permit.
- Table 4 below shows the total phosphorus limits. It is unclear how the total phosphorus 30-day average concentration limits (mg/L) in the 2011 permit were calculated. It appears that the total phosphorus limits were halved; however the 2011 Permit Fact Sheet does not describe why the limits were halved. Additional coordination with the NMED and EPA will be required to understand the calculation methodologies.
- Table 5 below shows the total nitrogen limits highlighted. For total nitrogen, five phases of seasonal mass and concentration limitations for total nitrogen were established in the 2011 permit in accordance with the TMDL. Each phase created seasonal total nitrogen limits based on the number of septic systems captured by the permittee and utilized a two to one non-point source/point source trading ratio. The 2011 Permit Fact Sheet states:

  > *"According to information provided by the facility, a sufficient number of septic systems had been captured by VTSV WWTF to allow for the use of Phase V total nitrogen limits. The proposed permit includes 7-day average mass limits which were calculated using the 0.095 MGD design flow."*

  However, it is appears that the total nitrogen 30-day average loading limit (lbs/day) are the Phase III limits, and not the Phase V limits.

- For the months of July through October it is unclear how the 30-day average concentrations were calculated. It appears that a scaled down design flow methodology was used and the 30-day average concentration (mg/L) for July and August were divided by 2, and the 30-day average concentration (mg/L) for September and October were divided by 5. It may be feasible to revise this calculation methodology based on more accurate average flows during those months. More coordination with the NMED and EPA will be required to refine the flow calculations (see the Permitting Alternatives section below).

Table 3: 2006-2016 VTSV WWTF Design Capacity and Design Flow Used to Calculate Permit Limits

	2005 TMDL (Peak Daily Flow) (MGD)	2006 Permit (Peak Daily Flow) (MGD)	2011 Permit (Peak Daily Flow) (MGD)	2016 Permit (Peak Period Flow) (MGD)
WWTF Design Capacity	0.095	0.095	0.167	0.44
Design Flow Used to Calculate Total Phosphorus Permit Limits	0.200	0.095	0.095	TBD

Table 4: 2000-2016 Total Phosphorus Limits

	2000 Permit		2005 TMDL			2006 Permit			2011 Permit			
Season	**30-day Av. Limit (mg/L)[1]**	**7-day Av. Limit (mg/L)[1]**	**Seasonal WLA (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**30-day Av. Limit (lbs/day)[2]**	**30-day Av. Limit (mg/L)[1]**	**7-day Av. Limit (mg/L)[1]**	**30-day Av. Limit (lbs/day)[2]**	**7-day Av. Limit (lbs/day)[3]**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)[3]**
November through April	1.0	1.0	1.46	0.8	1.0	0.8	1.0	1.0	0.8	1.2	0.5	0.75
May and June	2.0	2.0	5.80	3.0	4.5	1.6	2.0	2.0	1.6	2.4	1.0	1.5
July and August	3.0	3.0	3.32	4.0	6.0	1.2	3.0	3.0	1.2	1.8	1.5	2.25
September and October	5.0	5.0	2.44	7.0	10	0.8	5.0	5.0	0.8	1.2	2.5	3.75

[1] Source: Water Quality Management Plan for Rio Hondo.
[2] Source: All concentrations are based on the Water Quality Management Plan for Rio Hondo. November through June uses 0.095 MGD as the design capacity. July and August loading limits were calculated using half of the design flow (0.0475 MGD). September and October loading limits were calculated using 1/5 of the design flow (0.019 MGD).
[3] The allowable 7-day average is defined as 1.5 times the allowable 30-day average.

Table 5: 2000-2016 Total Nitrogen Limits

Phase	Season	2000 Permit			2005 TMDL		2006 Permit			2011 Permit			
		30-Day Av. Limit (lbs/day)	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)	30-day Av. Limit (mg/L)[1]	7-day Av. Limit (mg/L)[1]	30-Day Av. Limit (lbs/day)[2]	30-day Av. Limit (mg/L)[3]	7-day Av. Limit (mg/L)[4]	30-Day Av. Limit (lbs/day)[2]	7-day Av. Limit (lbs/day)[4]	30-day Av. Limit (mg/L)[3]	7-day Av. Limit (mg/L)[4]
Phase I 0% capture	November through April	NA	NA	NA	6.5	9.5	11.1	6.5	9.5				
	May and June	NA	NA	NA	26	39	44.0	26	39				
	July and August	NA	NA	NA	30	45	25.1	30	45				
	September and October	NA	NA	NA	55	82	18.5	55	82				
Phase II 25% capture	November through April	NA	NA	NA	7	10.5	12.4	7	10.5				
	May and June	NA	NA	NA	27	40.5	45.3	27	40.5				
	July and August	NA	NA	NA	32	48	26.4	32	48				
	September and October	NA	NA	NA	59	88.5	19.8	59	88.5				
Phase III 50% capture	November through April	NA	NA	NA	8	12	13.7	8	12				
	May and June	NA	NA	NA	28	42	46.6	28	42				
	July and August	NA	NA	NA	33	49.5	27.7	33	49.5				
	September and October	NA	NA	NA	62	93	21.1	62	93				
Phase IV 75% capture	November through April	NA	NA	NA	9	13.5	15.0	9	13.5				
	May and June	NA	NA	NA	29	43.5	47.9	29	43.5				
	July and August	NA	NA	NA	35	52.5	29.0	35	52.5				
	September and October	NA	NA	NA	67	100.5	22.4	67	100.5				
Phase V 100% capture	November through April	NA	NA	NA	10	15	16.2	10	15	13.65	20.5	8.2	12.3
	May and June	NA	NA	NA	29	45	49.1	29.5	44.3	46.55	68.8	27.9	41.2
	July and August	NA	NA	NA	36	55	30.3	36.3	54.5	27.7	41.6	16.6	24.9
	September and October	NA	NA	NA	71	110	23.7	71.0	106.5	21.1	31.7	12.7	19

[1] Phase II-IV total nitrogen limits were not included in the TMDL. The limits were calculated based the annual TMDL loading limit.
[2] Source: 30-day average (lbs/day) were calculated in the 2005 TMDL.
[3] Source: November through June uses 0.2 MGD as the design capacity. For 2011, July and August concentration limits were calculated using half of the 2006 limits (mg/L). September and October loading limits were calculated using 1/5 of the 2006 limits (mg/L).
[4] The allowable 7-day average is defined as 1.5 times the allowable 30-day average.

Septic Systems Offset

Per the 2005 TMDL, there are approximately 77 septic systems with Liquid Waste Disposal Permits are located in the Village of Taos Ski Valley. Those systems are permitted for 2,000 gallons per day. Three entities (Austing Haus Bed and Breakfast, The inn at Taos Valley, and Taos East Condominium Association) located in Taos Ski Valley hold NMED issued Ground Water Discharge Permits for larger systems, with a design capacity of 2,600, 3,150, and 6,000 gallons per day.

A phased plan for a community-wide sewer line extension project was mentioned in the 2005 TMDL for the Village of Taos Ski Valley. The objective of this phased project was to convert all on-site septic systems in the community to the wastewater treatment facility (WWTF). The city council and public works department were incorporating this plan to help reduce nonpoint source pollution contributed by septic systems in Taos Ski Valley. If the Village succeeds in converting all septic systems to the WWTF, then the portion of the total nitrogen LA that is associated with septic systems (e.g. 5.17 lbs/day) can become a WLA. If the WWTF does not pull in the septic systems, it will not proceed on to Phases II-V and would be bound to the WLA at Phase I, with the LA still reflecting the original septic load. Table 5 above shows the total nitrogen limits for this phased approach

The current 2011 NPDES discharge permit indicates that the VTSV WWTF is at Phase V, 100% capture), and is capturing a cumulative design capacity of approximately 160,000 gallons per day (GPD) from septic systems. However, it is appears that the total nitrogen limits are the Phase III limit, and not the Phase V limits, which could mean that the VTSV WWTF still has additional septic system offset capacity. This information will need to be verified with VTSV and further coordination with the NMED and EPA will be required.

One possible location for additional septic system offsets is the Amizette area, which is currently not connected to the VTSV WWTF. FEI estimated an EQR of 300 contributing flow of approximately 66,000 gallons per day (GPD). According to the 2006 permit, total nitrogen limits for Phases II through V will be effective when the permittee has captured septic systems with the following cumulative design capacities into the sewer system:

Table 6: Total Nitrogen Cumulative Design Capacities Capture Requirements

Phase II	40,937 GPD or greater
Phase III	81,975 GPD or greater
Phase IV	122,812 GPD or greater
Phase V	160,000 GPD

If VTSV WWTF is currently at Phase III (81,975 GPD) and is able to capture the Amizette area, it may be possible for the VTVSV WWTF 2016 discharge permit to include Phase IV total nitrogen limits. However, further investigation would be required to determine if the Amizette area is not already included in the TMDL calculations and offset assumptions to fully understand the potential use of the Amizette area for additional credits.

Permitting Alternatives

The following alternatives are options VTSV could pursue for alternative permit limits in its 2016 NPDES discharge permit.

Revise the TMDL

The 2005 TMDL for the Rio Hondo states the following:

> *"Continuous revisions to the TMDL are intended as a part of the implementation plan. During the revisions, additional water quality data may be generated, and targets will be re-examined and potentially revised. The TMDL is considered to be an evolving management plant. The TMDL notes that in the event that new data indicate that the targets used in the analysis are inappropriate or if new standards are adopted, the load capacity will be adjusted accordingly."*

It could be possible for VTSV to request revisions and updates to the 2005 TMDL based on existing data and 2016 VTSV WWTF design capacity flows. VTSV would need current ambient water quality data to revise the WLA and LA (2005 TMDL). This could result in higher WLA for the VTSV WWTF.

Antidegradation Review

For the 2016 NPDES discharge permit renewal, the VTSV WWTF could undergo an antidegradation review to utilize the VTSV WWTF 2016 design capacity for permit limit calculations. The antidegradation review process is described in the above section. If increases to loads can be made under *de minimis* provisions, a formal antidegradation review is not needed.

Alternative Permit Calculation Methods

For the 2016 NPDES discharge permit renewal, VTSV could work with the NMED and EPA to refine the calculations used to determine the permit limits or revise the assumptions used to calculate the limits. For example, more accurate scaled down seasonal design flows could be proposed, utilizing different flows besides a peak daily flow, or using an alternative averaging period to calculate permit limits.

The most likely methods for the VTSV WWTF to be considered *de minimis* are limiting load increase to 10% or limiting design flow to 10% of low flow. LRE recommends working with NMED and EPA to determine what the baseline water quality is for determining assimilative capacity.

Compliance Schedule

VTSV may be able to request a compliance schedule for total phosphorus and total nitrogen in the 2016 permit renewal. This would allow time for VTSV to come into compliance, and address any standard changes in a basin-wide hearing. The following regulation language describes the possible allowance of a compliance schedule in the VTSV WWTF 2016 discharge permit:

> *The first NPDES permit issued to a new source or a new discharger shall contain a schedule of compliance only when necessary to allow a reasonable opportunity to attain compliance with requirements issued or revised after commencement of construction but less than three years before commencement of the relevant discharge. For recommencing dischargers, a schedule of compliance shall be available only when necessary to allow a reasonable opportunity to attain*

compliance with requirements issued or revised less than three years before recommencement of discharge (40 CFR 122.47).

VTSV would need to consult with NMED and EPA to determine if the facility would be treated as a new source or a new discharger. If the upgraded VTSV WWTF is not treated as a new source or a new discharger then a compliance schedule could be allowed.

Revise Basin Water Quality Standards

VTSV could participate in the next hearing to revise the current water quality standards in the Rio Hondo basin. This effort would include additional investigation into the New Mexico Water Quality Control Commission hearing schedule, preparation of hearing testimony in support of a water quality standard change, additional studies for appropriate water quality standards, etc.

Alternative Permit Limits

Based on the above permitting alternative scenarios, LRE estimated total phosphorus and total nitrogen limits. FEI Engineers has provided the following proposed WWTF design flows for improvement/expansion of the VTSV WWTF. These flows were used to calculate the proposed alternative effluent limits.

Table 7: Proposed VTSV WWTF Design Flows

Startup Flow[1] (MGD)	Average Annual Design Flow (MGD)	Maximum Month Design Flow[2] (MGD)	Peak Period Flow[3] (MGD)
0.09	0.20	0.31	0.44

[1] Theoretical flow rate based on peaking factor
[2] Flow based on 2015 EQR estimate
[3] Average of sustained high flow days

Attachment 1, "Permit Limit Alternatives.xlsx" includes the calculations and limits for alternative permit limits.

Recommendations

- LRE first recommends working and coordinating with the NMED and EPA to refine the permit limit calculations and fully understand all of the calculation assumptions. The most likely area of flexibility for alternative permit limits is utilizing alternative calculation methods. Nitrogen limits may be further increased by additional capture of septic discharges to generate nutrient credits. More information is needed to determine whether the Amizette area was included within the original phased plan for credit generation. If not, it may be a source of additional credits.
- Based on our current understanding, the TMDL WLA is the upper cap for nitrogen and phosphorus. Since past phosphorus limits have been based on the old WLA from the Rio Hondo Watershed Management plan, there may be potential to increase the limits significantly. This would require meeting the *de minimis* requirements in the State's Antidegradation Policy or a

formal antidegradation review. It does not appear that TMDL WLAs could be increased for nitrogen because presumably they were equally stringent or more stringent than limits in the Rio Hondo Water Quality Management Plan. LRE recommends working with NMED and EPA to determine the appropriate baseline water quality condition for any antidegradation considerations.

- It may be possible to work with NMED and EPA to determine a different implementation method for nutrient permit limits. For example, it may be possible to request alternative averaging periods and design flow considerations based on the fact that nutrients are not directly toxic to aquatic life, and their impact generally results from accumulated algal growth over the course of a growing season.
- It may be possible to demonstrate via site specific data collection or modeling that standards should be revised for the stream. If water quality standards could be adjusted based on this information, the TMDL could be revised, and this could allow for seasonal limits based on periods when nutrients are most typically problematic (i.e. the summer growing season), and to allow higher loads in winter with lower loads in summer.

References

"Integrated 303(d) List of Impaired Waters", Approved by the New Mexico Water Quality Control Commission, 2014.

New Mexico Surface Water Quality Bureau, Monitoring, Assessment and Standards Section, "Final Approved Total Maximum Daily Load (TMDL) for the Rio Hondo (South Fork of Rio Hondo to Lake Creek)", June 15, 2005.

"State of New Mexico Continuing Planning Process (Appendix A), Antidegradation Policy Implementation Procedure", Adopted by the New Mexico Water Quality Control Commission, November 30, 2010.

"The Village of Taos Ski Valley NPDES Permit (No. NM0022101) and Fact Sheet", February 27, 2006.

"The Village of Taos Ski Valley NPDES Permit (No. NM0022101) and Fact Sheet", August 4, 2011.

2000-2016 Total Phosphorus Limits

	2000 Permit		2005 TMDL			2006 Permit			2011 Permit			
Design Capacity	PDF (0.095 MGD)		PDF (0.095 MGD)			PDF (0.095 MGD)			PDF (0.167 MGD)			
Flow Used to Calculate Limits	PDF (0.095 MGD)		PDF (0.2 MGD)			PDF (0.095 MGD)			PDF (0.095 MGD)			
	30-day Av. Limit (mg/L)[1]	7-day Av. Limit (mg/L)[1]	Seasonal WLA (lbs/day)	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)	30-day Av. Limit (lbs/day)[2]	30-day Av. Limit (mg/L)[1]	7-day Av. Limit (mg/L)[1]	30-day Av. Limit (lbs/day)[2]	7-day Av. Limit (lbs/day)[3]	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)[3]
November through April	1	1	1.46	0.8	1	0.8	1	1	0.8	1.2	0.5	0.75
May and June	2	2	5.8	3	4.5	1.6	2	2	1.6	2.4	1	1.5
July and August	3	3	3.32	4	6	1.2	3	3	1.2	1.8	1.5	2.25
September and October	5	5	2.44	7	10	0.8	5	5	0.8	1.2	2.5	3.75

[1] Source: Water Quality Management Plan for Rio Hondo.

[2] Source: All concentrations are based on the Water Quality Management Plan for Rio Hondo. November through June uses 0.095 MGD as the design capacity. July and August loading limits were calculated using half of the design flow (0.0475 MGD). September and October loading limits were calculated using 1/5 of the design flow (0.019 MGD).

[3] Source: The allowable 7-day average is defined as 1.5 times the allowable 30-day average.

Scenario 1: No Change

-No antidegradation review

-Concentration limits (mg/L) stayed the same as the 2011 permit

-Concentrations based on the Water Quality Management Plan for Rio Hondo

-November through June uses 0.095 MGD as the design capacity. July and August loading limits were calculated using half of the design flow (0.0475 MGD). September and October loading limits were calculated using 1/5 of the design flow (0.019 MGD).

-The allowable 7-day average is calculated as 1.5 times the allowable 30-day average.

