AquaWorks DBO, Inc.
3252 Williams Street
Denver, Colorado 80205

(303) 477-5915
www.aquaworksdbo.com
info@aquaworksdbo.com

Mr. Bret Icenogle, P.E.
Water Quality Control Division
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, CO 80246-1530

August 24, 2022

RE: Community of Milner WWTP – Site Application

Dear Mr. Icenogle,

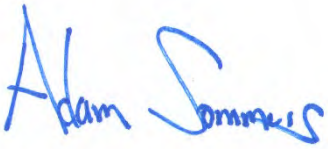
Routt County on behalf of the Milner Community is submitting the attached Project Needs Assessment and Site Approval Amendment Application (Regulation 22.10) for its proposed wastewater treatment improvement project. The project is in unincorporated Routt County, Colorado. The current facility is in general compliance with CDPHE regulations; however, it is 40 years old, and the existing equipment has reached the end of its design life

In summary, the proposed project involves installing a new MBR treatment facility and removing the existing lagoons. The current hydraulic rating of 32,000 GPD and organic rating of 65 pounds per day of BOD will not change. The location of the discharge to the Yampa River will remain the same.

Please let me know if you require a hard copy of this document in addition to this electronic version.

Please feel free to contact me at (303) 477-5915 with any questions.

Sincerely,
AQUAWORKS DBO, INC.



Adam Sommers, P.E., AICP

cc. Routt County
James Wheatley, Grants & Loans Unit

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Denver, Colorado 80205

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Mr. Scott Cowman
Environmental Health Department
Routt County Courthouse Annex
136 6th Street, Suite 201
Steamboat Springs, CO 80487

August 24, 2022

Re: Community of Milner WWTP – Project Needs Assessment & Site Application

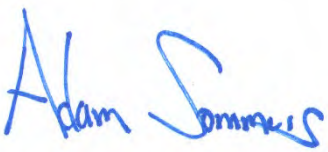
Dear Mr. Cowman,

Routt County on behalf of the Community of Milner will be submitting a Site Approval amendment application to the Colorado Department of Public Health and Environment for improvements to its existing wastewater treatment system. In summary, the proposed project will involve installing a new wastewater treatment facility with upgraded treatment technology and removing the existing lagoons once the new project is operational. The existing facility is reaching the end of its design life and will be replaced with a technology that is capable of treating wastewater to a higher quality.

The new treatment facility will be designed to treat the same amount of hydraulic and organic loading as the current facility: 32,500 gallons per day of flow and 65 pounds per day of biological oxygen demand. The discharge to the Yampa will remain in the same location.

The Routt County Environmental Health Department is being provided with a copy of the Site Application document per CDPHE requirements. We request that you review the application. Comments, if any, can be directed to me and Mr. Bret Icenogle at bret.icenogle@state.co.us.

Sincerely,
AQUAWORKS DBO, INC.



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Mr. Jay Harrington
County Manger
Routt County
522 Lincoln Avenue, Suite #30
Steamboat Springs, CO 80487

August 24, 2022

Re: Community of Milner – Project Needs Assessment & Site Application

Dear Mr. Harrington,

Routt County on behalf of the Community of Milner will be submitting a Site Approval amendment application to the Colorado Department of Public Health and Environment for improvements to its existing wastewater treatment system. In summary, the proposed project will involve installing a new wastewater treatment facility with upgraded treatment technology and removing the existing lagoons once the new project is operational. The existing facility is reaching the end of its design life and will be replaced with a technology that is capable of treating wastewater to a higher quality.

The new treatment facility will be designed to treat the same amount of hydraulic and organic loading as the current facility: 32,500 gallons per day of flow and 65 pounds per day of biological oxygen demand. The discharge to the Yampa will remain in the same location.

The Routt County Environmental Health Department is being provided with a copy of the Site Application document per CDPHE requirements. We request that you review the application. Comments, if any, can be directed to me and Mr. Bret Icenogle at bret.icenogle@state.co.us.

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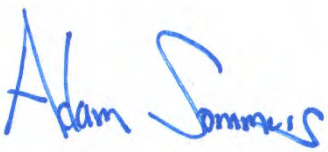
AQUAWORKS DBO, INC.



Adam Sommers, P.E., AICP

Project Needs Assessment, Capital Improvement Plan, Preliminary Engineering Report, and Amended Site Application Wastewater Treatment Improvement Project

August 2022

Community of Milner, Routt County

South Main Street
Milner, CO 80487

Unincorporated Routt County, Colorado
CDPES Permit COG590148

AquaWorks DBO, Inc.
3252 Williams Street
Denver, CO 80205
(303) 477-5915

COLORADO LICENSED
ADAM SOMMERS
38169
8/24/22
PROFESSIONAL ENGINEER

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ABBREVIATIONS

(Not all may be included in this report)

AWDBO	AquaWorks DBO, Inc.
BNR	biological nutrient reduction
BOD	biological oxygen demand
CBOD	carbonaceous biochemical oxygen demand
CDPHE	Colorado Department of Public Health and Environment
DMR	discharge monitoring report
EQR	equivalent residential
Ft	feet
GPD	gallons per day
GPM	gallons per minute
HMI	human machine interface
Hp	horsepower
I&I	inflow and infiltration
ICIS	Integrated Compliance Information System
KW	kilowatt
LS	lump sum
MBR	membrane bioreactor
MCL	maximum contaminate level
MLSS	mixed liquor suspended solids
MG	million gallons
MGD	million gallons per day
Mg/L	milligrams per liter
O&M	operation and maintenance
PEL	Preliminary Effluent Limits
PLC	programmable logic controller
POTW	Publicly Owned Treatment Works
PPD	pounds per day
RAS	return activated sludge
SBR	sequencing batch reactor
SCADA	supervisory control and data acquisition
SRF	State Revolving Fund
SRT	solids retention time
TSS	total suspended solids
WWTP	wastewater treatment plant
WAS	waste activated sludge

2. EXECUTIVE SUMMARY

Routt County owns and operates the wastewater treatment plant for the Community of Milner, Colorado. The County is proposing an effort to address issues with the outdated wastewater facility on behalf of the community. The Community of Milner is located in unincorporated Routt County. The community lies adjacent to US Highway 40 approximately 11 miles west of Steamboat Springs and 10 miles east of Hayden.

The intent of this report is to present preliminary engineer information and to satisfy the requirements for the State Revolving Fund Project Needs Assessment and the Regulation 22 Site Location Amendment application requirements. The site location amendment application form is located in Appendix A.

The Milner WWTP service area encompasses an estimated 38 acres. The WWTP serves 250 residents through 108 service connections. The historic flow treated at the facility has an average annual flow of approximately 16,300 gallons per day (GPD) and the maximum month average flow occurs in June and is 26,400 GPD. The existing facility is rated to treat 32,500 GPD flow and 65 pounds of BOD per day.

The current facility is a 40-year-old aerated lagoon system. Effluent is discharged from the site to the Yampa River. The lagoons have not been meeting regulatory requirement for Biological Oxygen Demand and likely need to be emptied of sludge. Additionally, the system occasionally exceeds limits for ammonia. Given the age of the system, condition, and compliance issues, it is prudent for the County to plan an upgrade to the system with the objective of meeting long-term discharge permit requirements. Improvements are also proposed to the collection system.

Figure 1: WWTP Exterior

The alternatives evaluated in this report include taking no action, interconnecting with another facility, and installing a new membrane bioreactor or sequencing batch reactor treatment technology.

The membrane bioreactor was selected as the preferred alternative because of its

filtration capabilities, modularity, small footprint, ease of installation, ability to meet future anticipated discharge permit limits, and simplicity of operation.

The conceptual engineer's opinion of probable costs for this project is $3,490,975. Installation can be completed in 2024 if the implementation schedule is followed.

3. SYSTEM STRUCTURE AND OPERATIONS

3.1 LEGAL OWNERSHIP OF SYSTEM

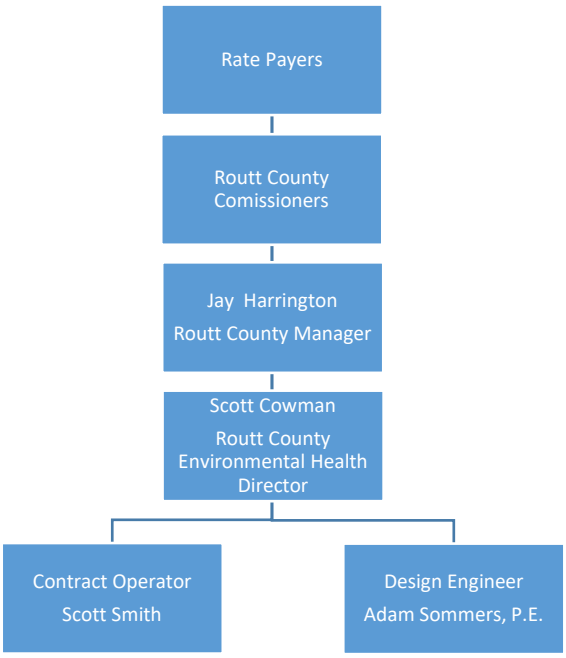
The system is a community facility owned by Routt County. The contact information is as follows:

B. Scott Cowman
Environmental Health Director
Routt County
136 6th Street
Milner, CO 80487
(970) 870-5588

3.2 ORGANIZATIONAL CHART

The system's organizational chart is as follows:

Figure 2: Organizational Chart



3.3 CURRENT OPERATOR IN RESPONSIBLE CHARGE & CERTIFICATION

The facility has its own operator in responsible charge to manage, operate, and maintain the facility. Scott Smith maintains wastewater treatment Class A Treatment Certificate #CWP-XA-00013-0395 (Expires 3/18/2025) and Class 4 Collections Certificate CWP-C4-00221-0102 (Expires 1/1/2024). A Class A Treatment Certificate is the highest wastewater treatment certification available in Colorado and therefore adequate to operate any proposed treatment technology.

4. PROJECT PURPOSE AND NEED

4.1 COMPLIANCE

Discharge monitoring report records from the WWTP were obtained from the operator. In addition, a search of EPA's ICIS database was conducted for this report.

The lagoons have not been meeting regulatory requirements and accumulated biosolids likely need to be removed. The system exceeded BOD in 2010, 2011, 2019, and 2021, ammonia in 2008 and 2009, and e-coli in January 2022. Emptying the ponds of accumulated biosolids would allow the lagoons to function better. However, the condition of the liners is questionable, and the overall status of the plant requires a more comprehensive approach to meet long-term compliance objectives.

Violations were issued for non-reporting events between 1994 and 2015. One inspection violation was issued in 2020 for improper labeling of equipment and has since been resolved.

The project is necessary to return this facility to compliance and replace the 40-year-old lagoon system. In addition, the lift station feeding raw wastewater to the lagoons needs upgrades or replacement. The lift station does not meet current CDPHE design requirements.

The new facility is designed to comply with current water quality regulations and the discharge permit issued by the CDPHE for Milner WWTP. A modern system that is more efficient and reliable will help the Community of Milner to operate safely and in compliance into the future.

Figure 3: ECHO Compliance History

Year Compliance History by Quarter

Download Data

Program/Pollutant/Violation Type					QTR 1	QTR 2	QTR 3	QTR 4	QTR 5	QTR 6	QTR 7	QTR 8	QTR 9	QTR 10	QTR 11	QTR 12	QTR 13+
CWA (Source ID: CO0047449)					01/01-03/31/19	04/01-06/30/19	07/01-09/30/19	10/01-12/31/19	01/01-03/31/20	04/01-06/30/20	07/01-09/30/20	10/01-12/31/20	01/01-03/31/21	04/01-06/30/21	07/01-09/30/21	10/01-12/31/21	01/01-05/27/22
Facility-Level Status					No Violation Identified	Violation Identified	Violation Identified	No Violation Identified	No Violation Identified	No Violation Identified	No Violation Identified	No Violation Identified	No Violation Identified	Violation Identified	Significant/Category I Noncompliance	Significant/Category I Noncompliance	Violation Identified
Quarterly Noncompliance Report History						Other Violation	Other Violation							Other Violation	Effluent - Monthly Average Limit	Effluent - Monthly Average Limit	
Pollutant		Disch Point	Mon Loc	Freq													
BOD, 5-day, 20 deg. C	E	002 - A	Effluent Gross	Mthly			8%							153%	170%	57%	
BOD, 5-day, 20 deg. C	E	002 - A	Effluent Gross	NMth										140%	80%	4%	
BOD, 5-day, percent removal	E	002 - A	Percent Removal	Neither		11%	15%							243%	205%		
E. coli	E	002 - A	Effluent Gross	Mthly													535%
E. coli	E	002 - A	Effluent Gross	NMth													338%
Single Event Violations				Agency													
Management Practice Violations - Improper Operation and Maintenance				State				12/09/2019	01/15/2020								

4.2 EXISTING FACILITY LIMITATIONS

Milner WWTP is not meeting regulatory requirements. The existing facility is 40 years old and requires updated equipment, including upgrades to the lift station. The system consists of two aerated lagoons and one settling pond which need to be pumped or replaced. The project is being driven by the current facility's age and condition and its ability to maintain compliance with both current and future anticipated effluent limits.

The facility is currently authorized to discharge under Permit #CO0047449 with an approved 600:1 mixing ratio according to the 2015 water quality assessment. Below is an excerpt of the 2015 discharge permit effluent limits:

Figure 4: Permit #C00047449 Limits

ICIS Code	Effluent Parameter	Effluent Limitations Maximum Concentrations			Monitoring Requirements	
		30-Day Average	7-Day Average	Daily Maximum	Frequency	Sample Type
50050	Effluent Flow (MGD)	0.0325		Report	3 Days/Week	Recorder
00400	pH (su)			6.5-9	Weekly	Grab
51040	*E. coli* (#/100 ml)	2000	4000		Monthly	Grab
50060	TRC (mg/l)	6.6		0.5	Monthly	Grab
00610	Total Ammonia as N (mg/l)				Monthly	Grab
	January	65		65	Monthly	Grab
	February	65		65	Monthly	Grab
	March	65		65	Monthly	Grab
	April	65		65	Monthly	Grab
	May	65		65	Monthly	Grab
	June	65		65	Monthly	Grab
	July	65		65	Monthly	Grab
	August	65		65	Monthly	Grab
	September	65		65	Monthly	Grab
	October	65		65	Monthly	Grab
	November	65		65	Monthly	Grab
	December	65		65	Monthly	Grab
00310	BOD_5 (mg/l)	30	45		Monthly	Grab
81010	BOD_5 (% removal)	85 (min)			Monthly	Calculated
00530	TSS (mg/l)	75	110		Quarterly	Grab
84066	Oil and Grease (visual)			Report	Weekly	Visual
03582	Oil and Grease (mg/l)			10	Contingent	Grab
70295	TDS (mg/l)	Report		Report	Quarterly	Grab
70295	PWS intake (mg/l)	Report		Report	Quarterly	Grab
70295	WWTF effluent (mg/l)	Report		Report	Quarterly	Grab

4.3 OPERATIONS AND MAINTENANCE ISSUES

Figure 5: Photo of Existing Lagoons

The existing facility is a 40-year-old aerated lagoon system that was built in 1982. Influent wastewater is preliminarily screened, and gravity fed to a raw sewage lift station that delivers sewage to the treatment plant. Treatment is accomplished through an aerated lagoon system consisting of three ponds. Effluent disinfection and chlorine contact is provided prior to discharge to the Yampa River. The lagoons have not been meeting regulatory discharge permit limits for BOD, ammonia, and e. coli and the permit exceedances indicate accumulated biosolids likely need to be removed from the ponds.

The treatment plant operations and controls at the Milner WWTP are basic and are typical of other lagoon treatment plants within Colorado. Due to the basic treatment configuration, malfunctions are limited; however, operations and maintenance challenges do persist or arise regularly. Typical operation and maintenance issues experienced at Milner WWTP are described below.

Maintaining a facility with aged equipment and 40-year-old lagoons, which is not meeting the discharge requirements, is a challenge for both the operator and owner. The equipment is antiquated, and wastewater equipment and treatment processes have evolved since the lagoons were constructed. To meet both current and future anticipated limits, the existing treatment plant needs to be improved. The lift station is also old and experiences frequent clogging, requiring the operator to remove the pumps from the wetwell to restore pump operation.

The lagoon liners are a concern for the existing facility. The liners are 40 years old, and it is unknown if the liners would meet Regulation 61 seepage requirements limiting seepage to 10^{-6} cm/sec. A study would need to be performed to determine the seepage rate requiring time and engineering investment into a study and report for an unknown outcome.

Lagoon treatment systems have relatively large surface areas relative to mechanical treatment plants and the large surface area allows heat loss from the wastewater to atmosphere. In winter, Milner's weather at high elevation causes water temperatures to drop significantly and the ponds frequently freeze causing the surface aerators to freeze and become inoperable. Aerators may be difficult to operate and maintain for a portion of the winter season due to freezing conditions. The inability to aerate or mix when aerators freeze, leads to greater possibility of discharge permit violations.

According to records on file at CDPHE, biosolids were last removed in summer 1999. There is a significant accumulation of biosolids in the ponds. The accumulation of biosolids is reducing treatment volume and is likely contributing to the facility's discharge permit exceedances and need to be removed.

Denali Water Solutions (formerly Veris) was hired to provide estimated solids accumulation, biosolids characterization and associated removal cost. Based on Denali's sampling and measurements, the accumulated solids are Class B biosolids. Depending on location, Lagoon Pond 1 has between three and six feet of sludge depth, Lagoon Pond 2 has between two and five feet of sludge depth and Lagoon Pond 3 (settling) has a consistent two feet of sludge depth. The full report from Denali is included in the Appendix.

Currently, only single-phase power is provided to the Milner WWTP site limiting the equipment that can be used at the existing treatment plant site.

Finally, the treatment plant does not have telemetry to allow alarms or other plant operational data to be provided to the operator. The operator must visit the plant site and perform checks around the facility to determine if equipment is operating properly. The lack of telemetry and alarms limits the ability of the operator to receive current information and extends the period over which equipment may be malfunctioning.

5. EXISTING FACILITIES ANALYSIS

5.1 AREA DISCHARGE PERMITS

The 1-mile and 5-mile-radius maps are below and in Appendix C. AquaWorks DBO is not aware of any other WWTPs in a 5-mile-radius.

Figure 6: 1-Mile Radius Map

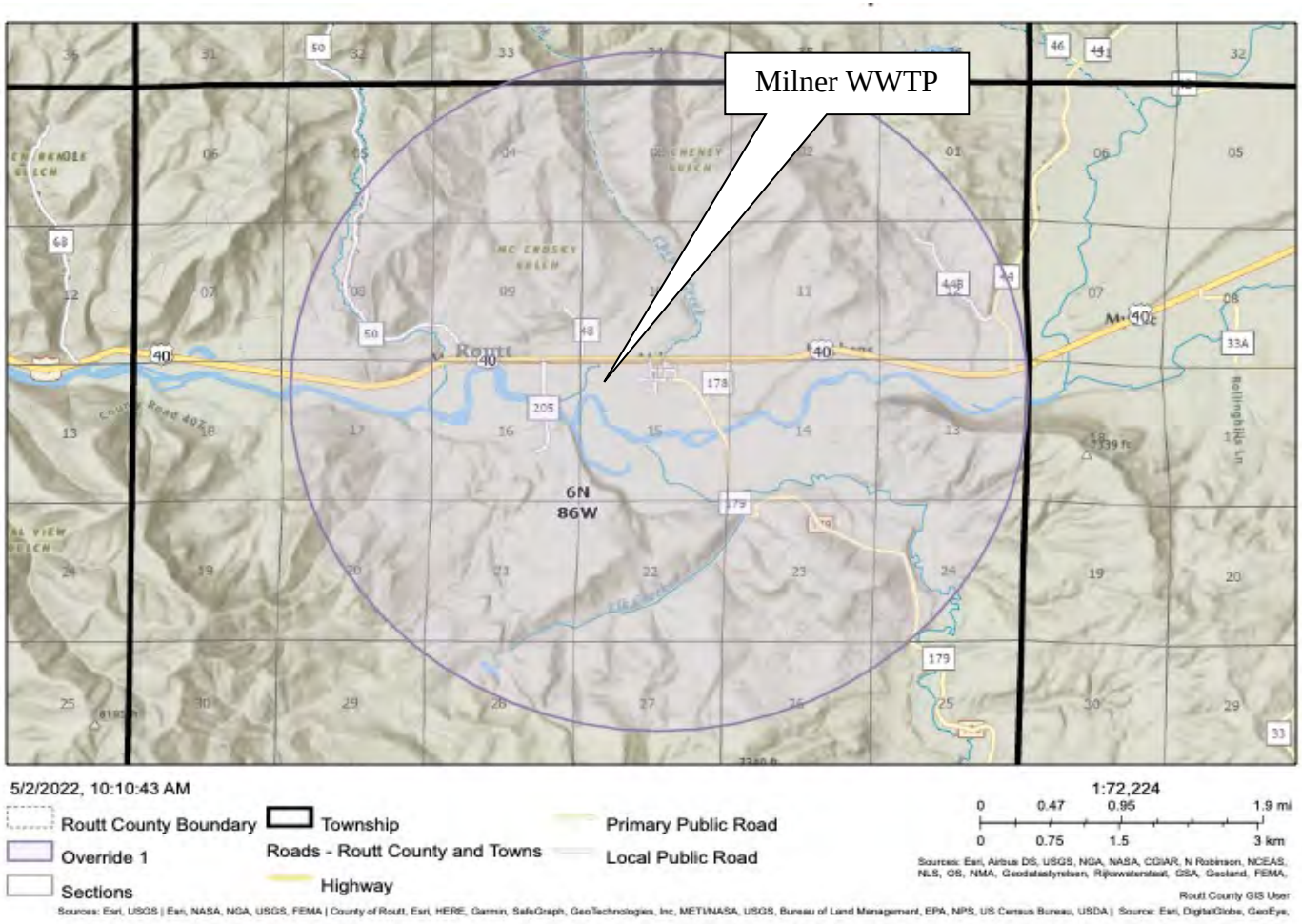
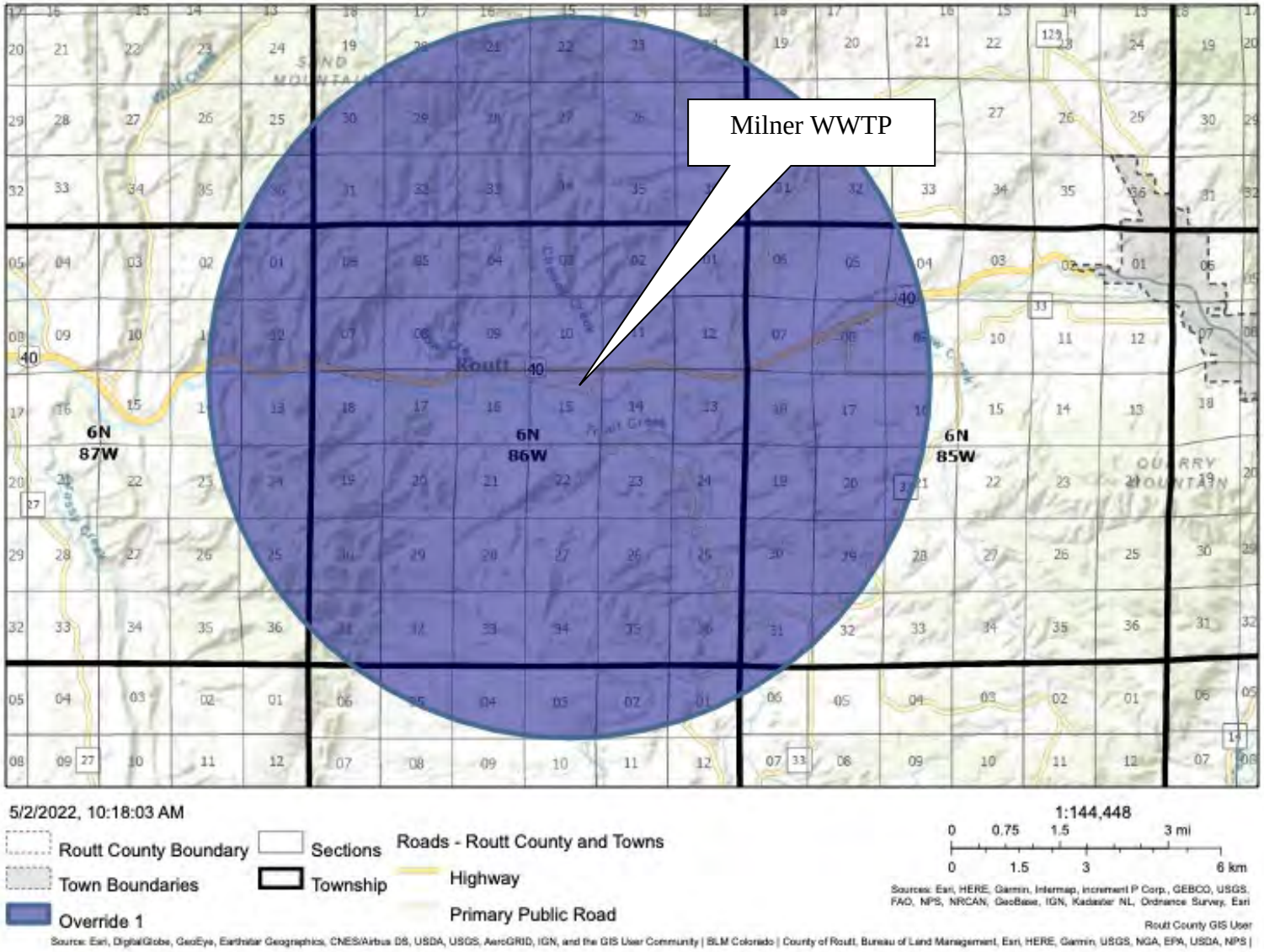


Figure 7: 5-Mile Radius Map



5.2 SERVICE AREA

The Community of Milner WWTP serves approximately 38 acres in unincorporated Routt County, Colorado. The community lies adjacent to US Highway 40 approximately 11 miles west of Steamboat Springs and 10 miles east of Hayden.

The Milner WWTP provides wastewater treatment services to predominantly residential properties of approximately 250 residents through 108 service connections. While there are limited number of properties zoned for commercial uses, the wastewater is characterized as residential waste. There are no industrial connections. The zoning map is provided in Appendix E.

The population in Milner has only grown by 50 people in the last 40 years since the plant was built in 1982. A more detailed discussion of the population trends can be found in section 6.4 Population and Water Demand Projections.

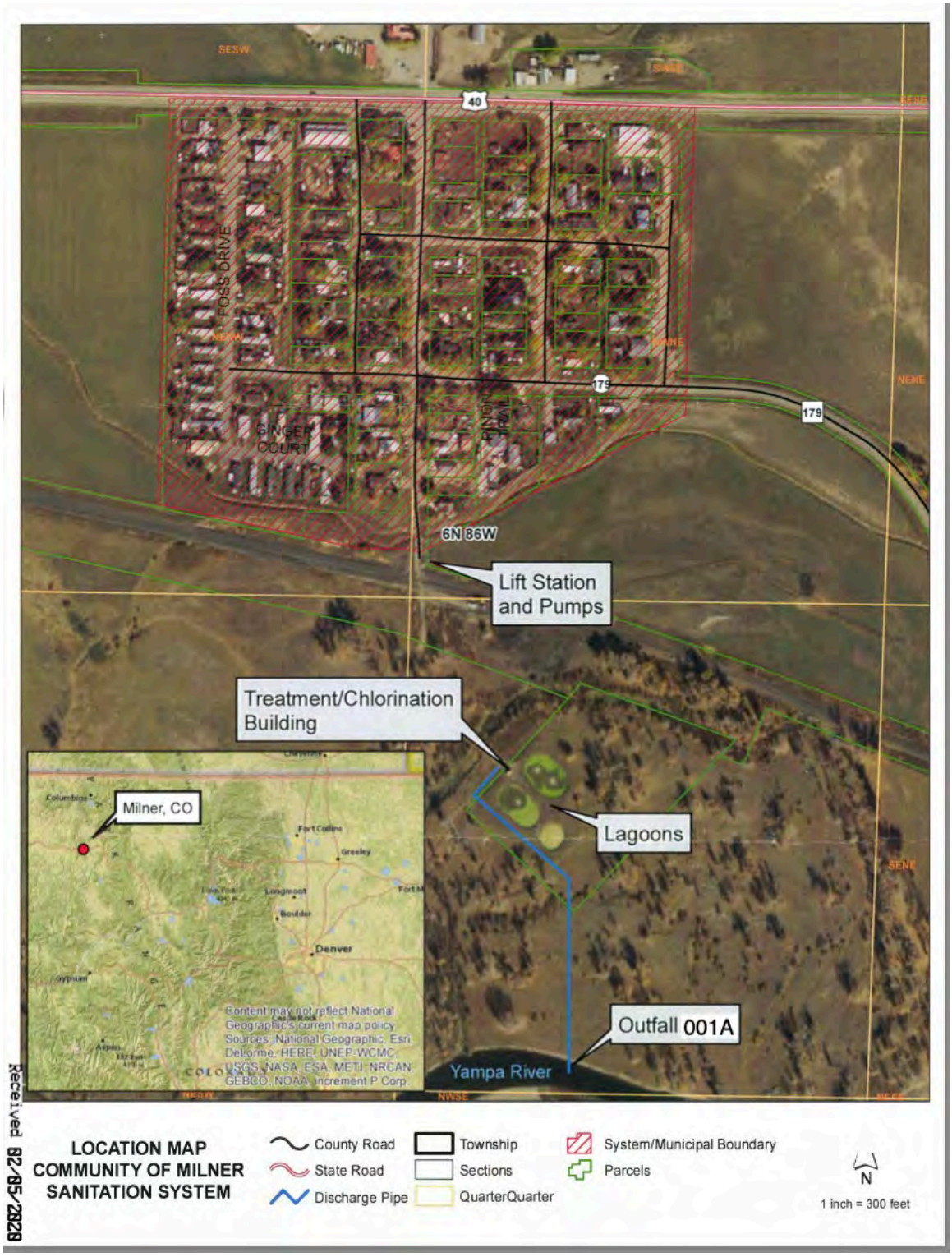
Routt County maintains approximately 4,000 feet of sewer line for Milner, one sewage lift station (with 2 pumps), and a wastewater treatment plant with 3 lagoon ponds.

Please see the Milner WWTP service area map in the Appendix B for additional detail.

5.3 FACILITIES LAYOUT AND DESCRIPTION

The WWTP site is located at South Main Street, Milner, in unincorporated Routt County, Colorado. The nearest incorporated towns are Steamboat Springs which is approximately 11miles to the east and Hayden which is approximately 10 miles to the west. Access to the site is obtained from South Main Street. The existing WWTP is in the Southwest ¼ of the Northeast ¼ of Section 15, Township 6 North, Range 86 West, of the 6th Principal Meridian (40.482262° N, 107.021028° W).

Figure 8: Site Map



Wastewater flows by gravity from the service area's collection system in 8-inch PVC lines. One hundred percent of the wastewater is collected at a lift station located on the south side of town. Then two submersible pumps send the wastewater through a 4-inch ductile iron forcemain to the

lagoon wastewater treatment plant. The wastewater is metered using a magnetic flow meter at the lift station. The forcemain passes under the ditch and the railroad tracks and is typically routed to Lagoon #1. After treatment in this first aerated lagoon, the wastewater flows on to Lagoon #2 and finally through Lagoon #3 for settling. Figure 9, below, shows the process flow diagram.

Once settled, effluent is disinfected in a chlorine basin and is discharged by gravity in an 8" PVC effluent line to the Yampa River. The discharge location will remain the same with this project.

The elevation of the project (6,480 feet above mean sea level) will need to be factored into the design of the proposed project. The facility will need to include additional aeration capabilities to compensate for the lower ambient oxygen concentrations encountered at this elevation.

The existing wastewater treatment plant was constructed in June 1982. It consists of the following treatment components:

- **Collection system:** 8" PVC
- **Influent Line:** 4" DIP forcemain
- **Lift Station:** Influent is pumped to the treatment facility via 2 pumps into 4" DIP
- **3 Lagoon Ponds:** Processed through a three-pond aerated lagoon system
- **Effluent Measurement:** The flow rate is measured with a V-notch weir.
- **Chlorine Contact Tank:** Disinfection achieved in a chlorine contact chamber
- **Discharge Line:** Effluent flows by gravity in an 8" PVC into the Yampa River

An updated system is needed to take advantage of new, more efficient technologies for multiple reasons. Most importantly, the County needs to be sure that the condition of the plant will serve the long-term needs of the community.

Due to the age, the condition of the mechanical equipment is unsatisfactory. Specifically, the lift station and lagoon pond liners are the biggest concern. The lagoons were installed with 40-year-old technology and liners which need to be replaced. Additionally, accumulated biosolids have not been removed for 15 years and likely need to be removed from the ponds.

Lagoons at high elevations are not efficient, are difficult to maintain, and have difficulty meeting regulatory discharge limits. Therefore, Routt County recommends upgrading the existing lagoon treatment to a different treatment technology. The proposed facility will feature higher quality effluent with a greater ability to nitrify and disinfect the wastewater.

The new treatment plant will be located on the north side of the railroad tracks as current lagoons are on reclaimed land within the 100-year floodplain. In addition, locating the WWTP on the north

side of the tracks will eliminate the need for a lift station. The new location, on the existing lift station site, will be more suitable for the upgraded treatment facility.

5.4 EXISTING PROCESS FLOW DIAGRAM

The County's existing process flow diagram is as follows:

Figure 9: Existing Process Flow Diagram

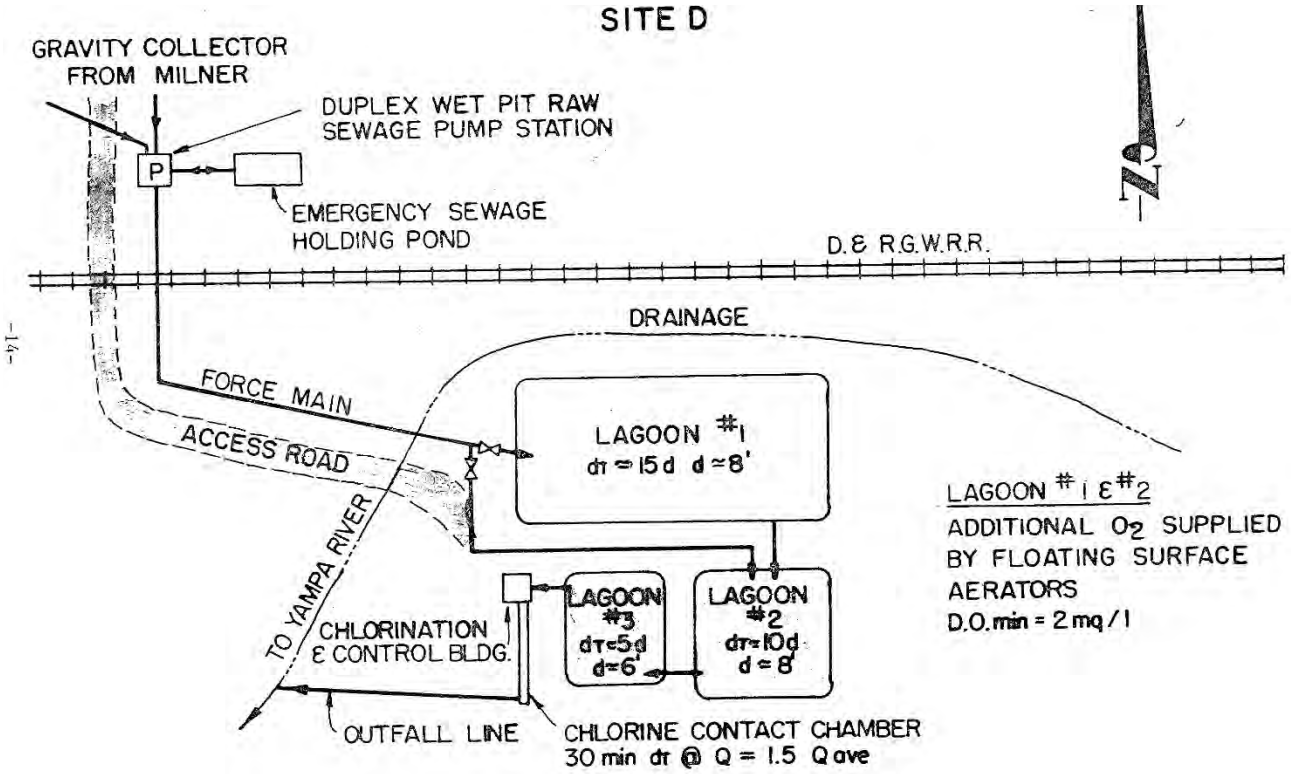


FIG. 3

5.5 EXISTING WASTEWATER FLOWS

The facility monitors influent wastewater flow to the treatment plant using a magnetic flow meter at the lift station.

Influent flow rates were evaluated for January 2005 through February 2022. The 30-day average annual flow for this period was 16,300 GPD and the peak day was 22,700 GPD. The following table shows the average and maximum flow rates for each month over the period of 2005-2021.

Table 1: Influent Monthly Flow Volume 2005-2022

Month	30-Day Average (GPD)	Max Day (GPD)
January	14,800	19,300
February	14,800	18,300
March	14,900	19,500
April	16,100	24,400
May	21,400	32,400
June	26,400	39,600
July	16,400	25,000
August	14,700	18,500
September	13,900	18,400
October	13,900	19,100
November	13,900	19,100
December	14,800	18,800
Average	**16,300**	**22,700**

As Figure 11 shows, Milner receives higher flows during April through June, which indicates I&I during this period. The County believes the flow during those months increases approximately one and a half times due to I&I. The County has an ongoing program to decrease I&I and it believes that the lift station may have deficiencies that are contributing to the I&I which will be resolved with the planned project. Further, this report recommends improvements to the collection system to reduce I&I.