	2016 Permit Alternatives			
Design Capacity	PPF (0.44 MGD)			
Flow Used to Calculate Limits	PDF (0.095 MGD)			
	30-day Av. Limit (lbs/day)	7-day Av. Limit (lbs/day)	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)
November through April	0.8	1.2	0.5	0.75
May and June	1.6	2.4	1.0	1.50
July and August	1.2	1.8	1.5	2.25
September and October	0.8	1.2	2.5	3.75

Scenario 2: Antidegradation Review to use current Design Flows

-Concentrations based on the Water Quality Management Plan for Rio Hondo

-November through June uses design capacity. July and August loading limits were calculated using half of the design flow. September and October loading limits were calculated using 1/5 of the design flow.

-The allowable 7-day average is calculated as 1.5 times the allowable 30-day average.

-stream concentration limit = 0.078231204 **<-- This calculation is based on the 1981 WLA of 1 lb/day and assuming background concentrations from the 2005 TMDL**

	2016 Permit Alternatives																			
Flow Used to Calculate Limits	MMDF (0.2 MGD)					MMDF (0.31 MGD)					Startup (0.09 MGD)					PPF (0.44 MGD)				
	Flow Assumption	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**
November through April	0.2	1.00	1.5	0.60	0.9	0.31	1.00	1.5	0.39	0.6	0.09	1.00	1.5	1.33	2.0	0.44	1.00	1.5	0.27	0.4
May and June	0.2	3.66	5.5	2.19	3.3	0.31	3.66	5.5	1.41	2.1	0.09	3.66	5.5	4.87	7.3	0.44	3.66	5.5	1.00	1.5
July and August	0.1	2.08	3.1	2.49	3.7	0.155	2.08	3.1	1.61	2.4	0.045	2.08	3.1	5.54	8.3	0.22	2.08	3.1	1.13	1.7
September and October	0.04	1.51	2.3	4.54	6.8	0.062	1.51	2.3	2.93	4.4	0.018	1.51	2.3	10.09	15.1	0.088	1.51	2.3	2.06	3.1

Scenario 3: Antidegradation Review to use current TMDL limits

-Using TMDL Seasonal WLA

-The allowable 7-day average is calculated as 1.5 times the allowable 30-day average.

-November through June uses design capacity. July and August loading limits were calculated using half of the design flow. September and October loading limits were calculated using 1/5 of the design flow.

	2016 Permit Alternatives																			
Flow Used to Calculate Limits	MMDF (0.2 MGD)					MMDF (0.31 MGD)					Startup (0.09 MGD)					PPF (0.44 MGD)				
	Flow Assumption	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**
November through April	0.2	1.46	2.2	0.8	1.2	0.31	1.46	2.2	0.5	0.8	0.09	1.46	2.2	1.8	2.7	0.44	1.46	2.2	0.4	0.5
May and June	0.2	5.80	8.7	3.0	4.5	0.31	5.80	8.7	1.9	2.9	0.09	5.80	8.7	6.7	10.0	0.44	5.80	8.7	1.4	2.0
July and August	0.1	3.32	5.0	4.0	6.0	0.155	3.32	5.0	2.6	3.9	0.045	3.32	5.0	8.9	13.3	0.22	3.32	5.0	1.8	2.7
September and October	0.04	2.44	3.7	7.0	10.5	0.062	2.44	3.7	4.5	6.8	0.018	2.44	3.7	15.6	23.3	0.088	2.44	3.7	3.2	4.8

Scenario 4: De Minimis

-Using 30-day (lbs/day) from 2006 permit+10%

-November through June uses design capacity. July and August loading limits were calculated using half of the design flow. September and October loading limits were calculated using 1/5 of the design flow.

-The allowable 7-day average is calculated as 1.5 times the allowable 30-day average.

	2016 Permit de Minimis																			
Flow Used to Calculate Limits	AADF (0.20 MGD)					MMDF (0.31 MGD)					Startup (0.09 MGD)					PPF (0.44 MGD)				
	Flow Assumption	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**Flow Assumption**	**30-day Av. Limit (lbs/day)**	**7-day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**
November through April	0.2	0.88	1.3	0.5	0.8	0.31	0.88	1.3	0.3	0.5	0.09	0.88	1.3	1.2	1.8	0.44	0.88	1.3	0.2	0.4
May and June	0.2	2.70	4.1	1.6	2.4	0.31	2.70	4.1	1.0	1.6	0.09	2.70	4.1	3.6	5.4	0.44	2.70	4.1	0.7	1.1
July and August	0.1	2.30	3.5	2.8	4.1	0.155	2.30	3.5	1.8	2.7	0.045	2.30	3.5	6.1	9.2	0.22	2.30	3.5	1.3	1.9
September and October	0.04	1.90	2.9	5.7	8.5	0.062	1.90	2.9	3.7	5.5	0.018	1.90	2.9	12.7	19.0	0.088	1.90	2.9	2.6	3.9

Additional antidegradation (de minimis scenarios could be developed using the Rio Hondo or TMDL as the baseline conditions (e.g. Scenario 2 baseline).

2000-2016 Total Nitrogen Limits Scenarios

		2000 Permit			2005 TMDL		2006 Permit	
		0.2 MGD			0.2 MGD		0.2 MGD	
Phase	**Season**	**30-Day Av. Limit (lbs/day)**	**30-day Av. Limit (mg/L)**	**7-day Av. Limit (mg/L)**	**30-day Av. Limit (mg/L)[1]**	**7-day Av. Limit (mg/L)[1]**	**30-Day Av. Limit (lbs/day)[2]**	**30-day Av. Limit (mg/L)[3]**
Phase I	November through April	NA	NA	NA	6.5	9.5	11.1	6.5
	May and June	NA	NA	NA	26	39	44	26
	July and August	NA	NA	NA	30	45	25.1	30
	September and October	NA	NA	NA	55	82	18.5	55
Phase II	November through April	NA	NA	NA	7	10.5	12.4	7
	May and June	NA	NA	NA	27	40.5	45.3	27
	July and August	NA	NA	NA	32	48	26.4	32
	September and October	NA	NA	NA	59	88.5	19.8	59
Phase III	November through April	NA	NA	NA	8	12	13.7	8
	May and June	NA	NA	NA	28	42	46.6	28
	July and August	NA	NA	NA	33	49.5	27.7	33
	September and October	NA	NA	NA	62	93	21.1	62
Phase IV	November through April	NA	NA	NA	9	13.5	15	9
	May and June	NA	NA	NA	29	43.5	47.9	29
	July and August	NA	NA	NA	35	52.5	29	35
	September and October	NA	NA	NA	67	100.5	22.4	67
Phase V	November through April	NA	NA	NA	10	15	16.2	10
	May and June	NA	NA	NA	29	45	49.1	29.5
	July and August	NA	NA	NA	36	55	30.3	36.3
	September and October	NA	NA	NA	71	110	23.7	71

[1] Phase II-IV total nitrogen limits were not included in the TMDL. The limits were calculated based the annual TMDL loading limit.

[2] Source: 30-day average (lbs/day) were calculated in the 2005 TMDL.

[3] Source: November through June uses 0.2 MGD as the design capacity. For 2011, July and August concentration limits were calculated using half of the 2006 limits (mg/I

[4] The allowable 7-day average is defined as 1.5 times the allowable 30-day average.

	2011 Permit							
	0.2 MGD				MMDF (0.2 MGD)			
7-day Av. Limit (mg/L)[4]	30-Day Av. Limit (lbs/day)[2]	7-day Av. Limit (lbs/day)[4]	30-day Av. Limit (mg/L)[3]	7-day Av. Limit (mg/L)[4]	30-Day Av. Limit (lbs/day)	7-day Av. Limit (lbs/day)	30-day Av. Limit (mg/L)[1]	7-day Av. Limit (mg/L)[2]
9.5								
39								
45								
82								
10.5								
40.5								
48								
88.5								
12	13.65	20.5	8.2	12.3	13.7	20.5	8.2	12.3
42	46.55	68.8	27.9	41.2	46.6	69.8	27.9	41.9
49.5	27.7	41.6	16.6	24.9	27.7	41.6	16.5	24.8
93	21.1	31.7	12.7	19	21.1	31.7	12.4	18.6
13.5					15.0	22.5	9.0	13.5
43.5					47.9	71.9	28.7	43.1
52.5					29.0	43.5	17.5	26.3
100.5					22.4	33.6	13.4	20.1
15					16.2	24.3	9.7	14.6
44.3					49.1	73.7	29.4	44.2
54.5					30.3	45.5	18.2	27.2
106.5					23.7	35.6	14.2	21.3

.). September and October loading limits were calculated using 1/5 of the 2006 limits (mg/L)

2016 Permit Alternatives							
MMDF (0.31 MGD)				Startup (0.09 MGD)			
30-Day Av. Limit (lbs/day)	7-day Av. Limit (lbs/day)[4]	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)[4]	30-Day Av. Limit (lbs/day)	7-day Av. Limit (lbs/day)[4]	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)[4]
13.7	20.5	5.3	7.9	13.7	20.5	18.2	27.3
46.6	69.8	18.0	27.0	46.6	69.8	62.0	93.0
27.7	41.6	10.6	16.0	27.7	41.6	36.7	55.0
21.1	31.7	8.0	12.0	21.1	31.7	27.6	41.3
15.0	22.5	5.8	8.7	15.0	22.5	20.0	30.0
47.9	71.9	18.5	27.8	47.9	71.9	63.8	95.7
29.0	43.5	11.3	16.9	29.0	43.5	38.9	58.3
22.4	33.6	8.6	13.0	22.4	33.6	29.8	44.7
16.2	24.3	6.3	9.4	16.2	24.3	21.6	32.4
49.1	73.7	19.0	28.5	49.1	73.7	65.4	98.1
30.3	45.5	11.7	17.6	30.3	45.5	40.3	60.5
23.7	35.6	9.2	13.7	23.7	35.6	31.6	47.3

PPF (0.44 MGD)			
30-Day Av. Limit (lbs/day)	7-day Av. Limit (lbs/day)[4]	30-day Av. Limit (mg/L)	7-day Av. Limit (mg/L)[4]
13.7	20.5	3.7	5.6
46.6	69.8	12.7	19.0
27.7	41.6	7.5	11.3
21.1	31.7	5.6	8.5
15.0	22.5	4.1	6.1
47.9	71.9	13.1	19.6
29.0	43.5	8.0	11.9
22.4	33.6	6.1	9.1
16.2	24.3	4.4	6.6
49.1	73.7	13.4	20.1
30.3	45.5	8.3	12.4
23.7	35.6	6.5	9.7

APPENDIX B
WWTF DRAWINGS

FEI ENGINEERS

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS
WWTP PER
January 2016

Sheet List Table

Sheet Number	Sheet Title
General Sheets	
G0-01	COVER SHEET & DRAWING INDEX
G0-02	GENERAL ABBREVIATIONS, LEGENDS & SYMBOLS
G0-03	DESIGN CRITERIA
G0-04	ALTERNATIVE 1 - MEMBRANE BIOREACTOR PROCESS FLOW DIAGRAM
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G0-06	ALTERNATIVE 3 - ICEAS SBR BASINS PROCESS FLOW DIAGRAM
Civil Sheets	
C1-01	EXISTING SITE PLAN
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C1-03	SITE LAYOUT - IFAS WITH MLE PROCESS
C1-04	SITE LAYOUT - ICEAS SBR BASINS
Process Sheets	
P1-01	HEADWORKS PLAN & SECTION
P1-02	TREATMENT PLANT PLANS
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SHEET NUMBERING SYSTEM:

X0-00
- SHEET NUMBER
- 0 = GENERAL
- 1 = PLAN VIEW
- 2 = ELEVATION VIEW
- 3 = SECTION VIEW
- 4 = DETAILS
- G = GENERAL SHEETS
- C = CIVIL SHEETS
- A = ARCHITECTURAL SHEETS
- S = STRUCTURAL SHEETS
- P = PROCESS SHEETS
- M = MECHANICAL SHEETS
- E = ELECTRICAL SHEETS
- I = INSTRUMENTATION SHEETS

LOCATION MAP

VICINITY MAP

LOCATION: W:\VTSV-S14-0132 - WWTP\G0-01.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt

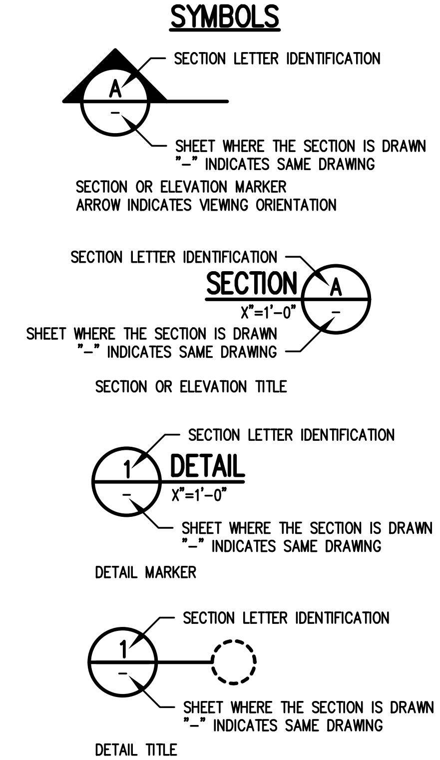
ABBREVIATIONS

AA	ANNUAL AVERAGE
AB	ANCHOR BOLT
ABAN	ABANDON
ABC	AGGREGATE BASE COURSE
AC	AIR CONDITIONING
ACOUS	ACOUSTICAL
ACP	ASPHALTIC CONCRETE
AD	AREA DRAIN OR ACCESS DOOR
ADD	ADDENDUM
ADJ	ADJUSTABLE
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AL	ALUMINUM
ALT	ALTERNATE
AMT	AMOUNT
AOR	ACTUAL OXYGEN REQUIRED/ UPTAKE RATE
APPROX	APPROXIMATE
ARV	AIR RELIEF VALVE
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASPH	ASPHALT
ASSY	ASSEMBLY
ATS	AUTOMATIC TRANSFER SWITCH
AVG	AVERAGE
AVS	AUTOMATIC VALVE STATION
AWWA	AMERICAN WATER WORKS ASSOCIATION
B	BLOWER
BB	BOND BEAM
BAF	BAFFLE
BC	BACK OF CURB
BF	BOTTOM FACE
BFV	BUTTERFLY VALVE
BIO	DIGESTED SLUDGE
BLDG	BUILDING
BLK	BLOCK
BM	BENCHMARK
BMPS	BEST MANAGEMENT PRACTICES
BOD	BIOCHEMICAL OXYGEN DEMAND
BOT	BOTTOM
BSMT	BASEMENT
BV	BALL VALVE
CA	COMPRESSED AIR
C/C	CENTER TO CENTER
CB	CATCH BASIN
CCW	COUNTER CLOCKWISE
CDOT	COLORADO DEPARTMENT OF TRANSPORTATION
CEN	CENTRATE
CIP	CAST IRON PIPE
CJ	CONSTRUCTION JOINT
CL	CHAIN LINK OR CENTER LINE
℄	CENTER LINE
CLG	CEILING
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
CONSTR	CONSTRUCTION
CONT	CONTINUOUS
COR	CORNER
CP	CENTRIFUGAL PUMP
CPLG	COUPLING
CTR	CENTER
CU FT	CUBIC FEET
CW	COLD WATER
CWL	CONTROL WATER LEVEL
CY	CUBIC YARDS
DEFL	DEFLECTION
DEMO	DEMOLITION
DI	DEIONIZATION
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DL	DEAD LOAD
DN	DOWN
DR	DRAIN
DWG	DRAWING
DWL	DOWEL
DWV	DRAIN WASTE AND VENT
EA	EACH
ECC	ECCENTRIC
EF	EACH FACE OR ELECTRICAL FAN
EFF	EFFLUENT
EJ	EXPANSION JOINT
EL	ELEVATION
EXST	EXISTING
EXST GR	EXISTING GRADE
EXT	EXTERIOR
EXTN	EXTENSION
FF	FINISHED FLOOR
F/F	FACE TO FACE
FCA	FLANGE COUPLING ADAPTER
FD	FLOOR DRAIN
FDN	FOUNDATION
FED	FEDERAL
FES	FLARED END SECTION
FF	FINISH FLOOR
FIN	FINISH
FLG	FLANGE
FL OR ℄	FLOW LINE
FN	FENCE
FM	FLOW METER OR FORCE MAIN
FOC	FACE OF CONCRETE
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FPW	FIRE PROTECTION WATER SUPPLY
FR	FRAME
FRP	FIBERGLASS REINFORCED PLASTIC
FSTNR	FASTENER
FT	FEET
FTG	FOOTING OR FITTING
FUR	FURNACE
G	GAS
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GB	GRADE BREAK
GIP	GALVANIZED IRON PIPE
GRND	GROUND
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE
GR	GRIT SLURRY
GR BM	GRADE BEAM
GRC	GALVANIZED RIGID CONDUIT
GRTG	GRATING
GSP	GALVANIZED STEEL PIPE
GV	GATE VALVE
GWB	GYPSUM WALL BOARD
H	HIGH
HB	HOSE BIB
HBP	HOT BITUMINOUS PAVEMENT
HDWL	HEAD WALL
HNDRL	HAND RAIL
HNDWL	HANDWHEEL
HORIZ	HORIZONTAL
HP	HORSEPOWER
HR	HOUR
HRT	HYDRAULIC RESIDENCE TIME
HS	HIGH STRENGTH
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HW	HOT WATER
HWL	HIGH WATER LINE
HWY	HIGHWAY
HYD	HYDRANT
INCL	INCLUDED
INCR	INCREASER
ID	INSIDE DIAMETER
IF	INSIDE FACE
INF	INFLUENT
INL	INLET
INSTL	INSTALLATION
INSTR	INSTRUMENT
INSUL	INSULATION
INTR	INTERIOR
INV	INVERT
INV EL	INVERT ELEVATION
ISA	INSTRUMENT SOCIETY OF AMERICA
ISO	ISOMETRIC
JST	JOIST
JTS	JOINTS
KO	KNOCKOUT
KPL	KICK PLATE
KWY	KEYWAY
L	LEFT OR LITER
LAB	LABORATORY
LATL	LATERAL
LB(S)	POUND(S)
LCMU	LIGHTWEIGHT CONCRETE MASONRY UNIT
LF	LINEAR FOOT
LG	LENGTH
LH	LATENT HEAT
LL	LIVE LOAD
LOC	LOCATION
LP	LOW PRESSURE OR LIGHT POLE
LRG	LARGE
LT	LIGHT
LT WT	LIGHT WEIGHT
LWC	LIGHT WEIGHT CONCRETE
LWL	LOW WATER LEVEL
MAINT	MAINTENANCE
MAN	MANUAL
MATL	MATERIAL
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MECH	MECHANICAL
MED	MEDIUM
MFM	MAGNETIC FLOW METER
MFR	MANUFACTURER
MG	MILLION GALLONS OR MILLIGRAMS
MGD	MILLION GALLONS PER DAY
MGMT	MANAGEMENT
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MLSS	MIXED LIQUID SUSPENDED SOLIDS
MM	MAX MOUNTH
MO	MASONRY OPENING
MRGYB	MOISTURE RESISTANT GYPSUM WALL BOARD
MTG	MOUNTING
N	NITROGEN OR NORTH
NA	NOT APPLICABLE
NF	NEAR FACE
NIC	NOT IN CONTRACT
NP	NO PAINT
NPL	NAME PLATE
NPT	NATIONAL PIPE THREAD
NPW	NON-POTABLE WATER
NRS	NON-RISING STEAM
NS	NEAR SIDE
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OE	OVERHEAD ELECTRIC
OF	OVER FLOW
OPNG	OPENING
OPP	OPPOSITE
OPT	OPTIONAL
P	PUMP
PA	PIPE ANCHOR
PAR	PARALLEL
PCO	PRESSURE CLEAN OUT
PCP	PROGRESSING CAVITY PUMP
PE	PLAIN END
PEFF	PRIMARY EFFLUENT
PERM	PERMANENT
PERP	PERPENDICULAR
PG	PRESSURE GAGE
PH	PEAK HOUR
PL	PLATE OR PROPERTY LINE
PLBG	PLUMBING
PLYWD	PLYWOOD
PNT	PAINT
POLY	POLYETHYLENE
PORT	PORTABLE
POS	POSITIVE
PPM	PARTS PER MILLION
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PRELIM	PRELIMINARY
PREP	PREPARATION
PROJ	PROJECT
PROP	PROPERTY
PRS	PRESSURE REDUCING STATION
PRV	PRESSURE REDUCING VALVE
PRTV	PRESSURE TEMPERATURE RELIEF VALVE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PT	POINT OF TANGENCY
PV	PLUG VALVE
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PW	POTABLE WATER
QAVG	AVERAGE DAILY FLOW
QMAX	MAXIMUM DAILY FLOW
QPEAK	PEAK HOUR FLOW
QCV	QUICK COUPLER VALVE
QTR	QUARTER
QTY	QUANTITY
R	RISER
RAD	RADIUS
RAS	RETURN ACTIVATED SLUDGE
RC	REINFORCED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RD	ROOF DRAIN
RED	REDUCER
REC	RECESSED
RECT	RECTANGULAR
REF	REFERENCE
REHAB	REHABILITATION
REINF	REINFORCE
REQD	REQUIRED
RESIL	RESILIENT
RFCA	RESTRAINED FLANGED COUPLING ADAPTER
RFG	ROOFING
RH	RIGHT HAND
RM	ROOM
RND	ROUNDS
RO	ROUGH OPENING
ROW	RIGHT OF WAY
RPBP	REDUCED PRESSURE BACKFLOW PREVENTER
RMP	REVOLUTIONS PER MINUTE
RPS	REVOLUTIONS PER SECOND
RTN	RETURN
S	SOUTH
SA	SUPPLY AIR
SALV	SALVAGE
SAN	SANITARY
SB	SPLASH BLOCK
SBNR	SINGLE BASIN NUTRIENT REMOVAL
SCFM	STANDARD CUBIC FEET PER MINUTE
SCH	SCHEDULE
SCRN	SCREEN
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SEFF	SECONDARY EFFLUENT
SHT	SHEETING OR SHEET
SHTHG	SHEATHING
SIM	SIMILAR
SLR	SLUDGE LOADING RATE
SLV	SLEEVE
SM	SMOOTH
SOR	STANDARD OXYGEN REQUIRED/ UPTAKE RATE
SOTE	STANDARD OXYGEN TRANSFER EFFICIENCY
SP	SPACING
SPEC	SPECIFICATION
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCH
SQ YD	SQUARE YARD
SRT	SOLIDS RETENTION TIME
SS	SANITARY SEWER
SST	STAINLESS STEEL
SST BT	STAINLESS STEEL BOLT
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
STL JST	STEEL JOIST
STL PL	STEEL PLATE
SUPP	SUPPLY
SUSP CLG	SUSPENDED CEILING
SV	SOLENOID VALVE
SVC	SERVICE
SW	SIDEWALK
SWMP	STORM WATER MANAGEMENT PLAN
SYMM	SYMMETRICAL
SYS	SYSTEM
T&B	TOP AND BOTTOM
T&G	TONGUE AND GROOVE
T&P	TEMPERATURE AND PRESSURE
TB	TOP OF BEAM
TBK	THRUST BLOCK
TBM	TEMPORARY BENCH MARK
TD	TRENCH DRAIN
TE	TOP ELEVATION
TEMP	TEMPORARY
TF	TOP OF FOOTING
TFA	TO FLOOR ABOVE
TFB	TO FLOOR BELOW
TFF	TOP OF FINISH FLOOR
THD	THREAD(ED)
THK	THICK
TJ	TOP OF JOIST
TOB	TOP OF BANK
TOC	TOP OF CONCRETE
TOE	THREADED ONE END
TOF	TOP OF FOOTING
TOT	TOTAL
TOW	TOP OF WALL
TP	TOP OF PAVEMENT
TR	TOP OF RIM
TSL	TOP OF SLAB
TWL	TOP WATER LEVEL
TYP	TYPICAL
UBC	UNIFORM BUILDING CODE
UNGD	UNDERGROUND
UGE	UNDERGROUND ELECTRIC
UGT	UNDERGROUND TELEPHONE
ULT	ULTIMATE
UN	UNION
UNFIN	UNFINISHED
UNIF	UNIFORM
UV	ULTRAVIOLET
VAC	VACUUM
VB	VALVE BOX
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VIF	VERIFY IN FIELD
VTR	VENT THROUGH ROOF
W	WIDE, WIDTH, WATER OR WEST
W/	WITH
W/O	WITHOUT
W/W	WALL TO WALL
WAS	WASTE ACTIVATE SLUDGE
WC	WATER CLOSET
WCO	WALL CLEANOUT
WD	WOOD
WDW	WINDOW
WH	WALL HYDRANT
WHSE	WAREHOUSE
WI	WROUGHT IRON
WL	WATER LINE OR WIND LOAD
WP	WASTE PIPE
WPR	WORKING PRESSURE
WSE	WATER SURFACE ELEVATION
WSR	WASTE SLUDGE RECYCLE
WT	WEIGHT
WTR	WATER
WTRPRF	WATERPROOFING
WW	WASTEWATER
WWF	WELDED WIRE FABRIC
X-SECT	CROSS SECTION
YCO	YARD CLEANOUT
YD	YARD DRAIN
YH	YARD HYDRANT

LEGEND

- EARTH
- ROCK
- GROUT
- GRAVEL
- STEEL
- CONCRETE
- SAND
- CONCRETE MASONRY UNIT
- RIGID INSULATION
- BATT INSULATION
- GLASS
- STEEL PLATE
- SCREEN
- GRATING IN PLAN
- GRATING IN SECTION
- WOOD IN SECTION
- EXISTING STRUCTURE
- NEW STRUCTURE
- DRAINAGE FLOW LINE
- FENCE
- BUSHES, TREES
- BID ALTERNATE
- THRUST BLOCK
- PIPE 4" ø OR GREATER
- HARNESSED MECHANICAL COUPLING
- NEW VALVE W/ TIE RODS
- EXISTING VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- MECHANICAL JOINT
- FLANGED JOINT
- NEW PIPE IN SECTION
- EXISTING PIPE IN SECTION
- WALL SLEEVE
- PIPE LESS THAN 4"ø
- LINE TURNING UP
- LINE TURNING DOWN
- STOP & WASTE VALVE
- BALL VALVE
- PLUG VALVE
- GATE VALVE
- PRESSURE RELIEF VALVE
- GAS LINE
- WATER LINE
- TELEPHONE LINE
- PROPOSED STORM DRAIN/CULVERT
- UNDERGROUND ELECTRIC
- OVERHEAD ELECTRIC W/ POWER POLE
- ELECTRICAL LIGHT POLE
- EXISTING SANITARY SEWER
- PROPOSED SANITARY SEWER
- PROPERTY LINE
- SURVEY CONTROL POINT
- LIMITS OF PROPOSED ACCESS ROAD
- PROPOSED CONTOUR
- EXISTING CONTOUR
- SILT FENCE

SYMBOLS



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FEI ENGINEERS

PRELIMINARY
NOT FOR CONSTRUCTION

REV. No.	DATE	DESCRIPTION
1	1/2016	WWTP PER

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

GENERAL ABBREVIATIONS, LEGENDS & SYMBOLS

PROJECT No.: VTSV-S14-0132
DATE: 1/6/2016
DESIGNED BY: KV
DRAWN BY: KPR
CHECKED BY: MAD

G0-02

LOCATION: W:\VTSV-S14-0132 - WWTP\G0-02.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt

TREATMENT DESIGN SUMMARY

GENERAL DESIGN INFORMATION

SITE ELEVATION:	9,270 FT ASL

HYDRAULIC DESIGN FLOWS

30 DAY AVERAGE MAX MONTH FLOW (MMF):	0.31 MGD (215 GPM)
AVERAGE DAILY FLOW (ADF):	0.2 MGD (139 GPM)
PEAK PERIOD FLOW (PPF):	0.44 MGD (305 GPM)
PEAK HOURLY FLOW (PHF):	0.64 MGD (445 GPM)

DESIGN INFLUENT CONCENTRATIONS

BOD:	350 MG/L
TSS:	300 MG/L
TKN:	66 MG/L
NH_3:	45 MG/L
TP:	12 MG/L
ALKALINITY:	150 mg/L as $CaCO_3$

DESIGN INFLUENT LOADING

BOD @ 0.31 MGD:	911 PPD
TKN @ 0.31 MGD:	172 PPD
NH_3 @ 0.31 MGD:	117 PPD
TP @ 0.31 MGD:	31 PPD
AVERAGE BOD @ 0.2 MGD:	583 PPD
AVERAGE TKN @ 0.2 MGD:	110 PPD
AVERAGE NH_3 @ 0.2 MGD:	75 PPD
AVERAGE TP @ 0.2 MGD:	20 PPD

PERMITTED DESIGN EFFLUENT LIMITS

30-DAY / 7-DAY AVG BOD:	< 23.8 / < 35.7 LBS/DAY
30-DAY / 7-DAY AVG TSS:	< 23.8 / < 35.7 LBS/DAY
30-DAY AVERAGE NH_3:	< 5.34 LBS/DAY
30- DAY/7-DAY TN:	
NOVEMBER 1- APRIL 30	<13.65 / < 20.5 LBS/DAY
MAY 1- JUNE 30	< 46.55 / < 68.8 LBS/DAY
JULY 1- AUGUST 30	< 27.7 / <41.6 LBS/DAY
SEPTEMBER 1- OCTOBER 31	< 21.1 / <31.7 LBS/DAY
30- DAY/7-DAY TP:	
NOVEMBER 1- APRIL 30	<0.8 /< 1.2 LBS/DAY
MAY 1- JUNE 30	< 1.6 / < 2.4 LBS/DAY
JULY 1- AUGUST 30	< 1.2 / <1.8 LBS/DAY
SEPTEMBER 1- OCTOBER 31	< 0.8 / <1.2 LBS/DAY
30-DAY AVG/ DAILY MAX E.COLI:	126 / 235 PER 100 ML
30-DAY AVG/ DAILY MAX FECAL COLIFORM:	200 /400 PER 100 ML

MAJOR EQUIPMENT AND PROCESS SUMMARY

HEADWORKS

MECHANICAL BAR SCREEN (EXISTING)

QUANTITY:	1 DUTY
TYPE:	CONVEYOR SCREW SCREEN W/ MANUAL BYPASS SCREEN
CAPACITY:	0.5 MGD

MECHANICAL BAR SCREEN (NEW)

QUANTITY:	1 DUTY
TYPE:	CONVEYOR SCREW SCREEN W/ MANUAL BYPASS SCREEN
STRAINER TYPE:	PERFORATED PLATE
CAPACITY:	0.8 MGD
MOTOR HP:	2 HP

GRIT REMOVAL SYSTEM

MANUFACTURER:	SPIRAGRIT MODEL SG-6.-1.3
QUANTITY:	1 DUTY

GRIT PUMPS

QUANTITY:	2 TOTAL (1 DUTY, 1 SHELF SPARE)
TYPE:	VACUUM PRIMED PUMP
MOTOR HP:	10 HP

INFLUENT FLOW METERING (EXISTING TO BE RELOCATED)

QUANTITY:	1 DUTY
TYPE:	PARSHALL FLUME
SIZE:	3 IN

BIOLOGICAL TREATMENT PROCESS

ACTIVATED SLUDGE DESIGN CRITERIA

MLSS TEMPERATURE:	8 TO 20 DEG CELSIUS
HYDRAULIC RETENTION TIME:	18 HOURS @ MMF (HRT)
YIELD:	0.6 LBS TSS/ LB BOD
F:M RATIO:	0.05
MLSS CONCENTRATION:	8000 - 10000 MG/L
DISSOLVED OXYGEN:	2.0 MG/L
SRT:	24 DAYS
MEMBRANE FLUX:	7.50 GAL/FT2. D

PROCESS AERATION REQUIREMENTS

ACTUAL OXYGEN REQUIRED (AOR, MML):	68 lbs 02/HR
AVG MONTH ACTUAL OXYGEN REQUIRED (AOR, AAL):	44 lbs 02/HR
STANDARD OXYGEN REQUIRED (SOR, MML):	5834 lbs 02/DAY
AVG STANDARD OXYGEN REQUIRED (SOR, AAL):	3764 lbs 02/DAY
AERATION TIME:	24 HRS/ DAY (W/DENITE)

RESIDUALS MANAGEMENT

SOLIDS HANDLING

AT MAXIMUM MONTH LOADING

WASTE SLUDGE GENERATION:	535 LBS/DAY (@ 350 MG/L INFLUENT BOD5, MMDF AND 0.6 YIELD)
VOLUME OF WASTE SLUDGE:	6400 GAL/DAY
CONCENTRATION FROM MBR:	10,000 MG/L (1%)
VOLATILE DESTRUCTION IN HOLDING TANK:	10% VSS/DAY
CONCENTRATION EXITING HOLDING TANK %:	1%
VOLUME OF SLUDGE POST STABILIZATION:	6000 GAL/DAY

AT ANNUAL AVERAGE DAY LOADING

WASTE SLUDGE GENERATION:	345 LBS/DAY (@ 350 MG/L INFLUENT BOD5, AADF AND 0.6 YIELD)
VOLUME OF WASTE SLUDGE:	4140 GAL/DAY
CONCENTRATION FROM MBR:	10,000 MG/L (1%)
VOLATILE DESTRUCTION IN HOLDING TANK:	10% VSS/DAY
CONCENTRATION EXITING HOLDING TANK %:	1%
VOLUME OF SLUDGE POST STABILIZATION:	3850 GAL/DAY

AT STARTUP LOADING

WASTE SLUDGE GENERATION:	155 LBS/DAY (@ 350 MG/L INFLUENT BOD5, STARTUP FLOW (0.09 MGD) AND 0.6 YIELD)
VOLUME OF WASTE SLUDGE:	1860 GAL/DAY
CONCENTRATION FROM MBR:	10,000 MG/L (1%)
VOLATILE DESTRUCTION IN HOLDING TANK:	10% VSS/DAY
CONCENTRATION EXITING HOLDING TANK %:	1%
VOLUME OF SLUDGE POST STABILIZATION:	1730 GAL/DAY

0 1
IF THIS BAR DOES NOT MEASURE 1"
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FEI ENGINEERS

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REV. No.	DATE	DESCRIPTION
1	1/2016	WWTP PER

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

DESIGN CRITERIA

PROJECT No.: VTSV-S14-0132
DATE: 1/20/2016
DESIGNED BY: KV
DRAWN BY: KPR
CHECKED BY: MAD

G0-03

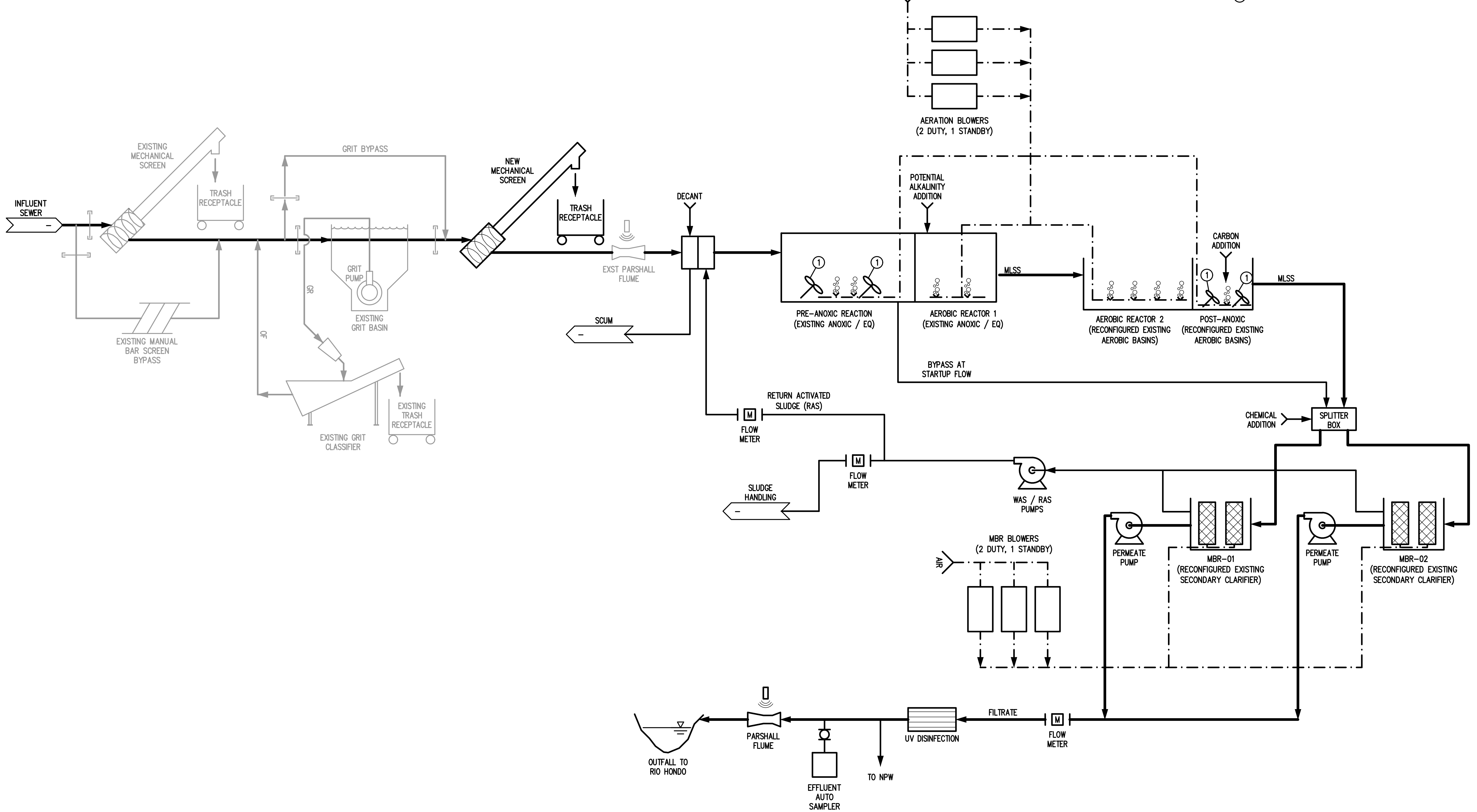
LOCATION: W:\VTSV-S14-0132 - WWTP\G0-03.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt

ALTERNATIVE 1 – MEMBRANE BIOREACTOR PROCESS FLOW DIAGRAM

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

EQUIPMENT NOTES:

1 MECHANICAL MIXER



ABBREVIATIONS:

OF – OVERFLOW
GR – GRIT
WAS – WASTE ACTIVATED SLUDGE
IMLR – INTERNAL MIXED LIQUOR
PW – POTABLE WATER
NPW – NON–POTABLE WATER
FA – FOUL AIR

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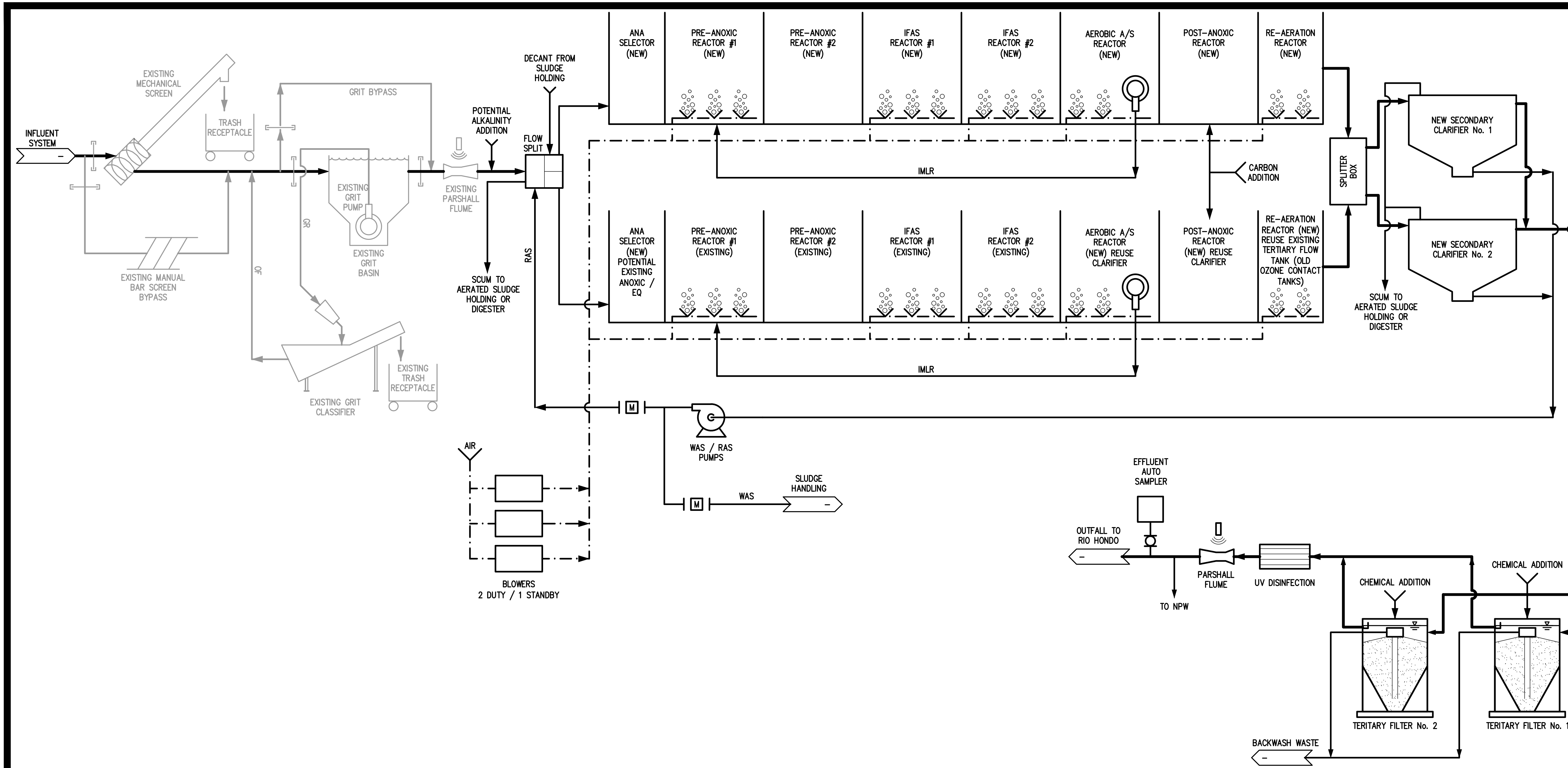
FEI ENGINEERS

REV. No.	DATE	DESCRIPTION
–	1/2016	WWTP PER

PROJECT No.: VTSV–S14–0132
DATE: 1/20/2016
DESIGNED BY: KV
DRAWN BY: SAJ
CHECKED BY: MAD

G0-04

LOCATION: W:\VTSV–S14–0132 – WWTP\G0–04.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt



ABBREVIATIONS:

OF – OVERFLOW
GR – GRIT
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NPW – NON-POTABLE WATER
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FEI ENGINEERS

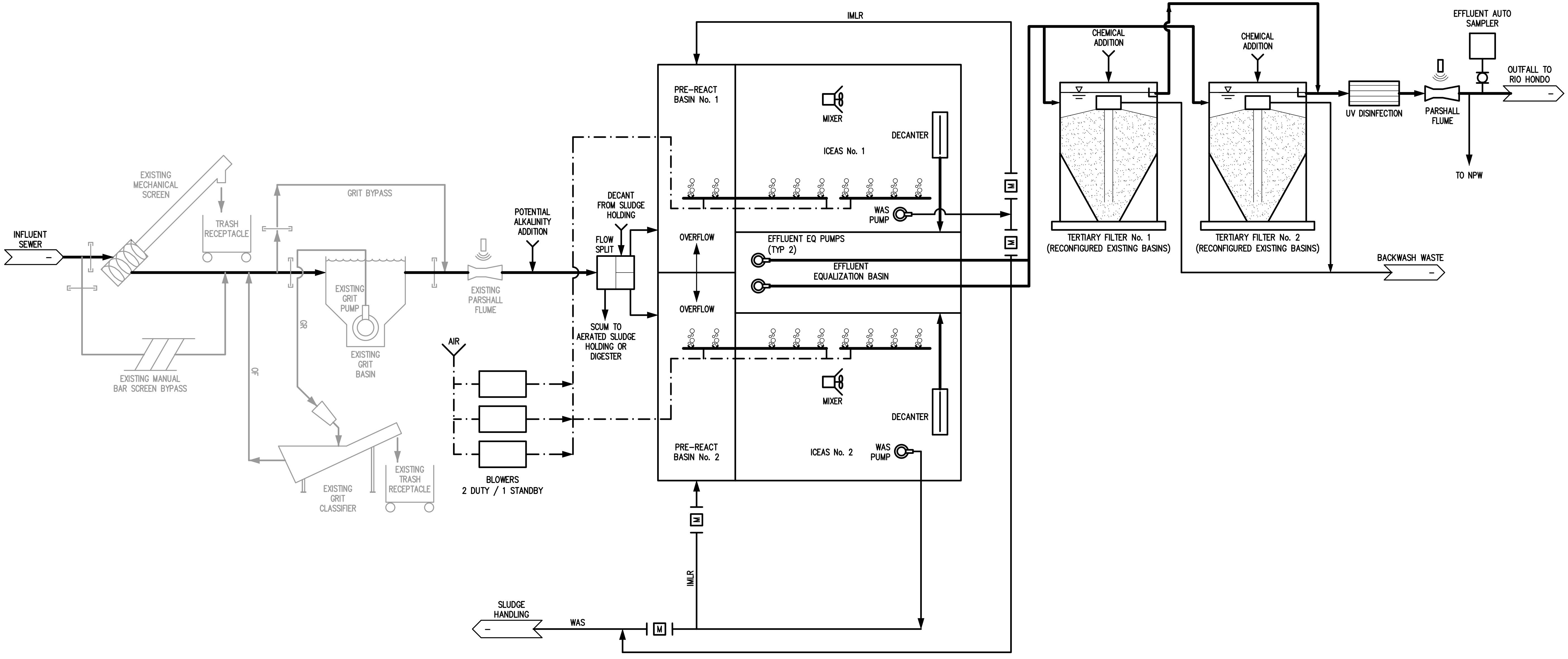
REV. No.	DATE	DESCRIPTION
–	11/2015	WWTP PER

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

ALTERNATIVE 2 – IFAS WITH MLE PROCESS FLOW DIAGRAM

PROJECT No.: VTSV-S14-0132
DATE: 1/20/2016
DESIGNED BY: KV
DRAWN BY: SAJ
CHECKED BY: MAD

G0-05



ABBREVIATIONS:

OF – OVERFLOW
GR – GRIT
WAS – WASTE ACTIVATED SLUDGE
IMLR – INTERNAL MIXED LIQUOR
NPW – NON-POTABLE WATER
RAS – RETURN ACTIVATED SLUDGE

FEI ENGINEERS

REV. No.	DATE	DESCRIPTION
–	11/2015	WWTP PER

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

ALTERNATIVE 3 – ICEAS SBR BASINS PROCESS FLOW DIAGRAM

PROJECT No.: VTSV-S14-0132
DATE: 1/20/2016
DESIGNED BY: KV
DRAWN BY: SAJ
CHECKED BY: MAD

G0-06

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LOCATION: W:\VTSV-S14-0132 – WWTP\G0-06.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt

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FEI ENGINEERS

REV. No.	DATE	DESCRIPTION
-	8/2014	WWTP PER

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NOT FOR CONSTRUCTION

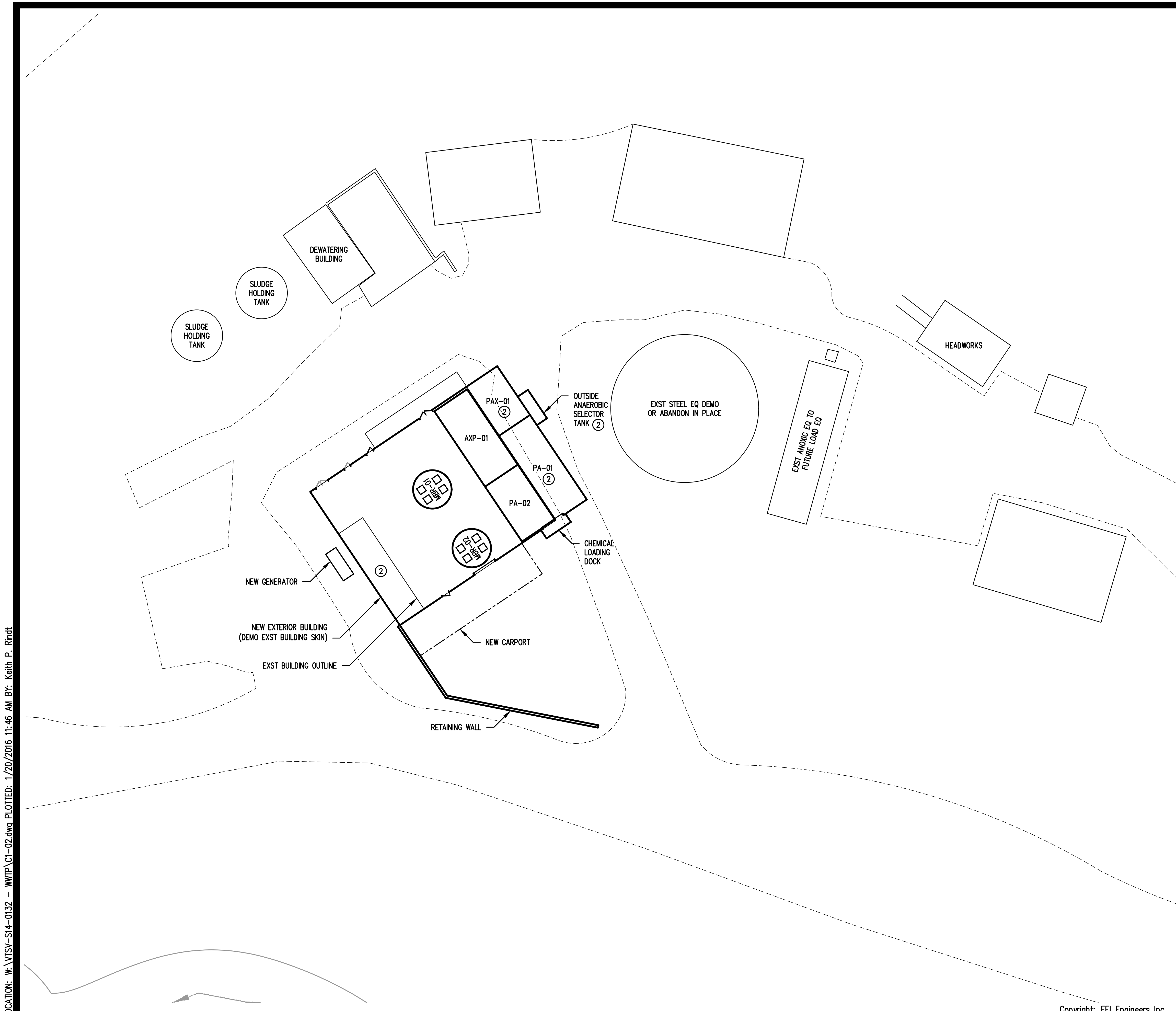
VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