Figure 10: Influent Wastewater 30-Day Average Flow Rates 2005–2021

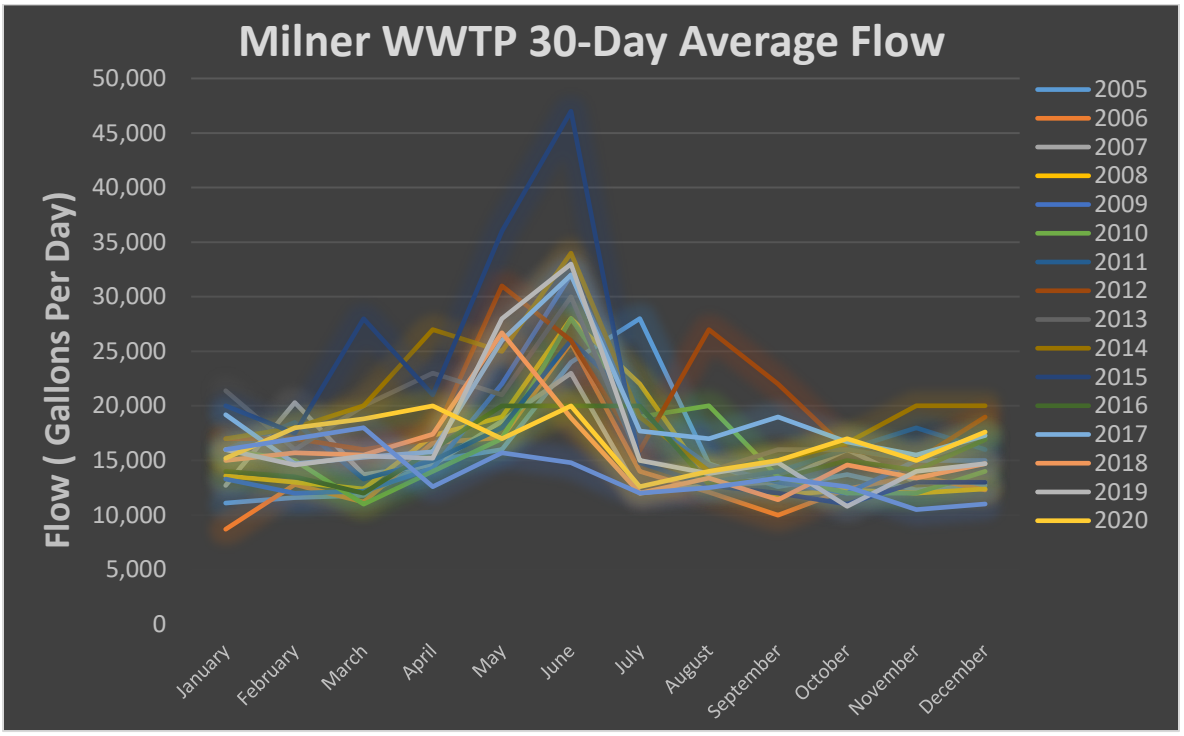
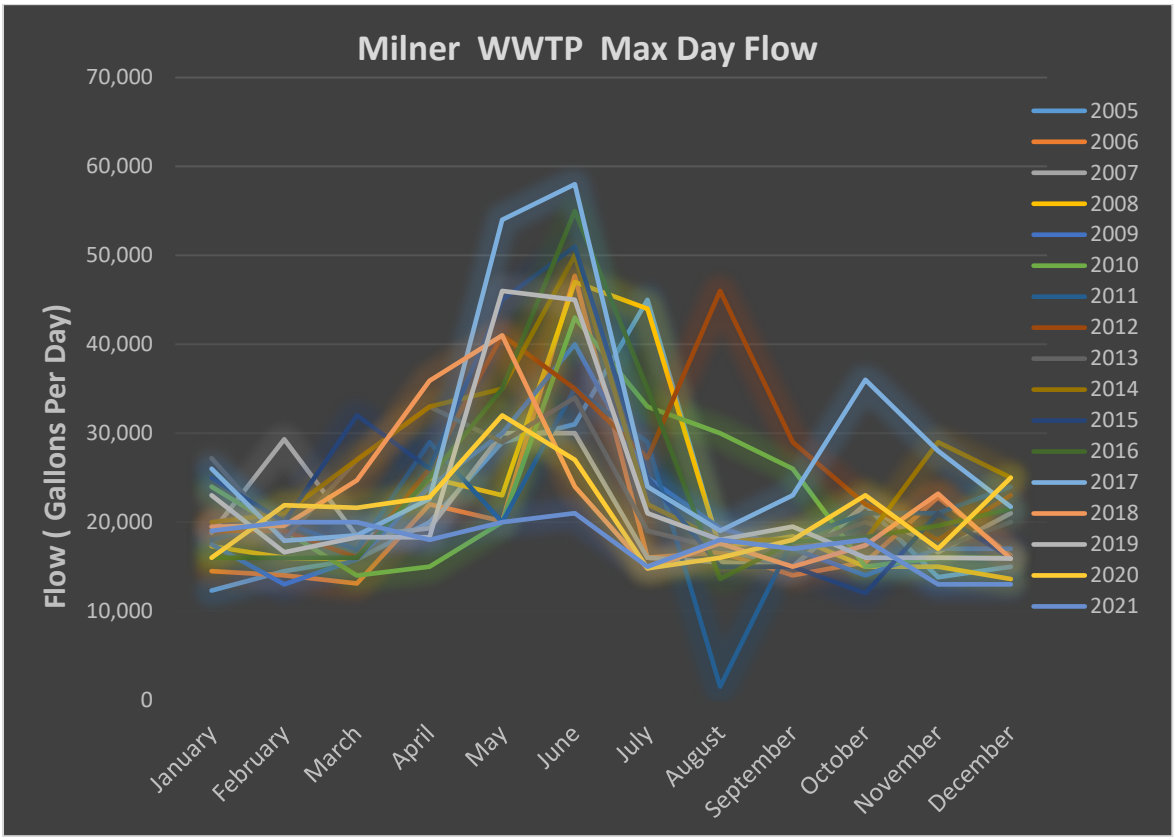


Figure 11: Influent Wastewater 30-Day Peak Flow Rates 2005–2021



The outlier in August 2011 low flow is likely an error in the reporting documentation.

The County's current discharge permit (CO0047449) is for 32,500 GPD flow and 65 pounds of BOD per day. The County desires to maintain this rating for the new Milner facility.

The numbers for the 30-day average and the maximum day in Table 2 show how the instantaneous flow rates were used to size the facility during the final design.

The current peak hour flow was calculated using Figure 3.1 of the State of Colorado Design Criteria for Domestic Wastewater Treatment Works, Policy WPC-DR-1 peak hour based on Milner's population. According to Figure 3.1, for populations of 200 – 300, the peaking factor is 4 (Section 3.2.2.d CDPHE 2012)

Table 2: Current and Future Maximum Wastewater Flows

	Current		Rating/Design	
Total Flow (30-day average)	16,300	GPD	32,500	GPD
Total Flow (Peak Day (2x Factor)	32,600	GPD	65,000	GPD
30-day Average Flow in Minutes	11	GPM	23	GPM
Peak Hour (4 Factor) In Minutes	44	GPM	92	GPM

Wasteload Forecast

The historic BOD concentration results from the DMR records for influent BOD were used to evaluate the current and proposed organic loading of the facility. The average concentration of BOD between 2005 and 2021 was 273 mg/L.

Table 3: Historical monthly Average BOD Concentrations 2005-2021

Month	Average BOD (mg/L)	Average BOD (PPD)
January	289	37
February	294	38
March	284	35
April	255	36
May	217	38
June	203	44
July	281	39
August	308	36
September	299	36
October	274	32
November	292	34

December	275	35
Average	**273**	**37**

The historic average BOD concentration translates to an average BOD loading of 37 pounds per day, 57% of the approved capacity of 65 pounds per day. The County desires to maintain the 65 pounds per day rating for the new facility to accommodate seasonal variations and future growth within the service area. At full design flow of 32,500 GPD, the concentration of the wastewater needed to amass the 65 pounds per day of BOD is 239 mg/l. This concentration is similar to the historic concentration.

The Figures below are graphs of influent BOD concentration and BOD loading in pounds:

Figure 12: Influent BOD Concentration 2005–2021

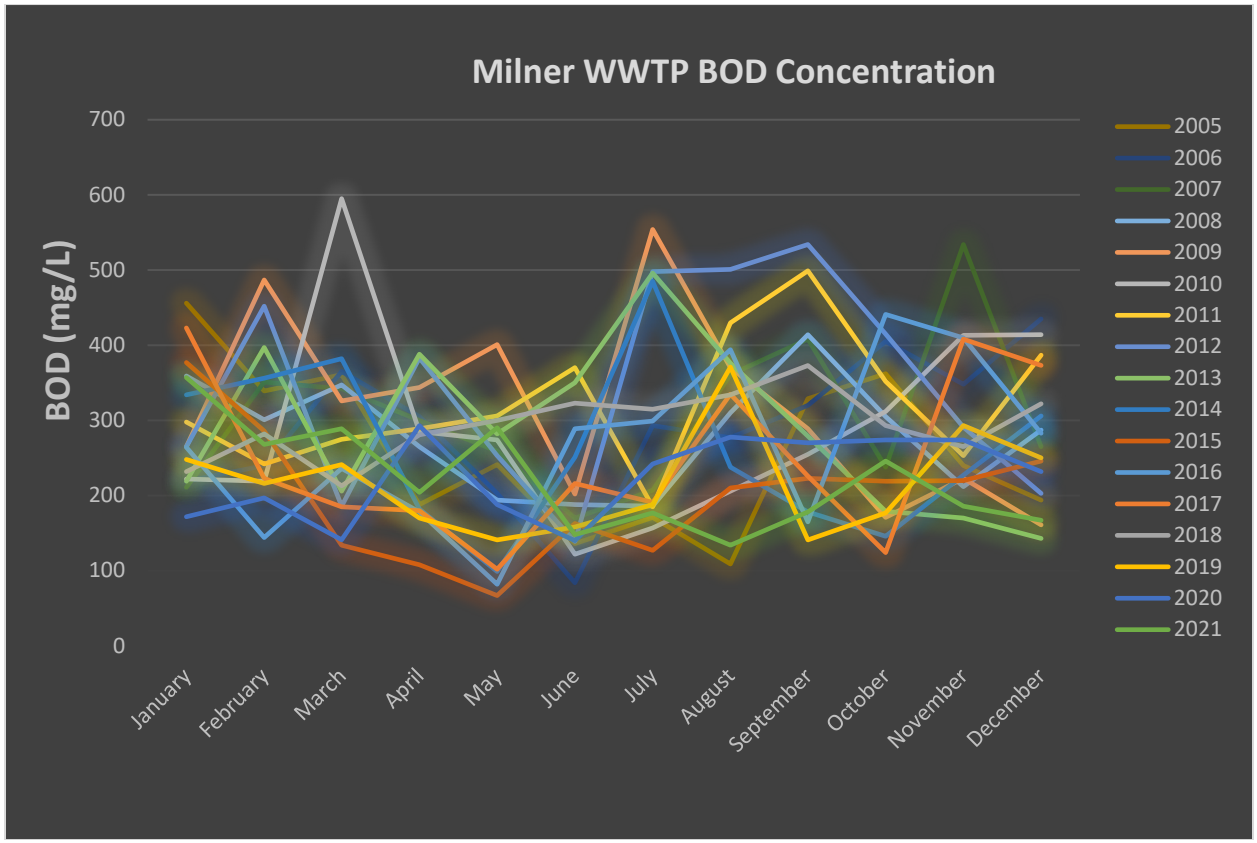
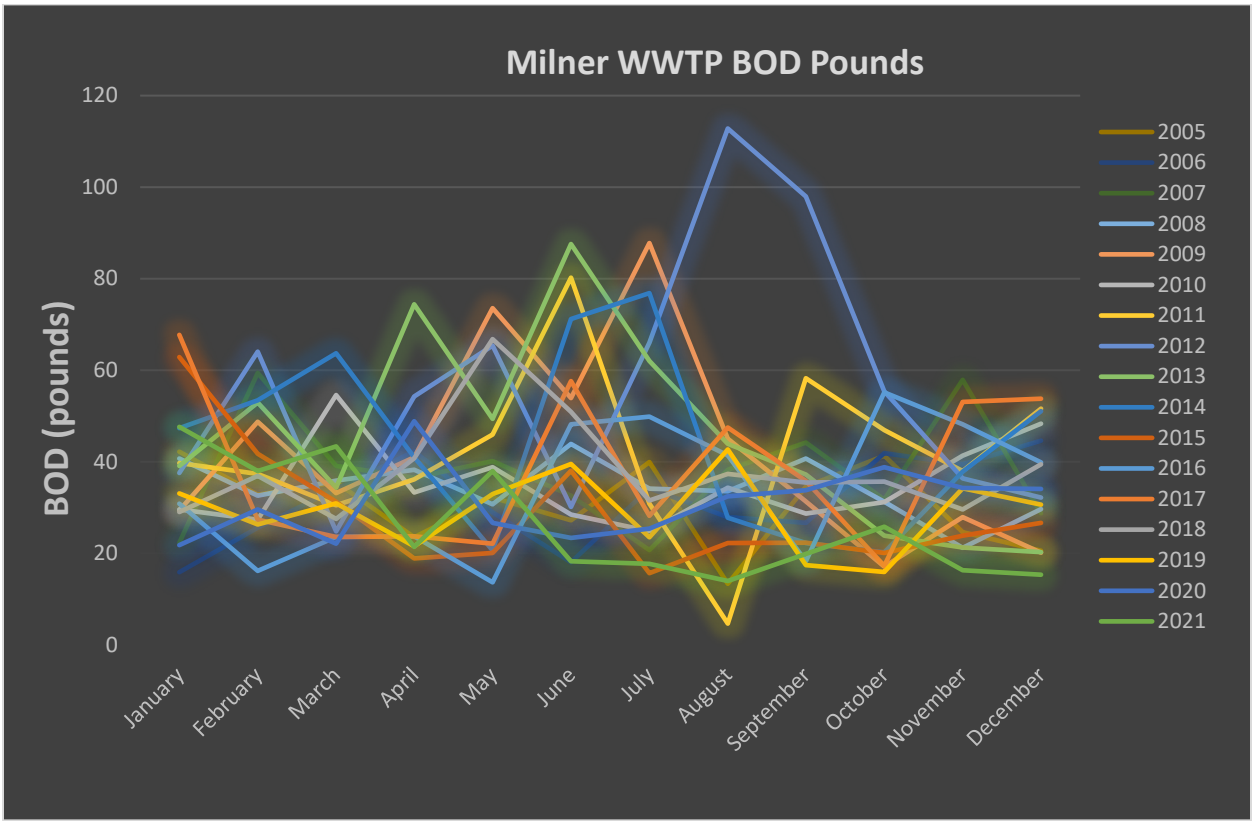


Figure 13: Influent BOD Pounds 2005-2021



The treatment plant's nitrogen and phosphorous wasteloads were also evaluated. The Community is comprised entirely of residential taps and therefore, AquaWorks DBO anticipates the raw wastewater quality should conform to engineering standard concentrations for residential wastewater. Based on comparable projects, normal strength residential wastewater is generally within the range of 50-60 mg/L Total Kjeldahl Nitrogen (TKN) and 6-8 mg/L total phosphorus.

In May 2011, the County began taking samples of nitrogen in the effluent discharged into the river. The phosphorous varied between 3.82mg/l and 7.76 mg/L with an average of 5.8 mg/L. Since significant phosphorus reduction is not expected within the current lagoon treatment plant system, the effluent concentrations should correspond to the influent concentration. The average effluent concentration of 5.8 mg/L correlates well with engineering planning values for raw wastewater with a residential use.

5.6 APPROPRIATENESS OF TREATMENT TECHNOLOGIES

The existing aerated lagoon system is 40 years old and consists of now outdated technology. Since 2008, Routt County has been evaluating treatment alternatives to upgrade or replace the wastewater treatment system.

The lift station was constructed with the original system in 1982 and has not received any major upgrades even though the traditional lift station lifespan is approximately 30 years. The lift station is a suspected source of I&I due to the County's previous investigation into sources of I&I.

The lagoon system consists of three treatment lagoons, the first two are aerated and the third is a settling pond. Based on a permit application submitted to CDPHE in 2006, biosolids were removed in summer of 1999 and have not been removed since. The ponds likely have a significant accumulation of biosolids over this period of time and need to be removed. The accumulation of solids diminishes treatment volume and causes treatment challenges. The treatment system is not efficiently removing BOD and has had violations in 2010, 2011, 2019, and 2021.

When the plant was first constructed in the 1982, permit limits in Colorado at that time generally did not include ammonia. As a result, the facility was not explicitly designed to provide nitrification treatment. Overall, Lagoon treatment plants can struggle with nitrification, primarily in winter when air temperatures decrease leading to cold water temperatures. Relative to mechanical treatment plants, lagoon systems are particularly susceptible to decreasing temperatures due to long hydraulic detention times and large pond surface areas which allows heat to escape and results in freezing. Nitrification is significantly inhibited at these low temperatures. Milner WWTP experiences the seasonal drop in pond temperatures and ponds can freeze during winter months. As a result, the plant struggles to meet ammonia limits despite moving the outfall location from the creek to the Yampa River to obtain higher ammonia limits in 2012.

The continuing trend is decreasing permit limits in discharge permits across the state. And new effluent parameters may be added. Overall, lagoon treatment plants have limited design and operational adjustments and are limited in their ability to treat for parameters like ammonia, total nitrogen and phosphorus.

5.7 CAPACITY OF TREATMENT TECHNOLOGIES

In 2008, Routt County conducted a Wastewater Facilities Master Plan and inventoried Milner's treatment system components present that that time:

- The lift station has a wet well capacity of 1,100 gallons with two pumps rated at 3.7 hp capable of 178 GPM each.

- The lagoon system consists of 3 lagoons. Lagoon #1 is 100' X 150' and has a detention time of 15 days. Lagoon #2 is 88' X 150' and has a detention time of 10 days. Lagoon #3 is 79' X 88' and has a detention time of 3 days.

- Lagoons #1 and #2 are aerated and operate with both aerated and facultative conditions. The aeration system consists of two surface aerators in Lagoon #1 and one surface aerator in Lagoon #2. The surface aerators are each rated at 2 hp and have a capacity of 3.8 lbs O2/bhp/hr. Lagoon #3 is not aerated and allows for solids settling.

- The wastewater treatment building houses the aeration control system, effluent flow measurement, and chlorine storage. Flow is measured with a V-notch weir underneath the building floor and recorded.

- Sodium hypochlorite (5%) is dosed at the head of the chlorine contact chamber where contact time is provided for disinfection before discharge to the Yampa River.

5.8 OPERATIONAL CONTROLS

The operational control of the current system is extremely basic – consistent with other lagoon treatment systems. The pumps and aerators function either as on or off and are controlled manually. The control structure that diverts flow to the lagoons is operated by either turning valves on or off to divert flow to one of the lagoons.

PLCs do not automatically control any of the unit processes. Dissolved oxygen, water level, and other system variables are collected and reported manually. The operator has little control over manipulating the system variables.

A new mechanical system would have up-to-date automation controls with a PLC-based master control panel monitoring and governing most of the treatment equipment. Inline instrumentation would be installed to automatically optimize process control. A new SCADA system would be included to record historical data and allow the operator to remotely access the PLC. An autodialer would be included so that alarm notifications are automatically reported to the operators' phones.

6. FACILITY PLANNING ANALYSIS

6.1 PROJECT AREA MAP

A project area map is included in the Appendix. Routt County's Community of Milner wastewater assets include:

- One wastewater lift station (with 2 pumps)
- Approximately 4,000 feet of collection lines and 17 manholes
- One 32,500 GPD lagoon treatment plant comprising of two aerated ponds followed by one settling pond.

6.2 208 PLAN COORDINATION

Coordination of 208 Agencies will not be a factor for this project as the site is not within an established 208 Planning Area.

6.3 LOCAL AND REGIONAL ISSUES

Routt County will coordinate the Site Application Review with referral agencies, most of which are the County itself. The project's intent is to upgrade an antiquated facility with an updated, efficient system with reliable and technologically current equipment. The new system would treat wastewater to a higher quality within the permitted flow rate of the facility. This upgrade project is not intended to promote any further development of the service boundary or excessive population growth within the area.

Historically, AquaWorks DBO has experienced those projects upgrading treatment technology while maintaining the rated plant capacity have been welcomed by local and regional stakeholders. These projects support existing population projections without encouraging unplanned growth. In addition, water quality is improved.

6.4 POPULATION AND WATER DEMAND PROJECTIONS

The 20-year growth projections for the project were estimated based on the current treatment requirements, a review of the Community of Milner's 2008 master plan, and a variety of growth rate scenarios. Based on the 2008 master plan, a total of 225 residents were served through 92 taps connected to the system at that time and the master plan contemplated a total buildout scenario of 30 additional taps. In 2022, the Community of Milner's lots are now nearly all built out, so the

growth scenarios differ only slightly. The most significant growth opportunities are subdividing a few of the larger lots.

The original design in 1982 reported that the system was serving 200 people. The County indicated that the Community of Milner had 92 taps in 2008 and served 225 people. The County also reported 100 taps in 2017 which increased to 108 taps in 2022. The current, 2022 population, in Milner, is 250 people which includes people living in approximately 40 mobile homes. The mobile home park is connected through one tap at the interconnect near the lift station. The 2008 master plan indicated a total buildout of 122 taps at an average of 163 gallons per day.

A design population of 325 residents was used to provide room for growth but the total population has varied little since 1982. A trailer park consisting of 40 mobile homes sits on the western border of the community but represents just one service. Given the historical growth of 50 people since 1982, 75 people over the 20-year planning period is more than adequate to allow for growth.

The historic flow treated at the facility averages 16,300 GPD and peaks during the spring months. As discussed previously, the flow increases in June are likely due to I&I. Based on discussions with the County, operations staff have observed that the 8-inch trunk line routed under the irrigation ditch and immediately upstream of the lift station appears to be a significant source of I&I at the ditch crossing. The irrigation ditch begins to flow in late May until July, which correlates with the increase in influent flow rates.

The County is evaluating the solutions to address the I&I. These solutions include lining the collection system pipe and manholes and/or replacing the earthen irrigation ditch with a pipeline surrounding the area where the irrigation ditch crosses over the sewer pipe. In addition to correcting any I&I occurring within the collection pipeline itself, the project will eliminate the lift station and thereby address any I&I that may be occurring at the lift station wet well.

Other sources of I&I are possible throughout the aging collection system. The system has been inspected and minor upgrades and incremental repairs have been made over the last 12 years. However, the collection system is near the end of life and upgrades would address other I&I that may be occurring within the collection system. AquaWorks DBO suggests evaluating the opportunity to rehabilitate the lines with a trenchless system that uses liners inserted inside the existing pipeline and coating the interior of the existing manholes. The upgrades would include hiring a contractor to CCTV the lines with a robot and locating existing penetrations, connections, and breaks.

Table 4: Historic, Current, and Future Maximum Wastewater Flows

Year	Taps	Population	Flow Rate (GPD)
1982 Design Report (Actual)		200	20,000
1982 Design Report (Projected)		325	32,500
1998 (Actual)	Unknown	200	
2008 (Actual)	92	225	15,600
2008 (Projected)	122	300	20,000
2020 (Actual)	102		16,700
2022 (Actual)	108	250	11,500
System Rating			**32,500**

In 2008 the flow rate equated to 69 gallons per person per day and in 2020 the flow rate equated to 68 gallons per person per day (assuming the growth rate was no more than 2 people). This is slightly lower than the expected design criteria of 75-100 gpd per person but still within reason of the planning range.

Table 5 presents a tabulation of the wasteload generation rates. Wasteloads were calculated for both current flow rates and design capacity:

Table 5: Wasteload Forecasts

	Current		Rating/Design	
Flow (30-day Average)	16,300	GPD	32,500	GPD
Population	250	people	325	people
BOD Loading	37	PPD	65	PPD

The current value for the BOD loading is less than the design value of 0.2 pounds per person per day. The rating for the facility is currently 65 PPD which is the typical strength of wastewater of 0.2 pounds per person per day (Table 6-2 of Regulation 43 On-site Wastewater Treatment System Regulation.

6.5 STAGING AND PHASING

The full 32,500 GPD treatment plant would be built and installed in one phase. The current wastewater treatment plant will remain operable as the new treatment plant is built. Once the new treatment plant is installed, the wastewater flow would be transferred to the new treatment plant. After starting up the new plant, the lagoon would be decommissioned. Decommissioning the lagoons would be performed in accordance with federal, state and local requirements.

Currently, the influent line entering the lift station is 12' below grade. The lift station can be eliminated by making the first treatment basin an influent equalization basin. The influent equalization would be deep, but the depth eliminates the need for a pumping step. The high-water level of the influent eq basin would be 1.5' below the influent line invert (13.5'). The depth of the influent eq tank would be about 7' deep – so the total depth of the influent eq tank would be 21-23' deep.

6.6 WATER QUALITY PLANNING TARGETS

The County currently holds the individual discharge permit #CO0047449. On April 26, 2022, an application was submitted to CDPHE to convert the individual discharge permit to a general COG590000 permit since the discharge exceeds 100:1 dilution. A new WQPT in the form of a new permit certification was issued in August 2022. The new permit limits are summarized in the table below. The entire certification can be found in Appendix S. The five chemicals proposed for this project were approved in the general permit.

Table 6: Surface Water Discharge Permit Effluent Limits (COG-590148)

Mechanical Facilities With Design Flows Of Less Than Or Equal To 0.25 MGD						
ICIS Code	Parameter	Discharge Limitation			Sampling	
		30-day Avg.	7-day Avg.	Daily Max	Frequency[1]	Type[2]
50050	Flow, MGD[3]	0.0325		Report	Continuous [4]	Recorder [4]
00310	BOD_5, mg/l	30	45		Monthly	Composite
81010	BOD_5, percent removal	85% (min)			Monthly	Calculated
00530	Total Suspended Solids, mg/l	30	45		Monthly	Composite
81011	TSS, percent removal	85% (min)			Monthly	Calculated
50060	Total Residual Chlorine, mg/l			0.5	Weekly	Grab
00400	pH, s.u.			6.5-9.0	Weekly	Grab
84066	Oil and Grease, mg/l			Report	Weekly	Visual
03582	Oil and Grease, mg/l			10	Contingent	Grab
51040	*E. coli*, no/100 ml [5]	2,000	4,000		Monthly	Grab
00610	Total Ammonia, mg/l as N	50		50	Monthly	Composite
	Total Dissolved Solids, mg/l					
70295	PWS Intake, mg/l [7]	Report		Report	Quarterly	Composite
70295	WWTF effluent, mg/l	Report		Report	Quarterly	Composite
81020	Sulfate (mg/l)	Report			Monthly	Composite
00940	Chloride (mg/l)	Report			Monthly	Composite
77885	Methanol, Total (µg/l)	Report			Monthly	Composite
01104	Aluminum, TR (µg/l)	Report		Report	Monthly	Composite
00680	Total Organic Carbon (mg/l)	Report		Report	Monthly	Composite
00978	Arsenic, Total Recoverable µg/l [6] (Until December 31, 2028)	Report			Monthly	Composite
00978	Arsenic, Total Recoverable µg/l [6] (Beginning January 1, 2029)	0.02			Monthly	Composite

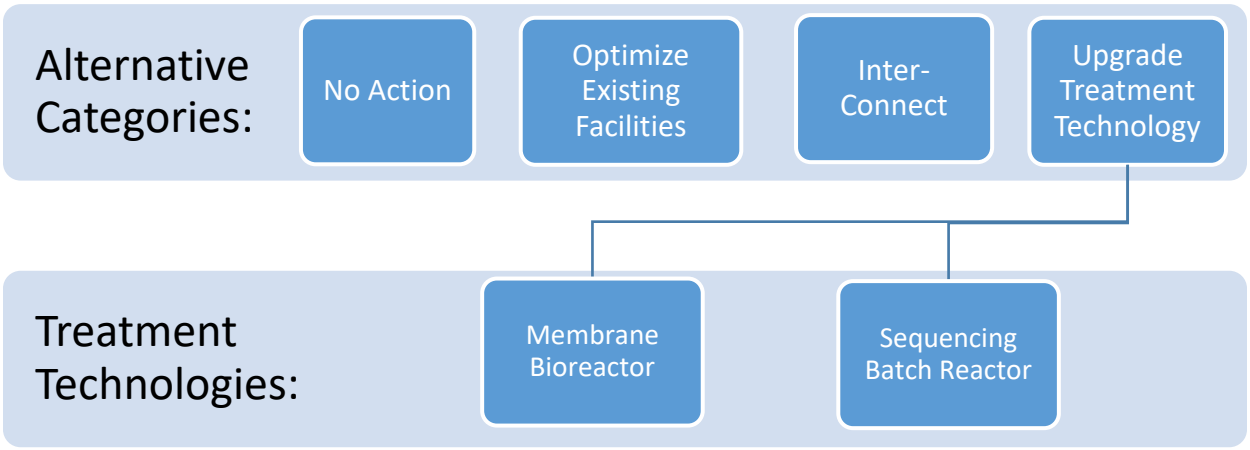
7. ASSESSMENT OF ALTERNATIVES

7.1 ALTERNATIVES

An analysis of potential reasonable alternatives was conducted for this project. The following alternatives were evaluated:

- No action.
- Optimizing the existing facilities.
- Interconnecting with the nearest facility.
- Upgrading the existing facility treatment technology with one of the following options:
    - Membrane Bioreactor (MBR)
    - Sequencing Batch Reactor (SBR)

Figure 14: Chart of Alternative Assessment Options



No Action: Since the 40-year-old aerated lagoon system is at the end of its design life and the system is not meeting discharge requirements, "No Action" is not a feasible long-term approach. Deferring action on the existing facility for a matter of years while the new plant is designed, permitted, and constructed is possible. However, it is not recommended to indefinitely postpone action on the facility replacement. Further, the County recognizes that the current opportunities for supplemental funding of wastewater projects incentivize pursuing a project at this time.

Optimizing the Existing Facilities: Optimizing the existing facility would involve making significant improvements to the lagoons. The lifespan of the existing lagoons could be extended if the accumulated sludge was removed.

A 12-inch clay liner was installed when the plant was constructed in 1982, however, the liner performance is unknown relative to Regulation 61 seepage limits. The liners could possibly need to be upgraded. If the liners need to be replaced, the existing liners would likely be replaced with synthetic liners The primary alternatives for synthetic liners were previously considered by Routt County in 2008 in the Master Plan for the nearby Phippsburg lagoons. The liner would need to be either 45 mils or 60 mils in thickness and made of synthetic material such as polypropylene, or HDPE. In order to remove the existing liners, the treatment equipment such as aerators and baffles would be taken out of the ponds, the sludge would be removed, and hauled or land applied.

After removing the sludge, the lagoon bottom, banks, and berms would be cleaned and graded. Then the subgrade would be compacted. A geofabric venting system would be laid first and the liner installed on top. The treatment equipment would be replaced inside the lagoon with either new or existing equipment.

The lagoons could be optimized with pre-treatment, baffles to prevent short-circuiting, mixing devices such as submerged bubble diffusers and/or mechanical mixing, aeration equipment, warmers, and covers to help conserve heat to avoid freezing. These additions and modifications could improve the treatment plant performance. However, rehabilitating and improving the existing lagoons would be expensive and result in small treatment gain. Lagoons are still not the best solution as the cold winter temperatures are so low that treatment efficiency is reduced. In addition, future regulatory limits are anticipated to decrease over time and lagoon treatment systems have limited ability to meet more stringent limits.

The County prefers to invest funds to upgrade the facility to current technology capable of meeting both current and future anticipated discharge permit limits instead of spending money to optimize the existing treatment process.

Interconnecting with Existing Facilities: The CDPHE provides direction in Section 22.3(1)(c)(v), Consolidation Analysis of the Implementation Policy for Regulation 22 (Policy CW-14), for determining whether interconnecting with existing facilities is feasible. The Policy CW-14 states that meeting only one of five factors is required to preclude consolidation and make connecting to an existing facility infeasible. An evaluation for consolidating with another treatment facility was performed and found infeasible due to economics.

The Community of Milner is isolated. The nearest towns of Steamboat Springs and Hayden are approximately 11 and 10 miles away, respectively. Interconnecting from that distance would be cost-prohibitive and based on item 7 of Section 22.3(1)(c) of Policy CW-14, an analysis of cost-effectiveness is not required because the nearest treatment works is greater than five miles away.

Upgrade Treatment Technology: The most desirable scenario is to replace the existing equipment with a different, more advanced treatment technology that is better suited to operate considering year-round site conditions and will perform for the anticipated future discharge permit limits. The County can implement new technologies developed and improved since the original facility was installed. New treatment technologies can allow for a smaller footprint, greater energy efficiency, simpler operations, greater operational control, and produce overall better effluent quality. Several treatment technologies are available. The two options evaluated for this project are the membrane bioreactor (MBR) and sequencing batch reactor (SBR).

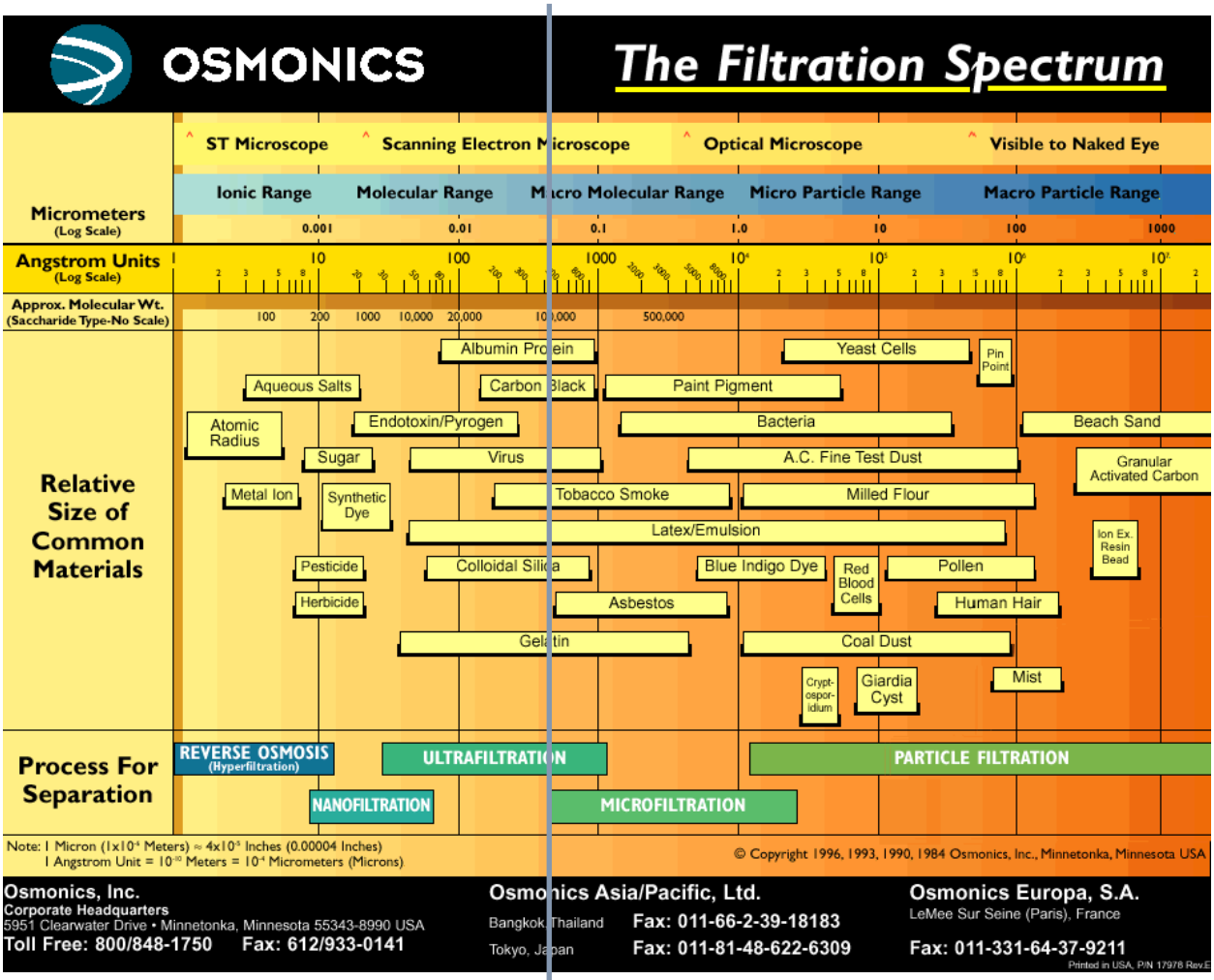
In addition, the new facility would replace the current lift station and be located safely outside the floodplain. The lift station needs to be replaced or upgraded and is a suspected source of I&I in the spring. Instead of going through the lift station and wet well, the future design allows wastewater to flow directly to the wastewater treatment plant influent equalization basin.

7.2 ALTERNATIVE #1 – MEMBRANE BIOREACTOR

The MBR was evaluated as Alternative #1. MBR equipment packages would consist of an influent fine screening channel, equalization basin, anoxic zone, bioreactor tanks, membrane filtration, chemical addition, disinfection and aerobic sludge digestion/holding. The configuration is typical for most MBR equipment manufacturers.

The use of the membrane provides advanced capabilities to produce high-quality effluent. MBR systems consist of aerobic sludge manipulation that uses semi-permeable membranes. The nominal pore size for many membranes is 0.04 µm. This porosity limits pathogenic flow-through and improves the ability to produce consistent high-quality effluent. Figure 15 shows the additional particles and pathogens that are filtered out with the use of a membrane.