EXISTING SITE PLAN

PROJECT No.: VTSV-S14-0132
DATE: 1/6/2016
DESIGNED BY: XXX
DRAWN BY: XXX
CHECKED BY: MAD

C1-01

LOCATION: W:\VTSV-S14-0132 - WWTP\C1-01.dwg PLOTTED: 1/20/2016 11:45 AM BY: Keith P. Rindt



SCALE: 1"=40'

GENERAL NOTES:

1. NEW BUILDING SIZE 91'-10"x65'-6"
2. EXTENSION OF EXISTING BUILDING.

PRELIMINARY
NOT FOR CONSTRUCTION

REV. No.	DATE	DESCRIPTION
-	11/2015	WWTP PER

FEI ENGINEERS

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

SITE LAYOUT – MEMBRANE BIOREACTOR

PROJECT No.: VTSV-S14-0132
DATE: 1/6/2016
DESIGNED BY: KV
DRAWN BY: KPR
CHECKED BY: MAD

C1-02

0 1 IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

LOCATION: W:\VTSV-S14-0132 – WWTP\C1-02.dwg PLOTTED: 1/20/2016 11:46 AM BY: Keith P. Rindt

SCALE: 1"=40'

IMPROVEMENT NOTES:

1. EXISTING EQ TANK TO BE REUSED AS LOAD EQ.
2. TRAIN 1 (0.1 MGD): USE OF EXISTING TANKS
   - A. ANAEROBIC SELECTOR FROM EXISTING ANOXIC / EQ TANK.
   - B. 4 EXISTING AERATION BASINS
   - C. CONVERT EXISTING SECONDARY CLARIFIERS TO AEROBIC A/S REACTORS, POST-ANOXIC REACTOR AND UTILIZE EXISTING OZONE CONTACT TANK FOR RE-AERATION.
3. NEW 30' SECONDARY CLARIFIERS (2 TOTAL).
4. NEW TERTIARY FILTER (4 TOTAL).
5. NEW PRE-FABRICATED BUILDING METAL BUILDING TO HOST NEW TREATMENT TRAIN, CLARIFIERS, TERTIARY FILTERS, PUMPS, BLOWERS, LABORATORY, OPERATIONS, CONTROL ROOM, SHOWER, AND RESTROOM.
6. TRAIN 2 (0.34 MGD): NEW TANKAGE

GENERAL NOTES:

1. UNDERGROUND UTILITIES ARE APPROXIMATE ONLY. CONTRACTOR SHALL FIELD LOCATE EXISTING UTILITIES PRIOR TO COMMENCING WORK.
2. TERTIARY FILTRATION BUILDING BASED ON BLUE-PRO FILTER VENDOR GENERAL ARRANGEMENT DRAWING.

0 1 IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

FEI ENGINEERS

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REV. No.	DATE	DESCRIPTION
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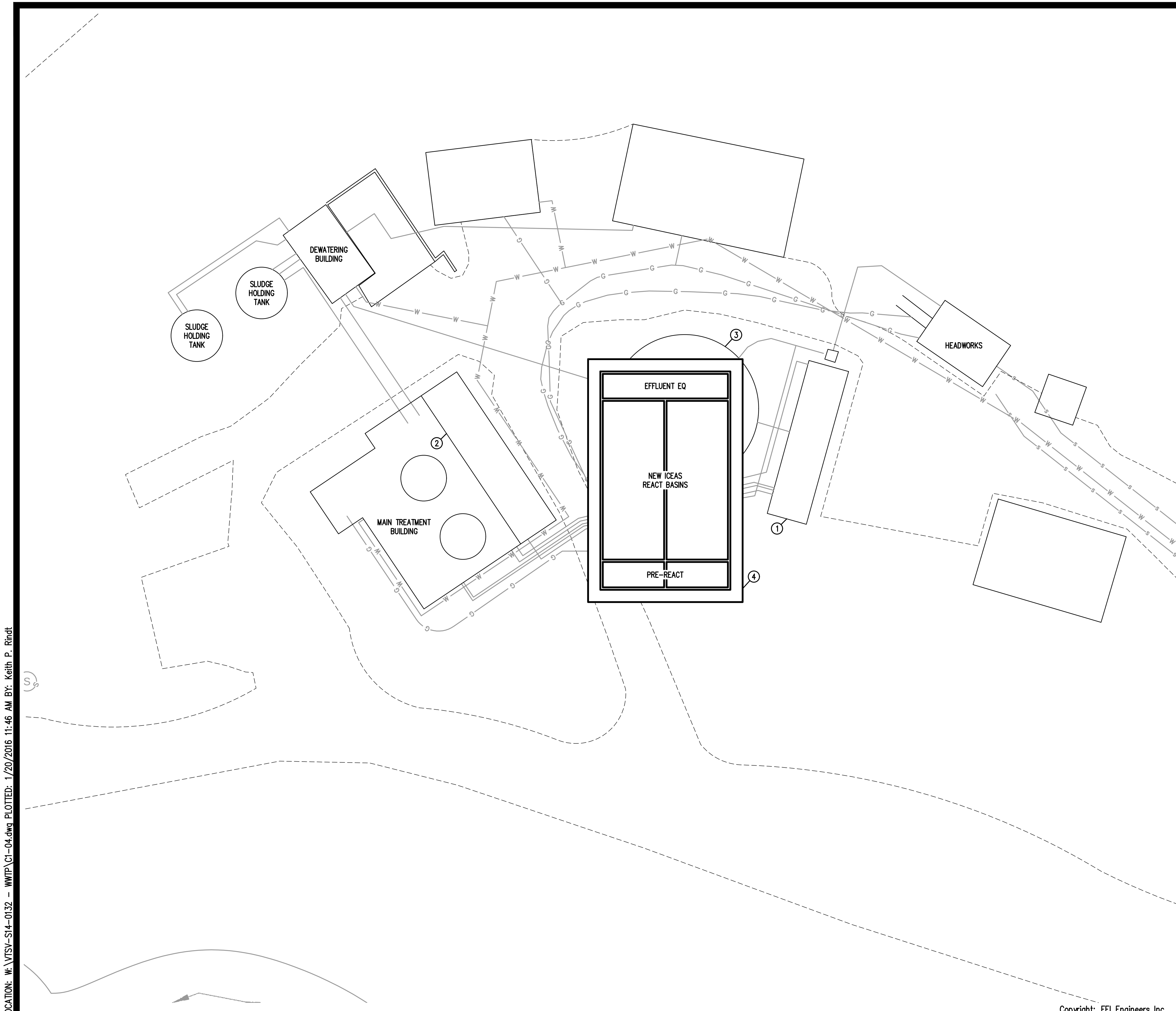
VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

SITE LAYOUT – IFAS WITH MLE PROCESS

PROJECT No.: VTSV-S14-0132
DATE: 1/6/2016
DESIGNED BY: KV
DRAWN BY: KPR
CHECKED BY: MAD

C1-03

LOCATION: W:\VTSV-S14-0132 – WWTP\C1-03.dwg PLOTTED: 1/20/2016 11:46 AM BY: Keith P. Rindt



SCALE: 1"=40'

NOTES:

1. EXISTING EQ TANK TO BE REUSED AS LOAD EQ TANK.
2. EXISTING AERATION BASINS TO BE RETROFITTED TO HOIST TERTIARY PHOSPHOROUS FILTERS.
3. EXISTING STEEL EQ TO BE DEMOLISHED.
4. PROPOSED PREFABRICATED METAL BUILDING.

GENERAL NOTES:

1. UNDERGROUND UTILITIES ARE APPROXIMATE ONLY. CONTRACTOR SHALL FIELD LOCATE EXISTING UTILITIES PRIOR TO COMMENCING WORK.
2. TERTIARY FILTERS BASED ON BLUE-PRO FILTER VENDOR GENERAL ARRANGEMENT DRAWING.

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VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

SITE LAYOUT – ICEAS SBR BASINS

PROJECT No.: VTSV-S14-0132
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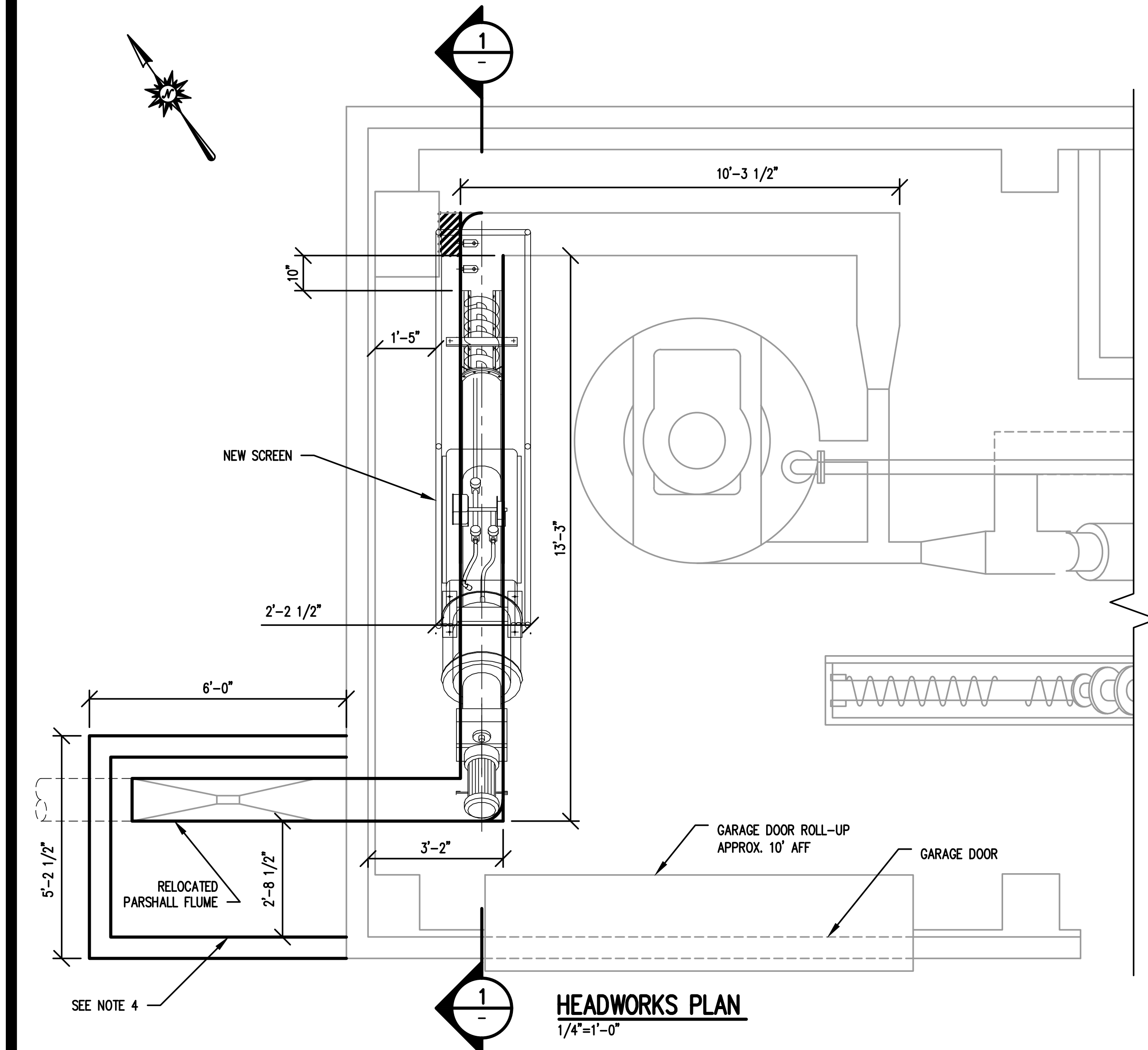
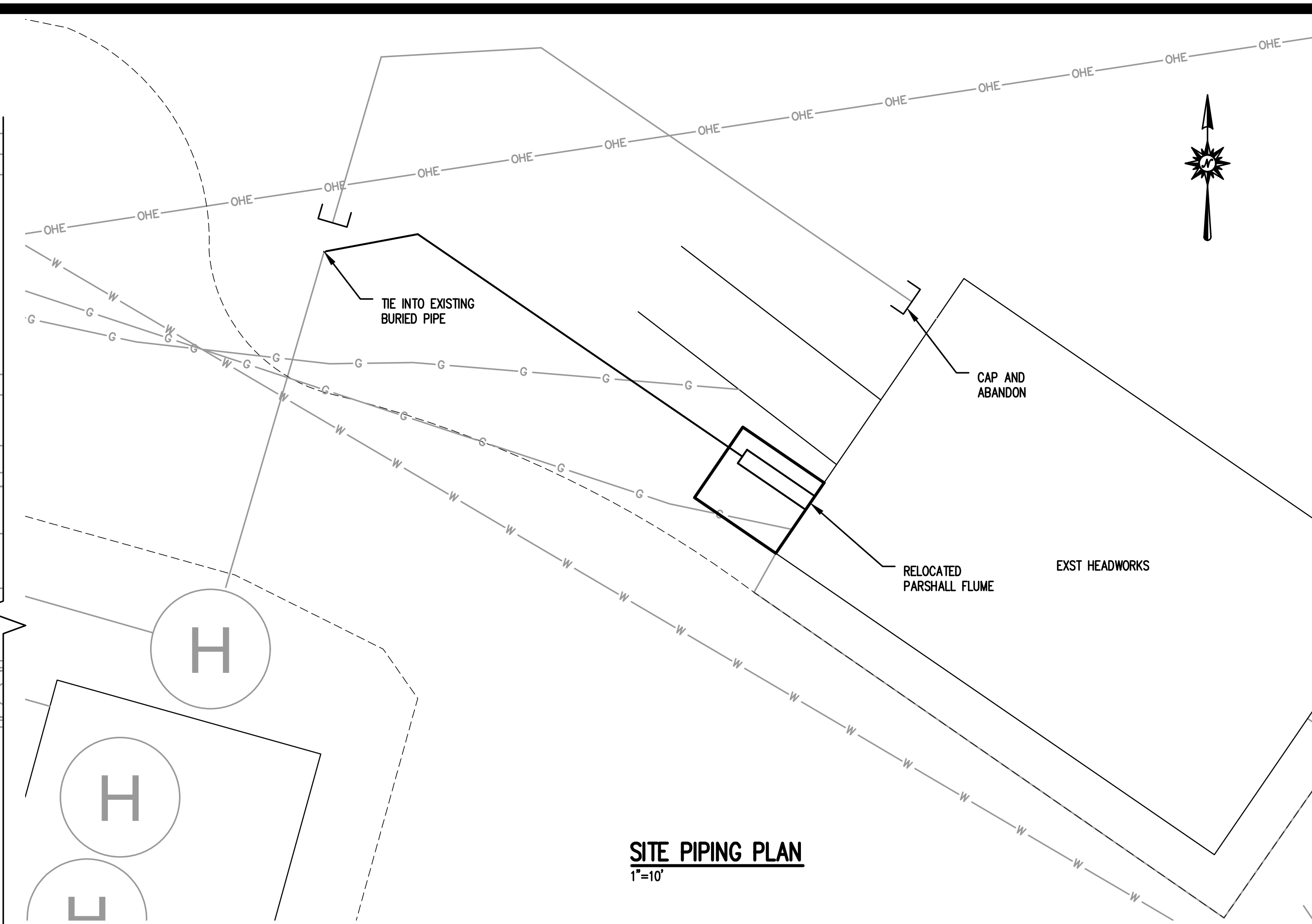
C1-04

LOCATION: W:\VTSV-S14-0132 – WWTP\C1-04.dwg PLOTTED: 1/20/2016 11:46 AM BY: Keith P. Rindt



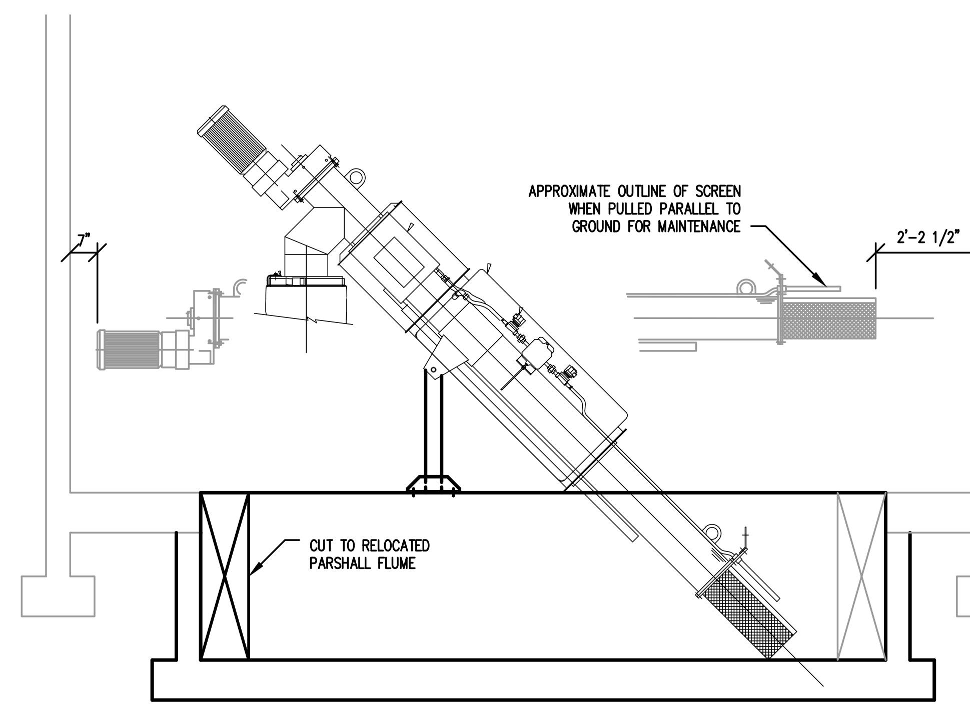
HEADWORKS PLAN
1/4"=1'-0"



SITE PIPING PLAN
1"=10'

NOTES:

1. EXISTING SCREEN U/S WATER LEVEL BASED ON 0.167 MGD OR 0.2 MGD (TO BE VERIFIED).
2. EXISTING SCREEN D/S WATER LEVEL BASED ON WATER LEVEL U/S OF GRIT CHAMBER (REFER TO TEC DRAWING HYDRAULIC PROFILE).
3. WATER LEVEL WILL VARY BASED ON INCREASED FLOW OF 0.31 MGD (MMDF) AND 0.44 MGD (PPF).
4. EXTEND EXISTING BUILDING TO WEST SIDE TO ACCOMMODATE RELOCATED PARSHALL FLUME WITH NEW AUTOSAMPLER.



SECTION 1
1/4"=1'-0"

0 1 IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

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WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

HEADWORKS PLAN & SECTION

PROJECT No.: VTSV-S14-0132
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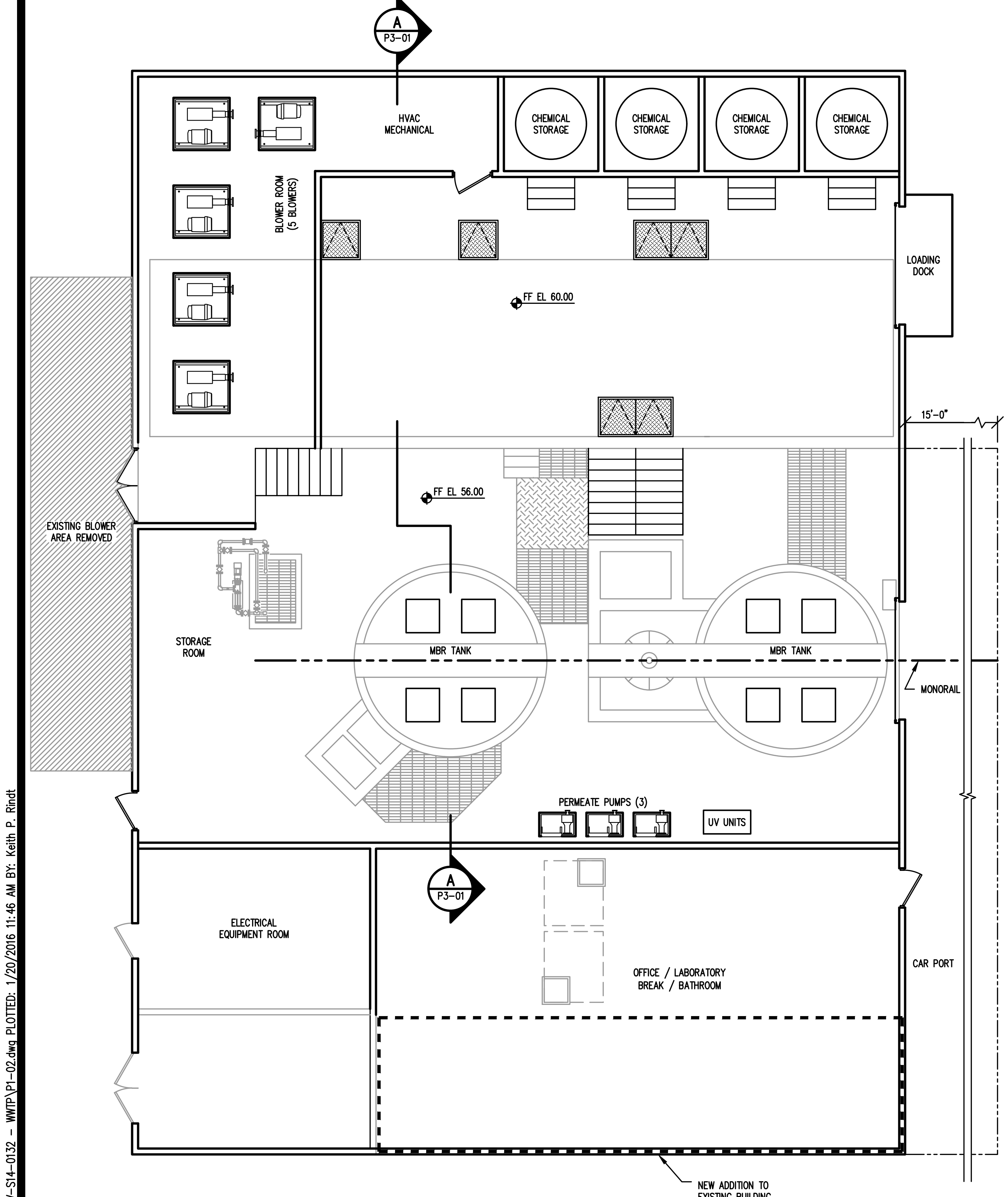
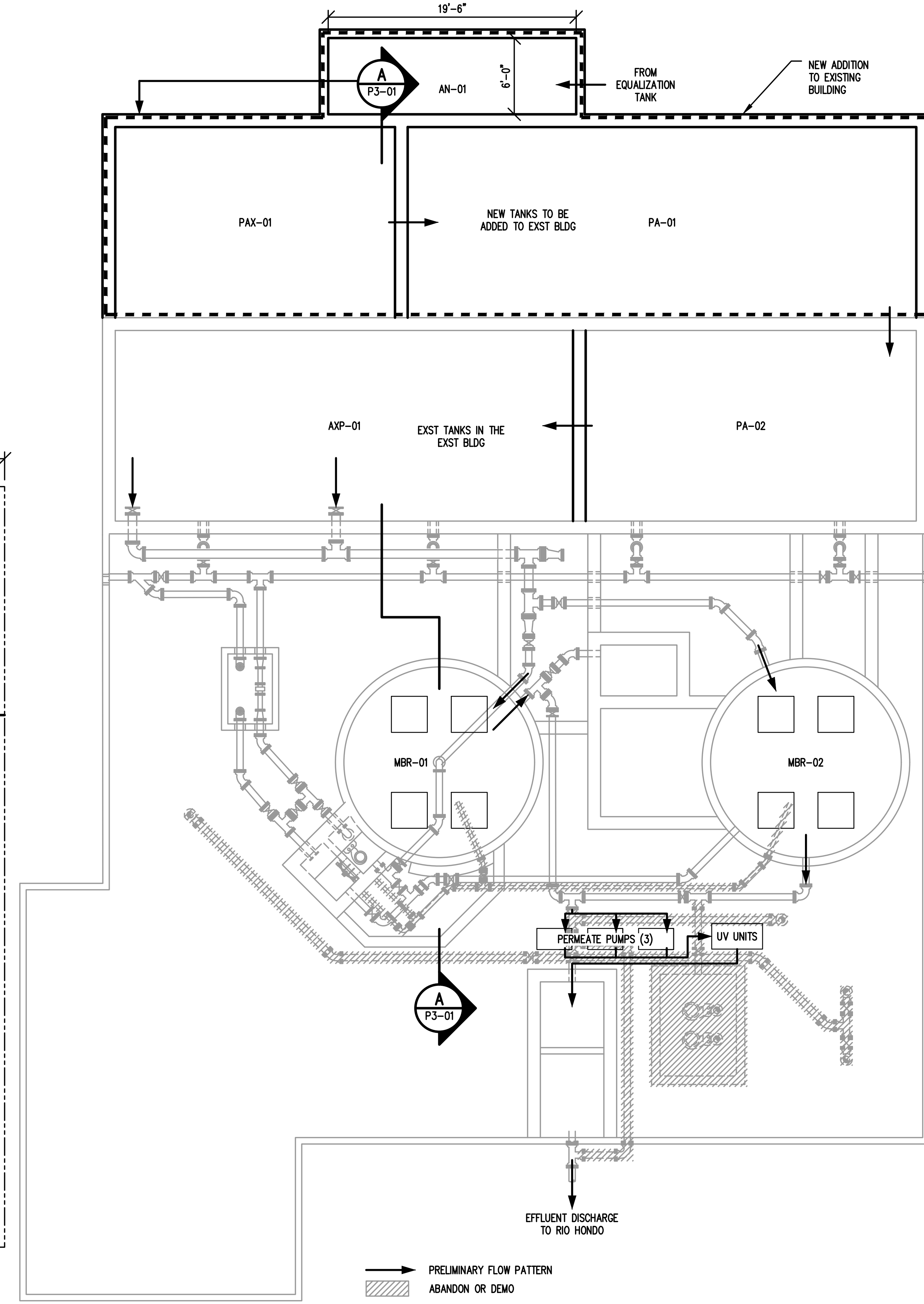
DRAWN BY: KPR
CHECKED BY: MAD

P1-01



UPPER LEVEL PLAN
3/32"=1'-0"



LOWER LEVEL PLAN
3/32"=1'-0"

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IF THIS BAR DOES NOT MEASURE 1"
DRAWING IS NOT TO LABELED SCALE

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REV. No.	DATE	DESCRIPTION
1	1/2016	WWTP PER

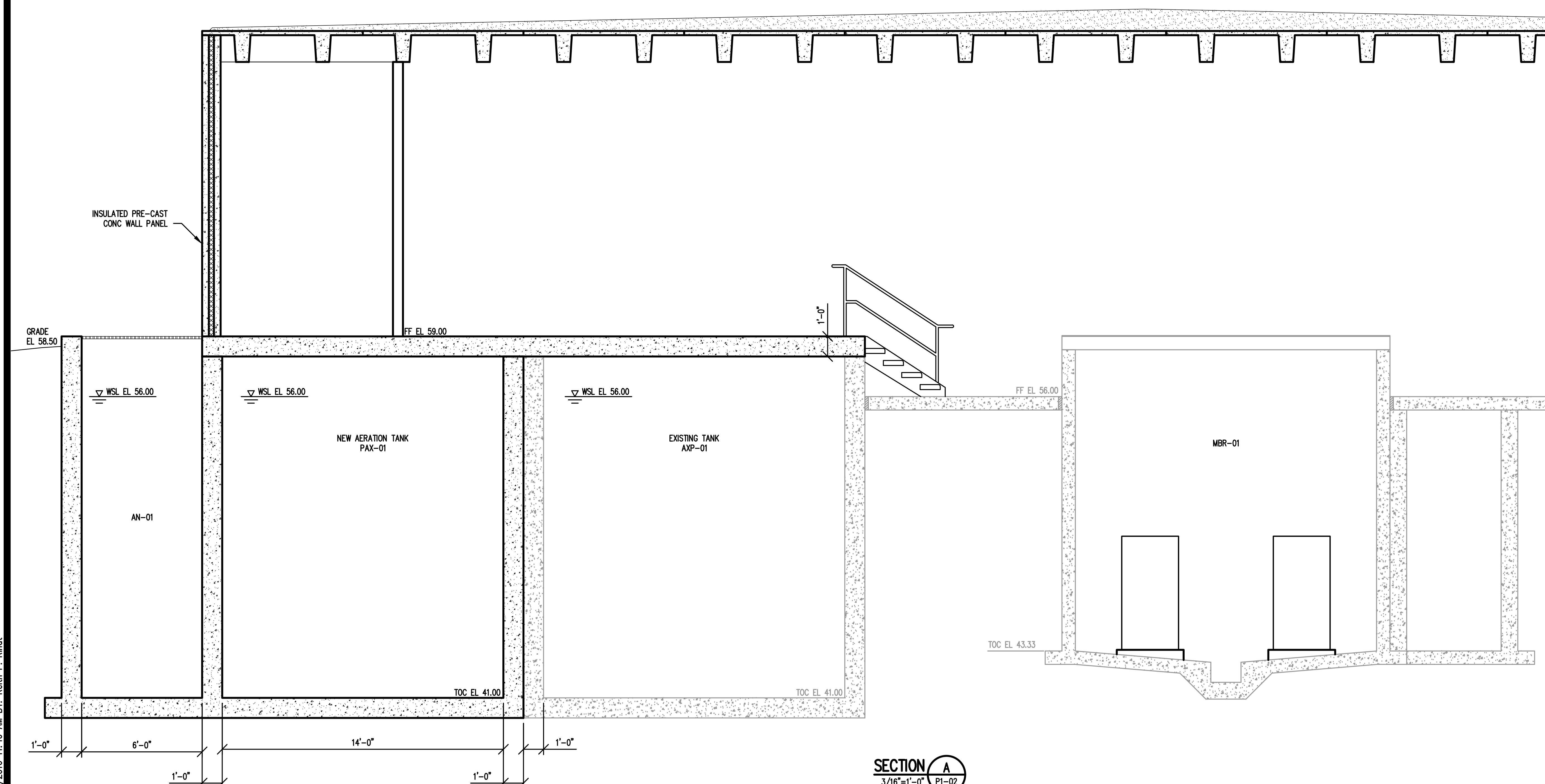
VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

TREATMENT PLANT PLANS

PROJECT No.: VTSV-S14-0132
DATE: 1/8/2016
DESIGNED BY: KV
DRAWN BY: SAJ
CHECKED BY: MAD

P1-02

LOCATION: W:\VTSV-S14-0132 - WWTP\P1-02.dwg PLOTTED: 1/20/2016 11:46 AM BY: Keith P. Rindt



SECTION A
3/16"=1'-0" P1-02

LOCATION: W:\VTSV-S14-0132 - WWTP\P3-01.dwg PLOTTED: 1/20/2016 11:46 AM BY: Keith P. Rindt

FEI ENGINEERS

PRELIMINARY
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REV. No.	DATE	DESCRIPTION
1	8/2014	WWTP PER