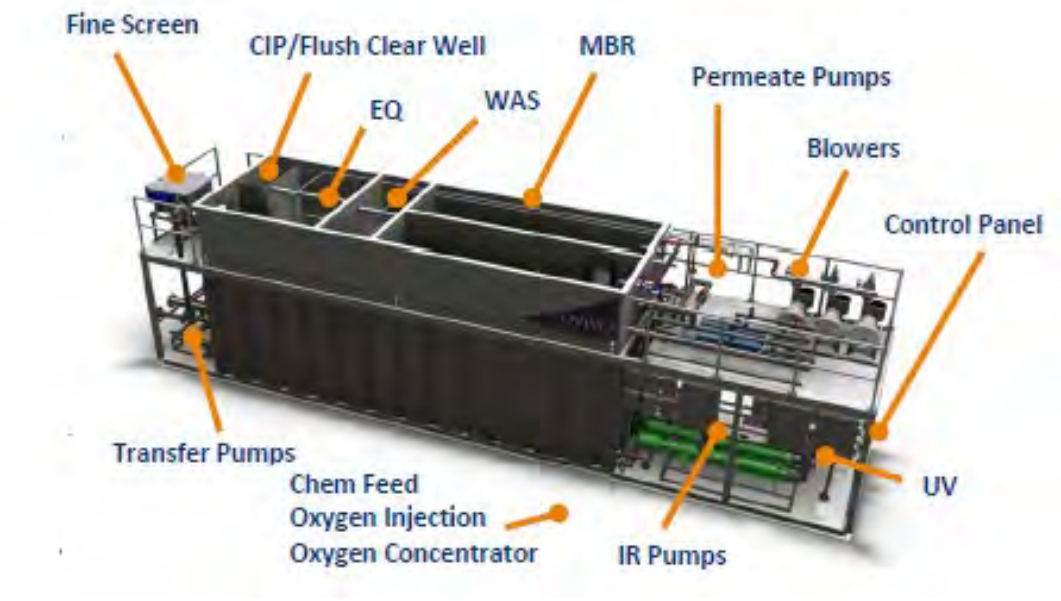
Figure 15: Filtration Spectrum



Not Filtered by Membrane ← → Filtered by Membrane

In this design, significant portions of the MBR equipment comes installed in a containerized system. Any in-basin equipment comes shipped loose for installation in new concrete tankage. Packaging as much of the equipment as possible allows for expedited installation times and reduced construction costs which is extremely valuable for this project given the short construction season. The figure below depicts a completely skid-mounted system. Much of the equipment shown below would be installed in new concrete tanks or the containerized system

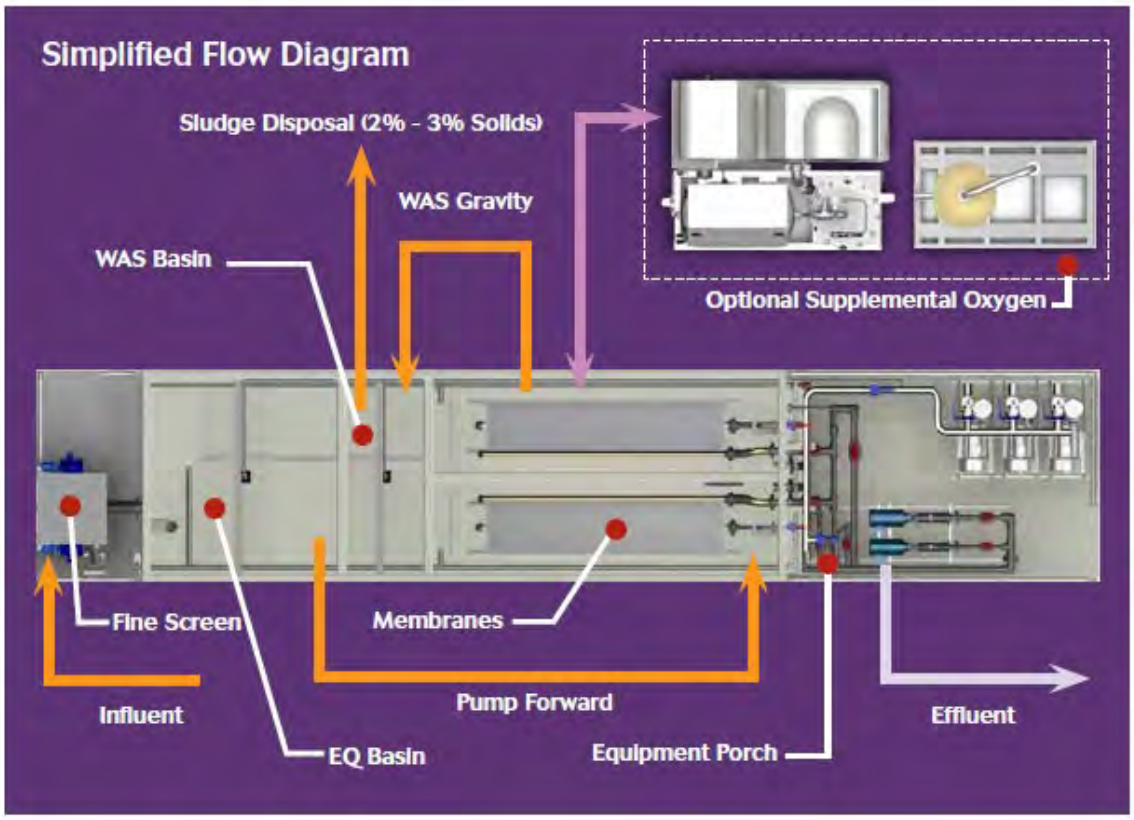
Figure 16: Overview of MBR Equipment



- Influent fine screening
- Influent flow measurement
- Equalization zone/aerated grit storage
- Aerated sludge holding
- Provisions for coagulant, carbon, and alkalinity addition, if needed
- Aeration treatment
- MBR basins
- Permeate pumps
- UV disinfection reactors
- Sodium hypochlorite and citric acid addition for membrane cleaning
- Real-time DO sensor equipment
- Pre-wired, factory-tested equipment
- Remote monitoring controls and alarm exporting

One treatment train is proposed for this facility, which is allowed by the CDPHE as the rated capacity is less than 40,000 GPD.

Figure 17: Sample MBR Design Flow Diagram



Influent Flow Conditions and Fine Screening

The influent enters the treatment train through a pretreatment fine screen first. This step is designed to meet peak flow rates and the screen's perforated opening is 2 mm for removing solids. Two fine screens are supplied but only one would be used at a time. One automatic fine screen is supplied along with another screen for standby. A redundant manual bar screen is provided along with a shelf spare motor.

Screenings are processed into a bin for ease of removal and disposal in a solid-waste facility.

Equalization Zone/Transfer Pumps

An integrated influent storage basin accommodates peak flow and I&I events to circumvent short-circuiting of the above-peak events. Redundancy in the design includes at least two transfer pumps (one duty and one standby). The transfer pumps help to control the membrane permeable flow-through rates and maintain the minimum submergence of the membranes. The basin is designed for grit to settle to the bottom. Additional aeration pumps are installed to keep the liquid from becoming septic.

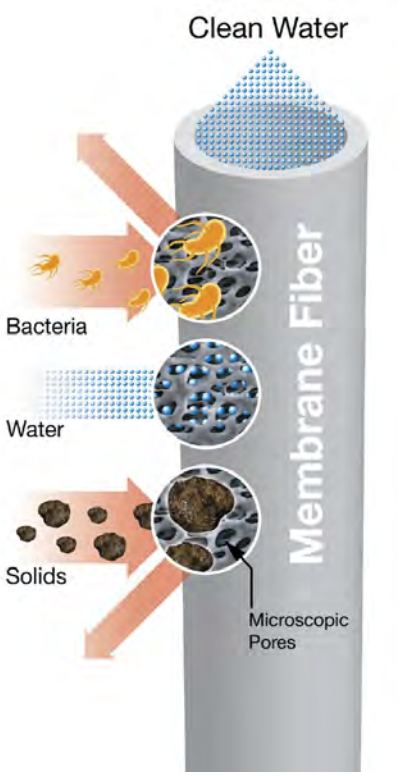
Biological Nutrient Reduction

The MBR treatment process can be designed for BOD and ammonia treatment and may be modified to include denitrification for nitrogen removal. The MBR includes an aerobic tank for nitrification and reduction of ammonia. the system's controls monitor dissolved oxygen levels and pH in the basin biomass to indicate the changing biological oxygen demand and nitrification needs. The MBR design can also be upgraded to include an anoxic tank for denitrification when discharge limits require nitrogen removal and coagulant dosing for phosphorous reduction.

Submerged Membranes

The MBR system's core treatment is housed in the two MBR basins. In the basins, an MLSS of 9,000 mg/L (or 12,000 mg/L for ceramic membranes), is maintained under constant aerobic conditions. Membranes use filtration to separate treated water from the mixed liquor. Regenerative blowers are supplied to provide constant aeration of the mixed liquor. The continuous scouring acts as a primary means of anti-fouling of the membranes. Typical operation of membranes calls for a set permeate period, determined by the manufacturer, followed by a rest function and/or a reverse flow. This alternating operation helps prevent overloading and fouling of the membrane cartridges.

Figure 18: Hollow Fiber Membrane



The membranes are installed in a parallel arrangement that use a permeate vacuum pump to achieve an optimal flow-through rate. Adjustments are made by the operator to achieve constant pressure. This feature provides optimal flux among flow-through capabilities, membrane surface area, and prevention of membrane fouling.

Effluent Operation

The effluent discharge rate is regulated by the permeate pumps. The pumps are controlled and monitored by the system's internal controls governed by the PLC. The flow rate is measured by an integral effluent magnetic flow meter and controlled with the PLC.

Operation & Maintenance

Process control of the MBR is performed through an integral HMI interface panel. The panel manipulates and monitors the operation of blowers, pumps, flows, and chemical addition.

Scheduled maintenance includes cleaning of the basins and sludge removal. The manufacturer suggests that the basins be cleaned with a chemical cleaner for organic and inorganic fouling. The frequency of cleaning is dependent upon influent loading characteristics. The cleaning chemicals used consist of sodium hypochlorite and citric acid.

As with any process, the use of a proactive procedure provides optimal system performance for continuous quality treatment. Influent, effluent, and in-basin monitoring of wastewater conditions allows the system to evaluate trends and predictive measures to be taken to forecast possible interruptions in effluent quality. A scheduled routine of sludge removal is required at the intervals deemed necessary.

Waste sludge storage

The MBR alternative includes a separate storage tank for aerobic waste sludge. The storage tank is typically sized to provide approximately 30 days of storage to facilitate periodic sludge hauling. Solids are wasted from the aerated tank and pumped to the sludge holding tank. The sludge holding tank contains coarse bubble diffusers for aeration and decant pumps to allow for sludge thickening. Typical solids within the tank can be thickened to approximately 2% dry solids by weight. Level control in the tank will indicate when solids must be decanted or removed by vacuum truck.

Chemical Addition

The MBR process requires the following five chemicals for operations and maintenance:

- Alum to promote the removal of phosphorus if needed.
- Carbon addition for denitrification, if needed.
- Caustic soda for pH and alkalinity adjustment.
- Sodium hypochlorite for back-pulsing of membranes.
- Citric acid for cleaning to prevent inorganic fouling of membranes

A Chemical Evaluation application was submitted with the General Permit Application for the above chemicals.

7.2.1 CAPITAL AND O&M COSTS – MEMBRANE BIOREACTOR

Table 7 provides a conceptual-level annual estimate of the O&M costs for the MBR alternatives. Contract operations were estimated by estimating operator time and visits and through discussions with the current operator. The sludge disposal costs are estimated based on hauling the accumulated solids waste to Steamboat Springs WWTP.

Table 7: MBR O&M Annual Estimates

Item	Cost
Sludge Disposal	$15,000
Power (at $0.1 per kW/hr)	$6,000
Chemicals	$3,000
Membrane Replacement Budget	$10,000
Replacement Parts Budget	$20,000
Analytical Testing	$5,000
Contract Operations	$25,000
Miscellaneous	$10,000
Total:	$94,000

7.2.2 ADVANTAGES & DISADVANTAGES – MEMBRANE BIOREACTOR

The following is a summary of the advantages and disadvantages of the MBR:

Table 8: MBR Advantages/Disadvantages

Advantages	Disadvantages
Controls, pumps, chemical feed system, and blowers come mounted on a skid	High equipment cost
Uninterrupted quality effluent due to the physical nature of the membrane	High power costs due to continuous blower and permeate pump operation
High-quality effluent. High BOD and ammonia removal	Possible membrane fouling
Lower probability of coarse diffusers becoming plugged	Lower oxygen transfer rate due to the coarse diffusers
Increased MLSS concentration >9,000 mg/L or 12,000 mg/L (smaller footprint required)	Membranes require replacing approximately every 10 years (20 years for ceramics)
Can meet strict future phosphorous limits without additional equipment	Membranes do not perform well at cold temperatures (< 10°C)

7.3 ALTERNATIVE #2 – SEQUENCING BATCH REACTOR

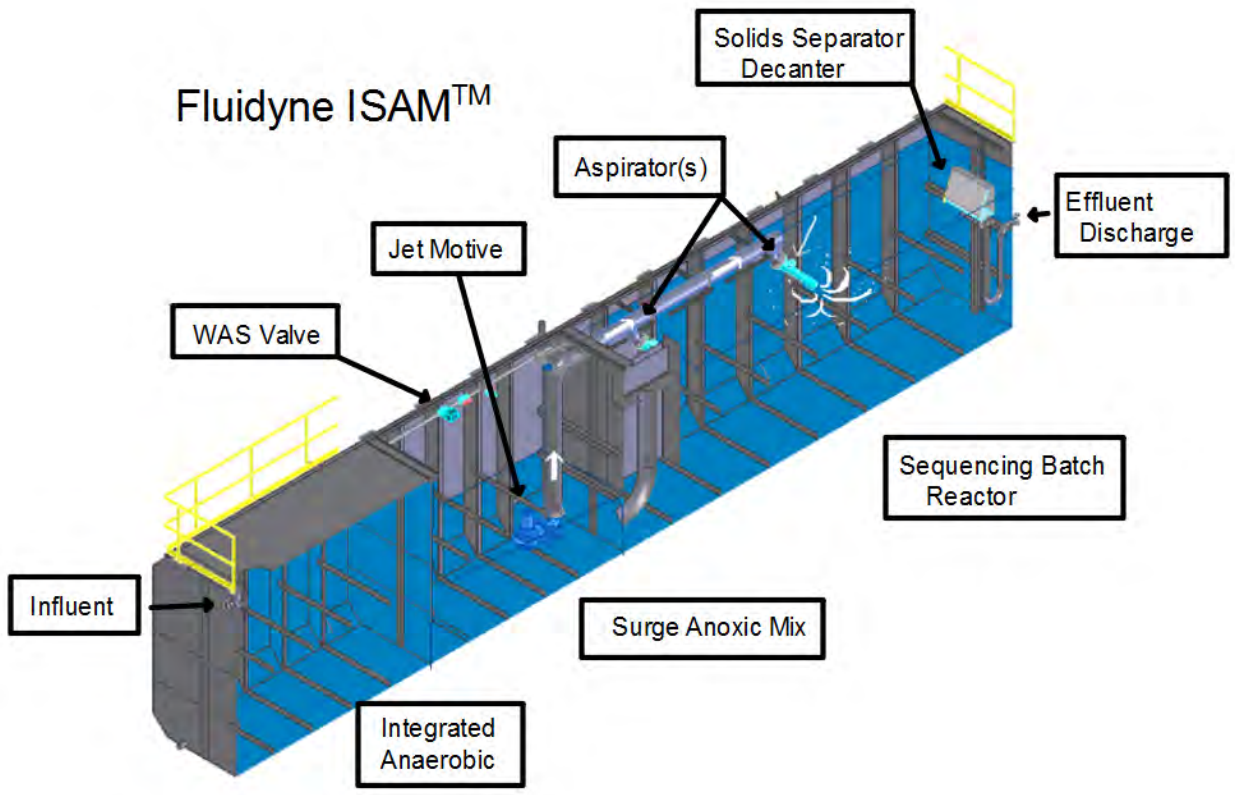
The SBR treatment facility alternative consists of an activated sludge system with most of the required equipment and controls supplied by a common manufacturer. The equipment features the following major components:

- Influent conditioning/equalization
- Anaerobic sludge handling
- Jet motive/wastewater transfer pumps
- Jet aspirator aeration system

- SBR basins
- Automated floating solids excluding decanter
- UV disinfection
- PLC-based control system

The Fluidyne ISAM SBR brochure is provided in Appendix O for additional general background. The proposed system for Milner's package consists of a single treatment train process. This configuration provides enhanced operator control and additional redundancy capabilities. The functions and basis of the design for each of these treatment steps are discussed below.

Figure 19: Overview of the SBR Process



The image above shows all the equipment in a metal tank.

Influent Conditioning/Sludge Storage Tanks

After the influent flow measurement and screening, raw wastewater flows by gravity into the first component of the biological process, the influent conditioning/equalization chamber. This chamber is a variable-level chamber where heavy influent solids and grit settles out, like a primary clarifier. Here, settleable solids are converted to soluble BOD. Underflow baffles are incorporated

into the design to prevent direct short-circuiting which causes uneven treatment and conversion rates.

Waste Sludge Storage

The SBR alternative includes a separate storage tank for aerobic waste sludge. The storage tank is typically sized to provide approximately 30 days of storage to facilitate periodic sludge hauling.

SBR manufacturers have documented significant volatile-solid reductions and typical sludge solid concentrations of 3–4%. This results in an extremely efficient sludge storage system and minimizes the frequency of hauling. Based on observations of the stored sludge levels, sludge will be removed as needed with a vacuum truck and hauled offsite to a permitted facility.

Jet Motive – Wastewater Transfer Pumps

The multipurpose jet motive pumps serve three essential functions for the SBR. First, the pumps act on an intermittent cycle to forward-feed partially treated water into the SBR while simultaneously acting as Venturi aerators. Second, the pumps cycle water between the SBR and the anoxic basin to denitrify the wastewater. Third, the jet motive pumps feed WAS to the front of the plant by siphoning a side stream of the sludge. Enough jet motive pumps will be supplied to provide redundancy.

Aeration System – Aspirating Nozzles

The motive pump also activates an aspirating jet aerator to oxygenate the SBR. The aerator nozzles are in the SBR's basin. The oxygen-delivery system is sized to exceed the calculated oxygen requirements to accomplish treatment (CBOD and ammonia conversion).

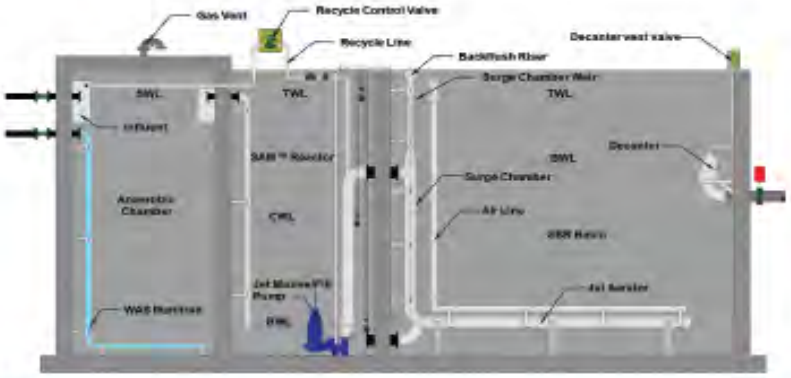
Sequencing Batch Reactor (SBR)

Each batch of wastewater is treated within a cycle in the SBR basin. Each cycle has five distinct phases:

1. Fill/react
2. Interact/react
3. Settle
4. Decant
5. Filled Decant

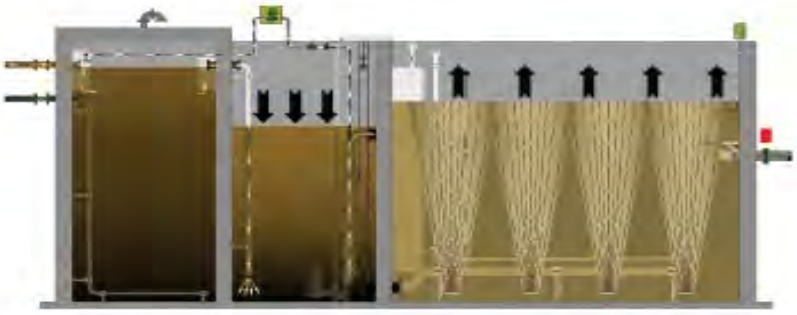
The following is a description and illustration of the five phases of the SBR process:

Figure 20: SBR Phases



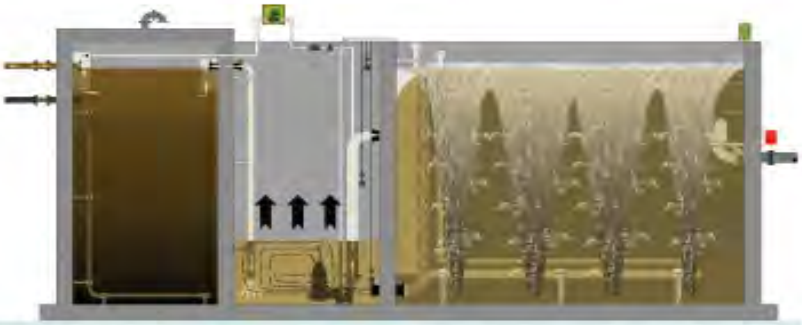
System Components:

Influent continuously enters the anaerobic chamber where solids settle. Settleable BOD is converted to soluble BOD. BOD is reduced by 30% and solids are reduced by 60%. The influent then flows to the SAM™ reactor. Mixed liquor is maintained in the SAM™ reactor to suppress orders and initiate and accelerate carbon and nitrogen reduction.



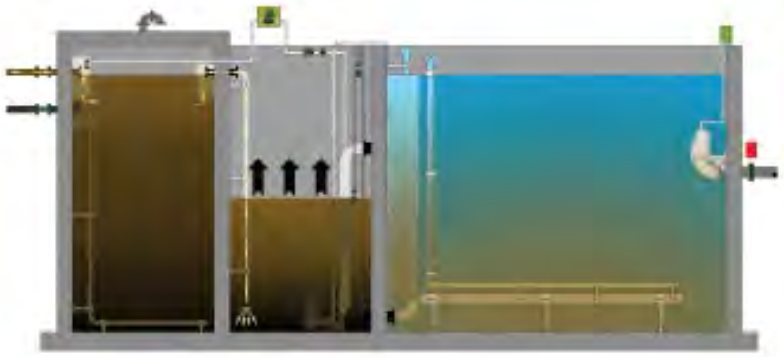
Fill Phase:

When the level in the SAM™ reactor reaches a predetermined "control level" the motive liquid pump is started. The SBR basin is filled and mixed. A percentage of the pumped flow is returned to the anaerobic chamber where biological solid settle. Settled solids in the anaerobic chamber are digested.



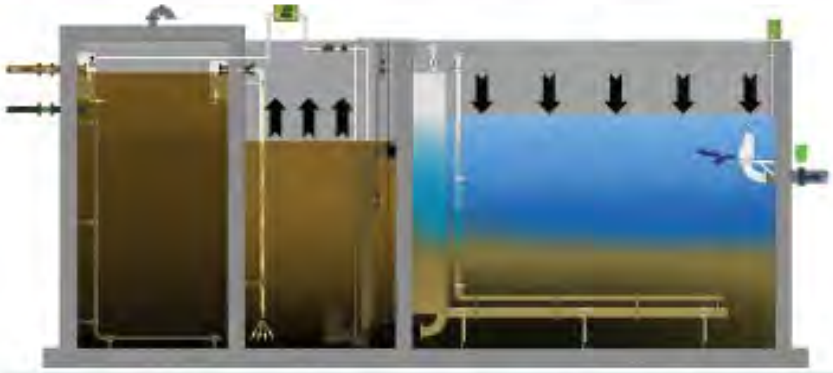
Interact Phase:

When the level in the SBR reaches TWL, nitrified mixed liquor overflows the surge chamber weir and is returned to the SAM™ chamber to mix and react with the raw influent. Aeration is cycled on and off to provide the required oxygen. Denitrification is reliable and complete. Scum is also removed from the SBR basin.



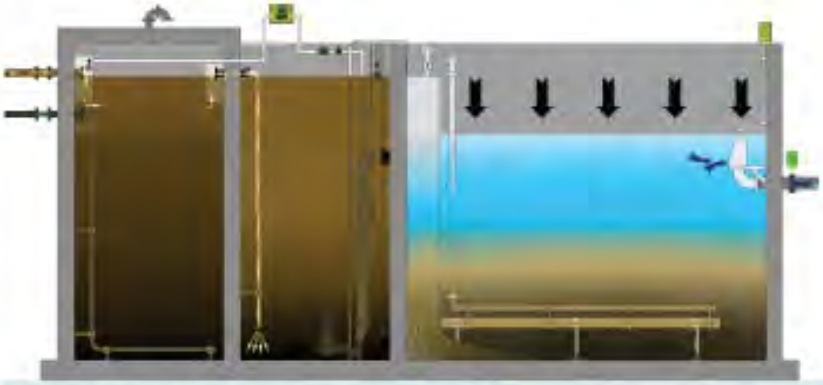
Settle Phase:

When the level in the SAM™ reactor again reaches "control level" aeration is discontinued and the SBR basin settles under perfect quiescent conditions.



Decant Phase:

When the settle timer expires, the decant valve is open and treated effluent is withdrawn from the upper portion of the SBR basin by means of a fixed solids excluding decanter.



Filled Decant Phase:

If, during peak flow events, the SAM™ reactor reaches TWL before the decant phase ends, influent flows in a reverse direction through the surge return line and overflows the surge chamber secondary weir and is diffused into the settled sludge at very low velocity as the decant phase continues.

Filtration

Filtration would not be included with this SBR alternative. Space in the facility's building could be provided in the event future strict phosphorous limits are implemented and filtration needs to be added to the SBR treatment.

Disinfection System

Decanted supernatant passes through a duplex (one duty/one standby) ultraviolet disinfection system. This equipment does not require any added chemicals.

Biological Nutrient Reduction

The SBR has features that allow for BNR through the modulation of the MLSS and react cycles. Uric nitrogen is removed first through anaerobic denitrification, which converts urea-based nitrogen into ammonia. The SBR then allows for nitrification via an aerobic process whereby the ammonia is converted to nitrite/nitrate molecules.

OPERATION & MAINTENANCE

The SBR system is highly automated but would require daily operation and maintenance by operators for optimal process control. The SBR is operated by a PLC with HMI manipulation. The process is automated and is optimized when the operator makes adjustments to achieve a quality effluent. As with all wastewater facilities, the SBR runs best with daily supervision and provides consistent operation if a proactive regiment is implemented. A true understanding of influent/effluent and in-basin conditions allows the operator to make educated adjustments and predictions for wastewater treatment.

Daily or weekly maintenance may include settleability, MLSS testing of the SBR, and a monthly sludge judge analysis of the sludge storage basin. Pump maintenance should be performed in accordance with the manufacturer's O&M requirements.

Sludge dewatering or hauling is typically done monthly but is subject to influent loading conditions. Design criteria will influence how frequently sludge must be removed.

Chemical Addition

The SBR process requires the addition of the following chemicals:

- Alum, to promote the removal of phosphorus.
- Soda ash, for alkalinity adjustment.
- Carbon addition for additional denitrification, if needed.

7.3.1 CAPITAL AND O&M COSTS – SEQUENCING BATCH REACTOR

Table 9 provides a conceptual-level annual estimate of the O&M costs for the SBR. Contract operations were estimated by estimating operator time and visits and through discussions with the current operator. The sludge disposal costs are estimated based on hauling the accumulated solids waste to Steamboat Springs WWTP.

Table 9: SBR Annual O&M Estimates

Item	Cost
Sludge Disposal	$15,000
Power (at $0.1 per kW/hr)	$5,000
Chemicals	$3,000
Replacement Parts Budget	$20,000
Analytical Testing	$5,000
Contract Operations	$25,000
Miscellaneous	$10,000
Total:	$83,000

7.3.2 ADVANTAGES & DISADVANTAGES – SEQUENCING BATCH REACTOR

The following is a summary of the advantages and disadvantages of the SBR:

Table 10: SBR Advantages/Disadvantages

Advantages	Disadvantages
Lower equipment costs	Plant can gain too much MLSS and produce solids in effluent if not properly maintained
Reduced amount of sludge generated as well as the ability to store sludge	If the anaerobic tank is not maintained below a set sludge level, it can provide unsightly scum in the SBR, eventually causing poor settleability.
Lower electrical consumption	Larger buried concrete tanks would be required
No consumables (membranes) to replace	Does not have a membrane as a barrier to retain solids

8. SELECTED ALTERNATIVE

8.1 JUSTIFICATION OF SELECTED ALTERNATIVE

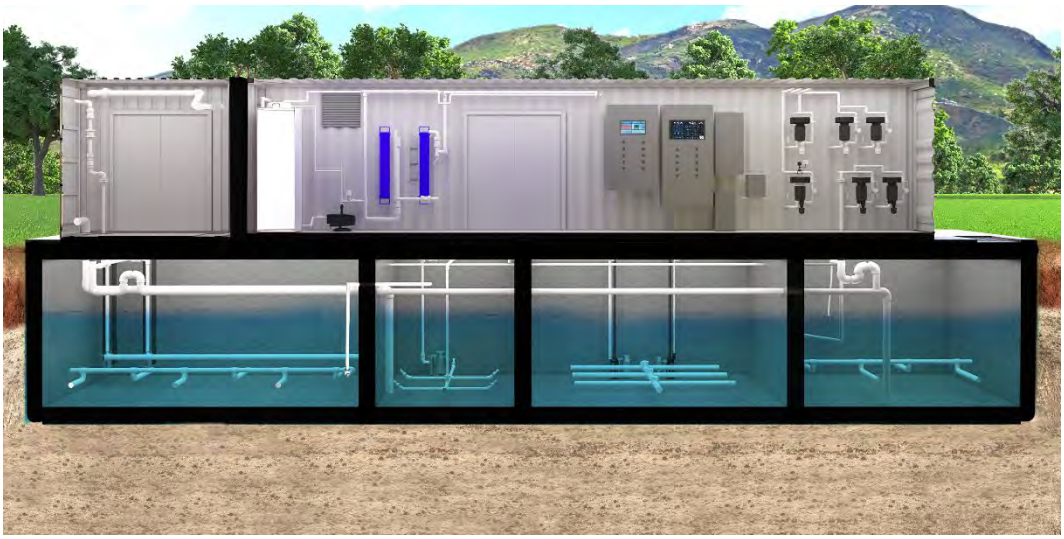
The County proposes implementing the membrane bioreactor (MBR) treatment technology for the Milner WWTP facility. This approach provides the most robust practical level of wastewater treatment within a small footprint and low cost.

The MBR can produce consistent effluent quality better than other available technologies such as conventional activated sludge, rotating biological contactor, moving bed bioreactor, sequencing batch reactor, lagoon, and oxidation ditches. The MBR contains an ultrafilter membrane with 0.04-micron openings for the removal of particulates, bacteria, and viruses. Anything larger than this opening is unable to pass through the membrane and will not be discharged into the environment with the effluent.

The most significant reason why the MBR technology was selected is that this option offered a quick turn-key solution in the small footprint available at Milner's lift station site. This technology is supplied by Newterra as a made-to-order system. Most of the equipment is installed inside of a container offsite and shipped ready to operate. No further building is required to house the treatment equipment. The system can be manufactured off-site while sitework and concrete tanks are completed on site, significantly reducing construction time. For further information on the Newterra MBR system, see the product brochure in Appendix M.

Due to Milner's schedule to upgrade the treatment system and the short construction window at this elevation, a quick, cost-effective solution is essential. The equipment installation process is greatly simplified with this approach as it does not require the onsite contractor to complete ordering and installing the specialized process equipment, electrical, and controls.

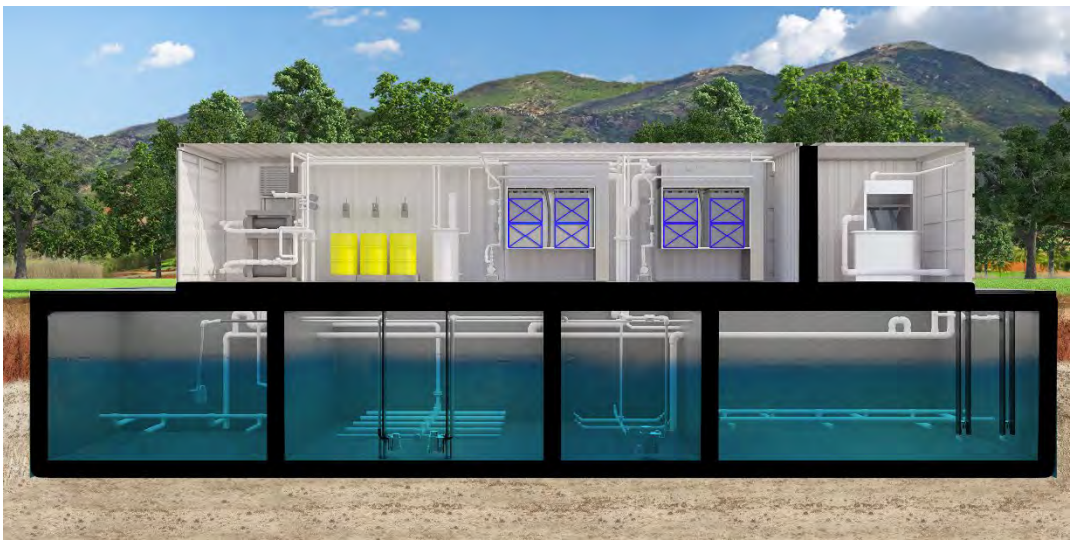
Figure 21: Cross-section View of Newterra Containerized MBR System



The small footprint that the MBR requires is desirable to the County because the available land area is limited by an irrigation ditch, the surrounding private property, rail lines, and the large area of the floodplain. The new facility will be installed where the current lift station is located.

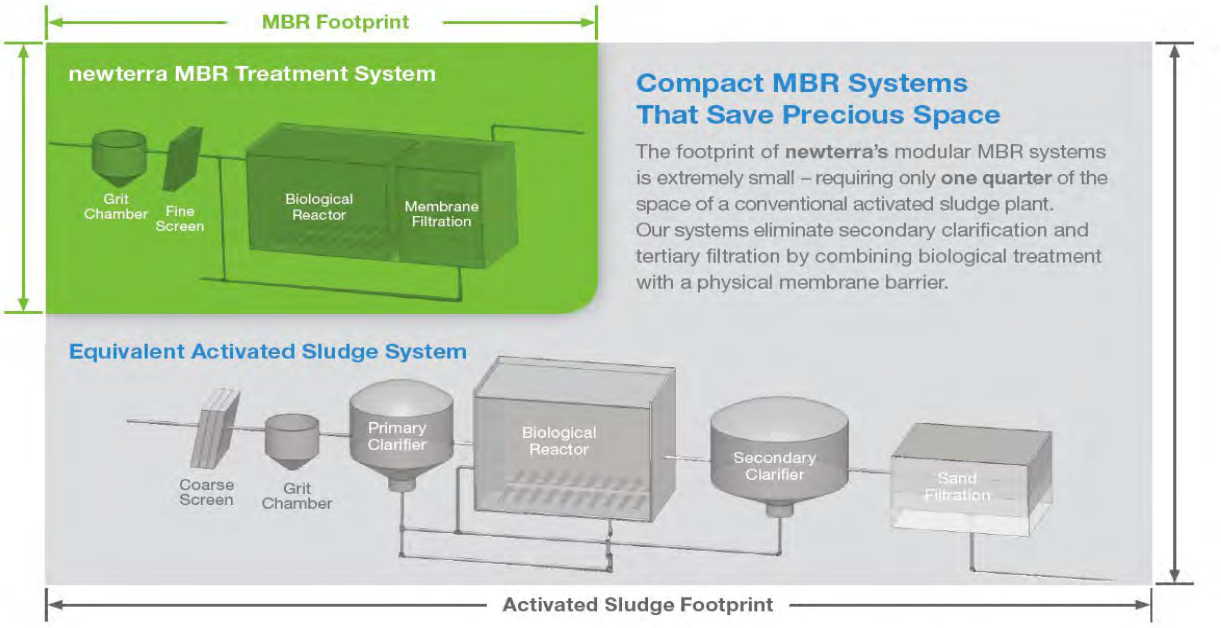
The EQ basin of the new facility will essentially replace the lift station. This situation addresses the need to replace the existing, aged lift station and eliminate the I&I originating from the lift station. Cast in place concrete tanks would be installed and act as a foundation for the containerized MBR unit.

Figure 22: Cross-section View of Newterra Containerized MBR System



In addition, the operational hours needed to maintain the MBR is lower than many other treatment facilities. This is due to the high level of automation available through the PLC-operated controls floats, and dissolved oxygen in-line measuring devices.

Figure 23: MBR Space Saving Features



Milner can expect to see measurable improvements to WWTP treatment operations over the course of the new plant's life. It is anticipated that the MBR treatment plant would result in efficient use of time, higher-quality effluent production, and overall improved sustainable practices.

In addition to providing upgraded wastewater treatment technology, the proposed project would decommission existing lagoon ponds and related infrastructure. Biosolids would be removed from the lagoon ponds. Removed biosolids would be handled and disposed of according to federal, state, and local regulations.

The project includes a feasibility analysis of the costs and benefits of including solar power for the wastewater treatment plant in order to offset electrical needs from the grid and reduce operating costs for the proposed plant. The results of the solar study are included in Appendix Q.

The majority of the project would involve replacing the wastewater treatment lagoons with a new mechanical system. Upgrading the collection system to address the infiltration and inflow could also be completed. The table below shows the percent of the cost of the project based on the categories of work.

Table 11: Cost Category Selection

Section	Item
Secondary Treatment	60
Advanced Treatment	30
Infiltration/Inflow	10
New Collector Sewers	0
New Interceptors	0
CSO Correction	0
Storm Sewers	0
Recycle Water Distribution	0
Nonpoint Source Pollution Control Activities	0
TOTAL (must equal 100%)	**100**

8.2 TECHNICAL DESCRIPTION AND DESIGN PARAMETERS

The proposed design for the Milner WWTP consists of a 32,500 GPD MBR. The plant design uses the natural gravity flow to carry the influent through course screening to an equalization tank to even out peak flows. Influent transfer pumps convey wastewater from the equalization tank through fine screens to the aerated tank.

The wastewater flows to the aeration basin where dissolved oxygen is added for BOD reduction and nitrification. After aeration, nitrified wastewater is conveyed to the MBR for filtration through the membranes. After filtration, the wastewater is treated using UV reactors for disinfection before being discharged to the Yampa River using the existing outfall. Effluent pumps will be sized to deliver effluent from the UV system to the existing Yampa River outfall assuming flood conditions.

The treatment process design includes chemical dosing for alkalinity and pH control to optimize nitrification and design provisions for alum addition for future phosphorus removal should it become necessary. Solids are wasted out of the aerobic basin and discharged into the aerated sludge storage tank. The sludge storage tank contains decant pumps to thicken solids and is operated to maintain adequate dissolved oxygen to minimize odors.

Solids may be handled in various methods. The solids handling methods for this project include hauling waste solids to a larger WWTP for further processing, onsite thickening to roughly 18% solids to dispose of thickened solids in a landfill, or treating solids to produce biosolids for beneficial reuse.

Treating solids for beneficial reuse requires that the biosolids treatment and quality meet the stringent requirements within Regulation 64 Biosolids Regulation. To meet even the least restrictive Class B biosolids requirements in Regulation 64, the solids must meet metals concentration limits, be aerobically treated to reduce fecal coliforms, and meet vector attraction reduction criteria. Phippsburg WWTP would need to digest the solids by maintaining aerobic digestion conditions for 60 days at 15^{o} C or 40 days at 20^{o} C. Vector reduction requirements would be achieved by providing at least 38% volatile solids reduction over this digestion period.

In lieu of an aerobic digestion system, the biosolids could be composted to achieve the necessary treatment. For composting, Regulation 64 requires the temperature of the biosolids be maintained at 40^{o} C or higher and greater than 55^{o} C for four hours for five days.

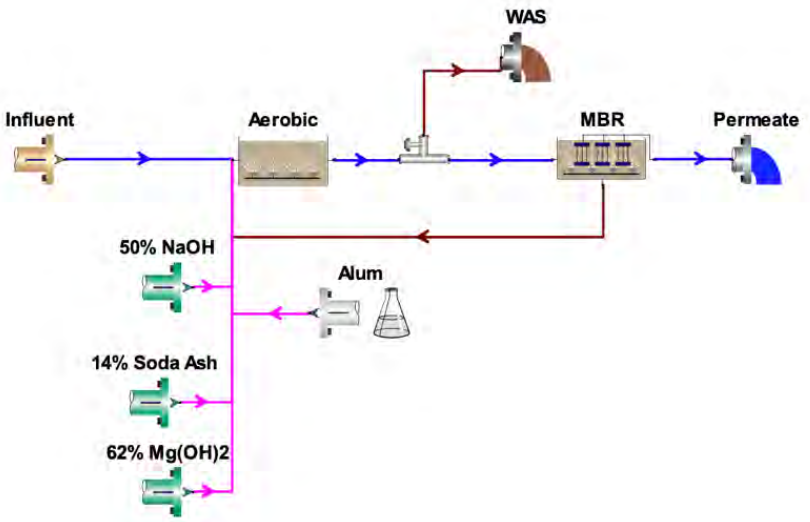
Sludge press systems and composting facilities that treat the solids are cost prohibitive for a small community and small treatment facility like Milner. The lift station site is space constrained and there isn't enough property to construct a digester or composting facility. Therefore, it is recommended that the County hauls solids from the MBR solids holding tank to a larger WWTP.

The lift station site has a nearby neighbor. The design includes odor control using an activated carbon adsorption system to remove odors and to be a good neighbor for nearby residents. Details of the individual process components are included in the Newterra proposal contained in Appendix N. These documents provide supplemental information to the Assessment of Alternatives section of this report.

8.3 PROPOSED PROCESS FLOW DIAGRAM

The detailed processes diagram for the proposed facility is included in the Appendix.

Figure 24: MBR Process Flow



8.4 APPROPRIATENESS OF TREATMENT TECHNOLOGIES

MBRs are a proven and popular treatment technology, with several successful installations in Colorado. The design for the Milner WWTP would have individual treatment processes similar to successful applications of other Newterra installations. Process calculations for the Milner WWTP are included in Appendix N. These calculations demonstrate the Newterra technology and design can meet the anticipated effluent limits at Milner WWTP.

Appendix I includes the certification for the effectiveness and cost evaluation for the recommended MBR treatment alternative.

8.5 ENVIRONMENTAL IMPACTS

A project needs assessment checklist is provided in Appendix H. Overall, the proposed project would result in net improvements to the environment. The MBR technology would provide robust treatment for BOD, TSS, ammonia, and phosphorus. Treated effluent from the proposed MBR plant would be of significantly higher quality than the current lagoon effluent. The proposed system would result in reduced pounds per day of pollutants discharged into the environment.

It is not anticipated that this project would negatively impact threatened and endangered species or other wildlife. In fact, the lagoons in the floodplain and near wetlands would be removed.

The site has previously been disturbed during the lift station construction. Based on current information, AquaWorks DBO does not expect the project to have impacts to any cultural, historical, or archeological resources during construction.

Routt County is in compliance with all federal and state regulations for air quality. A project of this size, with minimal disturbance area, is not anticipated to impact air quality. The decommissioning of the lagoons will be completed in accordance with federal, state, and local regulations.

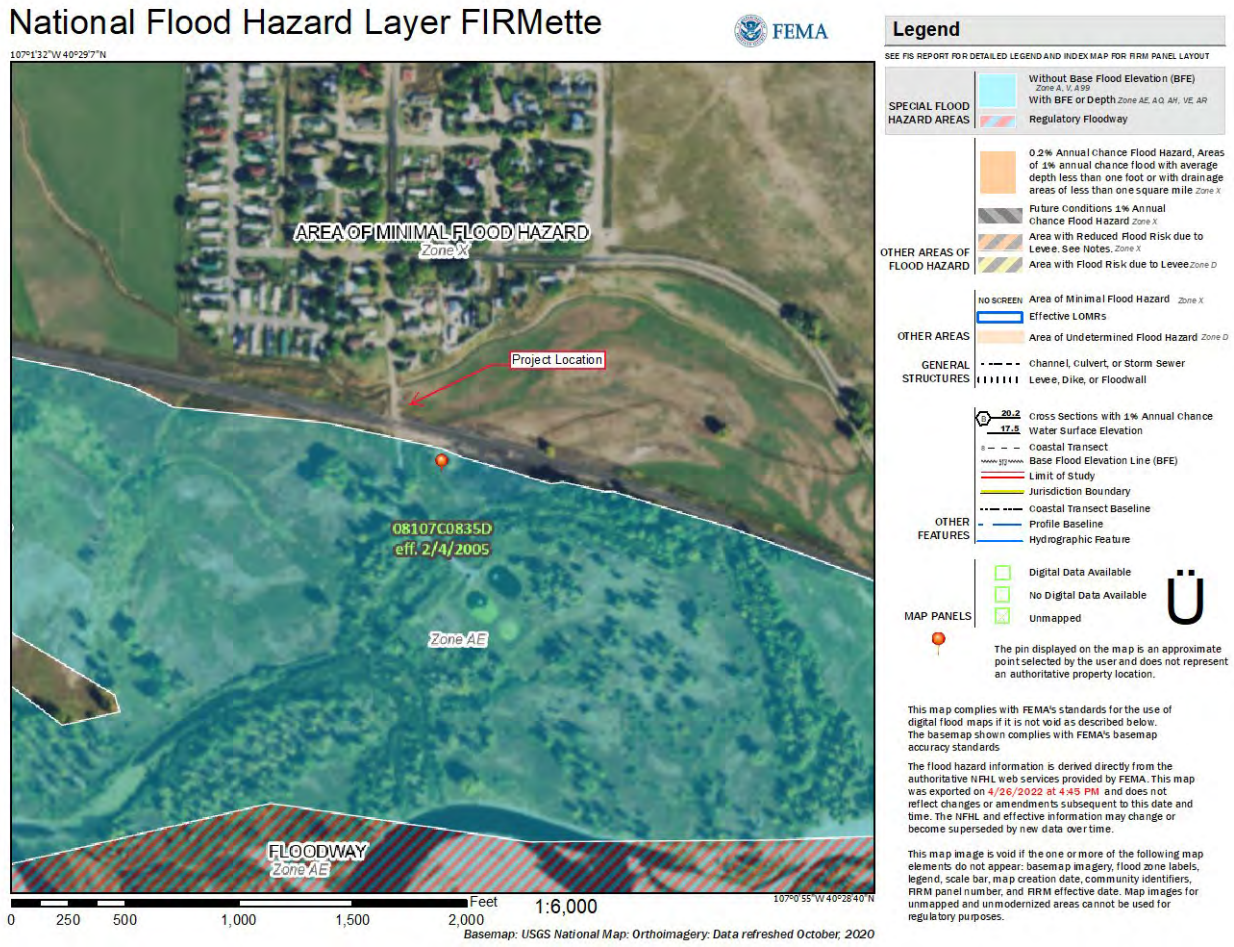
It is anticipated that the implementation of the project would have some unavoidable impacts, as with the construction of most public works projects. Construction methods would minimize these impacts by implementing measures such as implementing best stormwater management practices, limiting construction activities to daytime hours, and maintaining a traffic control plan.

The contractor will be required to obtain a CDPHE Construction Activities Stormwater Discharge Permit during the construction phase of the project if the area of disturbance is greater than 2 acres. The contractor would need to follow the erosion control measures and best management practices specified by the design engineer to minimize the amount of sediment that leaves the site during earthwork activities.

The current WWTP lagoons are shown within the 100-year floodplain on the FEMA map. Although AquaWorks DBO has seen documentation stating the lagoons were raised out of the floodplain, the FEMA map below shows the lagoons are in the floodplain. The proposed MBR treatment plant site would be outside of the floodplain and located on the north side of the train tracks which would mitigate any floodplain issues associated with the location of the existing plant. The project would include abandoning and reclaiming the existing lagoon treatment plant. Solids and liquid waste from the existing treatment plant will be treated and disposed of according to state, federal, and local regulations.

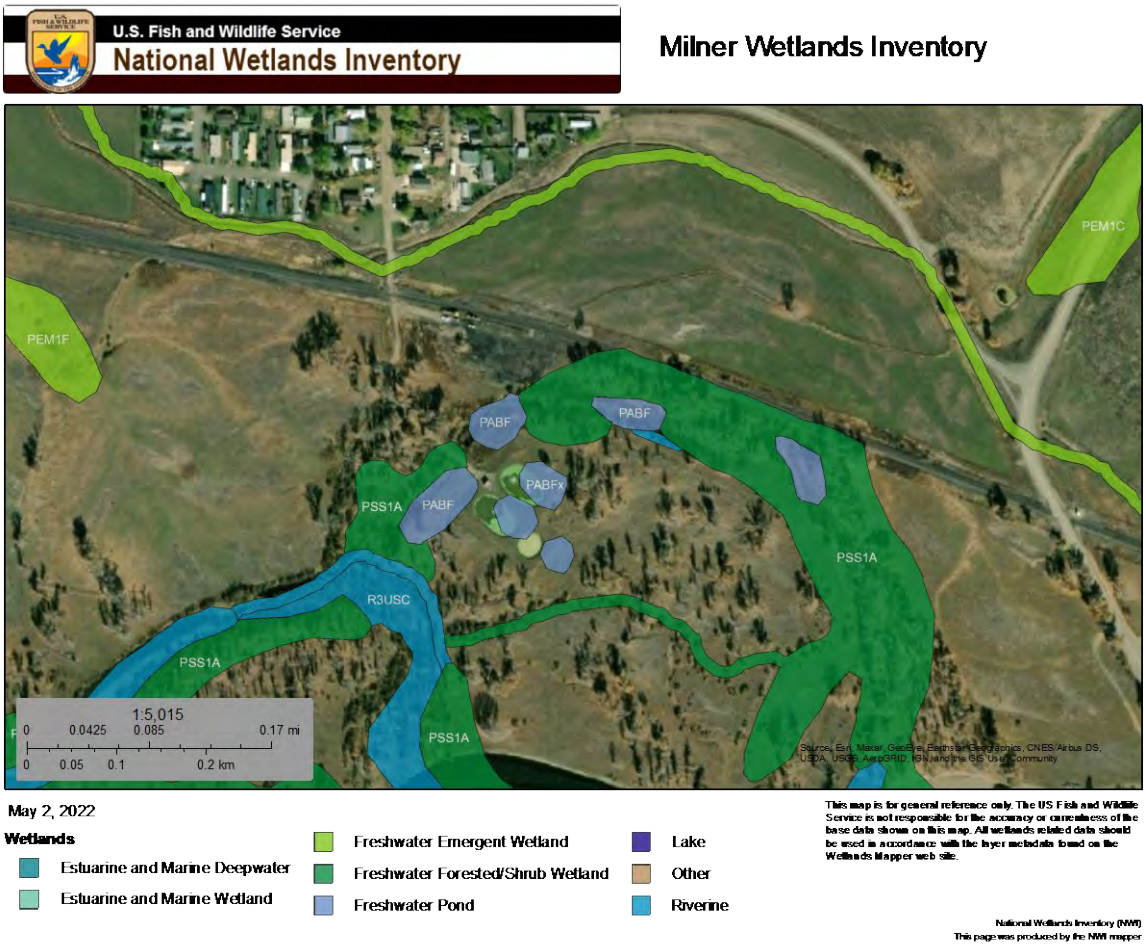
Routt County planning was contacted to confirm floodplain concerns. The County confirm that there are no floodplain issues for the proposed project. Appendix J and the figure below shows the project area location on the FEMA floodplain map of the area.

Figure 25: FEMA Floodplain Map



The National Wetland Inventory Map is provided in the figure below and in Appendix L. The wetlands inventory shows the treatment lagoons as freshwater ponds. Other areas around the outside of the site are freshwater forested or shrub wetlands. As indicated in the figure below, the National Wetlands Inventory map does not show any wetlands where the WWTP would be located:

Figure 26: National Wetlands Inventory Map



A completed Environmental Checklist is included in the Appendix.

8.6 LAND REQUIREMENTS

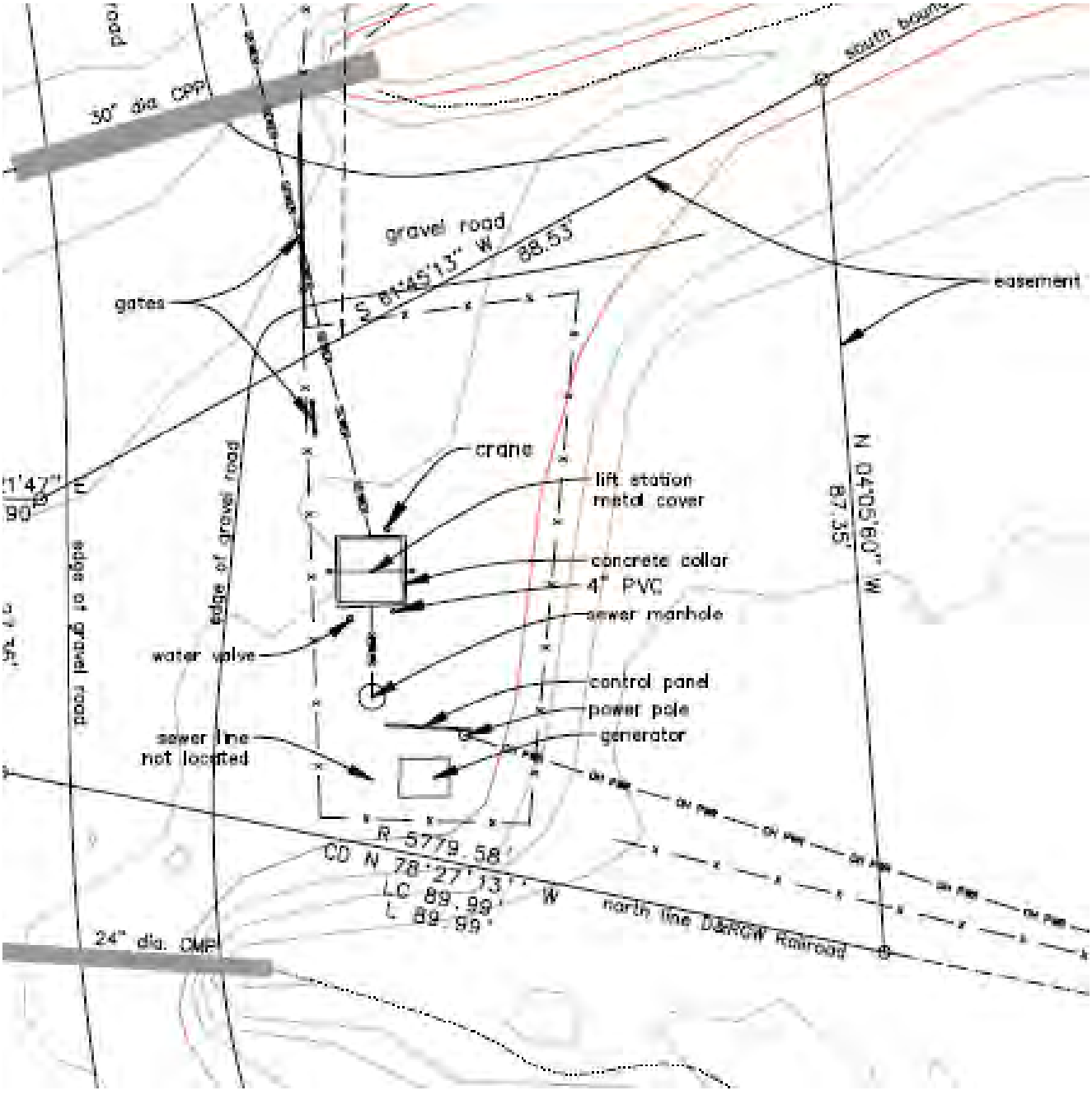
The existing WWTP site is owned by Routt County. Camilletti & Sons owns all the land surrounding the facility. Figure 27 and Appendix D shows the project area and the local land ownership surrounding the existing wastewater treatment plant and lift station sites. In addition, a Routt County Property Record card showing the County as the owner is included in Appendix G. The existing wastewater treatment plant would be abandoned and reclaimed under this scenario.

Figure 27: Land Ownership Map

The new MBR facility would be constructed on the lift station site located on the north side of the railroad tracks. The lift station is on an easement. The MBR treatment plant would be located near the center of the easement to maximize setbacks from neighbors and wetlands. The new infrastructure would be designed to avoid locating new structures in the existing floodplain or wetlands. Policy CW-14 requires that a treatment plant less than 50,000 gpd have a setback of 250 from habitable structures without mitigating factors. While the easement would not allow a full 250-foot setback, the design includes mitigating factors. The treatment plant is fully enclosed within a building that includes activated carbon for odor control. Historically, WWTPs that are operated correctly do not receive odor complaints. Aerosols will not be present as there will be no uncovered basins and noise-producing equipment such as pumps and blowers will be housed inside the building to reduce any noise. An emergency generator will be the only equipment outside and will only be used during emergencies or for brief periods of routine exercise.

The lift station easement is held by Routt County. The survey document is located in the preliminary drawing set in Appendix P for reference. The figure below documents the easement boundaries:

Figure 28: Proposed Wastewater Treatment Site



On the lift station site, new concrete basins are installed before the containerized system arrives on site. The system is delivered ready to install on top of the concrete basins and would require

about six weeks of setup prior to start-up. No additional buildings for the wastewater treatment equipment would be necessary.

A rendering of the proposed system is shown in the figure below.

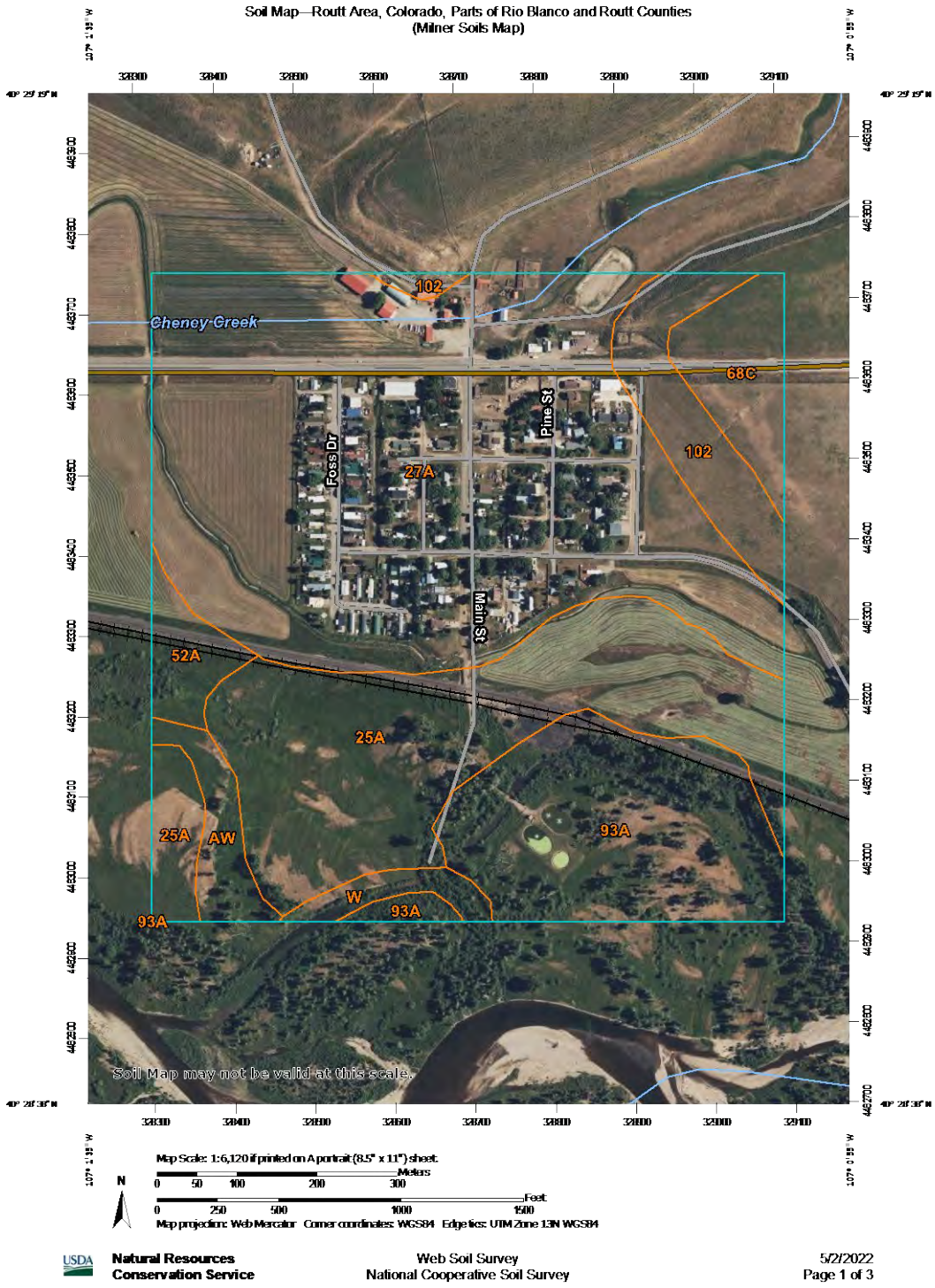
Figure 29: Above and Below Ground Image of Newterra Containerized MBR System

8.7 GEOTECHNICAL ANALYSIS

A site-specific geotechnical study has not been conducted yet. One will be completed during the final design phase to calculate the bearing capacity of the existing soil and determine if there are any adverse soil conditions. AquaWorks DBO will confirm with the geotechnical engineer during the final design phase that the design meets their recommendations.

The Natural Resources Conservation Services soils map is provided in Appendix K and the figure below for the surrounding area is presented below. According to the soils map, the lift station site is located in an area of toponas loam with minimal slope of only 0 to 3 percent (map symbol 25A). Based on the soils map, no unusual construction challenges are anticipated due to soil conditions.

Figure 30: NRCS Soils Map



8.8 CONSTRUCTION CHALLENGES

Significant construction issues are not anticipated on the site. Although, construction challenges would be like other projects of this magnitude. Such challenges may include scheduling construction crews, obtaining materials in a timely manner, obtaining the local and state approvals, and construction oversight.

This site is by an irrigation ditch on one side. The ditch operates for approximately one month from the end of May through June. Construction will be scheduled to minimize challenges but if dewatering is needed, permits will be obtained.

One item that will require consideration during the final design is maintaining operations at the existing facility while constructing the new one. Since the new treatment plant will be constructed on the lift station site, the lagoon treatment plant can continue operating unaffected during construction. The lift station must also maintain full operation during construction activities. There is adequate space to accomplish this, however, planning will be required. The design team will consider how to sequence the transfer of the operations to the new facility and the existing lift station and treatment plant facilities.

Other construction challenges will be similar to other projects of this magnitude. Such challenges may include scheduling construction crews, obtaining materials in a timely manner, obtaining the local and state approvals, and construction oversight.

8.9 OPERATIONAL ASPECTS

The recommended facility will have far more process control capabilities than the existing facility. Operators will need to be trained to operate the new automated and manual equipment. The new facility will have a PLC to control most treatment equipment and processes. Instrumentation will be provided to control the treatment process. Instrumentation will include flow metering, tank level monitoring and alarms, an online dissolved oxygen analyzer, a pH analyzer, pressure monitoring on membrane banks, and UV transmittance metering. Chemical feed systems will be configured to dose chemicals based on flow monitoring and an operator set point dose. Telemetry will be installed to allow operators to access the plant's control panel remotely.

Emergency Provisions:

The telemetry system will also export alarms automatically in the event an alarm condition is met. A generator, sized to operate 100% of the plant, will provide a backup source of power in the event the primary electrical source fails. The generator will be equipped with an automatic transfer

switch upon primary electrical source failure. A basic emergency plan template is provided in the Appendix F and a detailed emergency plan will be developed during the design and delivered with the facility's operation and maintenance manual.

8.10 COSTS

The following table provides an estimate of the probable costs for this project. In addition, Appendix I includes the signed certification for the effectiveness and cost evaluation conducted as part of the engineering analysis.

Table 12: Engineer's Conceptual Opinion of Probable Costs

Division:	Item:	Quantity:	Unit:	Unit Price	Total Price
1	**Contractor General Requirements**	1	LS	$100,000	$100,000
2	**Existing Conditions**				
	Clearing & Grubbing	1	LS	$5,000	$5,000
	Demo of Existing Structures	1	LS	$5,000	$5,000
3	**Concrete**				
	Buried Process Tank	1	LS	$500,000	$500,000
	Concrete Pads	1	LS	$10,000	$10,000
	Concrete Hatches to Access Buried Tanks	1	LS	$10,000	$10,000
9	**Painting**				
	Coat Influent Equalization Tank	1	LS	$30,000	$30,000
11	**Equipment**				
	MBR Process Treatment Equipment (Package by Newterra)	1	LS	$609,770	$609,770
	Portable Davit Crane & Bases	1	LS	$2,500	$2,500
	Coarse Screen	1	LS	$5,000	$5,000
	Equipment & Process Piping Installation	1	LS	$100,000	$100,000
26	**Electrical**				
	Line Voltage Electrical Improvements	1	LS	$50,000	$50,000
	Instrumentation & Controls	1	LS	$25,000	$25,000
	Backup Generator & ATS	1	LS	$75,000	$75,000
	New Transformer (If Required)	1	LS	$50,000	$50,000
31	**Earthwork**				
	Process Tank Excavation & Backfill	1	LS	$35,000	$35,000
	WWTP Site Work	1	LS	$10,000	$10,000

	Bollards	5	EA	$1,000	$5,000
33	**Utilities**				
	Site Piping	1	LS	$10,000	$10,000
	Import Material	1	LS	$15,000	$15,000
	Site Finishing	1	LS	$5,000	$5,000
	Erosion Control	1	LS	$10,000	$10,000
	Lagoon Grading & Restoration	1	LS	$50,000	$50,000
	Lagoon Mitigation				
	Removal of Biosolids	907,116	Gallons	$0.40	$362,846
	Onsite Solar Generation				
	Solar Equipment	1	LS	$148,439	$148,439
	Collection System Rehabilitation				
	Cured in Place Pipe Relining	4,000	LF	$45	$180,000
	Manhole Rehabilitation	17	MH	$5,000	$85,000
	Contractor Overhead & Profit:	12.0%			$299,227
	Subtotal:				$2,792,782
	Final Design Engineering:	10.0%			$279,278
	Bidding & Construction Engineering:	5.0%			$139,639
	Contingency:	10.0%			$279,278
	Grand Total:				**$3,490,978**

8.11 FINANCIAL SYSTEM AND RATE STRUCTURE CHANGES

The project will be funded using the state revolving fund loan and grant program. Routt County intends to apply for disadvantaged community status to obtain a design and engineering grant to fund the design work of the project. The construction will be funded through a combination of grants and SRF loan monies.

The operational costs of the WWTP will continue to be funded by the Community of Milner. The monthly charges will be included in the regular utility bills sent to the individual property owners. The increase in costs to the individual residents will not be known until the amount of funding assistance is determined. The County will be engaging Chris Brandewie with the Rural

Community Assistance Corporation to conduct a rate study to evaluate the financial feasibility of the project. This rate study will be complete in the fall of 2022 for review by the funding agencies.

Routt County will retain the management capabilities for maintaining the billing and operations of the facility.

8.12 ENVIRONMENTAL CHECKLIST

A completed Environmental Checklist is included in the Appendix so the CDPHE can determine if an Environmental Assessment is required.

8.13 PROJECT IMPLEMENTATION

Construction of the facility can occur as early as 2024. The following milestones highlight the anticipated schedule. However, the final schedule depends upon several factors, not all of which are under the control of the County, such as application review times, availability of funding, and weather.

Table 13: Implementation Schedule

Date	Item
Summer 2022	Submit PNA and Site Application to CDPHE
Summer 2023	Submit PDR and Final Plans and Specifications to CDPHE
Fall 2023	Submit SRF Loan Application
Late 2023	Obtain Final Design Approval from CDPHE and Bid Project
Spring 2024	Commence Construction
Fall 2024	Complete Construction

8.14 PUBLIC MEETING

The public meeting will be scheduled closer to when the SRF Loan Application is submitted. The public meeting advertisement, agenda, sign-in sheet, and meeting minutes will be provided to the Grants & Loans project manager once the meeting has been scheduled and completed.

REFERENCES

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Dismuke & Dismuke, Inc. (1981), *Community of Milner Sewage and Collection & Treatment Facilities*. Steamboat Springs, CO.

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Colorado Department of Public Health & Environment (2018). *Regulation 43 – On-Site Wastewater Treatment Regulation 5 CCR 1002-43.* Denver, CO.

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APPENDIX – SUPPLEMENTAL INFORMATION

- Appendix A: Regulation 22.10 Site Application Form
- Appendix B: Service Area Map
- Appendix C: One-Mile and Five Mile Radius Maps
- Appendix D: Map of Adjacent Properties
- Appendix E: Zoning Map
- Appendix F: Emergency Response Plan Template
- Appendix G: Routt County Property Record Card
- Appendix H: PNA Environmental Checklist
- Appendix I: Cost and Effectiveness Evaluation Certification
- Appendix J: FEMA Floodplain Map
- Appendix K: National Ressources Conservation Service Soil Map
- Appendix L: National Wetlands Inventory Map
- Appendix M: Newterra Brochure
- Appendix N: Newterra Proposal
- Appendix O: Fluidyne ISAM SBR Brochure
- Appendix P: Preliminary Drawings including Lift Station Site Survey
- Appendix Q: Solar Study
- Appendix R: Lagoon Biosolids Report
- Appendix S: Discharge Permit COG590148

APPENDIX A

SITE APPLICATION FORM

COLORADO
Department of Public Health & Environment

Water Quality Control Division
Engineering Section

4300 Cherry Creek Drive South, B2
Denver, Colorado 80246-1530
CDPHE.WQEngReview@state.co.us
303-692-6298

Regulation 22 Site Location Application Form
Section 22.10 – Amendment of Existing Treatment Plant Site Location Approval

A. Project and System Information			
System Name	Community of Milner Wastewater Treatment Plant		
Project Title	WWTP Improvement Project		
County	Routt		
CDPS Permit No.	CO-0047449		
Date Fee Paid or payment attached		Invoice Number and Check Number	
Design Company Name	AquaWorks DBO, Inc.		
Design Engineer	Adam Sommers, P.E	CO License Number	38,169
Address	3252 Williams Street		
	Denver, CO 80205		
Email	adam@aquaworksdbo.com	Phone	(303) 477-5915
Applicant/Entity	Routt County		
Representative Name	B. Scott Cowman		
Address	136 6th Street, Suite 201		
	Steamboat Springs, CO 80487		
Email	scowman@co.routt.co.us	Phone	(970) 870-5588

B. Project Information			
Location (existing or proposed site)		***Proposed Project Design Capacity***	
Brief location description	South Main Street, Milner, CO 80487	Hydraulic Capacity (Maximum Month Average)	0.0325 MGD
Legal Description (e.g., Township, Range)	SW1/4, NE1/4, S15, T6N, R86W	Peak Hour Hydraulic Capacity	0.13 MGD
County	Routt		
Latitude	40.482262	Organic Loading Capacity – Treatment Plant Only (Maximum Month Average)	65 lbs. BOD_5/day or lbs. cBOD/day
Longitude	-107.020947		

Funding Process	Will the State Revolving Fund (SRF) loan program be used to finance any portion of the project?	Yes	☒	No	☐	If yes, please list project number	190570W

Project Schedule and Cost Estimate	
Estimated Bid Opening Date	Early Spring 2023
Estimated Completion Date	Fall 2024
Estimated Project Cost	$3,490,978

Project and System Information	
System Name	Community of Milner Wastewater Treatment Plant
Project Title	WWTP Improvement Project
County	Routt
Original Site Location Approval No. (attach copy of approval)	3498
Date of Site Location Approval	
CDPS Permit No.	CO-0047449
CDPS Permit expiration date	August 31, 2020 and currently administratively extended

1. Type of Site Amendment	
Changes in type of disinfection to include chlorine gas or from other types of disinfection to chlorination – Section 22.10(2)(a)(i).	☐
Other changes in the type of disinfection – Section 22.10(2)(a)(ii).	☐
Physical changes or additions to the liquid stream treatment processes that could impact hydraulic, pollutant(s), or solids loadings to the treatment process – Section 22.10(2)(a)(iii).	☒
Physical changes or additions to the unit processes in the solids stream treatment processes that would change the characteristics of the recycle stream or biosolids – Section 22.10(2)(a)(iv).	☐
Physical change to the treatment works that is similar in scope to those listed in Section 22.10(2)(a), but is not precisely covered by this list – Section 22.10(2)(a)(v).	☐
A decrease or increase in the approved, rated design capacity of the treatment works, as long as no construction is to take place, or a change in the design flow portioning that does not change the design capacity - Section 22.10(2)(b).	☐
The addition of, or increase of a treatment process to generate reclaimed domestic wastewater following secondary treatment at an existing treatment plant that has previously received site location and design approval, including treatment changes to achieve more restrictive reclaimed water categories and standards – Section 22.10(2)(c).	☐
Change in the type of discharge employed from a surface water discharge to a ground water discharge, or vice-versa, at the same approved site location, subject to appropriate water quality planning targets Section 22.10(2)(d)(i).	☐
Change in the type of discharge employed including a partial or complete change from a surface water or ground water discharge to reclaimed water use subject to the requirements in the Reclaimed Domestic Wastewater Control Regulation (5 CCR 1002-84) – Section 22.10(2)(d)(ii).	☐

2. Site Amendment Description

Construct a new MBR plant to replace the existing lagoon treatment plant. Treatment plant capacity will remain unchanged.

3. Comparison of Approved and Proposed Treatment Facilities

a. Treatment Capacity	Approved Treatment Facility	After Proposed Treatment Process Modification(s)
Hydraulic Capacity: Maximum Month Average	0.0325 MGD	0.0325 MGD
Hydraulic Capacity: Peak Hour	0.13 MGD	0.13 MGD
Organic Loading Capacity: Maximum Month Average	65 lbs. BOD_5/day or lbs. cBOD/day	65 lbs. BOD_5/day or lbs. cBOD/day

b. Treatment Facility Process Description	Two pond aerated lagoon with settling pond followed by chlorine disinfection	Membrane bioreactor with UV disinfection
c. Effluent disposal method (check all that apply)		
Surface Discharge to watercourse	☒	☒
Location of discharge (stream segment and legal description)	☐	☐
Groundwater Discharge	☐	☐
Land application	☐	☐
Treated Effluent Reuse (Regulation 84)	☐	☐
Evaporation	☐	☐
Other (enter description below)	☐	☐

4. Additional Factors

Please identify any additional factors that might help the Division make an informed decision on your site location application.

Response:

COLORADO
Department of Public Health & Environment

Water Quality Control Division
Engineering Section

4300 Cherry Creek Drive South, B2
Denver, Colorado 80246-1530
CDPHE.WQEngReview@state.co.us
303-692-6298

Applicant Certification and Review Agencies Recommendation
Section 22.10 – Amendment of Existing Treatment Plant Site Location Approval

Project and System Information	
System Name	Community of Milner Wastewater Treatment Plant
Project Title	Wastewtaer Treatment Improvement Project
County	Routt
CDPS Permit No.	CO-0047449

1. Applicant Certification

Applicant Legal Representative			
Position/Title Director Env. Health	Typed Name Scott Cowman	Signature B. Scott Cowman B. Scott Cowman (Aug 24, 2022 13:13 MDT)	Date Aug 24, 2022
Email scowman@co.routt.co.us		Phone (970)870-5588	
The system legal representative is the legally responsible agent and decision-making authority (e.g. mayor, president of a board, public works director, owner). The Design Engineer is not the legal representative and cannot sign this form.			

2. Review Agency Notification

As required in Section 22.10(1), the site location application and any amendment proposal supporting documentation must be submitted to all appropriate local governments, local health authority, 208 designated planning and management agencies and other state or federal agencies, as defined in 22.6(2). The review agencies will have 15 working days from receipt of the application to review and comment directly to the Division unless a brief extension is requested in writing. Please list below the review agencies to whom the site location application and proposal has been submitted and attach a copy of the transmittal letter.