VILLAGE OF TAOS SKI VALLEY
WASTEWATER TREATMENT FACILITIES IMPROVEMENTS

TREATMENT PLANT SECTIONS

PROJECT No.: VTSV-S14-0132
DATE: 1/8/2016
DESIGNED BY: XXX
DRAWN BY: XXX
CHECKED BY: MAD

P3-01

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IF THIS BAR DOES NOT MEASURE 1" DRAWING IS NOT TO LABELED SCALE

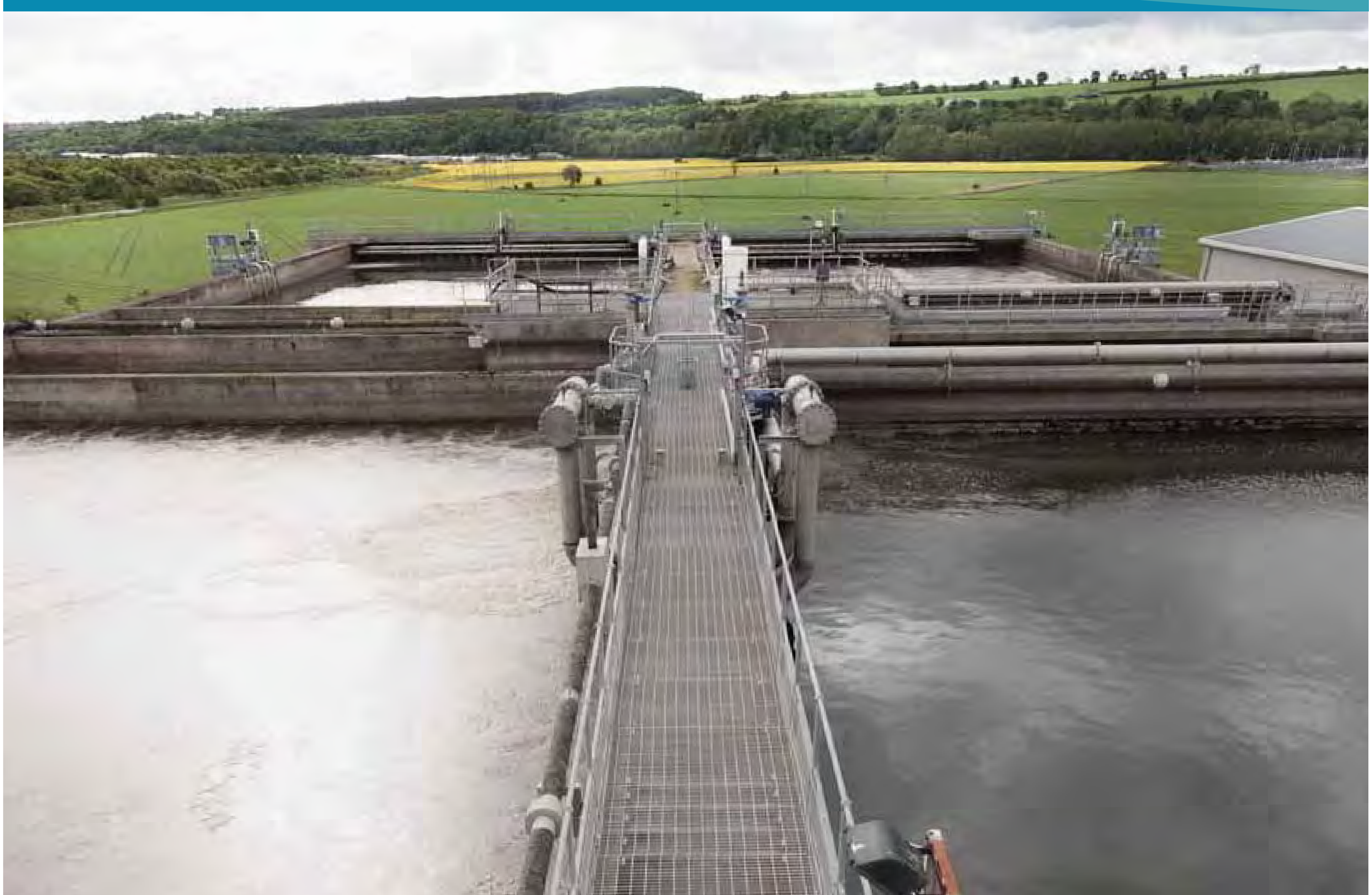
APPENDIX C.1
SANITAIRE ICEAS SBR

FLYGT SANITAIRE®

xylem
Let's Solve Water

Sanitaire ICEAS SBR

THE FULLY AUTOMATED, ADVANCED SBR TECHNOLOGY FOR MUNICIPAL AND INDUSTRIAL WASTEWATER TREATMENT



The proven wastewater treatment process solution that allows continuous inflow of wastewater into all basins

It's time you get to know Sanitaire ICEAS: the enhancement of the conventional SBR. ICEAS is the only proven wastewater treatment solution that allows continuous inflow of wastewater into all basins. The influent flow to the ICEAS basin is not interrupted at all during the settle and decant phases or at any time during the operating cycle.

What does this mean for you?
Simplicity, efficiency and robustness.

Sanitaire ICEAS is a proven process that enhances the standard SBR system performance and delivers substantial costs, operational and maintenance advantages. The ICEAS does not need primary and secondary settlement tanks, like a conventional activated sludge plant, hence significantly reducing the complexity of mechanical equipment, piping and control. The continuous inflow provides equal loading and flow to all basins, thereby simplifying operation and process control while reducing costs. The process enables single basin operation that is particularly useful for maintenance and for taking basins out of operation in low flow conditions.

The continuous flow SBR system
Designed as an ICEAS continuous flow process, the system will deliver reduced capital costs. To begin with, as opposed to conventional SBR, the ICEAS process necessitates only one set of tanks. This means that up to 30% less basin volume is actually required to achieve the same operating performance as a conventional SBR with the same design conditions. Typically the ICEAS requires up to 30% less volume to achieve the same performance than a conventional SBR. This results in savings due to less concrete, reduced excavation and smaller required land area.

The ICEAS process design allows simplified expansion because each basin forms a modular treatment unit. This makes the ICEAS process ideal for growing communities requiring wastewater treatment.

The ICEAS process technology is applicable for both pre-treatment and complete secondary treatment. ICEAS has been applied in the treatment of several types of industrial effluent including: pulp and paper, meat packaging, pharmaceutical, food processing, dairy industry, textile, bottling plants and chemical and agricultural products.

The advantages of the robust, continuous flow ICEAS process
- Minimizes the decant volume requirements
- All peak and diurnal loadings are distributed equally in all tanks simplifying plant operation
- Organic load is available for nutrient removal through the react phase
- Load during settle and decant provides 'substrate gradient' through react phase to select away from filaments
- Improved maintenance operation since you can run a two-tank system with one tank out of operation
- Peak loads evenly spread out over all basins
- Peak influent flows attenuated across all basins, thereby reducing peak effluent flows

They liked the ICEAS so much they bought another one

Doha Wastewater Treatment Works, Qatar. Phase 4

The ICEAS basin

The ICEAS basin is divided into two zones, the pre-react zone and the main react zone. A non-hydrostatic baffle wall with openings at the bottom is constructed to divide the ICEAS basin into the two zones. These openings at the bottom help distribute flows evenly into the main zone. The influent flows continuously into the pre-react zone and is directed down through engineered orifice openings at the bottom of the baffle wall into the main react zone. The pre-react baffle evenly disperses the incoming flow through the sludge and prevents short-circuiting. The volume of the pre-react zone is typically
10 to 15 percent of the total basin volume.

The ICEAS hydraulics

Time based cycles are used in sizing the ICEAS process. A normal cycle is designed to handle the Average Dry Weather Flow (ADWF) and Peak Dry Weather Flow (PDWF) to the plant. A storm cycle is used to handle the storm flows. The storm cycle operates with a shorter duration compared to the normal cycle so that higher flows can be processed by the system. Typically, the ICEAS process can be designed to handle 3 to 6 times the average flow conditions, while maintaining the same hours of aeration per day in all cycles.

Basin layers

Three stratified layers are formed in each basin at the end of the settle phase and beginning of the decant phase. The sludge blanket forms on the bottom of the basin
as the mixed liquor suspended solids (MLSS) settle. A buffer zone of one meter acts to buffer the sludge blanket from the volume that will be removed during the decant phase. The top layer of clear treated liquid is drawdown after the MLSS settles.

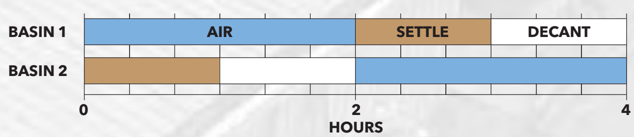
The advantage of the buffer zone is that it provides improved final effluent solids performance even in high flow operation, and at the end of the decant cycle.

Control features that enable more flow processing

ICEAS incorporates two or more hydraulic cycle control features that allow you to operate the system in two basic process modes: Nitrification (NIT) and Denitrification (NDNP).

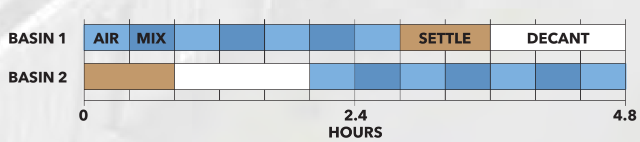
NIT Cycle

The simple cycle provides half the cycle for aeration and treatment of the sewage and a total of 2 hours for settle and decant. The cycles are staggered so one blower can provide air to a pair of basins while ensuring that only one basin is aerated at any time.



NDNP Cycle

If nutrient removal is required the cycle time is extended to provide time for anoxic periods to allow denitrification and Bio P removal. The continual feed provides BOD at all times to provide good denitrification rates at all points in the cycles and optimize nitrogen removal.



Today there are over 900 ICEAS installed all over the world

A time based control system for simple operation
Influent is received continuously during all phases of the cycle, including settle and decant. This allows the ICEAS process to be controlled on a time, rather than flow basis and ensures equal loading and flow to all basins at all timers. Use of a time-based control system in the ICEAS process facilitates simple changes to the process control program, and makes it easier to control the process.

In a flow-based conventional SBR, cycle times and individual segments of each cycle may be different among basins due to diurnal flow variations. Thus, it may not be possible to simply affect a change to the entire system. In essence, separate control must be maintained over each basin in the SBR system.

Robust driven decanter design
High quality workmanship and advanced engineering provide a long-lasting decanter. The decanter itself is built to be highly resilient and features a rugged stainless steel construction.

- A proprietary scum exclusion float prevents the carryover of floating material with the treated effluent
- Flow over the decanter weir is visible providing a check of effluent quality
- VFD actuator provide a constant effluent discharge rate to downstream facilities

Reduced operating cost

- No return sludge (RAS) pumping requirements
- Proven control system for optimizing energy usage
- Highly efficient Sanitaire Fine Bubble Aeration minimizes energy used for aeration
- No supplemental mechanical mixing required for aeration system

Reduced maintenance cost

- No influent or effluent control valves
- Continuous flow enables shut down of one basin to facilitate maintenance of equipment when required
- Retrievable aeration facilities not required
- Decanter actuator is easy to service from walkway

Continuous flow delivers Biological Nutrient Removal (BNR)

- The ICEAS process can be designed for enhanced nitrogen and phosphorus removal
- Alternating periods of 'air on' and 'air off' during the react phase can produce aerobic/anoxic/anaerobic conditions to promote nitrification / de-nitrification and enhanced biological phosphorus removal
- New and existing plants can be designed to accommodate future BNR effluent requirements

The ICEAS process is a fully automated and simple to operate biological treatment system that has multiple advantages over conventional activated sludge and SBRs

- Designed to handle flows from 100 m^3/day to 300,000 m^3/day
- High quality effluent (10/10/5/1 mg/l of BOD/TSS/TN/TP average)
- Smaller basin size and less equipment needed than conventional SBRs
- Eliminates primary and secondary clarifiers and return sludge pumps
- Reduced operating costs, since no mixers or pumps necessary for oxygen transfer or sludge recirculation

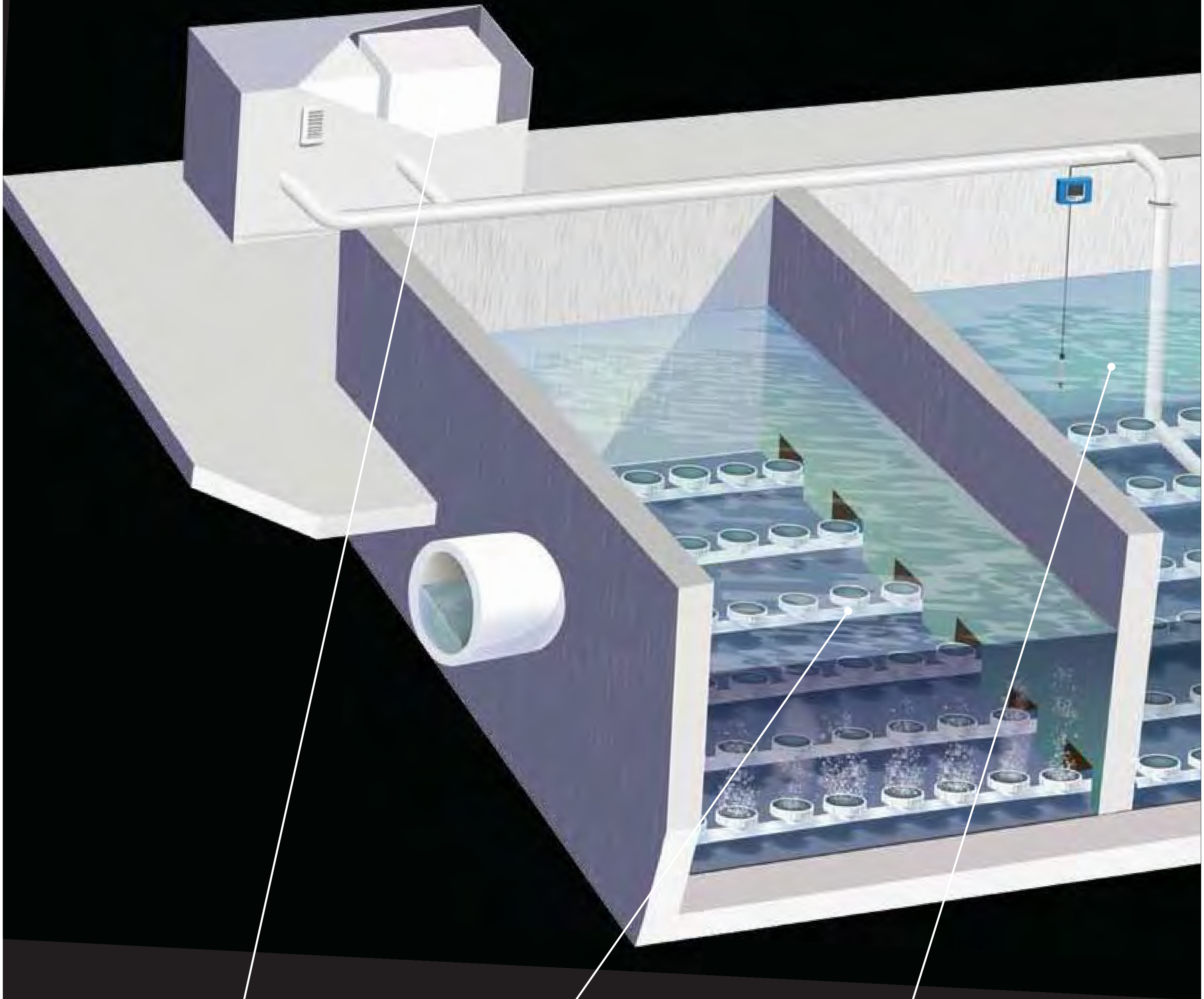
Simple civil construction
- The ICEAS does not require primary tanks or settlement tanks. All treatment is done ina single basin
- Construction is simple with a single set up structures and common wall construction, reducing construction cost and time
- Flexible basin configuration means rectangular or circular tanks can be used
- Significantly reduced foot print over conventional activated sludge

Pre-react zone process
The pre-react zone acts as a selector with high F:M to promote proper settling. It effectively disperses flow across the width of the tank with no disturbance of blanket during settle and decant. Short circuiting does not occur throughout the process.
- PRZ has usually a 3-hour retention time for a 2-hour settle and decant period
- Flow from the PRZ hydraulically displaces treated effluent in the main aeration zone

Continuous inflow design
- Operates as a time-based control system for continuous inflow of wastewater
- Provides equal loading and flow to all basins, simplifying operation and process control
- Can be designed to accommodate up to six times average daily flow
- PLC based control and SCADA software can provide remote monitoring capabilities
- Capable of single basin operations

Energy efficient aeration systems
- Sanitaire diffusers provide high oxygen transfer efficiency
- Sanitaire Fine Bubble Membrane aeration systems are engineered for durability in domestic and industrial applications and require minimal maintenance
- Patented design of piping system accommodates thermal expansion and contraction
- Sanitaire aeration systems are one of the most energy efficient methods
- Aeration efficiencies of 4-6 kg O2/ kWh possible including guarantees