Designated Management Agency (i.e., Water Quality Authority, Watershed Association, Watershed Authority)		
Agency	Typed Name	Notification Date
Email		Phone
County, if the site is located in unincorporated areas of a county		
County Routt County	Typed Name Jay Harrington	Notification Date 8/24/22
Email jharrington@co.routt.co.us		Phone (970) 879-0108
City or Town, if the site is located within a City/Town boundary or within three miles of the City/Town boundary (if multiple, attach additional sheets as needed)		
City/Town	Typed Name	Notification Date
Email		Phone

Local Health Authority		
Agency Routt County Env. Health Director	Typed Name Scott Cowman	Notification Date 8/24/22
Email scowman@co.routt.co.us		Phone (970) 870-5588
208 Designated Planning Agency		
Agency	Typed Name	Notification Date
Email		Phone

Other State or Federal Agencies, if treatment works is located on or adjacent to a site that is owned or managed by a federal or state agency.		
Agency	Typed Name	Notification Date
Email		Phone
Other undesignated Basin Water Quality Authority, Watershed Association, Watershed Authority, etc.		
Agency	Typed Name	Notification Date
Email		Phone

APPENDIX B

SERVICE AREA MAP

LOCATION MAP
COMMUNITY OF MILNER
SANITATION SYSTEM

County Road
State Road
Discharge Pipe
Township
Sections
QuarterQuarter
System/Municipal Boundary
Parcels

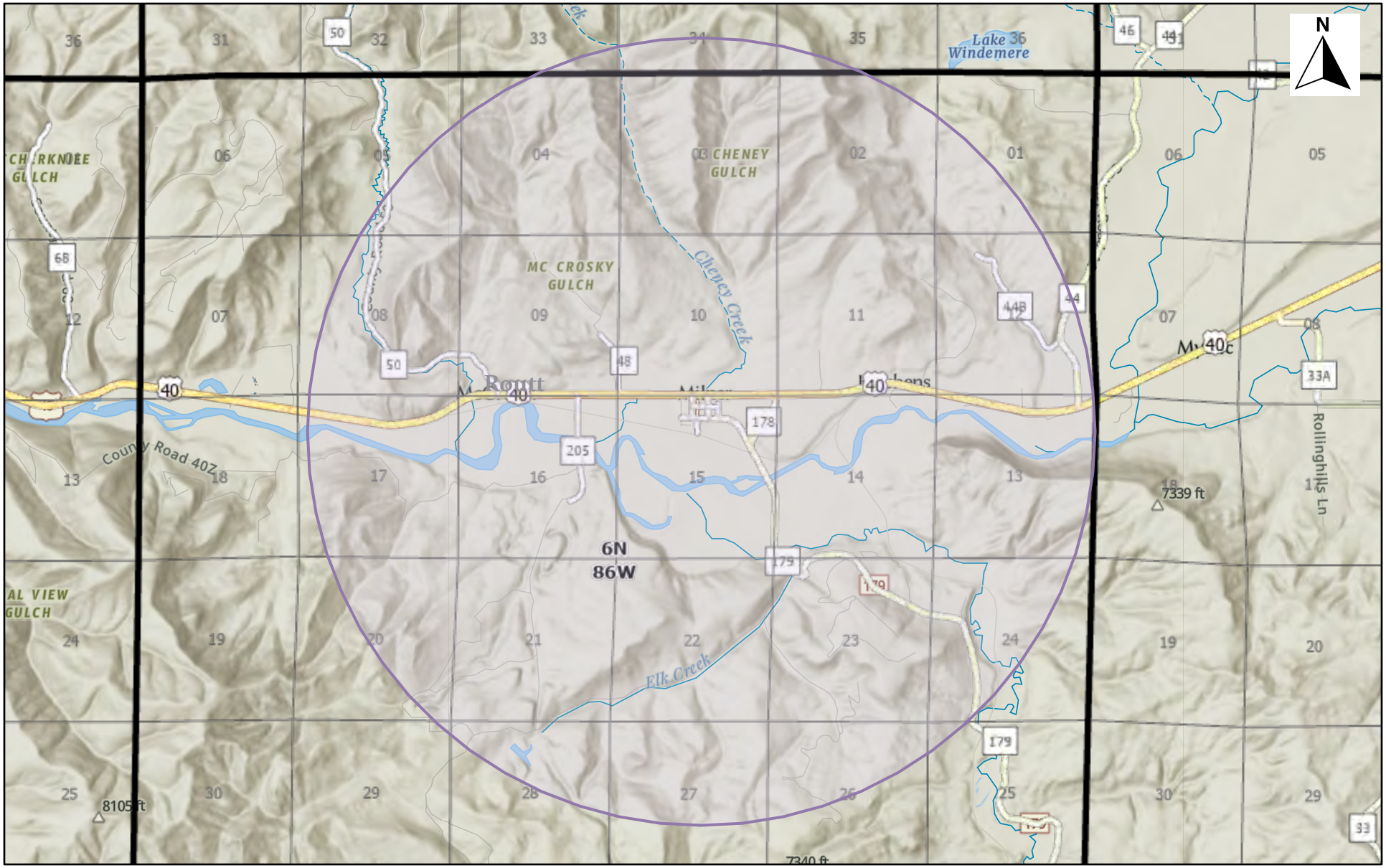
N

1 inch = 300 feet

APPENDIX C

ONE-MILE AND FIVE-MILE RADIUS MAPS

Milner One Mile Radius Map



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0 0.47 0.95 1.9 mi

0 0.75 1.5 3 km

Routt County Boundary

Override 1

Sections

Township

Roads - Routt County and Towns

Highway

Primary Public Road

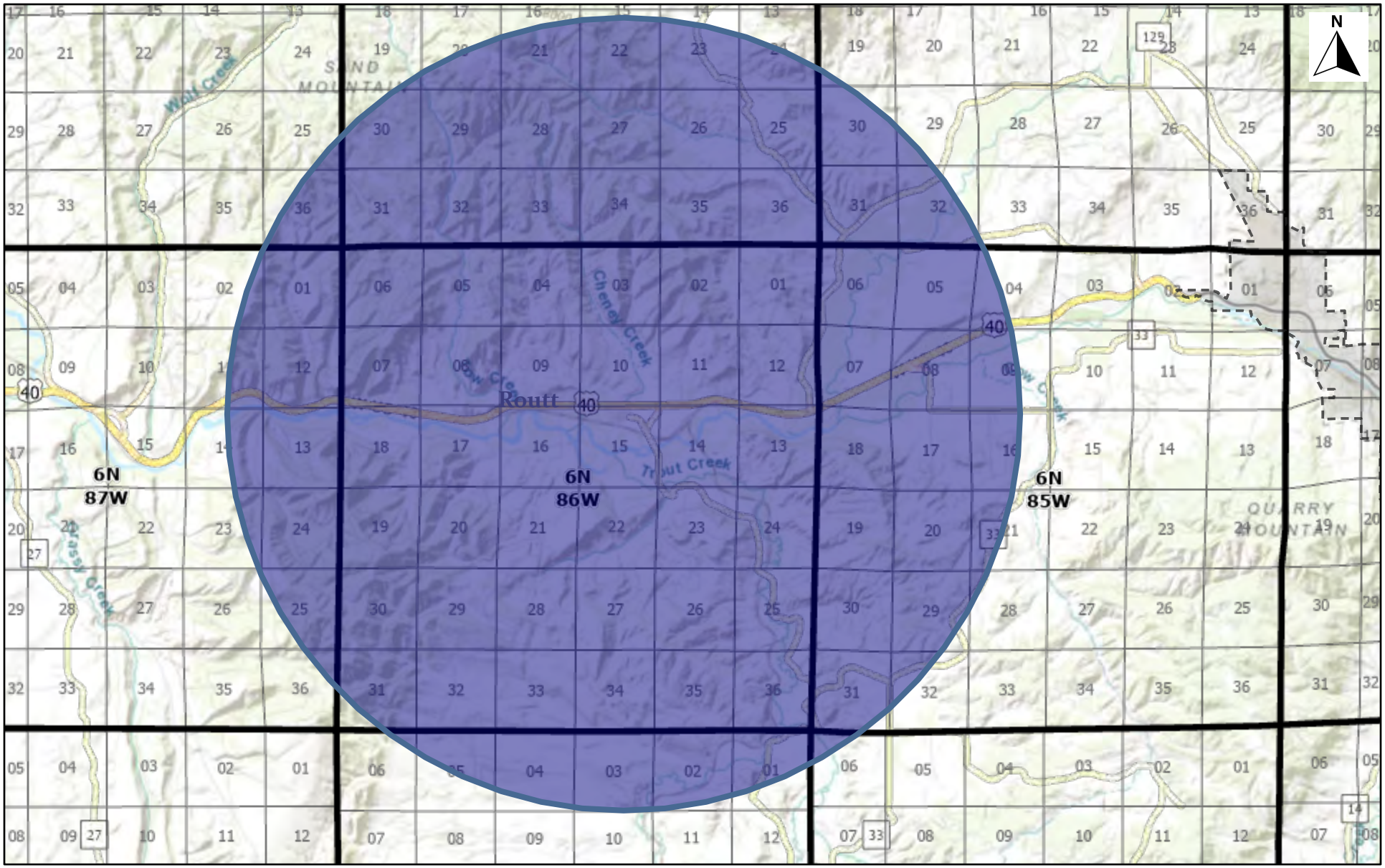
Local Public Road

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA,

Routt County GIS User

Sources: Esri, USGS | Esri, NASA, NGA, USGS, FEMA | County of Routt, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA | Source: Esri, DigitalGlobe, GeoEye,

Milner Five Mile Radius Map



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0 0.75 1.5 3 mi

0 1.5 3 6 km

Routt County Boundary

Town Boundaries

Override 1

Sections

Township

Roads - Routt County and Towns

Highway

Primary Public Road

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri

Routt County GIS User

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community | BLM Colorado | County of Routt, Bureau of Land Management, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS |

APPENDIX D

MAP OF ADJACENT PROPERTIES

Milner WWTP Ownership Map

5/24/2022, 11:47:43 AM

Routt County Boundary
Parcels
Subdivisions
Subdivisions
Addresses Routt County
Sections
Township
Roads - Routt County and Towns
Primary Public Road
Local Public Road
Private

1:3,000

0 0.03 0.06 0.11 mi
0 0.04 0.09 0.18 km

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Source: Esri,

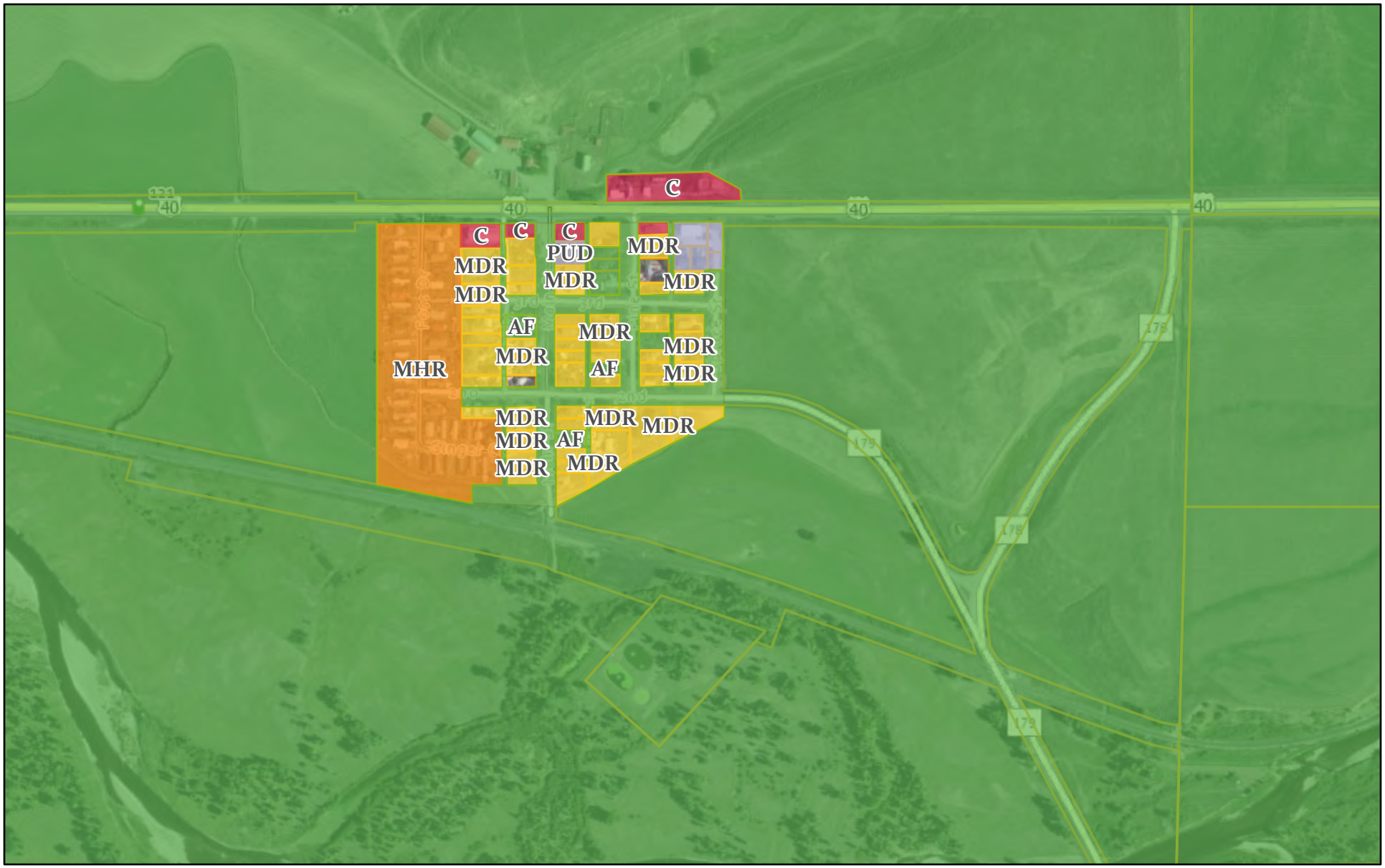
Routt County GIS User

Sources: Esri, USGS | Esri Community Maps Contributors, County of Routt, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA | Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

APPENDIX E

ZONING MAP

Milner Zoning Map



5/2/2022, 10:03:43 AM

1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Routt County Boundary

Parcels

Subdivisions

Subdivisions

Zoning Districts

Agriculture and Forestry

Commercial

Medium Density Residential

Mobile Home Residential

Planned Unit Development

Parcels for mailing addresses

Sections

Township

Mile Markers

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA,

Routt County GIS User

Sources: Esri, USGS | Esri, NASA, NGA, USGS, FEMA | Esri Community Maps Contributors, County of Routt, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US

APPENDIX F

EMERGENCY RESPONSE PLAN TEMPLATE

Section 1.
System Information

Keep this basic information easily accessible to authorized staff for emergency responders, repair people, and the news media.

System information

System Discharge Number		
System Name and Address		
Directions to the System		
Basic Description and Location of System Facilities		
Location/Town		
Population Served and Service Connections	_____ people	_____ connections
System Owner		
Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Emergency Plan		_____ Phone _____ Cell _____ Pager

Section 2.
Chain of Command – Lines of Authority

The first response step in any emergency is to inform the person at the top of this list, who is responsible for managing the emergency and making key decisions.

Chain of command – lines of authority

Name and Title	Responsibilities During an Emergency	Contact Numbers

Section 3.
Events that Cause Emergencies

The events listed below may cause wastewater system emergencies. They are arranged from highest to lowest probable risk.

Events that cause emergencies

Type of Event	Probability or Risk (High-Med-Low)	Comments

Section 4.
Emergency Notification

Notification call-up lists - Use these lists to notify first responders of an emergency.

Emergency Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Cell Phone**	**Email**
Local Law Enforcement				
Fire Department				
Emergency Medical Services				
Wastewater Operator (if contractor)				
Primacy Agency Contact				
Hazmat Hotline				
Interconnected Wastewater System				
Neighboring Wastewater System (not connected)				
RCAP Contact				

Priority Customers				
Organization or Department	**Name & Position**	**Telephone**	**Night or Cell Phone**	**Email**
Hospitals or Clinic(s)				
Public or Private Schools				
Public Water System				
Adult Care Facility				

State, Federal or Tribal Notification List

Organization or Department	Name & Position	Telephone	Night or Cell Phone	Email
State or Tribal Police				
Regulatory Agency State/Federal/Tribal				
Authorized Testing Laboratory				

Service / Repair Notifications

Organization or Department	Name & Position	Telephone	Night or Cell Phone	Email
Electric Utility Co.				
Electrician				
Gas/Propane Supplier				
Water Testing Lab.				
Sewer Utility Co.				
Telephone Co.				
Plumber				
Pump Supplier				
"Call Before You Dig"				
Rental Equipment Supplier				
Chlorine Supplier				
Pipe Supplier				

Media Notification List				
Organization or Department	**Name & Position**	**Telephone**	**Night or Cell Phone**	**Email**
Newspaper - Local				
Newspaper – Regional/State/Tribal				
Radio				
Radio				
TV Station				

Notification procedures

Notify wastewater system customers

Who is Responsible:	
Procedures:	

Alert local law enforcement, state, federal or tribal regulatory officials, and local health agencies

Who is Responsible:	
Procedures:	

Contact service and repair contractors

Who is Responsible:	
Procedures:	

Contact neighboring wastewater systems, if necessary

Who is Responsible:	
Procedures:	

Contact downstream water systems, if necessary

Who is Responsible:	
Procedures:	

Procedures for issuing a health advisory

Who is Responsible:	
Procedures:	

Other procedures, as necessary

Who is Responsible:	
Procedures:	

Section 5.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of emergency response.

Designated public spokesperson

Designate a spokesperson (and alternate) and contact regulatory agency for delivering messages to the news media and the public.

Designate a spokesperson and alternates

Spokesperson	Alternate

Section 6.
The Vulnerability Assessment

This is an evaluation of each wastewater system component to identify weaknesses or deficiencies that may make them susceptible to damage or failure during an emergency. It also assesses facilities for security enhancements that may guard against unauthorized entry, vandalism, or terrorism.

Facility vulnerability assessment and improvements identification

System Component	Description and Condition	Vulnerability	Improvements or Mitigating Actions	Security Improvements
Collection System				
Sewage Pumping				
Treatment				
Effluent Disposal				
Computer and Telemetry System				
Other Consider-ations				

Section 7.
Response Actions for Specific Events

In any event there are a series of general steps to take:

1. Analyze the type and severity of the emergency;
2. Take immediate actions to save lives;
3. Take action to reduce injuries and system damage;
4. Make repairs based on priority demand; and
5. Return the system to normal operation.

The following tables identify the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

A. Power outage

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

B. Collection system blockage or line break

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

C. Collection system pumping facilities failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

D. Treatment system failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

E. Effluent disposal failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

F. Chemical contamination

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

G. Vandalism or terrorist attack

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

H. Flood

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

I. Earthquake

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

J. Hazardous materials spill into collection system

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

K. Electronic equipment failure

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

L. Cyber attack

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

M. Other

Assessment	
Immediate Actions	
Notifications	
Follow-up Actions	

Section 8.
Returning to Normal Operation

Returning to normal operations

Action	Description and Actions

Section 9.
Plan Approval

Plan approval

This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	Signature	Date

APPENDIX G

ROUTT COUNTY PROPERTY CARD RECORD

Routt County Assessor's Office, Property Search

R0532392
38600 MAIN ST

Owner:
ROUTT COUNTY
522 LINCOLN AVE STEAMBOAT SPRINGS, CO
80487

Actual Value
$64,000

KEY INFORMATION

Account #	**R0532392**	Parcel #	**938151001**
Tax Area	**32 - *RE1* MID-ROUTT_Town of Milner & the surrounding area**		
Neighborhood	**MILNER**		
Subdivision	**-**		
Legal Desc	**TR IN SW4NE4 SEC 15-6-86 TOTAL 5.38A**		
Property Use	**UTILITY**		
Total Acres	**5.38**		
Owner	**ROUTT COUNTY**		
Situs Addresses	**38600 MAIN ST**		
Total Area SqFt	**-**		
Business Name	**-**		

ASSESSMENT DETAILS

	Actual	**Assessed**
Land Value	**$0**	**$0**
Improvement Value	**$0**	**$0**
Total Value	**$64,000**	**$18,560**
Exempt Value	**-**	**$-18,560**
Adjusted Taxable Total	**-**	**$0**

PUBLIC REMARKS

PUBLIC REMARK	**PUBLIC REMARK DATE**
2009;UPDATED SITUS PER EMY. EL	5/21/2009

LAND DETAILS

LAND OCCURRENCE 1 - RES LAND

Property Code	**9138 - COUNTY MISC LAND**	Economic Area	**OUTLYING AREAS**
Super Neighborhood	**-**	Neighborhood	**WEST - HAYDEN INFLUENCE**
Land Code	**RURAL WEST 5-19.99 AC**	Land Use	**GRAZING B**
Zoning	**AF**	Site Access	**YEAR-ROUND**
Road	**GRAVEL**	Site View	**AVERAGE**
Topography	**LEVEL**	Slope	**NOT AFFECTED**
Wetness	**SLIGHT**	Water	**COMM/PUBLIC**
Utilities	**ELECTRIC**	Sewer	**COMM/PUBLIC**
Acres	**5.38**	Description	**-**

BUILDINGS

EXTRA FEATURES / OUTBUILDINGS

No data to display

SALES HISTORY

No data to display

TAX AUTHORITIES

TAX AREA	TAX AUTHORITY ENTITY	AUTHORITY TYPE	2021 LEVY BY ENTITY	2021 TAX AREA LEVY	ENTITY % OF TAX BILLS
32	COLORADO RIVER WATER CONSERVANCY	Water Conservancy	0.501	73.056	0.70%
32	HAYDEN CEMETERY	Cemetery District	0.371	73.056	0.50%
32	HAYDEN SCHOOL DISTRICT	School District	43.158	73.056	59.10%
32	ROUTT COUNTY	County	16.991	73.056	23.30%
32	SOLANDT MEMORIAL HOSPITAL	Health Service District (Hospital)	0.343	73.056	0.50%
32	STEAMBOAT SPRINGS AREA FIRE PROTECTION DISTRICT	Fire Protection District	8.161	73.056	11.20%
32	UPPER YAMPA WATER CONSERVANCY DISTRICT	Water Conservancy	1.82	73.056	2.50%
32	WEST ROUTT REGIONAL LIBRARY	Library District	1.711	73.056	2.30%

PRIOR YEAR ASSESSMENT INFORMATION

YEAR	ACTUAL VALUE	ASSESSED VALUE	MILL LEVY	AD VALOREM TAXES
2021	$64,000	$0	73.06	$0
2020	$56,650	$0	73.36	$0
2019	$56,650	$0	73.14	$0
2018	$75,000	$0	74.24	$0
2017	$75,000	$0	60.08	$0
2016	$79,400	$0	58.73	$0


2nd Avenue
2nd Avenue
2nd Avenue
Pond Drive
15 6N86W

APPENDIX H

PNA ENVIRONMENTAL CHECKLIST

COLORADO
Department of Public Health & Environment

ENVIRONMENTAL CHECKLIST

Use the Discussion and References space at the end of each section to document your responses. For example, explain how you determined the level of impact and document the reasoning if checking PA (possible adverse) for any resource. Attach additional pages if necessary.

1. Brief project description, including identification of selected alternative:

   Replace existing lagoons with a mechanical treatment plant.

2. Describe if the project will improve or maintain water quality, and if the project addresses a TMDL, and/or Watershed Management Plan.

   The project will improve the effluent quality leaving the facility. Right now, the community has a lagoon based treatment system. The new mechanical plant will remove more BOD, TSS, ammonia, total nitrogen, and phosphorous.

3. Provide latitude and longitude of the proposed project (if a transmission / distribution / collection line identify the center point not the whole line):

   40.479947
   -107.021022

4. Provide discharge (WW) or source (DW) information: N/A □

   Effluent drain line to permitted location.

5. Provide NPDES/PWSID number:

   CO0047449

6. Provide primary waterbody name and waterbody ID, secondary name (if available), and State designated surface water use:

   Yampa River

7. Did your analysis consider how this project impacts community planning efforts in other areas (i.e. transportation, housing, etc.)?

The proposed project will have limited community impacts as it is replacing an existing facility in the same location.

Y = Yes N = No PA = Possible Adverse

1. Physical Aspects - Topography, Geology and Soils

Y ☐ N ☑ PA ☐ a. Are there physical conditions (e.g., steep slopes, shrink-swells soils, etc.) that might be adversely affected by or might affect construction of the facilities?

Y ☐ N ☑ PA ☐ b. Are there similar limiting physical conditions in the planning area that might make development unsuitable?

Y ☐ N ☑ PA ☐ c. Are there any unusual or unique geological features that might be affected?

Y ☐ N ☑ PA ☐ d. Are there any hazardous areas (slides, faults, etc.) that might affect construction or development?

Discussion and References:

2. Climate

Y ☐ N ☑ PA ☐ a. Are there any unusual or special meteorological constraints in the planning area that might result in an air quality problem?

Y ☐ N ☑ PA ☐ b. Are there any unusual or special meteorological constraints in the planning area that might affect the feasibility of the proposed alternative?

Discussion and References:

3. Population

Y ☐ N ☑ PA ☐ a. Are the proposed growth rates excessive (exceeding State projections, greater than 6% per annum for the 20 year planning period)?

Y ☐ N ☑ PA ☐ b. Will additional growth be induced or growth in new areas encouraged as a result of facilities construction?

Y ☐ N ☑ PA ☐ c. Will the facilities serve areas which are largely undeveloped areas at present?

Discussion and References:

4. Housing, Industrial and Commercial Development and Utilities

Y ☐ N ☑ PA ☐ a. Will existing homes or business be displaced as a result of construction of this property?

Y ☐ N ☑ PA ☐ b. Will new housing serviced by this facility affect existing facilities, transportation patterns, environmentally sensitive areas, or be in special hazard or danger zones?

Y ☐ N ☑ PA ☐ c. Will new housing create strains on other utilities and services - policies, power, water supply, schools, hospital care, etc.?

Discussion and References:

5. Economics and Social Profile

Y ☐ N ☑ PA ☐ a. Will certain landowners benefit substantially from the development of land due to location and size of the facilities?
Y ☐ N ☑ PA ☐ b. Will the facilities adversely affect land values?
Y ☐ N ☑ PA ☐ c. Are any poor or disadvantaged groups especially affected by this project?

Discussion and References:

6. Land Use

Y ☐ N ☑ PA ☐ a. Will projected growth defeat the purpose of local land use controls (if any)?
Y ☐ N ☑ PA ☐ b. Is the location of the facilities incompatible with local land use plans?
Y ☐ N ☑ PA ☐ c. Will inhabited areas be adversely impacted by the project site?
Y ☐ N ☑ PA ☐ d. Will new development have adverse effects on older existing land uses (agriculture, forest land, etc.)?
Y ☐ N ☑ PA ☐ e. Will this project contribute to changes in land use in association with recreation (skiing, parks, etc.), mining or other large industrial or energy developments?

Discussion and References:

7. Floodplain Development

Y ☑ N ☐ PA ☐ a. Does the planning area contain 100 year floodplains?
If yes -
Y ☐ N ☑ PA ☐ b. Will the project be constructed in a 100 year floodplain?
Y ☐ N ☑ PA ☐ c. Will the project serve direct or indirect development in a 100 year floodplain anywhere in the planning area?

Discussion and References:

The project is currently located on both the north and south sides of the railroad track. The land on the south side containing the lagoons in the 100-year floodplain. The

8. Wetlands

Y ☑ N ☐ PA ☐ a. Does the planning area contain wetlands as defined by the U.S. Fish and Wildlife Service?
If yes -
Y ☐ N ☑ PA ☐ b. Will any structure of the facility be located in wetlands?
Y ☐ N ☑ PA ☐ c. Will the project serve growth and development which will directly or indirectly affect wetlands?

Discussion and References:

9. Wild and Scenic Rivers

Y ☐ N ☑ PA ☐ a. Does the planning area contain a designated or proposed wild and scenic river?
If yes -
Y ☐ N ☑ PA ☐ b. Will the project be constructed near the river?

Y ☐ N ☑ PA ☐ c. Will projected growth and development take place contiguous to or upstream from the river segment?

Y ☐ N ☑ PA ☐ d. Will the river segment be used for disposal of effluent?

Discussion and References:

10. Cultural Resources (Archeological/Historical)

Y ☐ N ☑ PA ☐ a. Are there any properties (historic, architectural, and archeological) in the planning area which are listed on or eligible for listing on the National Register of Historic Places?

If yes -

Y ☐ N ☐ PA ☐ b. Will the project have direct or indirect adverse impacts on any listed or eligible property?

Discussion and References:

11. Flora and Fauna (including endangered species)

Y ☐ N ☑ PA ☐ a. Are there any designated threatened or endangered species or their habitat in the planning area?

Y ☐ N ☑ PA ☐ b. Will the project have direct or indirect adverse impacts on any such designated species?

Y ☐ N ☑ PA ☐ c. Will the project have direct or indirect adverse impacts on fish, wildlife or their habitat including migratory routes, wintering or calving areas?

Y ☐ N ☑ PA ☐ d. Does the planning area include a sensitive habitat area designed by a local, State or Federal wildlife agency?

Discussion and References:

12. Recreation and Open Space

Y ☐ N ☑ PA ☐ a. Will the project eliminate or modify recreational open space, parks or areas of recognized scenic or recreational value?

Y ☐ N ☑ PA ☐ b. Is it feasible to combine the project with parks, bicycle paths, hiking trails, waterway access and other recreational uses?

Discussion and References:

13. Agricultural Lands

Y ☐ N ☑ PA ☐ a. Does the planning area contain any environmentally significant agricultural lands (prime, unique, statewide importance, local importance, etc.) as defined in the EPA Policy to Protect Environmentally Significant Agricultural Lands dated September 8, 1978?

Y ☐ N ☑ PA ☐ b. Will the project directly or indirectly encourage the irreversible conversion of Environmentally Significant Agricultural Lands to uses which result in the loss of these lands as an environmental or essential food production resource?

Discussion and References:

14. Air Quality

Y ☐ N ☑ PA ☐	a.	Are there any direct air emissions from the project (e.g., odor controls, sludge incinerator) which do not meet Federal and State emission standards contained in the State Air Quality Implementation Plan (SIP)?
Y ☐ N ☑ PA ☐	b.	Is the project service area located in an area without an approved or conditionally approved SIP?
Y ☐ N ☑ PA ☐	c.	Is the increased capacity of the project greater than 1 mgd?
Y ☐ N ☑ PA ☐	d.	Do the population projections used in the facilities plan exceed the Sate or area wide projections in the SIP by more than 5%?
Y ☐ N ☑ PA ☐	e.	Does the project conform to the requirements of the SIP? (See EPA regulations under Section 316 of the Clean Air Act.)
Y ☐ N ☑ PA ☐	f.	Is the project inconsistent with the SIP of an adjoining State that may be impacted by the Project?
Y ☐ N ☑ PA ☐	g.	Does the project violate national ambient Air Quality Standards in an attainment or unclassified area?
Y ☐ N ☑ PA ☐	h.	Will the facilities create an odor nuisance problem?

Discussion and References:

15. Water Quality and Quantity (Surface/Groundwater)

Y ☐ N ☑ PA ☐	a.	Are present stream classifications in the receiving stream being challenged as too low to protect present or recent uses?
Y ☐ N ☑ PA ☐	b.	Is there a substantial risk that the proposed discharge will not meet existing stream standards or will not be of sufficient quality to protect present or recent stream uses?
Y ☐ N ☑ PA ☐	c.	Will construction of the project and development to be served by the project result in non-point water quality problems (sedimentation, urban stormwater, etc.)?
Y ☐ N ☑ PA ☐	d.	Will water rights be adversely affected by the project?
Y ☐ N ☑ PA ☐	e.	Will the project cause a significant amount of water to be transferred from one sub-basin to another (relative to the 7-day, 10 year flow of the diverted basin)?
Y ☐ N ☑ PA ☐	f.	Will stream habitat be affected as a result of the change in flow or stream bank modification?
Y ☐ N ☑ PA ☐	g.	Are stream conditions needed for deciding upon the required limitations inadequately specified in the 208 Plan? If so, have the wasteload allocations calculations been performed and approved by the State and EPA?
Y ☐ N ☑ PA ☐	h.	Is an Antidegradation Review required?
Y ☐ N ☑ PA ☐	i.	Will the project adversely affect the quantity or quality of a groundwater resource?
Y ☐ N ☑ PA ☐	j.	Does the project adversely affect an aquifer used as a potable drinking water supply?
Y ☐ N ☑ PA ☐	k.	Are there additional cost effective water conservation measures that could be adopted by community to reduce sewage generation?

Discussion and References:

16. Public Health

Y ☐ N ☑ PA ☐	a.	Will there be adverse direct or indirect noise impacts from the project?
Y ☐ N ☑ PA ☐	b.	Will there be a vector problem (e.g., mosquito) from the project?

Y ☐ N ☑ PA ☐ c. Will there be any unique public health problems as a result of the project (e.g., increased disease risks)?

Discussion and References:

17. Solid Waste (Sludge Management)

Y ☐ N ☑ PA ☐ a. Will sludge disposal occur in an area with inadequate sanitary landfills or on land unsuitable for land application?

Y ☐ N ☑ PA ☐ b. Are there special problems with the sludge that makes disposal difficult (hazardous, difficult to treat)?

Y ☐ N ☑ PA ☐ c. Is the technology selected for sludge disposal controversial?

Discussion and References:

18. Energy

Y ☐ N ☑ PA ☐ a. Are there additional cost effective measures to reduce energy consumption or increase energy recovery which could be included in this project?

Discussion and References:

19. Land Application

Y ☐ N ☑ PA ☐ a. Has a new or unproven technique been selected?

Y ☐ N ☑ PA ☐ b. Is there considerable public controversy about the project?

Y ☐ N ☑ PA ☐ c. Will the project require additional water rights or impact existing water Rights?

Y ☐ N ☑ PA ☐ d. Is the project multi-purpose?

Discussion and References:

20. Regionalization

Y ☐ N ☑ PA ☐ a. Are there jurisdictional disputes or controversy over the project?

Y ☐ N ☑ PA ☐ b. Is conformance with the 208 plan in question?

Y ☐ N ☑ PA ☐ c. Is the proliferation of small treatment plants and septic systems creating a significant health problem?

Y ☐ N ☑ PA ☐ d. Have inter-jurisdictional agreements been signed?

Discussion and References:

21. Public Participation

Y ☐ N ☑ PA ☐ a. Is there a substantial level of public controversy?

Y ☐ N ☑ PA ☐ b. Is there adequate evidence of public participation in the project?

Discussion and References:

22. Environmental Laws

Y ☐ N ☑ PA ☐ a. Does the project threaten to violate any State, Federal or local law or requirement imposed to protect the environment?

Discussion and References:

Prepared By: Adam Sommers, P.E. - Design Engineer
Name, Title, and Affiliation

Date: 5/20/2022

APPENDIX I

COST AND EFFECTIVENESS EVALUATION CERTIFICATION

COLORADO
Department of Public Health & Environment

Dedicated to protecting and improving the health and environment of the people of Colorado

Cost and Effectiveness Certification

Project Name: Community of Milner WWTP

Borrower: Routt County

As a condition for receiving assistance through the Colorado Water Pollution Control Revolving Fund (WPCRF), I certify that the cost and effectiveness evaluation has been performed per Section 602(b)(13) of the Water Resources Reform and Development Act of 2014 (WRRDA).

This cost and effectiveness evaluation included the following.

A. The borrower has studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is sought under this title; and

B. The borrower has selected, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation; and energy conservation, taking into account:

   a. the cost of constructing the project or activity;
   b. the cost of operating and maintaining the project or activity over the life of the project or activity; and
   c. the cost of replacing the project or activity.

Adam Sommers, P.E.
Licensed Professional Engineer (Printed)

8/10/2022
Date

Signature and Stamp of Licensed Professional Engineer

APPENDIX J

FEMA FLOOD PLAIN MAP

National Flood Hazard Layer FIRMette

FEMA

107°1'32"W 40°29'7"N

107°0'55"W 40°28'40"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

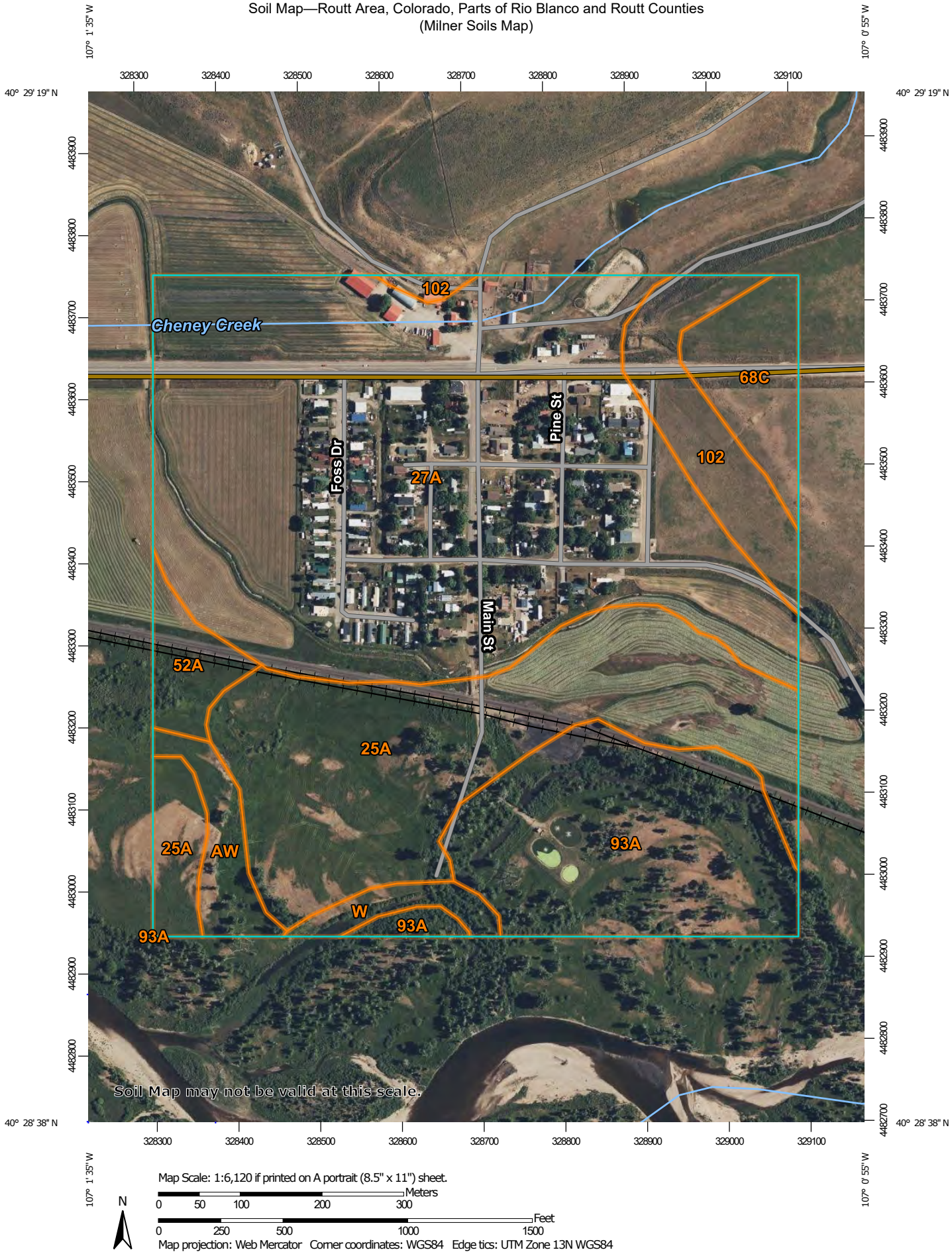
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/26/2022 at 4:45 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX K

NRCS SOILS MAP

Soil Map—Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
(Milner Soils Map)



Map Scale: 1:6,120 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Routt Area, Colorado, Parts of Rio Blanco and Routt Counties
Survey Area Data: Version 11, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 9, 2020—Jul 11, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
25A	Toponas loam, 0 to 3 percent slopes	36.0	22.8%
27A	Middlecreek loam, 1 to 5 percent slopes	74.5	47.2%
52A	Slocum loam, 0 to 3 percent slopes	3.5	2.2%
68C	Rabbitears loam, 3 to 12 percent slopes	6.4	4.0%
93A	Eachuston loam, 0 to 3 percent slopes	22.9	14.5%
102	Shermap loam, 3 to 25 percent slopes	8.6	5.5%
AW	Venable, mucky peat, 0 to 3 percent slopes, frequently flooded	3.7	2.4%
W	Water	2.2	1.4%
Totals for Area of Interest		**157.9**	**100.0%**

APPENDIX L

NATIONAL WETLANDS INVENTORY MAP

U.S. Fish and Wildlife Service
National Wetlands Inventory

Milner Wetlands Inventory

May 2, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

APPENDIX M

NEWTERRA MBR BROCHURE

Modular Decentralized Water & Wastewater Systems

Scalable, cost-effective solutions for development projects and existing wastewater treatment plant retrofits.

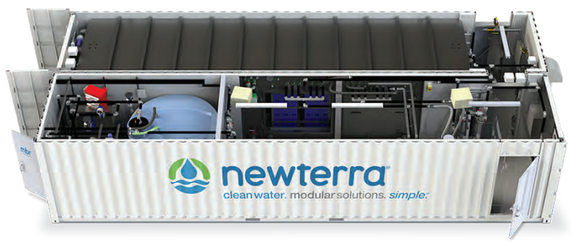
newterra®

clean water. modular solutions. *simple.*

newterra.com

Newterra Pre-Fabricated Modular Systems Are Designed To Grow As Your Development Grows

Newterra is leading the way with decentralized wastewater solutions that help you reduce project costs with a sustainable treatment approach. Our modular membrane bioreactor (MBR) systems are scalable – allowing treatment infrastructure to be added in stages as capacity requirements grow.



The Right Solution for a Wide Range of Projects

Newterra's innovative wastewater treatment systems are ideally suited to many types of projects, including:

- Greenfield & Retrofit Projects
- Existing Infrastructure Tie-ins
- Municipal WWTPs
- New Residential Developments
- Hotels, Resorts & Restaurants
- Campgrounds & Trailer Parks
- Mobile Home Communities
- Off-Grid & Remote Municipal Plants
- New Commercial Developments
- Service Area Expansions
- LEED® Certified & Green Buildings
- Schools & Hospitals
- Golf Courses
- Sports & Recreational Facilities
- Highway Rest Areas

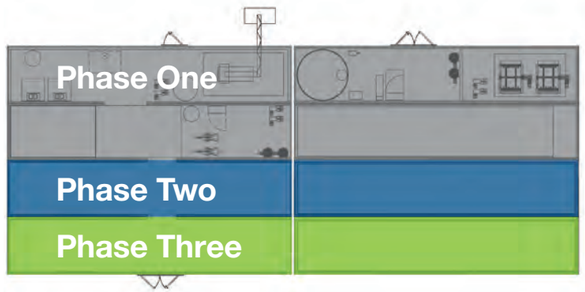
Self-Contained and Enclosed Systems

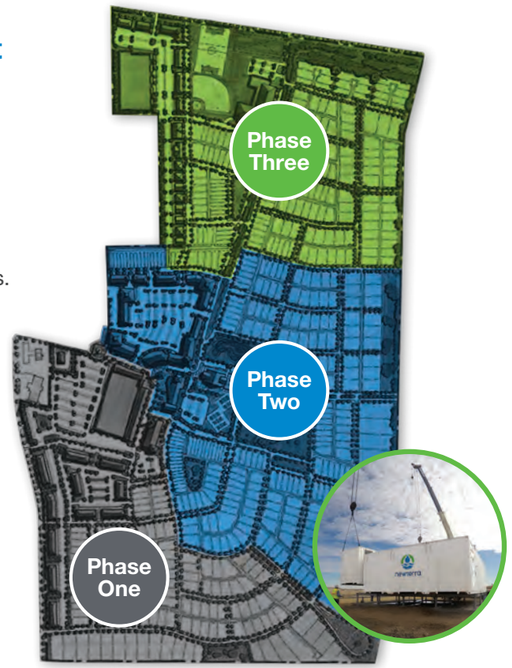
Newterra MBR wastewater systems are modular, and can be configured as fully self-contained units that can be clad with a variety of materials to blend in with surrounding structures, or integrated into new or existing treatment structures. They are built in our MET-certified manufacturing facility and have UL electrical certification.

Newterra systems can be clad to blend in with their surroundings *(above)*, or be loose-shipped for use with inground tanks and buildings *(inset, right)*.

Add Infrastructure with Each Phase of a Project

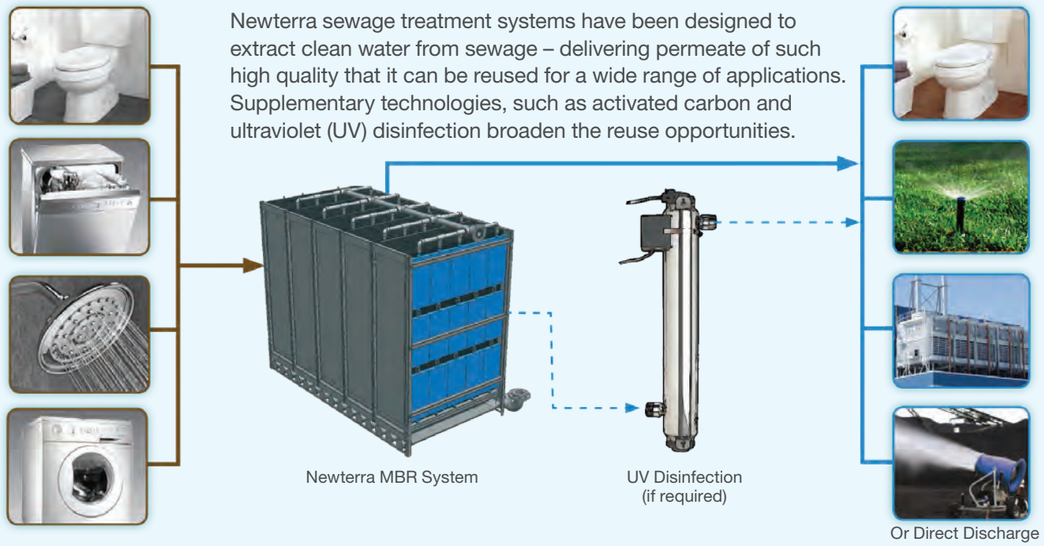
Our modular, scalable treatment technology allows you to phase in wastewater infrastructure in parallel with the treatment demands of your development. Newterra MBR systems can handle high loads, and are very resilient to flow and loading fluctuations. They are also extremely space efficient – reducing land requirements and providing more options of where the plant can be located. Newterra systems can be loose-shipped or pre-manufactured, and we offer you the option of renting or leasing to minimize your initial capital expenditures.





Sewage Treatment That Offers A Wide Range of Reuse Applications

Newterra sewage treatment systems have been designed to extract clean water from sewage – delivering permeate of such high quality that it can be reused for a wide range of applications. Supplementary technologies, such as activated carbon and ultraviolet (UV) disinfection broaden the reuse opportunities.



Compact, Operator-Friendly & Sustainable

Designed & Built for Minimal Maintenance

Newterra MBR systems are field proven in some of the most extreme conditions on the planet. Feedback from operators has been a key ingredient in the development and refinement of our low maintenance solutions:

- Intuitive, user-friendly controls and instrumentation
- Built-in telemetry & remote monitoring reduce plant visits by operator
- Air scouring & periodic membrane relaxation minimize CIP requirements
- Built-in redundancy to eliminate downtime
- Proven in a wide range of regions, climates and altitudes

Ambient Temperatures	High Altitudes
-40˚F to +104˚F	13,125 ft.
-40˚C to +40˚C	4,000 m

*Integrated cellular telemetry and our **SiteLink**™ technology allow 24/7 monitoring and operation by your staff, and proactive troubleshooting by our technical team*

Cost-Effective for New Facilities & Retrofits

At Newterra, we offer both custom-designed and pre-engineered, packaged MBR treatment systems for new facilities. Our technology is also very well suited to retrofitting conventional BNR and ENR plants to comply with higher regulatory standards or expand capacity. Newterra MBR modules can be easily incorporated into existing clarification tanks – more than tripling plant capacity within the current footprint and eliminating the need for costly infrastructure expansion.

A Global Water Technology Leader

Newterra is recognized as a leader in the development of modular treatment solutions for water, sewage, wastewater and groundwater remediation for industrial, municipal, land development, commercial & residential markets. Our heritage of innovation in providing clean water solutions dates all the way back to 1863. Over that time, Newterra has grown to over 200 people and we've installed thousands of treatment systems – some of which operate in the most extreme conditions on the planet.

Full Control from Start to Finish

At Newterra, we take full control of virtually every aspect of the treatment systems we build – from process design and engineering to manufacturing, installation, operations and ongoing parts & service support. That also includes manufacturing our own MicroClear® UF membranes in Newterra's ISO 9001:2008 certified facility. This award-winning approach ensures Newterra treatment systems meet our high standards for quality and on-time delivery.

200+ Employees

40+ Professional Engineers

10,000+ Installations Worldwide

newterra®
clean water. modular solutions. *simple.*

BEST MANAGED COMPANIES Platinum member

2015 Global Challenger 100

1.800.420.4056 | newterra.com

APPENDIX N

NEWTERRA PROPOSAL FOR MILNER WWTP

clean water. modular solutions. *simple.*™

Community of Milner MBR System
BUDGETARY PROPOSAL 2207813R1
32,500 US Gallons / Day

Newterra MEMBRANE BIOREACTOR WASTEWATER TREATMENT SYSTEM

Submitted To:

AquaWorks DBO

3252 N Williams St
Denver, CO 80205
USA

Adam Sommers
303.477.5915
adam@aquaworksdbo.com

Submitted By:

Chris Harris

Regional Sales Manager – South Central

13111 South Ridge Circle

Leander, TX 78641

512 417 2271

charris@newterra.com

Prepared By: Olena Mozharovska – Applications Engineering

2022-06-30

Newterra Inc.
112 North Curry Street, Carson City, NV, 89703
(800) 420-4056/www.newterra.com

Contents

Our Pledge to You

At Newterra, we recognize that our performance will directly affect the outcome of your project. That's what drives our Total Commitment to Project Success. This means that if we do not live up to your expectations, we will do whatever it may take to resolve an issue immediately.

Newterra has the distinction of being a two-time recipient of the prestigious Global Cleantech Top 100 Companies and has been named as one of Canada's Best Managed Companies for eight consecutive years.

Newterra Inc.
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(800) 420-4056/www.newterra.com

1 Introduction

1.1 Advantages of Newterra MBR System

The Newterra MBR system employs membrane biological reactor (MBR) technology with submerged ultrafiltration membranes. The system is designed to be the simplest, most operator-friendly membrane technology available in the market. The Newterra MBR system produces ultra-clean water (solids free effluent) which effectively meets any water standards for discharge and reuse.

The Newterra MBR system is a packaged wastewater treatment plant with modular design features. The system comes complete with containerized screen, biological treatment, and membrane filtration. The plant is housed inside modified high-cube shipping containers or prefabricated buildings - completely pre-assembled, pre-piped, pre-wired and pre-tested, ready for a quick site installation and start-up. The advantages that the Newterra MBR system offers include:

- Absolute Physical Barrier for Contaminants
- Short Delivery Period
- Factory Assembled & Tested
- Minimal Site Work Required
- Reliable & Low Maintenance System
- Compact Footprint
- Minimal Noise & Odourless Operation

Newterra Inc.
112 North Curry Street, Carson City, NV, 89703
(800) 420-4056/www.newterra.com

2 Technical Proposal

2.1 Design Basis

Design Parameters

PARAMETER	DESIGN VALUE	UNIT
Average daily flow (ADF)	32,500	gpd
Maximum Month Flow (MMF)	39,000	gpd
Maximum Daily Flow (MDF)	65,000	gpd
Peak Instantaneous Inlet Flow	135	gpm
Site power[1]	Three-phase, 480VY, 60Hz Maximum Available Fault Current: 10,000 Symmetrical RMS Amps	
System area classification	According to NFPA 820, 2016 Edition	
Ambient temperatures	0 to 92	°F
Elevation	6,520	ft

NOTES:

1. The system will not be rated for service entrance but this can be provided. Please contact Newterra to discuss if this is desired.

Wastewater Characteristics

Parameter	UNIT	Design Value
Chemical Oxygen Demand (COD) [1]	mg/L	480
Biochemical Oxygen Demand (BOD_5) [1]	mg/L	240
Total Suspended Solids (TSS) [1]	mg/L	240
Total Kjeldahl Nitrogen (TKN) [1]	mg/L	50
Total Phosphorus (TP) [1]	mg/L	10
Fat, Oil and Grease (FOG) [1]	mg/L	30
Water Temperature [1]	°F	50 to 77
Prohibited Chemicals/Compounds [3]	Not Present	
Grinder Pumps	Not Present Upstream of MBR	

NOTES:

1. Noted values are assumed. ***Any variance to assumed parameter values may require system modification at the sole responsibility of the purchaser. A change order will be required to proceed with modifications and will delay delivery***
2. A complete list of prohibited chemicals is included in the membrane maintenance manual. ***Use of any of these chemicals will nullify all warranties.***

Effluent Quality

Parameter	Units	Regulatory Limits	Design Value
Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)	mg/L	< 30	< 5
Total Suspended Solids (TSS)	mg/L	< 30	< 1
Total Ammonia Nitrogen (TAN)	mg/L	< 20	< 1

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Chemical Consumption

CHEMICAL	CONCENTRATION	FUNCTION	DESIGN VALUE [1]	UNIT
Sodium Hypochlorite	12% Solution	Membrane cleaning	5.0	gal/week
Citric Acid	30% Solution	Membrane cleaning	4.0	gal/week
Sodium Hydroxide[2]	50% Solution	pH Correction / Alkalinity addition	-	gal/day
Aluminum Sulphate[3]	48% Solution	Phosphorous reduction	-	gal/day
MicroCgTM(2000) [3]		Carbon Source	-	gal/day

NOTES:

1. Chemical consumption values are estimated based on the system operating at ADF and average loading and will vary based on actual operational conditions.
2. It is assumed that there is sufficient alkalinity such that sodium hydroxide will not be required. However, a chemical dosing pump has been provided in the event that there is insufficient alkalinity.
3. It is not required based on design influent and effluent conditions, but dosing capabilities are included in the event that it is needed.

Waste Activated Sludge (WAS) Production

LOCATION/HANDLING STAGE	VOLUME [2]	UNIT	SOLIDS CONTENT [1]	UNIT
WAS Volume	338	gpd	2%	w/w dry solids

NOTES:

1. WAS Production values are estimated based on the system operating at ADF and average loading and will vary based on actual operational conditions.

2.2 Process Description

Membrane bioreactor (MBR) treatment technology is a simple, yet effective combination of an activated sludge biological treatment process with membrane filtration. The ultrafiltration (UF) membranes act as a physical barrier against the passage of all particulate solids, unlike the gravity settling of mixed liquor in the conventional activated sludge process, where separation is not complete. As a result, the MBR can operate at a much higher mixed liquor suspended solids (MLSS) concentration (typically 8,000 to 12,000 mg/L vs. 2,000 to 4,000 mg/L in conventional activated sludge system). This results in a robust, versatile, and ultra-compact wastewater treatment system. In addition, the high concentration of biomass inventory in the MBR system provides resilience to changes in influent quality.

Flow-Equalization

Throughout the day the flow and strength of the wastewater will vary. To accommodate this, an equalization tank will buffer the flow and homogenize the loading. The equalization tank is aerated to maintain an aerobic environment to reduce odors and to maintain suspension of solids and pumps transfer wastewater to biological treatment.

Fine Screening

Raw wastewater entering the MBR system contains particulates and solids that could damage the equipment and membranes down-stream. Fine screening protects the down-stream equipment by removing large solids and fibrous material.

Biological Treatment

In the aerobic zone, the influent wastewater is combined with return activated sludge from the membrane tank. Fine bubble diffusers create an aerobic environment where the organics contributing to biological oxygen demand (BOD) and ammonia (TAN) are oxidized by the biology. Dissolved oxygen is continuously measured and aeration blowers controlled to maintain it in the range of 2 to 3 mg/L for process optimization and energy savings.

pH Correction and Alkalinity Addition

As organics and ammonia are oxidized alkalinity is consumed lowering the pH of the mixed liquor. To maintain the pH in the proper range and replenish alkalinity a sodium hydroxide solution is dosed into the mixed liquor, as required.

Membrane Filtration

After being treated biologically, the treated effluent is separated from the mixed liquor and solids by our membrane modules and the permeate extraction system. The membrane modules are continually air scoured to induce flow of mixed liquor over the membrane surface and prevent fouling and buildup of solids on the membrane surface without the use of chemicals.
The mixed liquor is then transferred to the inlet of the biological treatment to maintain even distribution of solids throughout the system and to introduce activated biology to the raw wastewater.

Effluent Disinfection

The UF membrane removes 99.9999% of bacteria and 99.99% of viruses. For additional disinfection and/or redundancy the effluent will pass through a UV reactor.

Waste Activated Sludge (WAS) Handling

As solids-laden wastewater enters the system, suspended bacteria grow and solids-free effluent is discharged, the suspended solids concentration in the mixed liquor (MLSS) will increase. To maintain the proper level of MLSS, solids must be removed from the system as Waste Activated Sludge (WAS) which is mixed liquor discharged from the aerobic tank at approximately 1% dry solids by weight.

WAS is discharged to a tank for holding and thickening. The holding tank is aerated to maintain an aerobic environment to reduce odors. In the thickening process, the WAS is allowed to settle and supernatant is pumped off, and returned to the MBR, thickening the sludge in the holding tank. By thickening the sludge to approximately 2% dry solids by weight, the total volume that must be disposed of is decreased, extending holding time and reducing operational costs. Level control in the tank indicates when the tank should be decanted or a vacuum truck should be scheduled to dispose of the WAS.

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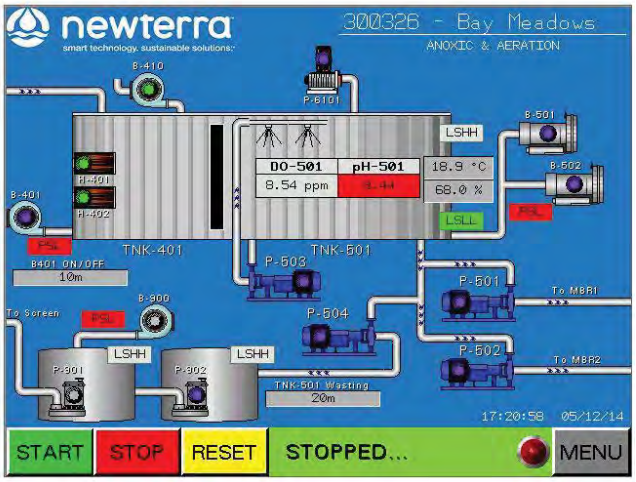
Modular Building

With 15 years of experience containerizing equipment Newterra has developed a modular building system that that includes insulation, HVAC, interior and exterior lighting, spill containment and sumps, access doors, and other features facilitating operations.
All equipment installation, wiring, and piping internal to a container is done in the ideal conditions of our climate-controlled, manufacturing facility with full access to proper tools, equipment and engineering support.

The full system will be assembled and undergo comprehensive Factory Acceptance Testing (FAT) before it leaves our facility. This rigorous testing prior to shipping to helps eliminate downtime when the system arrives on site.

Control & Automation System

Newterra's control and automation system combines a high level of instrumentation, an advanced PLC, and in-house custom programming to deliver a system that offers tremendous optimization capabilities yet requires no operator intervention for day to day operation.
The user interface can be accessed on-site from control panel mounted touchscreen HMIs or remotely from a computer over the internet with purchase of a telemetry package and annual subscription service.
Also with the telemetry package, alarm messages can be transmitted by email or text message to alert operators to issues, even when the operators are not on site.
All important information is logged so trends can be monitored to ensure the long term successful operation of the Newterra system.



2.3 Scope of Supply

2.3.1 Equipment Scope of Supply

Flow Equalization (Tank by others, equipment shipped loose for installation on site by others)

One (1) train total, each train includes:

- In-ground poured on site Equalization tank (Recommended working volume is at least 13,000 gal, maximum SWD of 8.20 ft)
  - Coarse bubble air diffuser grid
  - High level alarm switch
  - Low level alarm switch
  - Level transmitter
- Two (2) air mixing blowers (Installed in Newterra enclosure)
  - One (1) blower duty, one (1) blower common standby (shared with Sludge Holding Tank)
  - Regenerative
  - Inlet filter silencers
  - Check valves
  - Isolation valves
  - Temperature gauges
  - Pressure gauges
  - Low pressure alarm switch
- Two (2) screen feed pumps (Shipped loose, installed by others)
  - One (1) pump duty, one (1) pump standby
  - Myers
  - Submersible
  - Inlet flow transmitter (common between pumps – installed in Newterra enclosure)
  - Isolation valves
  - Check valves
  - Rail system for pumps removal

Fine Screening

One (1) train total, each train includes:

- One (1) fine screen
  - One (1) screen duty
  - Rotary brush
  - Automatic cleaning 2mm perforated plate
  - Critical spares (brushes and motor)
- Gravity discharge to Aerobic tank

Biological Treatment (Tank by others, equipment shipped loose for installation on site by others)

One (1) train total, each train includes:

- In-ground poured on site Aerobic tank (Recommended working volume is at least 11,825 gal, maximum SWD of 8.20 ft)
  - Fine bubble air diffuser grid
  - pH transmitter
  - Dissolved oxygen (DO) transmitter
  - High level alarm switch
  - Low level alarm switch
  - Level transmitter

- Two (2) aeration blowers (Installed in newterra enclosure)
  - One (1) blower duty, one (1) blower standby
  - Positive displacement
  - VFD controlled
  - Inlet filter silencers
  - Check valves
  - Isolation valves
  - Temperature gauges
  - Pressure gauges
  - Low pressure alarm switch
- Three (3) membrane feed pumps
  - Two (2) pumps duty, one (1) pump shelf spare
  - Barnes
  - Submersible
  - Isolation valves
  - Check valves
  - Rail system for pumps removal
- One (1) WAS pump
  - Barnes
  - Submersible
  - Isolation valve
  - Check valve
  - Rail system for pumps removal

Membrane Filtration

Two (2) trains total, each train includes:

- Membrane tank
  - All wetted components are stainless steel
  - Sample port for MLSS testing
  - Viewing window
  - Ground level access hatch
  - High level alarm switch
  - Level control switch
- Seven (7) submerged UF membrane modules with
  - Stainless steel housing
  - Air scouring diffusers
- Permeate extraction header
  - Clear PVC pipe sections for visual permeate monitoring
  - Membrane module isolation valves
- Two (2) permeate extraction pumps
  - One (1) pump duty, one (1) pump standby
  - Centrifugal
  - VFD controlled
  - Vacuum transmitter
  - Vacuum gauge
  - Isolation valves
  - Check valve
  - Pressure gauge
  - Sample port
  - Flow transmitter (Common between two permeate pumps)

- Membrane Backwash System (Common between membrane trains)
  - Holding tank with level switches
  - Automated permeate fill valve
  - Automated clean water fill valve
  - Flow transmitter
  - Automated 3-way backwash valves
- One (1) air bleed pump
- One (1) air scouring blower
  - Regenerative
  - Inlet filter silencer
  - Check valve
  - Isolation valve
  - Temperature gauge
  - Pressure gauge
  - Low pressure alarm switch
- Two (2) backwash pumps
  - One (1) pump duty, one (1) pump standby
  - Centrifugal
  - VFD controlled
  - Vacuum transmitter
  - Vacuum gauge
  - Isolation valves
  - Check valve
  - Pressure gauge
  - Sample port
  - Flow transmitter (Common between two backwash pumps)

Chemical Dosing

One (1) train total, each train includes:

- One (1) Sodium Hydroxide dosing pump
  - Diaphragm pump
  - Foot valve
- Spill containment for drum
- One (1) Citric Acid dosing system
  - Diaphragm pump
  - Foot valve
- Spill containment for drum
- One (1) Sodium Hypochlorite dosing system
  - Diaphragm pump
  - Foot valve
- Spill containment for drum
- One (1) Micro-C dosing system
  - Diaphragm pump
  - Foot valve
- Spill containment for drum
- One (1) Aluminum Sulphate dosing system
  - Diaphragm pump
  - Foot valve
- Spill containment for drum

Effluent Disinfection

One (1) train total, each train includes:

- Two (2) UV reactors Hallett 1000W
  - One (1) duty, one (1) redundant
  - Piped in parallel series?
  - Bypass valves

Sludge Holding & Thickening (Tank by others, equipment shipped loose for installation on site by others)

One (1) train total, each train includes:

- In-ground poured on site Sludge Holding Tank (Recommended volume is at least 7,122 gal, maximum SWD of 8.20 ft)
  - Coarse bubble air diffusers
  - High level alarm switch
  - Low level alarm switch
  - Level transmitter
- One (1) aeration blower (Installed in Newterra enclosure)
  - Regenerative
  - Inlet filter silencer
  - Check valve
  - Isolation valve
  - Temperature gauge
  - Pressure gauge
  - Low pressure alarm switch
- Two (2) decanting pumps
  - One (1) pump duty, one (1) pump standby
  - Barnes
  - Submersible
  - Isolation valve
  - Check valve
  - Rail system for pumps removal

Odour Control

Two (2) trains total, each train includes:

- One (1) activated carbon vessel
  - Pressure gauges
  - Vacuum gauges
  - Inlet moisture separator (only for one train)
  - Ventilation blower

System Enclosures

One (1) 40'x8' Modified High-Cube Shipping Containers and one (1) 10'x8' Framed Building with siding.
MET certified, built to NEC standards with all wiring complete and all equipment pre-piped factory tested and mounted in enclosure.
New high-cube modified shipping containers with the following features:

- Exterior paint
- Lifting eyes on upper corners
- Coated plywood floor

    - Sump basins with drain
- Welded steel double doors with safety window and push/crash bar lever
- Barn-style double doors
- Interior lighting
- Exterior lighting
- Insulation
- Heating
- Ventilation fan
- Passive vent louvers with hood
- Low temperature alarm switch
- Emergency stop switch
- Duplex 15 Amp GFI receptacle for heat trace inlet and discharge

Control System Module

PLC based control panel with the following standard features:

- MET certification
- AIC rating of 10000
- NEMA 12 panel enclosure
- Primary circuit protection
- Main power block
- Branch circuit protection with circuit breakers for motors
- Motor starters with overload protection
- Variable frequency drives where required
- Branch circuit protection with circuit breakers for powered devices
- PLC control system
- 24 VDC IS power supply
- Intrinsically safe barriers for switches in classified areas
- Alarm notification in the event of a main power failure
- Wired and installed
- Factory tested prior to shipping

Outside cover of panel to contain the following:

- System ready light
- Red alarm indicator light
- Programmable touch screen with:
    - Colour P&ID display
    - Display of measurements recorded from any transmitters present in system
    - System on/off control
    - Safety control over all valves and motors with timed delay when in Hand position
    - Timers for solenoid valves and motors present in system
    - Alarm indicators with reset function
    - Run indicators for system components
    - USB port for datalogging download (USB key included)
    - Alarm reset button
- Emergency stop button

Operation and Maintenance Manual

- Operating instructions for all treatment system components
- Copy of operating manual for each piece of equipment *(Digital copy only)*

- Summary of system components
- Summary of system operation principles
- Summary of operation controls and failsafes
- Summary of maintenance requirements for each piece of equipment
- One digital copy provided
- All documentation provided in English

Factory Acceptance Testing (FAT)

- Material receipt inspection
- Assembly verification
- Leak test/set up verification
- Functional challenge
- FAT summary & deviation report

2.4 Customer's Scope of Supply

Newterra does not include the following unless expressly detailed in this proposal:

- Installation of loose shipped equipment supplied by Newterra
- Placement and anchoring (if required) of equipment
- Interconnecting piping supply and installation
- Interconnecting electrical and controls supply and installation including connection inside Newterra's control panel
- Electrical power supply to our electrical panel, lightning, grounding, etc.
- Permitting
- Potable water supply to the plant site for plant hydraulic test during startup
- Seed sludge
- Wastewater testing
- Chemicals supply and storage
    - NOTE: Based on local regulations, additional safety equipment may be required to store and handle chemicals on the site which have not been included as part of this proposal. This may include but be limited to: eye wash stations, safety showers, spill containment, secondary containment, isolation curtains, isolated ventilated bulk storage buildings, personal protective equipment, constant ventilation systems, vapor suppression equipment, and spill containment equipment. Newterra can provide pricing for these options upon request.
- Treated effluent and waste sludge disposal
- All civil work including design
    - Tank sizing as per Newterra supplied PFD, to be confirmed during detailed design
- Anything not mentioned in "Scope of Supply" above

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3 Commercial Proposal

3.1 Price Breakdown

Pricing

ITEM	PRICE
Budgetary Equipment Purchase Price	$ 574,800
Sales Tax on Equipment	Not Included
Total System Price	**$** 574,800

NOTES: Prices do not include any applicable taxes or duties unless otherwise stated.

Onsite visits

ITEM	PRICE
Estimated Onsite Startup	$ 26,375
Trip 1 • Includes two (2) 8-hour days of Site Acceptance Testing by one (1) factory trained **Newterra** representative • Includes expenses for travel, meals and accommodation • Additional days on-site to be billed at $1,200.00/day per technician plus expenses for travel, meals and accommodation	9,500
Trip 2 • Includes five (5) 8-hour days of onsite startup/commissioning by one (1) factory trained **Newterra** representative • Includes expenses for travel, meals and accommodation (weekend travel will be required with additional cost) • Additional days on-site to be billed at $1,200.00/day per technician plus expenses for travel, meals and accommodation	16,875

NOTES: Price is provided for general information and may be changed at time of order.

Freight Pricing

ITEM	PRICE
Estimated Equipment Freight to Site From Brockville, ON to Milner, CO	$ 8,595

NOTES: Price is provided for general information and may be changed at time of order.

3.2 Pricing Notes

- The pricing provided is contingent upon acceptance of Newterra's payment terms and Terms & Conditions outlined in this proposal and may be adjusted if other payment terms or T&C's are applied at time of order
- Newterra's pricing is based on reasonable market variability in our supply chain. In the event of extreme volatility, defined as an increase of greater than 10% of the Industrial Product Price Index (IPPI) in value

from the month of the proposal date to the month of submission of engineering documentation for approval, Newterra reserves the right to adjust the project price. IPPI is obtained from Statistics Canada, reference table 18-10-0265-02.

- All prices are quoted in United States Dollars (USD)

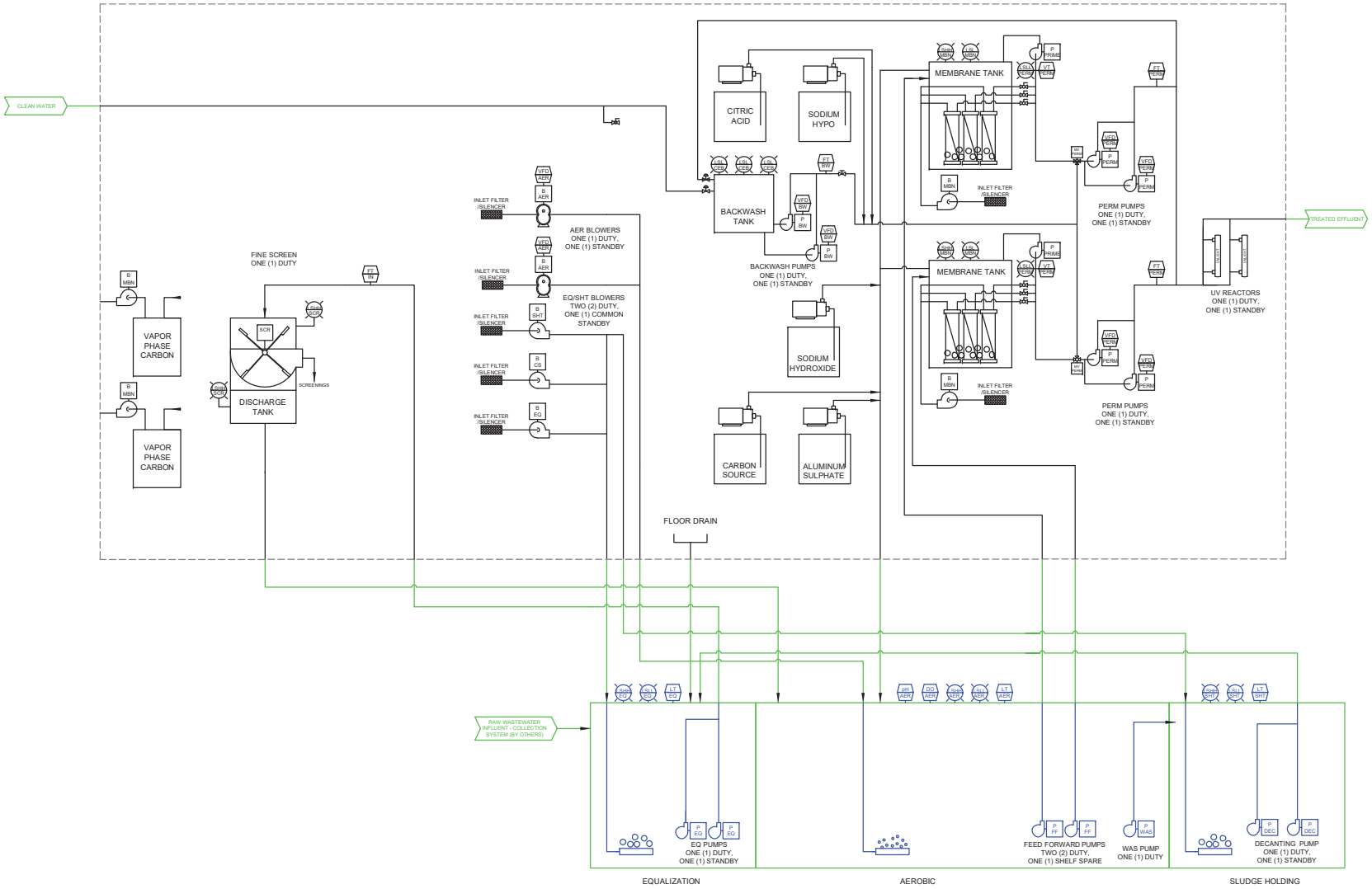
3.3 Payment Terms

- 25% on order acceptance (Due net 30 days or prior to shipment whichever is first)
- 25% on submittal of drawings for approval (Due net 30 days or prior to shipment whichever is first)
- 25% on approval to order materials (Due net 30 days or prior to shipment whichever is first)
- 25% due prior to shipment (invoice to be supplied 30 days in advance)

3.4 Terms & Conditions

- **Newterra**'s attached standard terms and conditions apply
- **Newterra**'s attached standard warranty applies

4 Process Flow Diagram



NOTES

SUPPLY BY NEWTERRA
INSTALL BY NEWTERRA (INSIDE MODULAR BUILDING)

SUPPLY BY NEWTERRA, INSTALL DEPENDS ON TANK CONFIGURATION

SUPPLY BY CONTRACTOR, INSTALL BY CONTRACTOR

ISO CONTAINER BASED MODULAR BUILDING

newterra

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LEVEL	REVISION	DATE	BY
R1	PRELIMINARY FOR QUOTE	29/06/2022	OM
R0	PRELIMINARY FOR QUOTE	27/05/2022	OM

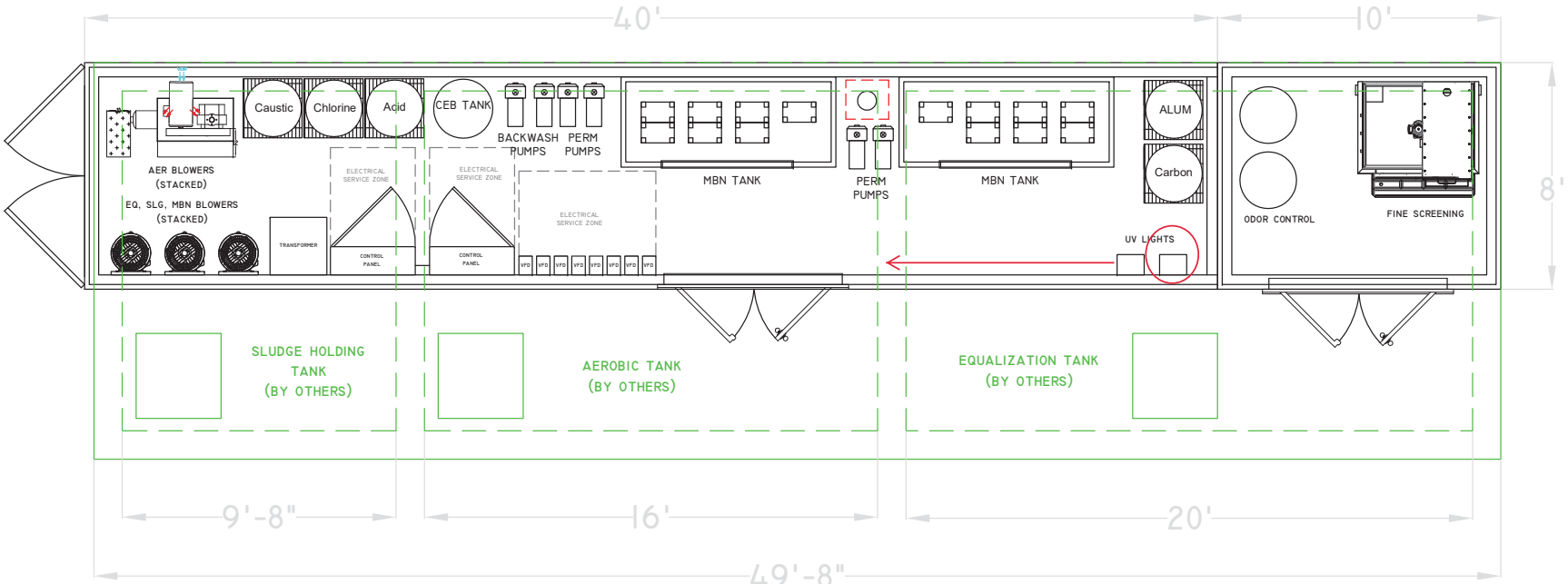
PROJECT NUMBER: 2207813

CUSTOMER: AquaWorks DBO

TITLE AND LOCATION: PROCESS FLOW DIAGRAM
Community of Milner

DRAWN BY | DATE | SHEET 1 | SHEETS 1

5 Preliminary Layout



NOTES

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LEVEL	REVISION	DATE (mm/dd/yy)	BY
RI	PRELIMINARY FOR QUOTE	29/06/2022	OM
R0	PRELIMINARY FOR QUOTE	27/05/2022	OM

PROJECT NUMBER: 2207813

TITLE AND LOCATION: PRELIMINARY LAYOUT
COMMUNITY OF MILNER

CUSTOMER: AQUAWORKS DBO

DRAWN BY | DATE | SHEET | SHEETS

6 Process Design

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Brockville, ON, K6V 5Y6
T: 800.420.4056 F: 289.203.1319

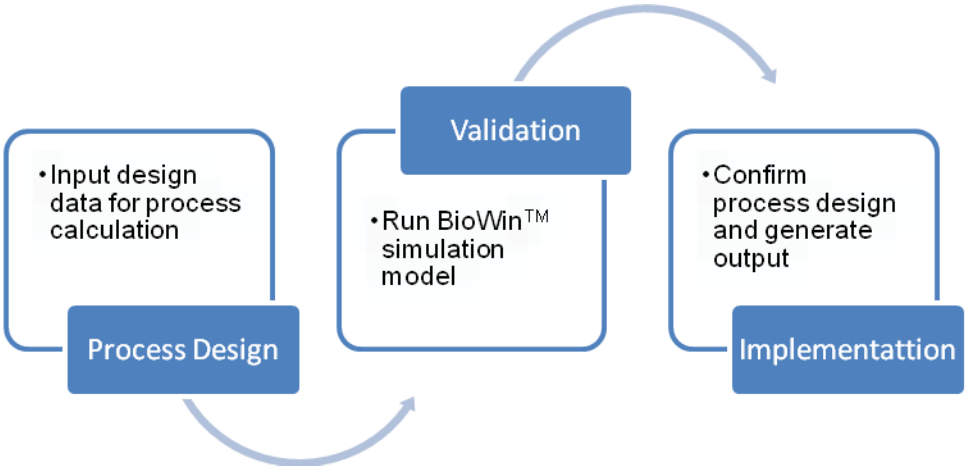
1.0 PROCESS DESIGN METHODOLOGY WITH BIOWIN™ MODELING

newterra utilizes an in-house MBR process design model based on a combination of empirical/heuristic data and biological kinetics constants/biochemical stoichiometry equations under steady state condition. The process design rationale incorporates elements from the Metcalf & Eddy Engineering Handbook, EPA's nitrogen control manual, nutrients removal guidelines developed by WEF, our systems field operating data and our conservative engineering practice and judgment.