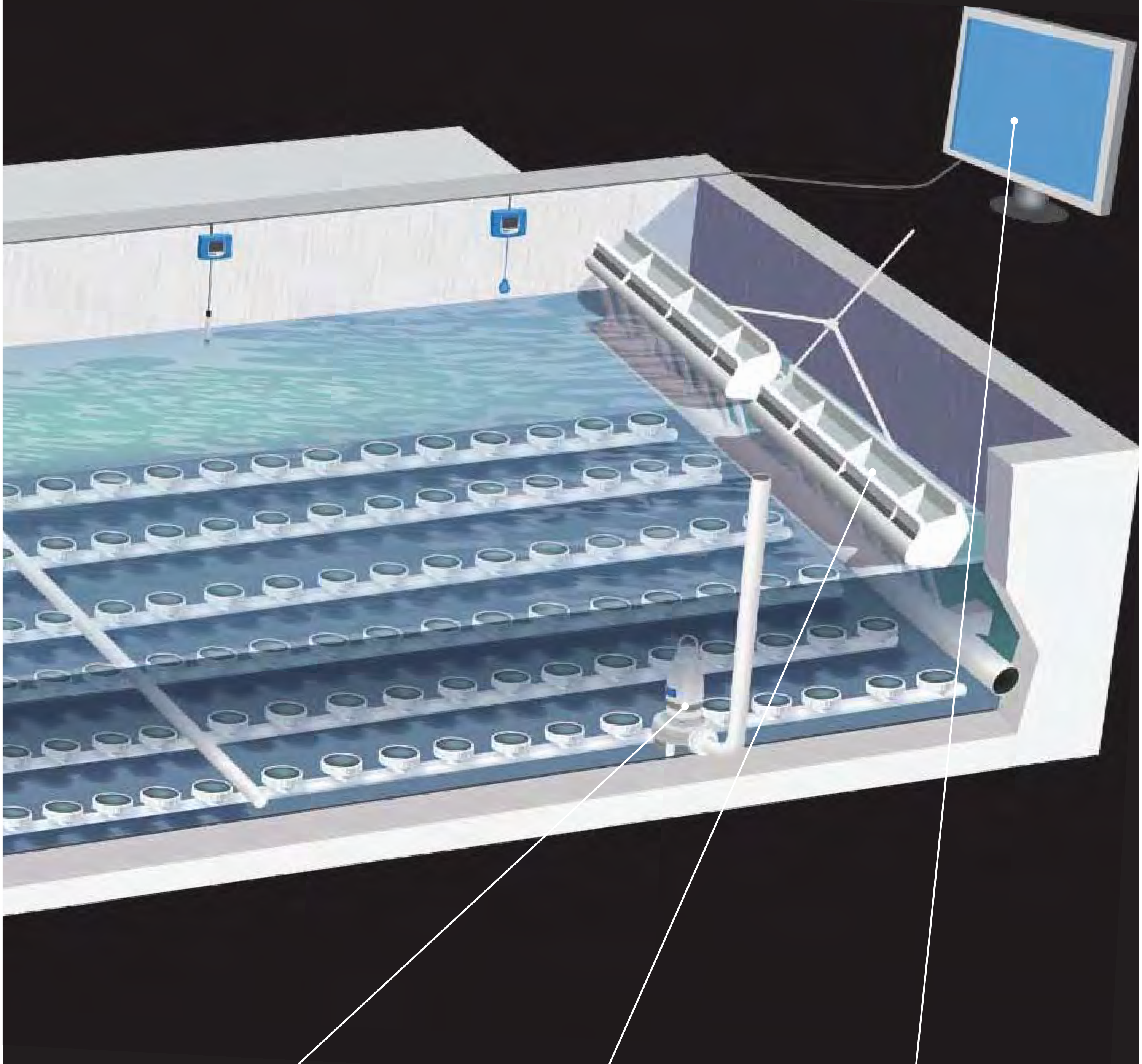
Rugged decanter design
- Rugged, corrosion resistant stainless steel construction
- Decants from the top down visibly withdrawing only the uppermost clear water from the basin
- Variable frequency driven actuator provides control flexibility to change decant times and accommodate high flows
- Actuator drive mounted outside of the basin at walkway level for easy maintenance and access
- Parked above top water level during react and settle phases serving as an emergency overflow device in cases of extreme storm conditions or power failure



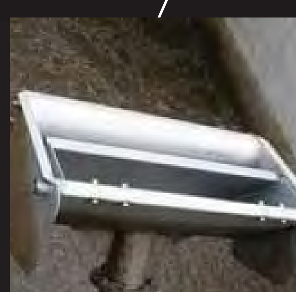
Blowers
Years of experience allow us to provide the correct blower type like centrifugal, rotary lobe, screw rotor etc. to match your operational aeration requirements

Aeration
Sanitaire Silver Series II is the most widely used fine bubble diffused aeration system available today, with millions installed worldwide

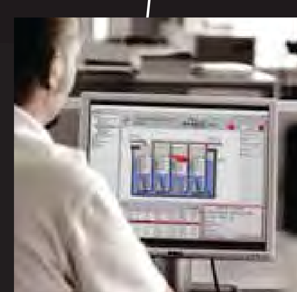
Mixers
Flygt compact mixers provide clog free, efficient hydraulics and reliable operation



Pumps
The Flygt proven submersible N-Pumps have been engineered to give highly efficient, reliable and trouble-free pumping over long duty periods

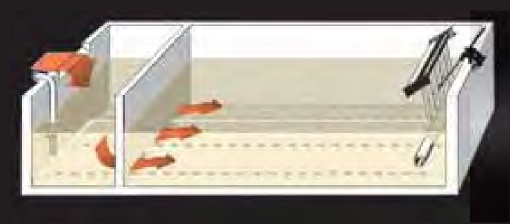


Decanters
The easy access to Sanitaire decanters makes maintenance straightforward. The resilient construction provides lifelong reliable operation



Control systems
The ICEAS control system makes it easy for the operator to understand and make cycle changes to optimise the plant performance

React

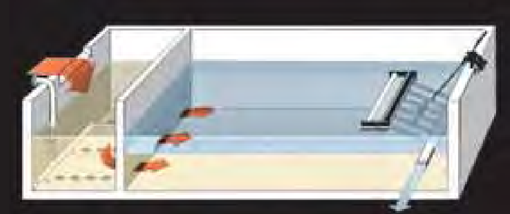


During the react phase, raw wastewater flows into the pre-react zone continuously to react with the mixed liquor suspended solids. The basin contents are aerated to remove pollutants, but depending on the process scheme, may also be anoxically mixed, allowed to react anaerobically, or a combination thereof. As the basin continues to fill, biological oxidation/reduction reactions take place simultaneously to treat the wastewater

Settle

During the settle phase, basin agitation from the react phase (i.e. aeration or mixing) is stopped to allow the solids to settle to the bottom of the basin. Raw wastewater continues to flow into the pre-react zone as the main-react zone settles. As the solids settle, a clear layer of water will remain on top of the basin

Decant



During the decant phase, the decanter rotates downward to draw off the clarified supernatant and discharge it to the effluent line. The decanter removes the top water and always reaches bottom water level at the end of the decant phase allowing maximum settlement time for optimal performance. Raw wastewater continues to flow into the pre-react zone displacing the treated effluent in the main-react zone over the decanter. Sludge is typically wasted from the basin during this phase in the cycle

Sterling Wastewater Treatment Works, UK

Scottish Water were required to upgrade the Sterling Wastewater Treatment Plant to improve the quality of the effluent in line with the European Urban Wastewater Treatment Directive (UWwTD). The upgrade included the removal of ammonia from the effluent that the existing treatment works was not able to achieve. The land owned by Scottish Water was not large enough to accommodate a traditional treatment plant and would mean the purchase of additional land and associated additional costs and potential delays to the project.

Sanitaire recommended to Scottish Water the ICEAS SBR. The ICEAS is a continuous flow SBR that treats the sewage to the required effluent in a single tank and therefore does not require separate settlement tanks. This feature significantly reduces the footprint of the plant, to such an extent that the ICEAS would fit on the existing site.

In working together with the main contractor, Sanitaire were able to construct the works on time, while still ensuring the continued operations of the existing works. The new ICEAS treated the same flow as the existing plant while occupying a significantly reduced area.

Jefferson City Regional Water Reclamation Facility, USA

"The plant has operated at a high level since it was built with very little labor needed to operate and maintain the plant. The service we receive from Xylem is second to no one. I have been in the wastewater business for 32 years and have never worked with a group of people that care more about their customers. You never get put off or "forgotten" when you call and ask for help. The answers they give are quick and accurate. I would highly recommend this type of plant and this company to anyone."

David F. Erwin, Plant Manager

By 1998 the existing facilities at Jefferson City Wastewater Treatment Plant were no longer effective in treating the increased flows from system growth, and City officials decided to upgrade the facility to meet current and future discharge standards and wet weather flows. In addition the city wanted to eliminate unpleasant odors that had become a concern over the years. The new treatment plant would serve 18,200 active customers and a daytime population exceeding 50,000. After evaluating several treatment options, SBR was chosen as the most effective system for treating wastewater to meet the City's objectives. The flexibility involved with process control of the ICEAS would allow increased reduction in BOD and total suspended solids (TSS), nutrient removal (nitrogen & phosphorus) and controlling high flow problems.

A conventional activated sludge plant would not fit within the existing centralized site's space constraints, and would increase project costs. The ICEAS technology saved about 30 percent in project costs and also offers an ongoing reduction in operations and maintenance expenses.

Xylem [ˈzīləm]

1) The tissue in plants that brings water upward from the roots
2) A leading global water technology company

We're 12,000 people unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com.

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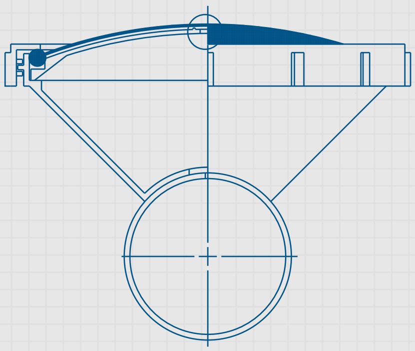
www.flygt.com
www.sanitaire.com

Membrane Disc
Fine Bubble Aeration Systems



Sanitaire

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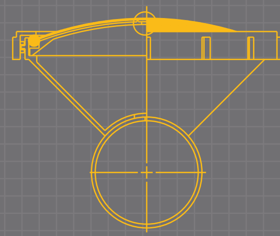
Engineered for life

Membrane Disc

Fine Bubble Aeration Systems



SANITAIRE®

Technology You Can Count On

SANITAIRE® is the trade name recognized throughout the wastewater treatment industry for quality products and advanced technology. SANITAIRE Silver Series membrane fine bubble disc diffusers are recognized worldwide for their high oxygen transfer efficiency and durability in wastewater treatment plant aeration processes.

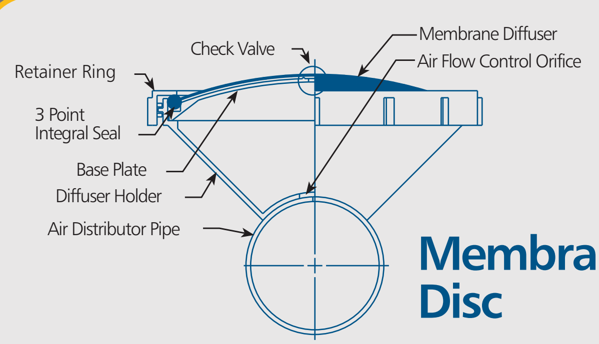
Owners and engineers prefer SANITAIRE fine bubble diffusers because:

- Power costs can be reduced by 50% or more.
- High oxygen transfer efficiency and low system headloss lead to low energy costs.
- Minimal maintenance is required.
- Gentle positive mixing action using full floor coverage aeration grids promotes excellent floc formation.

Sanitaire's leadership and experience in aeration technology has resulted in high quality SANITAIRE fine bubble disc aeration systems being specified more than any other. The SANITAIRE Membrane Disc fine bubble aeration system offers advantages in performance, ease of maintenance, construction integrity and quality. Ongoing research and developement shows Sanitaire's commitment to the most technologically advanced diffused aeration system.

Diffuser and Holder Features

- Diffuser holders are factory solvent welded to the air distribution piping providing superior mechanical strength and eliminating the necessity for field installation and leveling of individual assemblies.
- Membrane diffusers include an integral check valve. The non-perforated center portion of the membrane collapses onto the air release port of the base plate when the air is turned off. The diffuser slits also act as check valves and close onto the base plate when the air is turned off.
- Integral seal and threaded retainer ring design prevents air leakage and resulting contamination from mixed liquor solids leakage into the aeration system.



Membrane Disc

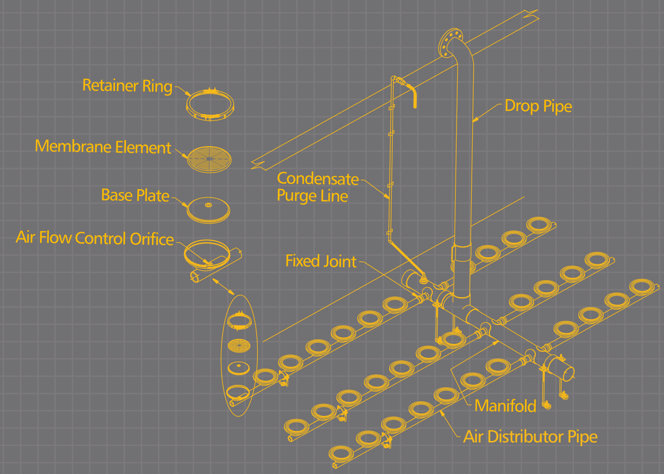
Top centerline diffuser mounting prevents cantilever or torque forces from being transmitted to piping system.

- Diffuser and holder are designed to provide full surface uniform air distribution and bubble release.
- The membrane is completely supported by the base plate, preventing reverse flexing.
- Available in 9-inch (229-mm) and 7-inch (178-mm) diameters.

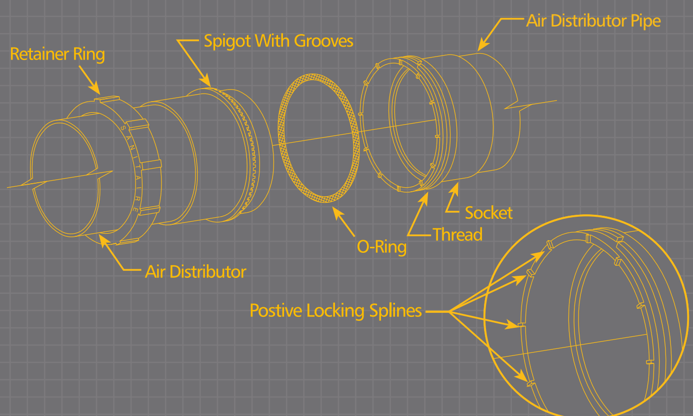
Proven System Components

- The SANITAIRE air distribution system incorporates patented locking pipe joints combined with guide type supports that do not positively grip the pipe to accommodate thermal expansion and contraction. The unique system design allows the individual distributor pipes to move freely through the pipe supports.
- The patented SANITAIRE fixed joint features an airtight O-ring seal, anti-rotational splines and a positive locking threaded retainer ring to prevent air leakage, pipe blow apart and distributor rollover.
- PVC air distribution piping system provides long-term mechanical integrity.
- Submerged components of corrosion resistant materials.
- Unique all stainless steel anchorage system with threaded supports for infinite adjustments on sloped or irregular floors.
- Joint components are factory solvent welded to the pipe ends, allowing for quick and easy field assembly of air distributor sections.
- Condensate removal with sumps and purge system.
- Over 10 million fine bubble diffusers installed worldwide.

Typical Membrane Disc Grid Layout



Sanitaire Positive Locking Fixed Joint



Membrane Disc Diffuser Advantages

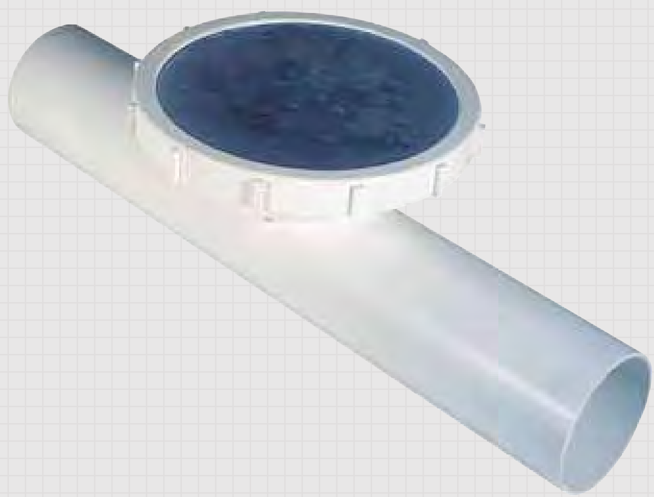
- Provides full surface, uniform air distribution and bubble release.
- Operating air pressure creates peripheral seal to eliminate air leakage.
- Precision die-formed slits are punched perpendicular to membrane grain direction for greater resistance to elongation and tearing.
- Proprietary technologically advanced membrane material blended from special synthetic rubber compound has been specifically engineered for domestic and industrial waste applications providing:
  - Extended service life.
  - Resistance to material property changes.
  - High modulus of elasticity.
  - Proper material thickness - lower unit stress.
  - Resistance to oils and ultraviolet light.
  - High oxygen transfer efficiency.
- Alternative materials and configurations available for specific applications.
- The unique design eliminates the use of hold-down bolts, lift limiters and metallic mechanical fasteners.
- Existing aeration tanks can be easily upgraded with membrane disc aeration, upgrading existing plant's organic treatment capacity without adding tankage.
- Convenient shipping - diffusers and piping are delivered in a compact palletized arrangement.
- Ease of installation - up to 12 units installed per man-hour. Step-by-step O&M manuals, educational videos and field service startup training provided with every system.
- Factory installed diffuser holders and pipe end fittings to reduce installation time.
- Pressure monitoring system available.

Applications

- Aeration Tanks
- Sludge Holding Tanks
- Aerobic Digesters
- Sequencing Batch Reactors
- Channel Aeration
- Air On/Air Off Processes
- Membrane Bioreactors

Those Who Choose Membrane Disc Aeration...
get the best of all worlds when they choose proven SANITAIRE systems for their wastewater treatment needs.

Sanitaire provides time-tested aeration technology and products for municipal and industrial markets worldwide.



Call Sanitaire - the aeration leader for more information

9333 N. 49th Street
Brown Deer, WI 53223 USA
Tel 414 365 2200
Fax 414 365 2210
www.sanitaire.com

Sanitaire

ITT Industries
Engineered for life

11/04 US Patent # 5,714,062

FLUIDYNE CORPORATION

THE EXPERIENCED LEADER IN SEQUENCING BATCH REACTOR TECHNOLOGY

ISAM™

SEQUENCING BATCH REACTOR PROCESS