The process design is further optimized and validated with BioWin™ modeling software, a proprietary wastewater treatment process simulator that is widely recognized for worldwide wastewater industry. BioWin™ is a wastewater treatment process simulator that ties together biological, chemical, and physical process models. The core of BioWin™ is its proprietary biological model which is supplemented with other process models (e.g. water chemistry models for calculation of pH, mass transfer models for oxygen modeling and other gas-liquid interactions).

Figure 1 depicts a systematic process design approach adopted by newterra when designing a MBR system. The multi-steps approach involves Process Design, Validation, and Implementation (see Figure 1).

Figure 1. newterra Process Design, Validation and Implementation (PVI) Flow Chart



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2.0 RESULTS

As illustrated in Table 1, the BioWin™ simulation run confirmed that all effluent parameters are well below the effluent targets.

Table 1. Comparison of BioWin™ Output and Effluent Targets

Effluent Parameters	BioWin™ Output	Effluent Targets
cBOD (mg/L)	0.89	< 30
TSS (mg/L)	0.00	< 30
NH_3-N (mg/L)	0.25	< 20

Please refer to the attachment for detailed information:

- Process Design Calculations
- BioWin™ Simulation Result

3.0 SUMMARY

In summary, newterra's MBR is capable of producing high quality effluent in accordance with the effluent targets of BOD/TSS of less than 10/10 mg/L.

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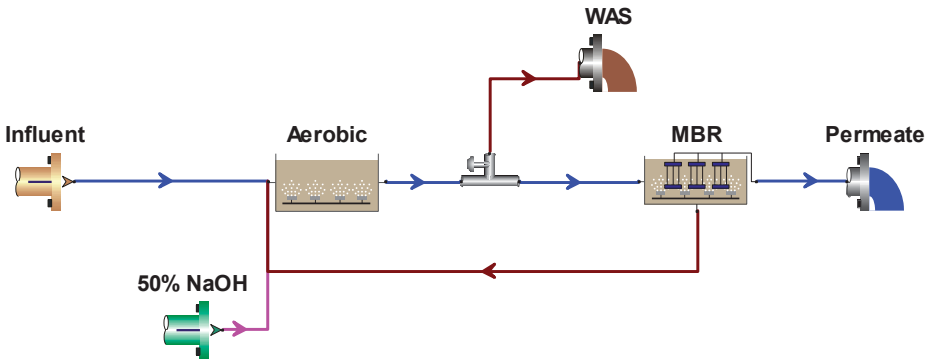
BioWin user and configuration data

Project details
Project name: Community of Milner **Project ref.: 2207813**

Saved: 6/29/2022

Steady state solution
SRT Ae+MBR: 16.04 days
Temperature: 10.0°C

Flowsheet



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Configuration information for all Bioreactor units

Physical data

Element name	Volume [m3]	Area [m2]	Depth [m]	# of diffusers
Aerobic	44.7600	17.9040	2.500	36

Operating data Average (flow/time weighted as required)

Element name	Average DO Setpoint [mg/L]
Aerobic	2.0

Configuration information for all Bioreactor - MBR units

Physical data

Element name	Volume [m3]	Area [m2]	Depth [m]
MBR	7.0600	3.3619	2.100

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
MBR	Flow paced	400.00 %

Element name	Average Air flow rate [m3/hr (20C, 1 atm)]
MBR	110.3

Configuration information for all Influent - BOD units

Operating data Average (flow/time weighted as required)

Element name	Influent
Flow	147.615
BOD - Total Carbonaceous mgBOD/L	240.00
Volatile suspended solids mg/L	192.00
Total suspended solids mg/L	240.00
N - Total Kjeldahl Nitrogen mgN/L	50.00
P - Total P mgP/L	10.00
S - Total S mgS/L	0

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N - Nitrate mgN/L	0
pH	7.00
Alkalinity mmol/L	6.00
Metal soluble - Calcium mg/L	80.00
Metal soluble - Magnesium mg/L	15.00
Gas - Dissolved oxygen mg/L	0

Element name	Influent
Fbs - Readily biodegradable (including Acetate) [gCOD/g of total COD]	0.1600
Fac - Acetate [gCOD/g of readily biodegradable COD]	0.1500
Fxsp - Non-colloidal slowly biodegradable [gCOD/g of slowly degradable COD]	0.7425
Fus - Unbiodegradable soluble [gCOD/g of total COD]	0.0500
Fup - Unbiodegradable particulate [gCOD/g of total COD]	0.1300
Fcel - Cellulose fraction of unbiodegradable particulate [gCOD/gCOD]	0.5000
Fna - Ammonia [gNH3-N/gTKN]	0.6600
Fnox - Particulate organic nitrogen [gN/g Organic N]	0.5000
Fnus - Soluble unbiodegradable TKN [gN/gTKN]	0.0200
FupN - N:COD ratio for unbiodegradable part. COD [gN/gCOD]	0.0350
Fpo4 - Phosphate [gPO4-P/gTP]	0.5000
FupP - P:COD ratio for unbiodegradable part. COD [gP/gCOD]	0.0110
Fsr - Reduced sulfur [H2S] [gS/gS]	0.1500
FZbh - Ordinary heterotrophic COD fraction [gCOD/g of total COD]	0.0200
FZbm - Methylotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZao - Ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZno - Nitrite oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZaao - Anaerobic ammonia oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZppa - Phosphorus accumulating COD fraction [gCOD/g of total COD]	1.000E-4
FZpa - Propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZam - Acetoclastic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZhm - Hydrogenotrophic methanogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZso - Sulfur oxidizing COD fraction [gCOD/g of total COD]	1.000E-4
FZsrpa - Sulfur reducing propionic acetogenic COD fraction [gCOD/g of total COD]	1.000E-4
FZsra - Sulfur reducing acetotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZsrh - Sulfur reducing hydrogenotrophic COD fraction [gCOD/g of total COD]	1.000E-4
FZe - Endogenous products COD fraction [gCOD/g of total COD]	0

Configuration information for all Splitter units

Operating data Average (flow/time weighted as required)

Element name	Split method	Average Split specification
WAS	Flowrate [Side]	3.29219183640427

Configuration information for all Influent - State variable units

Operating data Average (flow/time weighted as required)

Element name	50% NaOH

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Other Cations (strong bases) [meq/L]	19070.00
Flow	0.0097

BioWin Album

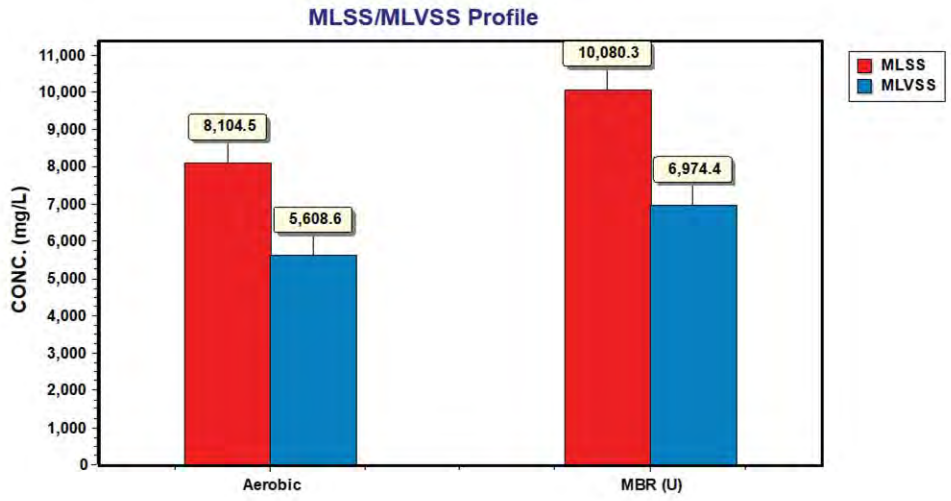
Album page - Summary

Elements	BOD - Total Carbonaceous [mg/L]	COD - Total [mg/L]	Total suspended solids [mg/L]	Volatile suspended solids [mg/L]
Influent	239.97	489.33	240.00	192.00
Aerobic	1912.05	8151.46	8104.45	5608.63
MBR	0.89	25.73	0	0
MBR (U)	2372.65	10127.88	10080.35	6974.36
Permeate	0.89	25.73	0	0

Album page - Influent

Elements	Flow [m3/d]	BOD - Total Carbonaceous [mg/L]	Total suspended solids [mg/L]	Volatile suspended solids [mg/L]	N - Total Kjeldahl Nitrogen [mgN/L]	P - Total P [mgP/L]	Alkalinity [mmol/L]	pH []
Influent	147.62	239.97	240.00	192.00	50.00	10.00	6.00	7.00

Album page - MLSS



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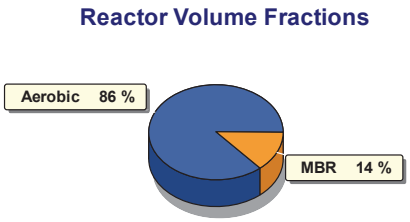
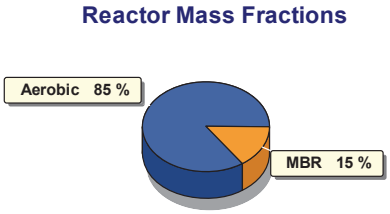
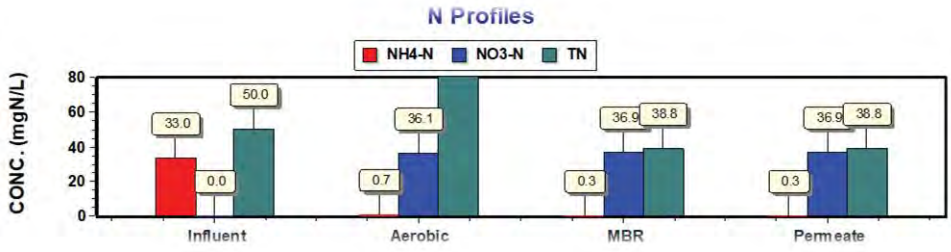
Album page - Fractions



Album page - Fractions



Album page - N and P profiles



Album page - N and P profiles

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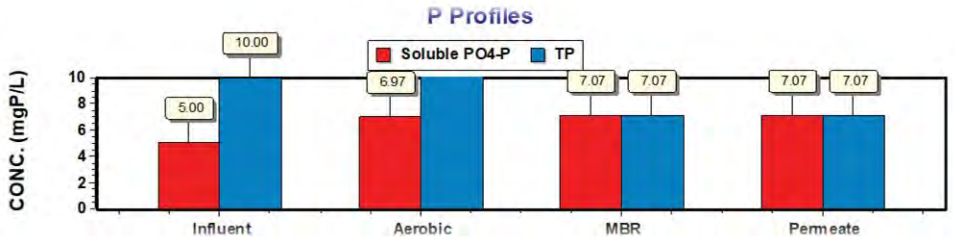

Album page - Aerobic

Aerobic			
Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes
Alkalinity	2.32	1.72	mmol/L and kmol/d
BOD - Filtered Carbonaceous	1.48	1.09	
BOD - Total Carbonaceous	1912.05	1411.25	
COD - Filtered	26.72	19.72	
COD - Particulate	8124.74	5996.75	
COD - Total	8151.46	6016.47	
COD - Volatile fatty acids	0.02	0.02	
Influent inorganic suspended solids	2069.04	1527.12	
ISS cellular	426.12	314.51	
ISS precipitate	0	0	
ISS Total	2495.83	1842.13	
N - Ammonia	0.74	0.55	
N - Filtered TKN	2.45	1.81	
N - Nitrate	36.11	26.65	
N - Nitrite + Nitrate	36.28	26.78	
N - Particulate TKN	416.01	307.05	
N - Total inorganic N	37.03	27.33	
N - Total Kjeldahl Nitrogen	418.46	308.86	
N - Total N	454.74	335.64	
P - Phosphorus in HMO	0	0	
P - Soluble PO4-P	6.97	5.15	
P - Total P	138.27	102.05	
pH	6.67		
S - Total S	0	0	
Total aluminium (all forms)	0	0	
Total Calcium (all forms)	101.40	74.85	
Total iron (all forms)	0	0	
Total Magnesium (all forms)	34.81	25.69	
Total suspended solids	8104.45	5981.77	
Volatile suspended solids	5608.63	4139.64	

Album page - MBR tank

MBR			
Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes
Alkalinity	2.24	0.32	mmol/L and kmol/d
BOD - Filtered Carbonaceous	0.89	0.13	

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BOD - Total Carbonaceous	0.89	0.13
COD - Filtered	25.73	3.71
COD - Particulate	0	0
COD - Total	25.73	3.71
COD - Volatile fatty acids	0.00	0.00
Influent inorganic suspended solids	0	0
ISS cellular	0	0
ISS precipitate	0	0
ISS Total	0	0
N - Ammonia	0.25	0.04
N - Filtered TKN	1.89	0.27
N - Nitrate	36.89	5.32
N - Nitrite + Nitrate	36.95	5.33
N - Particulate TKN	0	0
N - Total inorganic N	37.20	5.37
N - Total Kjeldahl Nitrogen	1.89	0.27
N - Total N	38.84	5.61
P - Phosphorus in HMO	0	0
P - Soluble PO4-P	7.07	1.02
P - Total P	7.07	1.02
pH	6.72	
S - Total S	0	0
Total aluminium (all forms)	0	0
Total Calcium (all forms)	80.80	11.66
Total iron (all forms)	0	0
Total Magnesium (all forms)	14.71	2.12
Total suspended solids	0	0
Volatile suspended solids	0	0

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newterra Project № 2207813R0
Subject: MBR WWTP
PROCESS DESIGN CALCULATION

Table 1: Influent Wastewater Characterization

Influent Flow Rate	Design Value	Metric Unit	Design Value	US Unit
Average Daily Flow (ADF)	*123*	m^3/d	32,500	gpd
Maximum Month Flow (MMF)	*148*	m^3/d	39,000	gpd
Maximum Daily Flow (MDF)	*246*	m^3/d	65,000	gpd
Peak Instantaneous Flow (PIF)	*30.753125*	m^3/h	135.42	gpm
Selected Design Flow, Q_D	6.15	m^3/h	27.08	gpm
Selected Peak Flow, Q_P	10.25	m^3/h	45.14	gpm

Influent Wastewater Characteristics	Design Value	Metric Unit
Chemical Oxygen Demand, COD, assumed	480	mg/L
Biochemical Oxygen Demand, BOD	*240*	mg/L
Total Suspended Solids,TSS	*240*	mg/L
Volatile Suspended Solids, VSS	192	mg/L
Total Kjeldahl Nitrogen, TKN	*50*	mg/L
Ammonia nitrogen, NH_4-N	35	mg/L
Total Phosphorus, TP	*10*	mg/L
Fat, Oil and Grease, FOG	*30*	mg/L
Minimum water temperature	*10*	˚C
Maximum water temperature	*25*	˚C
Alkalinity, assumed	*300*	mg/L
Site elevation	*1988*	m

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Table 2: Treated Effluent Specification

Effluent Water Specification	Effluent Limit	Design Value	Metric Unit
$cBOD_5$	< 30	< 5	mg/L
TSS	< 30	< 1	mg/L
NH_4-N + NH_3-N	< 20	< 1	mg/L

Table 3: Design of Equalization tank

Design of Equalization tank	Design Value	Metric Unit	Design Value	US Unit
Total Working Volume	49.2	m^3	13,000	gal
HRT	*8.00*	h		
Aeration	0.015	$m^3/m^3.min$	0.015	$ft^3/ft^3.min$
	51.3	m^3/h		
Blower Capacity	49.5	Nm^3/h	30.7	scfm
Number of basins	*1.00*	-		
Working Volume/basin	49.2	m^3	13,000	gal
Liquid Volume/basin	55.9	m^3	14,773	gal

Table 4: Membrane Calculation

Design of Membrane Tanks	Design Value	Metric Unit	Design Value	US Unit
1) Capacity				
Surface Area per Membrane Cassette	27.9	m^2	300	ft^2
Number of membrane tanks	*2*			
Number of membrane modules /membrane tank	*7*	-		
Selection of membrane module	500S	-		
Membrane cassettes per selected module	1	-		
Membrane surface area/module	28	m^2	300	ft^2
Total installed cassettes	14	-		
Total membrane area/ membrane tank	195.3	m^2	2101	ft^2
Total membrane area/ system	391	m^2	4202	ft^2

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Design of Membrane Tanks	Design Value	Design Value	Design Value	Design Value	Units
2) Flux Analysis	**ADF**	**MMF**	**MDF**	*ADF (N-1)*	
Influent flow rate (per tank)	61.51	73.81	123.01	123.0125	m^3/d
Instantaneous flux	15	17	29	29	LMH
Net flux	13	16	26.2	26	LMH
Reference net flux at 10°C (suez)	18	20.0	28.2	28.2	LMH
	ADF	**MMF**	**MDF**	**ADF (N-1)**	
Influent Flow rate (per tank)	16,250	19,500	32,500	32500	gpd
Net flux	7.7	9.3	15.4	15.4	GFD
Reference net flux at 10°C (suez)	10.6	11.8	16.6	16.6	GFD

Design of Membrane Tanks	Design Value	Metric Unit	Design Value	US Unit
3) Scouring Aeration				
Air flow per membrane module	8	N m^3/h	4.63	cfm
Air flow per membrane tank	55	N m^3/h	32.43	cfm
Total MBR air flow	110	N m^3/h	64.86	cfm
Total MBR air flow,standard	118	m^3/h	69.62	scfm

Design of Membrane Tanks	Design Value	Metric Unit	Design Value	US Unit
4) Membrane Tank Design				
Tank Type	Containerized			
Length, L	1.0	m	3.35	ft
Width, W	1.6	m	5.39	ft
Side Water Depth, SWD	2.1	m	6.89	ft
Volume per tank	3.5	m^3	929	gal
Volume displaced per tank by membranes	0.3	m^3	79	gal
Percent volume displaced by membranes	8%	%		
Effective volume per tank	3.2	m^3	850	gal
Total effective MBR volume, V_m	6.5	m^3	1,701	gal
HRT_m	1.1	h		
Blower headloss	27.3	kPa	3.96	psi

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Table 5: Biological Operating Parameters

Biological Operating Parameters	Design Value	Metric Unit
Design aerobic Sludge Retention Time, SRT	*16.0*	day
MLSS in aerobic tank	8,000	mg/L
MLSS in membrane tank	*10,000*	mg/L
Mixed Liquor Volatile Suspended Solids, MLVSS, in aerobic tank	5359	mg/L
MLVSS/MLSS	67	%
Recirculation Ratio, RR: Membrane tank => Aerobic tank	*4*	-

Table 6: Kinetic Constants at Design Temperature

Kinetics Constants for BOD Removal	Value at 20°C	Value at design temperature	Metric Unit
K_s	*32*	32	g BOD/m^3
$k_{e\ or}\ k_d$	*0.12*	0.08	per day
Biomass yield, Y	*0.40*	0.40	g VSS/g BOD
μ_m	*6*	3.05	g VSS/g VSS.day
k		7.63	g BOD/g VSS/day
f_d		0.15	g /g
Y_{obs}		0.48	g VSS/g BOD
Y_H		0.50	g TSS/g BOD
Yobs-overall		0.73	gTSS/g BOD

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Kinetics Constants for Nitrification	Value at 20°C	Value at design temperature	Metric Unit
$\mu_{m,n}$	0.75	0.38	g VSS/(g VSS.day)
K_n	0.74	0.44	g NH_4-N/m^3
k_{en} or k_{dn}	0.08	0.05	g VSS/(g VSS.day)
Y_n	0.12	0.12	g VSS/g NH_4-N
k_0		0.5	g/m^3
μ_n - Theoretical		0.11	g/(g/day)
Safety factor		1.5	
$SRT_{aerobic, theoretical}$		13.90	day

Table 7: Sludge Yield

Sludge Yield	Design Value	Metric Unit	Design Value	US Unit
Effluent BOD, S_e	1.58	mg/L		
NO_x	39.0	mg/L		
$P_{x,bio}$	7.69	kg VSS/day	16.93	lb/d
X_0	9.45	kg/day	20.81	lb/d
$P_{x,vss}= P_{x,bio}+ X_0$	17.1	kg/day	37.74	lb/d
$P_{x,tss, biomass}$	25.58	kg/day	56.34	lb/d
$P_{x,TSS, total}$	25.58	kg/day	56.34	lb/d
$Q_{w, biomass}$	3.20	m^3/day	845	gal/d
Nitrogen uptake through sludge production	*10.49*	mg/L		
Phosphorus uptake through sludge production	2.6	mg/L		

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Table 8: Design of Aerobic Tank

Design of Aerobic Tank	Design Value	Metric Unit	Design Value	US Unit
$V_{aerobic\ tank\ +\ membrane\ tank}$	51.22	m^3	13,534	gal
$HRT_{aerobic\ tank\ +\ membrane\ tank}$	8.33	h		
$V_{aerobic\ tank}$	44.76	m^3	11,826	gal
$HRT_{aerobic\ tank}$	7.28	h		
Number of trains	*1*	-		
Tank Geometry	Rectangular			
Tanks in series	*1*			
Volume/basin	44.76	m^3	11,826	gal
Length, L	8.77	m	28.77	ft
Width, W	*3.19*	m	10.46	ft
Side Water Depth, SWD	*1.60*	m	5.25	ft

Table 9: Biological Parameters

Biological Design Summary	Design Value	Metric Unit	Design Value	US Unit
F:M ratio-aerobic	0.070	kg BOD/kg MLSS.d	0.070	lb BOD/lb MLSS.d
F:M ratio-aerobic	0.104	kg BOD/kg MLVSS.d	0.104	lb BOD/lb MLVSS.d
F:M ratio-overall	0.070	kg BOD/kg MLSS.d	0.070	lb BOD/lb MLSS.d
F:M ratio-overall	0.104	kg BOD/kg MLVSS.d	0.104	lb BOD/lb MLVSS.d
Organic Loading rate - Aerobic	1.38	kg COD/m^3.d	106.9	lb COD/1000 ft^3.d
Organic Loading rate - Aerobic	0.69	kg BOD/m^3.d	53.5	lb BOD/1000 ft^3.d
Organic Loading rate - Overall	1.38	kg COD/m^3.d	106.9	lb COD/1000 ft^3.d
Organic Loading rate - Overall	0.69	kg BOD/m^3.d	53.5	lb BOD/1000 ft^3.d
$HRT_{aerobic}$	7.3	h	87	% V/V_{Total}
$HRT_{membrane}$	1.1	h	13	% V/V_{Total}
HRT_{total}	**8.33**	**h**		
$HRT_{total,\ max\ day}$	**5.00**	**h**		
SRT_{total}	**16.0**	**d**		

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Table 10: Aeration Requirement - Aeration Tank

Aeration Requirement in Aeration tank (Fine bubble)	Design Value	Metric Unit	Design Value	US Unit
BOD loading	35.43	kg/d	78.03	lb/d
TKN loading	7.38	kg/d	16.26	lb/d
TN in WAS	1.53	kg/d	3.38	lb/d
TP loading	1.48	kg/d	3.25	lb/d
S loading	0.00	kg/d	0.00	lb/d
Unit BOD oxygen demand	1.30	kg O_2/kg BOD	1.30	lb/lb
Unit nitrification oxygen demand	4.60	kg O_2/kg N	4.60	lb/lb
denitrification rate	0.00	%	0.00	lb/lb
Unit denitrification credit	-2.90	kg O_2/kg N	-2.90	lb/lb
Unit sulfide oxygen demand	2.00	kg O_2/kg S^{2-}	2.00	lb/lb
BOD oxygen requirement, R_1	46.06	kg O_2/d	101.44	lb O_2/d
Nitrification oxygen requirement, R_2	26.9	kg O_2/d	59.23	lb O_2/d
DeN oxygen credit, R_3	0.00	kg O_2/d	0.00	lb O_2/d
Sulfide oxygen requirement, R_4	0.00	kg O_2/d	0.00	lb O_2/d
Oxygen demand	72.95	kg O_2/d	160.68	lb O_2/d
Oxygen credit from membrane tanks	0.00	kg O_2/d	0.00	lb O_2/d
Design AOR for aeration tank	72.95	kg O_2/d	160.68	lb O_2/d
Alpha	0.50	-		
Beta	0.95	-		
Theta (Temp. correction)	1.02	-		
Tbasin, winter	10	°C	50	°F
Tbasin, summer	25	°C	77	°F
CsatT (surface sat DO at winter)	11.35	mg/L		
CsatT (surface sat DO at summer)	8.15	mg/L		
Effective depth correction factor	0.40	-		
Csat20	9.86	mg/L		
Target min operating DO	2.00	mg/L		
Psite	80.01	kPa	11.61	psi
SOR, winter	252.04	kg O_2/d	555.16	lb O_2/d
SOR, summer	275.53	kg O_2/d	606.88	lb O_2/d
AOR/SOR_{summer}	0.26	-		

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Aeration Requirement in Aeration tank (Fine bubble) (continued)	Design Value	Metric Unit	Design Value	US Unit
SWD	2.50	m	8.20	ft
SOTE at operating SWD	13.20	%		
Density of air	1.29	kg/m^3	0.01	lb/gal
% O2 in air	23.20	%		
	290.15	m^3/h		
Air Required	0.08	m^3/s		
Peaking Factor	*1.50*	-		
Design Air	405.42	Nm^3/h	255.9	scfm
Static headloss	21.6	kPa	3.13	psi
Minor loss	13.8	kPa	2.00	psi
Total headloss	35.4	kPa	5.14	psi

Table 11: AT Mixing Requirement

Aeration Tank Mixing Requirement	Design Value	Metric Unit	Design Value	US Unit
L or diam	4.88	m	16.01	ft
W	3.67	m	12.03	ft
SWD	2.50	m	8.20	ft
Area	18	m^2	193	ft2
Volume	45	m^3	11,826	gal
Number of aeration basins	1	-		-
Total AT volume	45	m^3	11,826	gal
Air supplied per area	0.27	m^3/min/m^2	1.33	scfm/ft^2
OUR avg	68	mg O_2/L.h	0.57	lb O_2/gal.h

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7 Warranty

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WARRANTY

This Warranty Agreement is between Newterra (known as Newterra) and customer (known as the Buyer).

General Warranty Statement

1. Newterra warranties those products of its manufacture against defective workmanship or material for a period of 12 months from startup or 18 months from the date of notice of readiness to ship, whichever comes first.
2. This warranty is expressly and strictly limited to replacing, without charge (see Warranty Exclusions), any part or parts which proven to Newterra's satisfaction upon examination, to have been defective in design, material or workmanship, and which have not been neglected, abused or misapplied, provided the Buyer gives Newterra immediate written notice upon discovery of any claimed defect.
3. During the warranty period, parts will be shipped as necessary with instructions to replace, which can be further elaborated over phone or email; visit(s) of our technician to site can be covered if there is a service agreement in place; otherwise, actual charges will be quoted to the owner at that time, if required.
4. Newterra will also warranty those component parts manufactured by others to the extent of the original manufacturer's warranty. In any case, specific components warranties will be extended a minimum of one year from date of notice of readiness to ship.
5. Membranes, if used, will be covered under separate warranty statement.
6. This warranty shall not be construed as a fitness of purpose warranty nor a performance warranty.

Warranty Exclusions

1. Warranty coverage does not include:
   - Freight, labor, travel, and living expenses associated with parts replacement
   - Normal maintenance items such as lubrication, fan belts, and cleaning of the equipment
   - Consumable items such as filters and reagents.
   - Replacement of items due to normal wear and tear
   - System parts damaged because of Buyer changes to the system and/or PLC program without the written consent of Newterra.
   - System electrical components or motors damaged by inconsistent power, voltage fluctuations and/or frequent power failures.
2. If the Buyer, or any contractor employed by the Buyer, contracts an outside company, other than Newterra for modification of system equipment, without knowledge of Newterra, the warranty coverage will be denied.
3. If the Buyer, or any installation contractor employed by the Buyer, contracts outside Newterra for installation work or erection of quoted equipment, the Buyer shall assume full responsibility for said contract.
4. The warranty shall not cover normally scheduled preventative maintenance or maintenance services listed in O&M Manual unless specifically contracted with Newterra.
5. If Newterra's Supplier assesses a part evaluation fee as part of their warranty claim assessment process, then the Buyer will be required to pay this fee. All parts must be returned to Newterra, transportation prepaid, unless other arrangements have been pre-approved by Newterra.

Warranty Validation

1. Newterra requires that the system be commissioned by a Newterra factory trained technician unless specifically authorized by Newterra. Newterra authorization will be dependent on the qualifications of the Buyer's / contractor technicians.
2. Warranty validation is conditional upon timely receipt of:
   a. Signed Installation Checklist – by authorized Buyer representative, if not Newterra.
   b. As built Site drawings – by authorized Buyer representative, if not Newterra.
   c. Signed Pre-Commissioning Checklist – by authorized Buyer's representative, if not Newterra.
   d. Signed Commissioning Checklist – by authorized Buyer's representative, if not Newterra.
3. If the warranty validation requirements are not followed, Newterra reserves the right to deny warranty coverage.

Warranty Conditions

1. The system must be maintained and serviced in accordance with the schedule and procedures listed in the system O&M Manual. Failure to follow Newterra's recommendations may result in a denial of warranty coverage. Newterra reserves the right to review maintenance records as part of the warranty claim assessment process.

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8 Terms & Conditions

TERMS AND CONDITIONS:

1. PURCHASE ORDER:
   Newterra ("Newterra" or "Seller") will not initiate work prior to purchasing party ("Buyer") providing a signed purchase order or letter which includes the overall price of system and options chosen, purchase order number, payment terms, billing address, Tax Identification Number, and Newterra Proposal Number including revision and date.

2. APPLICABILITY / SCOPE:
   All goods and services provided shall be governed by the terms and conditions set forth herein. Any modifications to these terms or to the scope of any purchase order or project hereunder, shall be mutually agreed upon and set forth in writing executed by both parties. Such writing shall clearly set forth the nature and extent of the change, and, if applicable, any adjustment in price associated with such change.

3. SCHEDULE
   Newterra's estimated delivery schedule is included in the proposal and may be affected by manufacturing loading at time of order. Authorizing Newterra to order long lead components at time of order may help to expedite the project schedule. In order to notify Newterra of the intent to allow the long lead components to be ordered immediately please check the box on the signature page of this document.

4. CREDIT APPROVAL:
   All new purchase orders are subject to mandatory credit approval for first time Newterra Buyers and discretionary credit approval for repeat Newterra Buyers (credit approval form available from Newterra upon request). Should Seller learn of any information that causes Seller concern about Buyer's ability to perform any of its obligations owing to Seller under a purchase order, Seller has the right to request Buyer to provide Seller adequate assurance of due performance on such terms as are deemed reasonable by Seller when acting in good faith, including the right to demand full or partial payment from Buyer as demanded by Seller. A complete credit check is required prior to shipping on a Net-30 or "C.O.D. – customer check acceptable" basis.

5. TELEMETRY SERVICES AGREEMENT:
   A Telemetry Services Agreement must be completed for all system orders that include a Newterra SiteLink Remote Telemetry and Communication Package. The Telemetry Services Agreement is required to activate the services listed in the proposal (Telemetry Service Agreement available from Newterra upon request).

6. CURRENCY: As per pricing page of the proposal.

7. PAYMENT TERMS:
   The price to be paid by Buyer shall be mutually agreed upon by the parties and set forth in writing. Unless otherwise agreed to, prices quoted do not include any state or local sales or use tax, special fees, duties or custom fees, freight and handling charges, or export crating costs that may be added to the price at invoicing. The Buyer agrees to make payments as described herein.

   Additionally, the Buyer agrees to grant to Newterra security as described below to secure the payment in full for the equipment supplied relating to this purchase order. The Buyer hereby assigns and pledges to Newterra a security interest in all of the Buyer's rights, title, and interest in the following (the "Collateral"):

   i. Equipment, supplies, fittings, machinery, and other tangible personal property, wherever located, sold to Buyer by Newterra under the purchase order;
   ii. The trade account receivable generated by the design, construction and installation of the equipment referenced above up to the cost of such equipment.

   The Buyer represents and warrants that this agreement and the UCC Financing Statement(s) executed herewith create a valid and perfected priority security interest in the Collateral, securing the payment of amounts owing by the Buyer to Newterra. The Security interest assigned to Newterra by the Buyer is released upon payment in full for the equipment.

8. METHOD OF PAYMENT:
   All orders shall be shipped C.O.D. or require payment in advance until credit has been established. Payment shall be made in the currency quoted without discount. Minimum billing amount is $100. Shipments outside of the U.S.A. and Canada shall be prepaid (by credit card, wire transfer, or cashier's check), or by an irrevocable Letter of Credit.

   Processing fees may be assessed for additional costs incurred for credit card charges, returned checks, Letters of Credit, or other bank charges. Wire transfers should be initiated with all bank charges paid from the account of the Buyer. Newterra reserves the right to specify the method and/or timing of payment (including prior to shipment).

   Newterra shall be entitled to a liquidated late charge calculated at a rate of 1.5% per month (18% per annum) or if lower, at the maximum rate permitted by law, for any payment not made within 10 days following the date due.

   If the Buyer disputes any portion of an invoice, they shall notify Newterra in writing with specific details and pay the undisputed portion as per the executed purchase order. Buyer shall reimburse all costs incurred in collection of past due amounts including but not limited to attorney's fees, court costs and collection fees incurred by Newterra.

   At Newterra's option, Letters of Credit will be accepted by Newterra when compliant with the following: The Letter of Credit must (a) Be IRREVOCABLE and CONFIRMED by a U.S.A. or Canadian bank; (b) Be in favor of Newterra; (c) State payment is by site draft payable; (d) State that ALL bank charges, including those outside the country of origin, are to be applied to BUYER'S account; (e) Must state Ex-Works, point as factory unless terms of Pro Forma Invoice specify otherwise, (f) Be

advised through a class A bank and show Buyer as applicant for the Letter of Credit.

9. SHIPPING & DELIVERY TERMS:
   Unless otherwise specified in the proposal, shipping incoterms are:

   FCA delivery location* as per incoterms® 2010, cost of transportation and in-transit insurance will be prepaid and added to the final invoice.
   *delivery location as specified in the proposal.

   If a customer wishes to arrange for their own transportation, then incoterms will be FCA Newterra final manufacturing facility as per incoterms® 2010.

   Equipment provided by Newterra cannot be held after completion without additional charges being paid to Newterra.

10. ACCEPTANCE:
   (a) Buyer shall inspect all shipments of equipment or other goods within 10 days of receipt and shall promptly notify Newterra of any specific defects or non-conforming goods. The parties acknowledge that acceptance of any goods supplied hereunder shall be deemed to have occurred if Buyer fails to notify Newterra of any such defects or non-conforming goods within 10 days of the date of receipt. The parties acknowledge that acceptance of any services provided hereunder shall be deemed to have occurred if Buyer fails to notify Newterra of any defects or non-conformance in such services within 10 days of the date the services were completed;

   (b) For any order hereunder which requires Newterra's involvement in the installation, start-up, check-out and/or commissioning of any Newterra equipment or system, the parties acknowledge that system acceptance shall be deemed to have occurred upon completion of the startup and checkout of the system, or upon beneficial use of the system by Buyer, whichever occurs first.

11. OPERATIONAL AND MAINTENANCE PROCEDURES:
   Buyer acknowledges that any improper use, maintenance, or modification of the equipment provided hereunder, or use of unqualified maintenance or service technicians will severely impair the operational effectiveness of the entire system. Buyer hereby agrees to indemnify, defend and hold harmless Newterra from and against any and all third-party claims arising, in any manner, out of: (a) Buyer's neglect of the equipment; (b) Buyer's use of technicians not authorized by Newterra to service the equipment; or (c) Buyer's improper use or modification of the equipment or failure to follow the operational and maintenance procedures provided with the equipment.

12. CUSTOM EQUIPMENT OR SYSTEMS:
   Buyer acknowledges that any approvals and/or listings specified in Newterra's proposal are limited to the specific scope and application set forth in the proposal and may not cover or apply to any custom or special equipment or services which are outside the scope of Newterra's proposal.

   Newterra shall retain all proprietary rights to any and all technical data, designs, or other information developed by Newterra (and not provided by Buyer) in the course of designing, developing and/or manufacturing custom equipment or systems.

   Programming for Newterra's custom equipment and systems is proprietary and will remain the property of Newterra and is not available for distribution to Buyer or others at any time.

13. TAXES:
   All applicable Federal, State/Provincial/Local sales or use taxes and/or custom/duty taxes are not included in the prices quoted by the Seller unless otherwise specified in writing. If Seller is subjected to any such tax in connection with this sale or the delivery; the same shall be added to the purchase price and Buyer shall be responsible for paying that tax or reimbursing Seller therefore within 30 days.

14. PROPOSAL EXPIRATION:
   Proposal and pricing valid for 90 days unless extended, in its sole discretion, by Newterra unless stated otherwise in the proposal.

15. DELAYS:
   If the approval to proceed with ordering material is not given within 21 days of execution of this order, Newterra reserves the right to adjust the sell price of this Purchase Order based on actual increases incurred from its Suppliers due to the delay in the project schedule.

16. SYSTEM STORAGE AFTER COMPLETION:
   At the Buyer's request, storage of completed systems may be provided. Upon receipt of a system storage request, Newterra will provide a quote to store the system at a nearby storage facility. The costs will include a monthly storage fee as well as the costs associated to load and unload the system at the storage yard (e.g. crane or fork truck), and financing charges for any unpaid balance that goes beyond due date of the requested storage time. The warranty period will start upon the date of notice of readiness to ship. Any invoices due for payment that are subject to the shipment of the system will be initiated and subject to payment based on the date of notice of readiness to ship.

17. OVERDUE ACCOUNTS:
   Overdue accounts of the above terms are subject to a finance charge of 1.5% per month. If legal proceedings are instituted for collection of overdue accounts unpaid after 30 days, the Buyer will be liable for all costs adjudged by the court, including court costs and reasonable attorney fees.

18. CHANGE ORDERS:
   Any Buyer driven change orders accepted by Newterra will be billed as follows: (1) Engineering hours billed at a rate of $150 per hour, (2) $500 administration fee plus materials and labor, and (3) all other costs associated with execution of change order, including but not limited to restocking fees, return fees, etc.

19. TECHNICAL ASSUMPTIONS:
This proposal and pricing is based on Newterra's interpretation of the sections of the RFP or specification that have been made available to Newterra. Exceptions have been noted wherever possible. In the event of a conflict between the language in the specification or the proposal, Buyer agrees that the language in the proposal takes precedence and is the basis of the proposed pricing and scope.

20. HEALTH & SAFETY:
Any health and safety requirements for entering a project site must be communicated at the time of Order. It is the Buyer/Owner's responsibility to ensure that field technicians operating on live panels are informed and equipped with the appropriate PPE.

21. INSTALLATION:
Electrical service and installation are not included unless specifically indicated in the proposal and approved in writing.

22. APPROVALS:
Local approvals and certificates are not included unless otherwise specified in the proposal.

23. SITE PERMITS & INSPECTIONS:
Obtaining any required site permits (i.e. building) is the responsibility of the Buyer/Owner; Newterra is not responsible for any such items unless otherwise specified in the proposal.

All required site inspections including, but not limited to electrical, building and fire are the responsibility of the Buyer/Owner; Newterra is not responsible for any such items.

24. WARRANTY:
Refer to separate warranty document(s) attached hereto and incorporated herein as if set forth in full

25. ENGINEERING SUBMITTAL PACKAGE:
Upon receipt of purchase order, Newterra and Buyer shall agree to a timeline for provision of engineering documentation, unless otherwise agreed to in writing.

26. BREACH:
In addition to any failure to comply with any other terms as set forth herein, the occurrence of any of the following events shall constitute a breach on the part of Buyer: (a) If Buyer shall become insolvent or make a general assignment for the benefit of creditors; (b) If a petition for Bankruptcy is filed by or against Buyer; (c) If, at any time Buyer fails to fulfill its obligations under the terms and conditions hereof, or acts in such a manner as to endanger performance of such obligations; (d) If Newterra shall reasonably believe that Buyer will not timely fulfill its obligations or otherwise perform hereunder, and Buyer is unable to provide reasonable assurances that such timely performance will occur.

Upon breach by Buyer, Newterra may terminate the contract or agreement by giving notice to the Buyer. Such termination may be effective immediately at the sole choice and discretion of Newterra. In the event of a breach and contract termination, Buyer is still responsible for all costs incurred by Newterra.

27. INDEMNIFICATION:
Each party shall defend, indemnify and hold each other's officers, directors and employees, harmless from and against any third party claims, damages or losses, including reasonable attorney's fees and costs (whether based on negligence, contract or any other legal theory), to the extent such claims, damages or losses are attributable to the negligence of each party or each party's failure to perform in accordance with the terms and conditions set forth herein and the recovering party is the prevailing party in any claim or litigation.

28. CONFIDENTIAL & PROPRIETARY INFORMATION:
Buyer acknowledges that the information and processes utilized by Newterra in the design, manufacture, and supply of its products and systems are confidential and proprietary to Newterra. Buyer agrees to treat as confidential and proprietary any such information or processes, including, but not limited to, design information or data, proposals, software, schematics, drawings, operational and maintenance manuals, testing procedures or other similar technical information ("Confidential Information") provided by Newterra in connection with the supply or installation of products or systems hereunder, and will, at a minimum, protect any such confidential Information in a manner commensurate with the measures taken to protect Buyer's own confidential or proprietary information. Newterra retains all rights, titles and interests in all such Confidential Information and Buyer shall not use or otherwise disclose to any third party any such Confidential Information except to the extent authorized by Newterra in writing.

29. INTELLECTUAL PROPERTY RIGHTS:
Excepting for the benefit of air and/or water treatment as contemplated by the design of the equipment, all rights, benefits from any value received as a result of the use of intellectual property, equipment, information or advice provided by Newterra remain the sole property of Newterra, specifically, including, but not limited to, as it may relate to carbon or water credits, etc.

Newterra retains any and all intellectual property rights in and to the equipment, services, and/or information supplied hereunder (including, but not limited to, patents, copyrights, trademarks and trade secrets) ("Intellectual Property").

Buyer is not granted any interest, right, or license with respect to any such Intellectual Property, except to use the equipment, services and/or information for the purposes for which it is specifically provided to Buyer in accordance with the terms and conditions hereof.
Newterra shall indemnify and hold Buyer harmless from and against all third-party claims of infringement or alleged infringement arising out of Buyer's use of any equipment, services, or information supplied by Newterra hereunder. Provided, however, that Newterra's indemnity obligation hereunder shall not apply to, and Newterra shall not be responsible for, any claims to the extent arising out of Buyer's modification of Newterra's equipment, services or information,

or use of such equipment, services or information: (a) in combination with equipment, services or information not supplied by Newterra, or (b) in the operation of any process or in any other manner inconsistent with the purpose for which Newterra's equipment, services or information were intended.

30. INSURANCE:
Each party shall provide and maintain at its own expense, such policies of insurance in such amounts as are appropriate and commercially reasonable for parties engaging in the type of activities contemplated by the projects entered into hereunder. Upon request, each party shall furnish the other with certificates evidencing the required insurance coverage.

31. LIENS:
Newterra shall promptly pay for all materials, supplies and labor employed by it in providing the goods and/or services hereunder, such that any equipment or system supplied to Buyer remains free of materialmen's, warehousemen's, mechanics', and any other similar liens. Newterra shall promptly discharge any such liens arising out of its performance hereunder.

32. PRESERVATION OF LIEN RIGHTS:
Newterra reserves all rights hereunder to file notice and execute liens in the event Buyer breaches it obligations in the proposal, purchase order, or as set forth herein. Any executed lien waiver, release claim, or payment application executed and submitted by Newterra shall not serve to waive Newterra's right to pursue a lien claim for previously noticed, reserved, or filed claims.

33. ASSIGNMENT:
The rights and responsibilities of Buyer as set forth herein are personal to Buyer and may not be assigned or delegated without the prior written consent of Newterra.

34. NON-WAIVER:
The parties' failure to demand strict performance or to otherwise enforce any rights hereunder shall not constitute a waiver of any rights hereunder. No claim arising out of a breach hereof may be discharged in whole or in part by a waiver of the claim unless supported by consideration and set forth in a writing signed by the waiving party. Any such waiver shall apply to the specifically identified claim only and shall in no way constitute a waiver or discharge of any other prior or subsequent claim.

35. SUSPENSION BY BUYER:
If any project or order, for which Newterra is to supply goods and/or services hereunder, is suspended by Buyer for any reason other than a breach by Newterra, Newterra shall take all reasonable measures to cooperate with Buyer in rescheduling any planned or ongoing work, and in otherwise complying with the suspension instructions. Provided, however, that in the event of any such suspension which continues for a period of 90 days, Newterra shall be entitled to terminate that order, without any further liability or obligation thereunder. Provided, further, that Newterra shall be entitled to prompt reimbursement from Buyer per Cancellation/Termination clause below.

36. CANCELLATION/TERMINATION:
Purchaser reserves the right at any time without cause to terminate or cancel all or part of any undelivered or unperformed portion of this Purchase Order by notice to Seller. Upon receipt of such notice, Seller shall immediately stop delivery or work on the portion of the order terminated or canceled. In the event of such termination or cancellation, Purchaser shall be liable for the value of the work performed, materials received, and any materials not received that cannot be cancelled, prior to the time that notice of termination is given. If any project or order, for which Newterra is to supply goods and/or services hereunder, is terminated in agreement with the provisions of these terms and conditions, Newterra shall be entitled to charge 25% of selling price if canceled prior to incurring related engineering, drafting, and production time. Additional costs incurred as a direct result of termination may include, but are not limited to, freight and storage charges, costs of labor, and transportation.

37. APPLICABLE LAW / DISPUTES:
Buyer acknowledges that the "Terms" from the Contract are deemed to be made in Pennsylvania for transactions in the U.S.A. and in Ontario for transactions in Canada, and that Buyer, in relation to this project, is deemed to be transacting business in Pennsylvania (U.S.A. transactions) and Ontario (Canadian transactions). It is the expectation of the parties that any disputes arising hereunder, whether in contract, tort or otherwise, will be amicably resolved by mutual agreement of the parties.

Any dispute, involving the supply of goods or services within the U.S.A. or Canada, which cannot be amicably resolved by the parties, shall be submitted to binding arbitration in accordance with the applicable rules and regulations of the American Arbitration Association for U.S.A contracts or the Canadian Arbitration Association for Canadian contracts. The substantive law of Pennsylvania for U.S.A. contracts or Ontario for Canadian contracts shall apply to any such arbitration, which shall be conducted in Philadelphia, Pennsylvania (U.S.A. contracts) or Ottawa, Ontario (Canadian contracts).

Nothing herein shall be construed as preventing Seller from enforcing any claim or right to a mechanic's lien or any claim or right against a bond regardless of where such a claim must be filed or enforced.

38. FORCE MAJEURE:
Neither party shall be liable for any cost increase, failure or delay in its performance resulting from any cause beyond its reasonable control including, but not limited to, acts of God; acts or omissions of civil or military authority; fires; floods; unusually severe weather; strikes or other labor disputes; embargoes; wars; political strife; riots; epidemic; pandemic; changes in laws, delays in transportation; sabotage; or fuel, power, material or labor shortages.

39. INTEGRATION / MODIFICATION:
Except as otherwise specifically set forth herein, these terms and conditions are intended by both Buyer and Newterra as the final and exclusive integrated expression of their agreement with

respect to any projects or orders subject hereto. No additions to or modifications of any of the terms or conditions herein shall be effective unless set forth in a writing duly executed by both parties.

40. CONSTRUCTION:
If these terms and conditions have been provided in response to an invitation to bid or other solicitation from Buyer, and the provisions set forth herein differ in any way from the provisions (if any) of Buyer's invitation or solicitation, these terms and conditions shall constitute Newterra's binding counteroffer upon the Buyer's decision to order from Newterra. If these terms and conditions constitute a counteroffer, acceptance hereof must be on the exact terms contained herein. Any additional, conflicting or different terms proposed by Buyer shall constitute a counteroffer by Buyer and shall not be effective unless set forth in a mutually agreed upon writing executed by both parties.

41. RETURNED GOODS:
No equipment shall be returned to Seller without its prior written authorization. All returns due to unwanted products or Buyer error will be assessed a minimum 25% restocking charge, based on the original invoice amount (shipping charges will be borne by the Buyer).

The Buyer will be credited the full invoice amount, including return shipping charges, if the original shipment was Newterra's error. To obtain specific performance under this warranty, the defective product must be returned to Newterra together with proof of purchase, installation date, failure date, supporting technical data, and documentation supporting the warranty claim.

Any defective product to be returned to a Newterra factory or service center must be sent Freight Prepaid. Buyers desiring to return product should contact our Customer Service Department at 1-800-420-4056 to obtain a Return Authorization (RA) number and a Return Material Tag (RMT). Each carton must be visibly marked with the RA number and have the RMT tag (RMT) in the packing list pouch and shipped via ground transport to: The Newterra facility indicated on the Return Authorization form.

The following applies to returns: (a) Cartons that are not marked with the RA number or do not have the RMT tag in the packing list pouch will be returned to the sender, unopened; (b) The appropriate credit will be issued upon verification of the age and condition of the product returned; (c) Customized products cannot be returned for credit unless it is identified that Newterra shipped the order in error; (d) Return of products not manufactured by Newterra will be subject to the original manufacturer's return to stock policy; (e) Newterra will not accept C.O.D. return shipments; (f) A return authorization will become null and void if equipment is not received by Newterra within 30 days of the date of issue. Claims for error in quantity or condition must be made within 10 days of receipt of the material. Newterra will not be responsible for any claimed shortages not reported within 10 days.

42. LIMIT TO LIABILITY:
Under no circumstances whatsoever will Newterra be responsible for liquidated, indirect, special, incidental or consequential damages including, but not limited to, lost business, overhead, loss of use of property, delay, damages, lost profits or third party claims, whether foreseeable or not, even if Newterra has been advised of the possibility of such damages in connection with the delivery, installation, use or performance of the equipment or the provision of maintenance services by Newterra regardless of whether such claims are alleged to have arisen out of breach of warranty, breach of contract, stricter absolute liability in tort, or other act, error or omission or any other cause whatsoever, or any combination of the foregoing.

Under no circumstances whatsoever will Newterra be responsible for direct damages in excess of 15% of the contract value.

43. HOLDBACK:
Newterra reserves the exclusive right to provide an irrevocable letter of credit in lieu of any holdback amount.

IN WITNESS WHEREOF, the Buyer hereby agrees and accepts these Terms and Conditions.

The customer authorizes Newterra to proceed with ordering the long lead parts per section 3 of these terms and conditions.

☐ Yes ☐ No

Company: _____

Signature: _____

Name (print): _____

Title: _____

Date: _____

APPENDIX O

FLUIDYNE ISAM SBR BROCHURE

ISAM™

INTEGRATED SURGE ANOXIC MIX

Proven Technology

FLUIDYNE'S ISAM™ IS A TOTAL TREATMENT SYSTEM

incorporating BOD, TSS and nitrogen removal along with sludge reduction in an integrated system. Raw (crude) sewage enters a covered anaerobic reactor for pretreatment, sludge thickening and sludge destruction. Complex organic solids undergo hydrolysis to simpler soluble organics which pass to the surge anoxic mix (SAM™) tank.

FLUIDYNE

The Experienced Leader in Wastewater Treatment Technology

fluidynecorp.com

319.266.9967

A TOTALLY NEW CONCEPT IN SBR DESIGN

FLUIDYNE ISAM™

In operation, all influent flow enters the anaerobic basin where influent solids are allowed to settle much like a primary clarifier. Elimination of primary solids in the anaerobic basin allows for much smaller SBR basins at equivalent SRT than conventional SBRs. The anaerobic selector also creates soluble carbon as a food source for biological nutrient removal through anaerobic conversion of settleable BOD to soluble BOD. The influent then flows to the SAM™ surge basin, or influent equalization basin. The surge basin provides flow and nutrient equalization to optimize treatment at the full range of flows and loadings.

100% ON-LINE STANDBY EQUIPMENT

Fluidyne's prepackaged ISAM SBRs are furnished with spare mixing/fill pump and aerator assembly installed for 100% redundancy.

REDUCES WASTE SLUDGE BY 75%

The Fluidyne ISAM™ Sequencing Batch Reactor incorporates an anaerobic selector chamber with the SAM™ SBR. The anaerobic selector not only provides consistent phosphorous removal by subjecting the recirculated biomass to anaerobic conditions, forcing the release of phosphorous, but also creates soluble carbon as a food source for phosphorous removal through anaerobic conversion of settleable BOD to soluble BOD. Additionally, anaerobic sludge digestion occurs in the anaerobic selector chamber, reducing waste solids production by up to 75% for the entire secondary process.

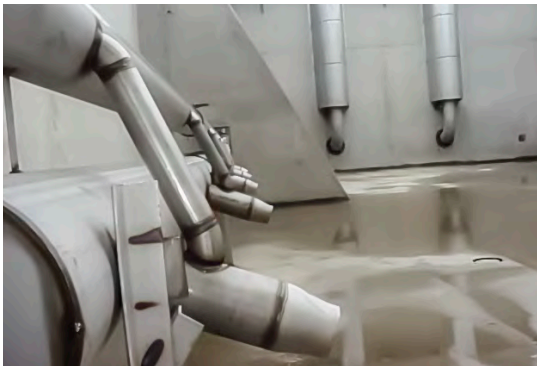
SEVERAL UNIQUE FEATURES

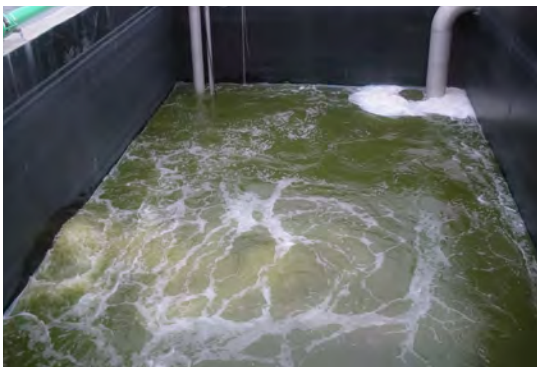
Several unique feature of the Fluidyne ISAM™ SBR include odor control and scum skimming. Mixed liquor is maintained in the SAM™ tank to immediately react with incoming flow from the anaerobic chamber to suppress odors and initiate and accelerate carbon and nitrogen reactions. Mixed liquor is recycled from the top of the SBR tank effectively removing scum by use of proprietary flow and scum control system. In addition, nitrates are recycled to the SAM™ tank for effective and rapid denitrification. Denitrification reactions are accelerated in the presence of the unreacted carbon from the raw sewage entering the SAM™ tank. Aeration and energy requirements are reduced as nitrates are fully reduced to nitrogen gas in the SAM™ tank.

EXPERIENCED LEADER IN
SEQUENCING BATCH REACTOR TECHNOLOGY

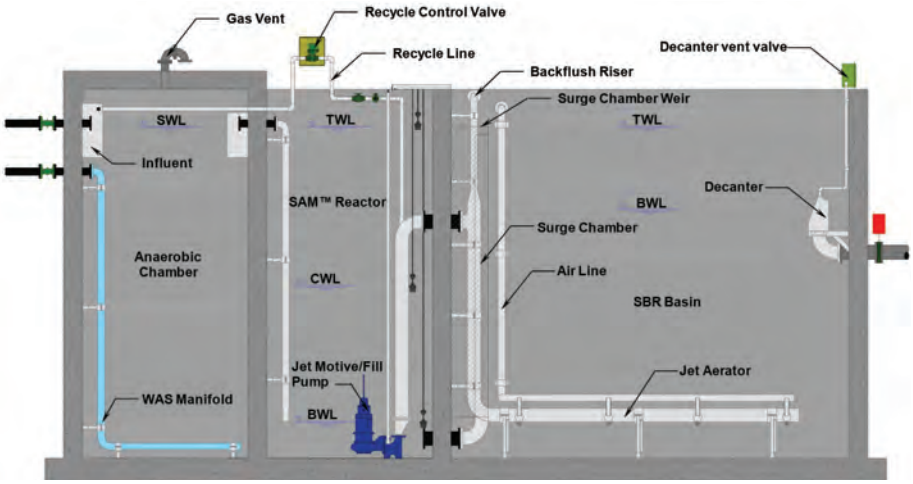
BENEFITS:

- Easy to operate and maintain
- Reduced operation and maintenance cost
- SBR basin has no moving parts that require maintenance.
- Power usage is controlled through the Fluidyne control panel
- Covered anaerobic selector chamber for odor control
- More flexible than continuous flow plants
- ISAM performs consistently regardless of influent flow changes
- Ability to handle highly variable flows and loading. Built in flow equalization is provided in the SAM™ reactor to handle peak hourly flows
- Built in sludge reduction system
- Aeration and mixing can automatically be adjusted to optimize power and prohibit filamentous growth
- Process utilizes quiescent settle and decant periods
- Small footprint with no digesters, secondary clarifiers,RAS piping and pumping
- Produces the highest quality effluent (Typical Fluidyne ISAM™ facilities are achieving less than 10 mg/L BOD5 and TSS, less than 1 mg/L NH3-N, less than 7 mg/L total N, and less than 2 mg/L phosphorus)
- Automatic scum skimming prior to effluent discharge provides highest quality effluent
- Easily expandable by adding additional flow trains



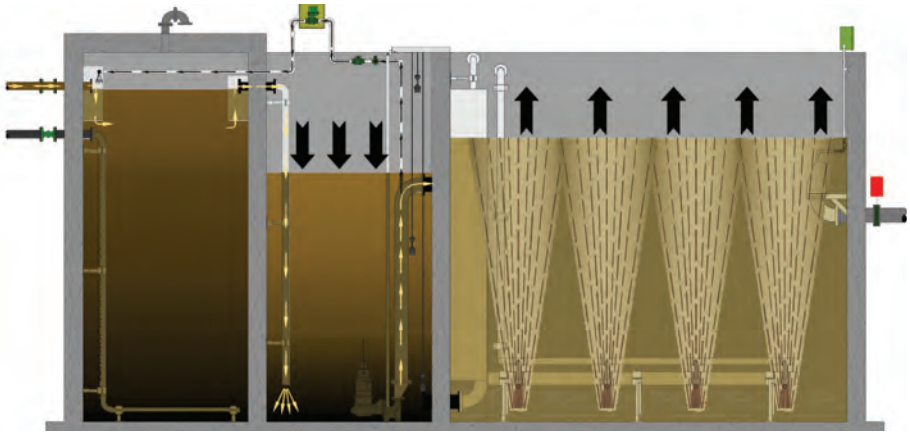


System Components:



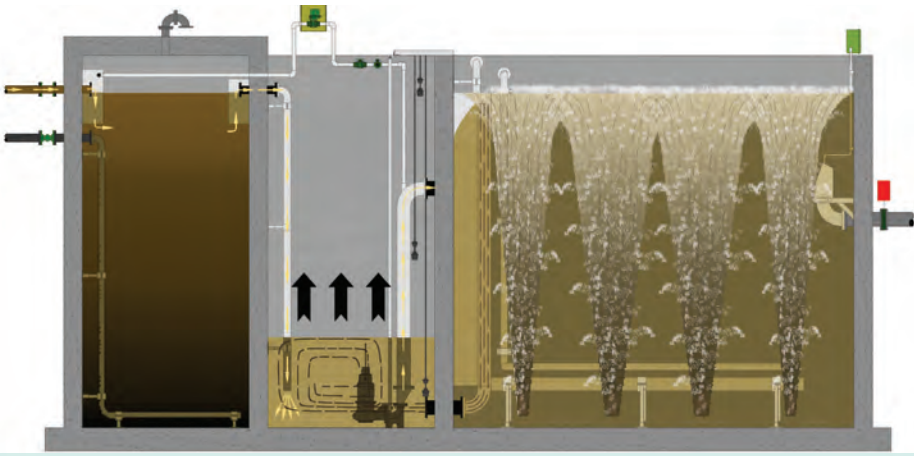
Influent continuously enters the anaerobic chamber where solids settle. Settleable BOD is converted to soluble BOD. BOD is reduced by 30% and solids are reduced by 60%. The influent then flows to the SAM™ reactor. Mixed liquor is maintained in the SAM™ reactor to suppress orders and initiate and accelerate carbon and nitrogen reduction.

Fill Phase:

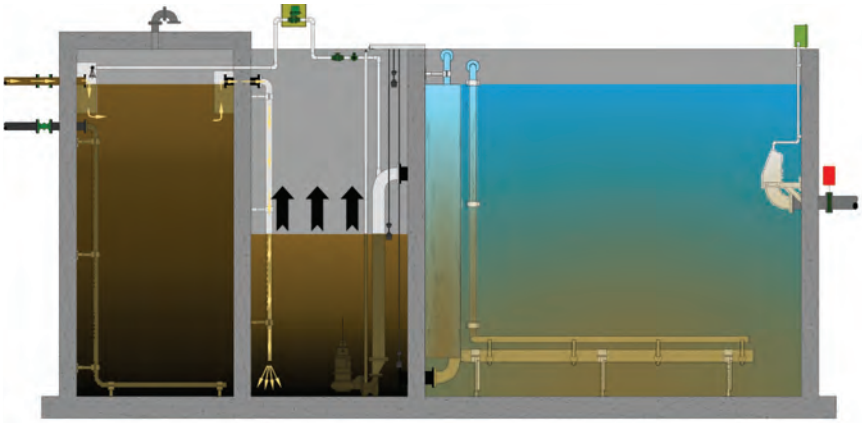


When the level in the SAM™ reactor reaches a predetermined “control level” the motive liquid pump is started. The SBR basin is filled and mixed. A percentage of the pumped flow is returned to the anaerobic chamber where biological solid settle. Settled solids in the anaerobic chamber are digested.

Interact Phase:

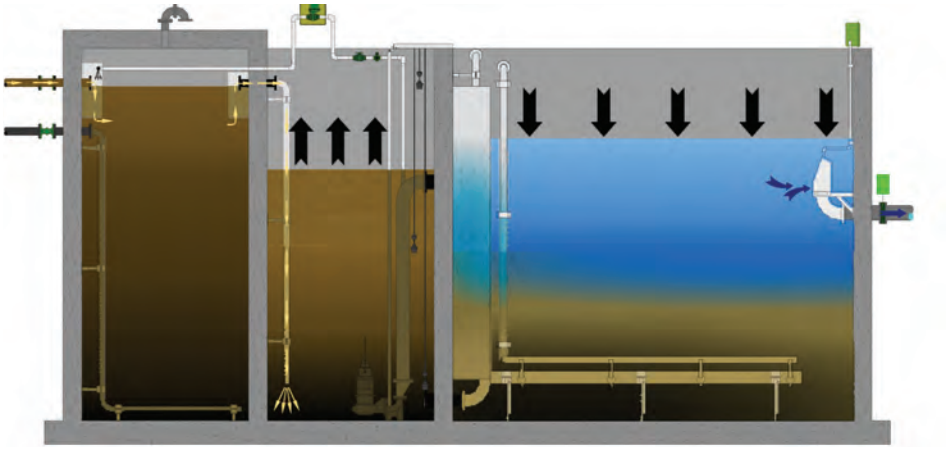


When the level in the SBR reaches TWL, nitrified mixed liquor overflows the surge chamber weir and is returned to the SAM™ chamber to mix and react with the raw influent. Aeration is cycled on and off to provide the required oxygen. Denitrification is reliable and complete. Scum is also removed from the SBR basin.



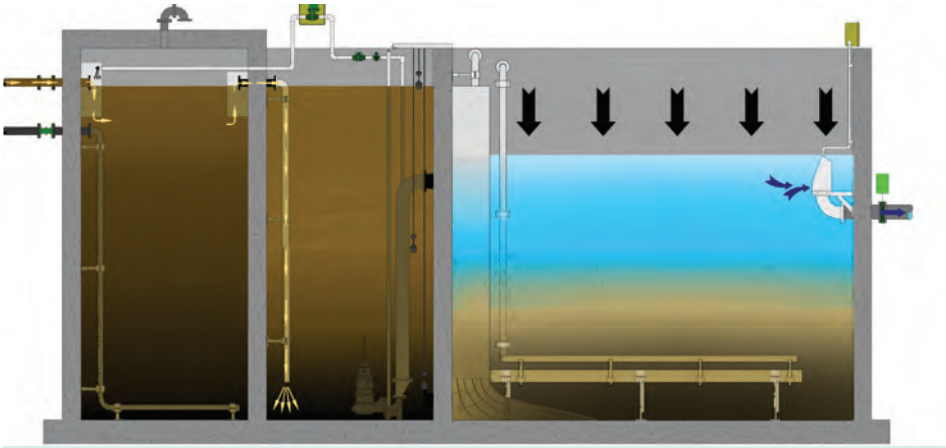
Settle Phase:

When the level in the SAM™ reactor again reaches “control level” aeration is discontinued and the SBR basin settles under perfect quiescent conditions.



Decant Phase:

When the settle timer expires, the decant valve is open and treated effluent is withdrawn from the upper portion of the SBR basin by means of a fixed solids excluding decanter.



Filled Decant Phase:

If, during peak flow events, the SAM™ reactor reaches TWL before the decant phase ends, influent flows in a reverse direction through the surge return line and overflows the surge chamber secondary weir and is diffused into the settled sludge at very low velocity as the decant phase continues.

FLUIDYNE

THE EXPERIENCED LEADER IN WASTEWATER TREATMENT TECHNOLOGY

THE EXPERIENCED LEADER IN WASTEWATER TREATMENT TECHOLOGY

FLUIDYNE CORPORATION

5436 Nordic Drive, Suite D
Cedar Falls, IA 50613

319.266.9967

fax: 319.277.6034
fluidyne@fluidynecorp.com

FLUIDYNECORP.COM

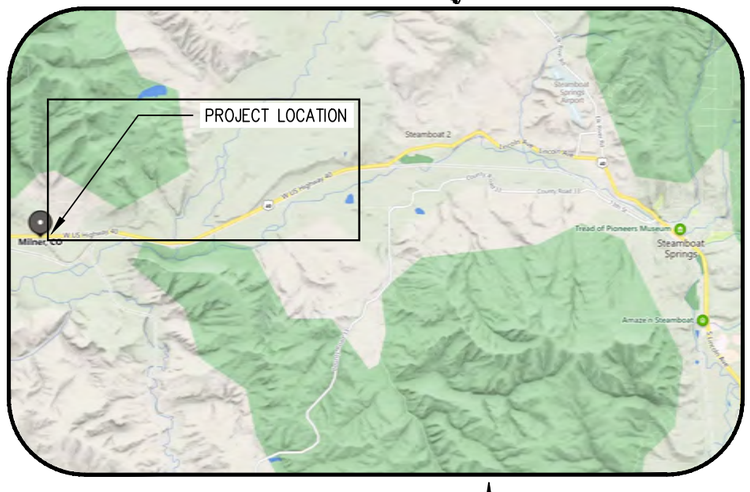
APPENDIX P

PRELIMINARY DRAWINGS WITH LIFT STATION SITE SURVEY

COMMUNITY OF MILNER
WASTEWATER TREATMENT IMPROVEMENT PROJECT
PRELIMINARY DRAWINGS
AUGUST 2022

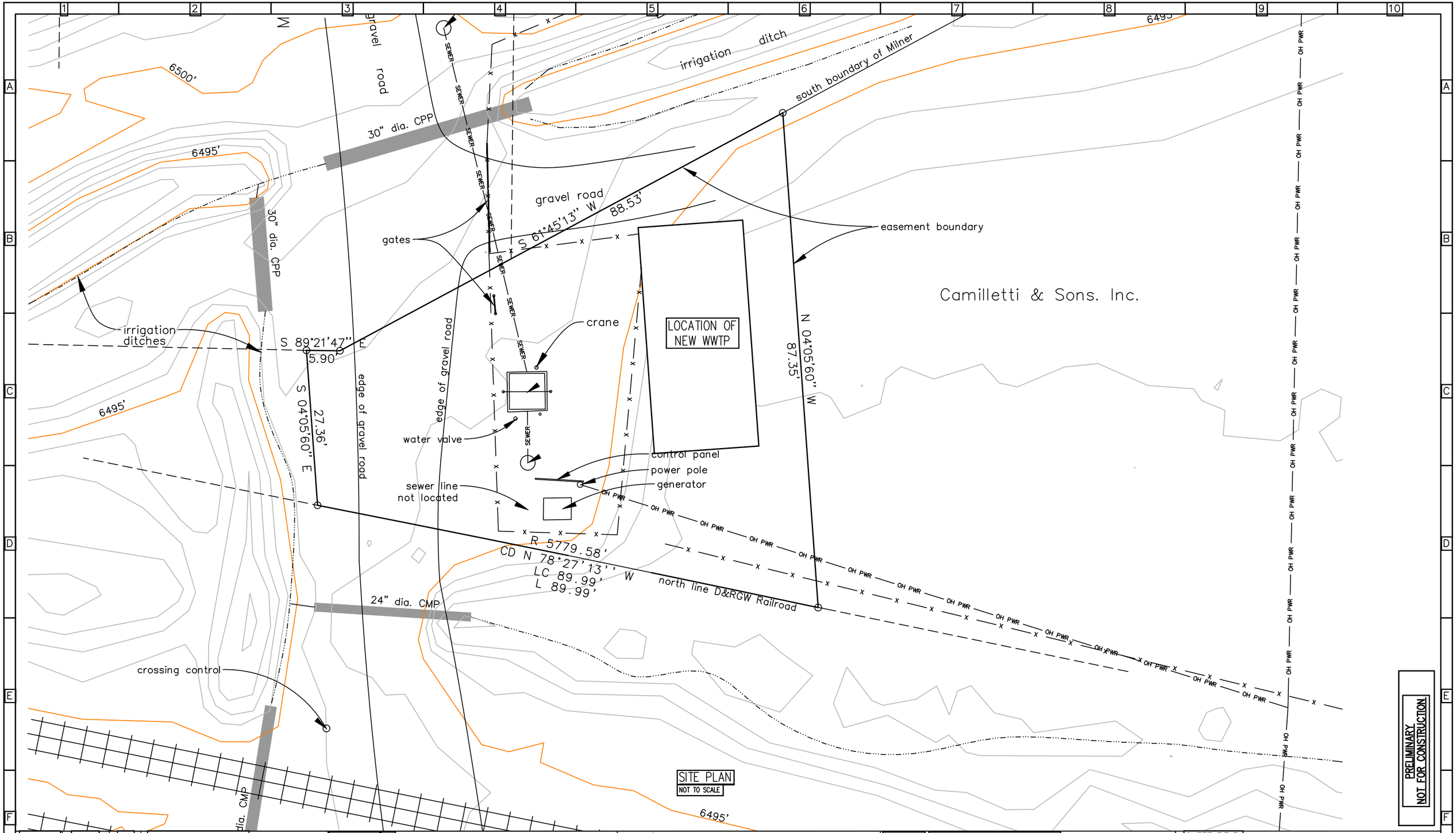
SHEET LIST TABLE	
SHEET NUMBER	SHEET TITLE
1	COVER SHEET
2	SITE PLAN
3	PROCESS FLOW DIAGRAM
4	HYDRAULIC PROFILE

VICINITY MAP
NOT TO SCALE



LOCATION MAP
NOT TO SCALE

AquaWorks DBO INC
DESIGN BUILD OPERATE
3252 WILLIAMS STREET | DENVER
COLORADO | 80205 | (303) 477-5915



REV. No:	DATE:	BY:	REVISION DESCRIPTION:

DRAWN BY: AS
DESIGNED BY: AS
FILE PRINTED ON: 7/8/2022 2:18:27 PM

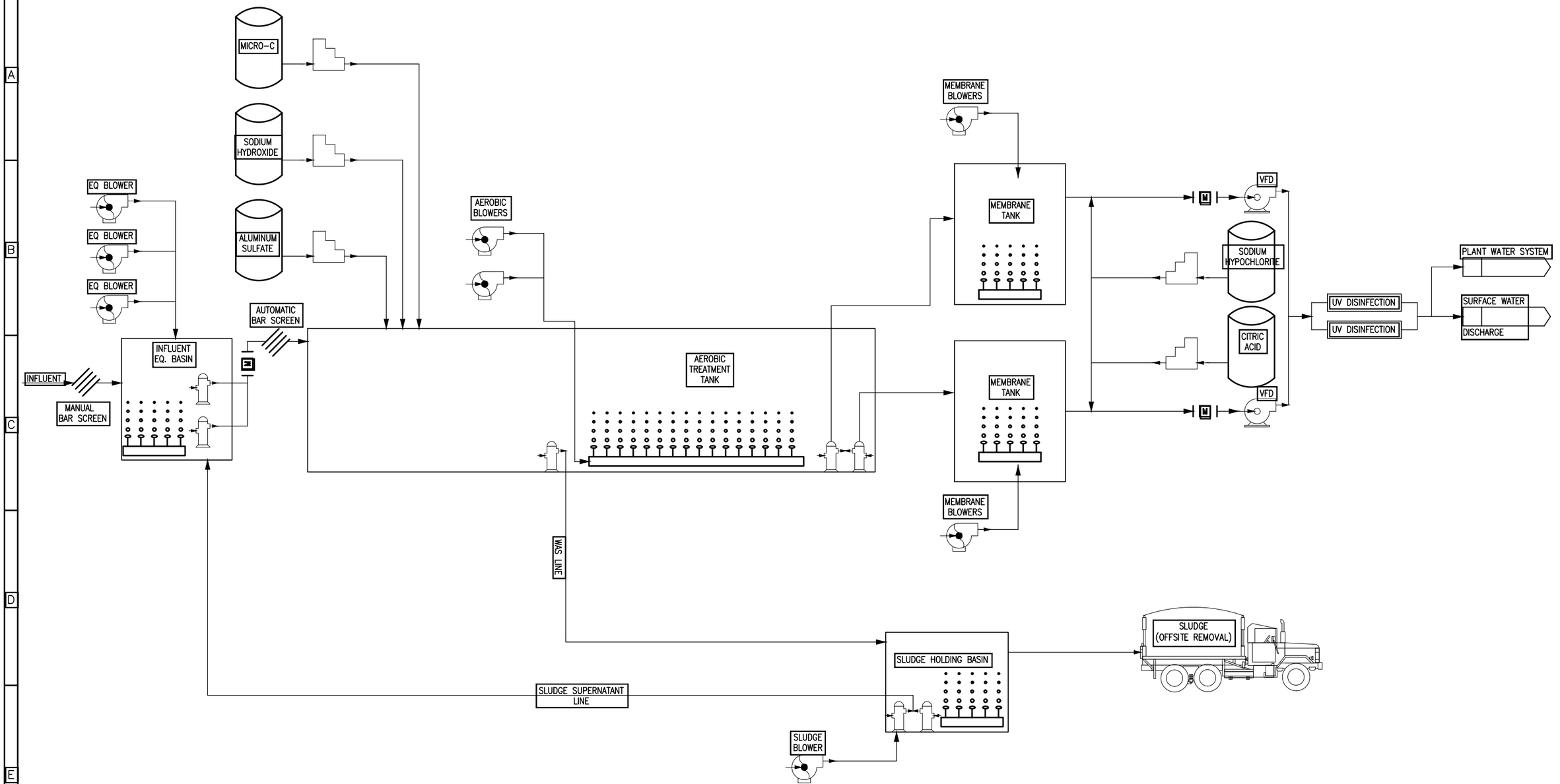
0 1 IF THIS BAR DOES NOT READ 1"
DRAWING IS NOT LABELED TO SCALE

AquaWorks DBO INC
DESIGN BUILD OPERATE

PROJECT: WWTP IMPROVEMENT PROJECT
COMMUNITY OF MILNER
ROUTT COUNTY, COLORADO

ENGINEER: AQUAWORKS DBO, INC.
3252 WILLIAMS STREET
DENVER, COLORADO 80205
(303) 477-5915

SHEET TITLE: SITE PLAN
PROJECT NUMBER: #2479
SCALE: NOT TO SCALE
SHEET: 2



PROCESS FLOW DIAGRAM
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

REV. No:	DATE:	BY:	REVISION DESCRIPTION:

DRAWN BY: AS
DESIGNED BY: AS
FILE PRINTED ON: 7/8/2022 2:18:27 PM

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

AquaWorks DBO INC
DESIGN BUILD OPERATE

PROJECT: WWTP IMPROVEMENT PROJECT
COMMUNITY OF MILNER
ROUTT COUNTY, COLORADO

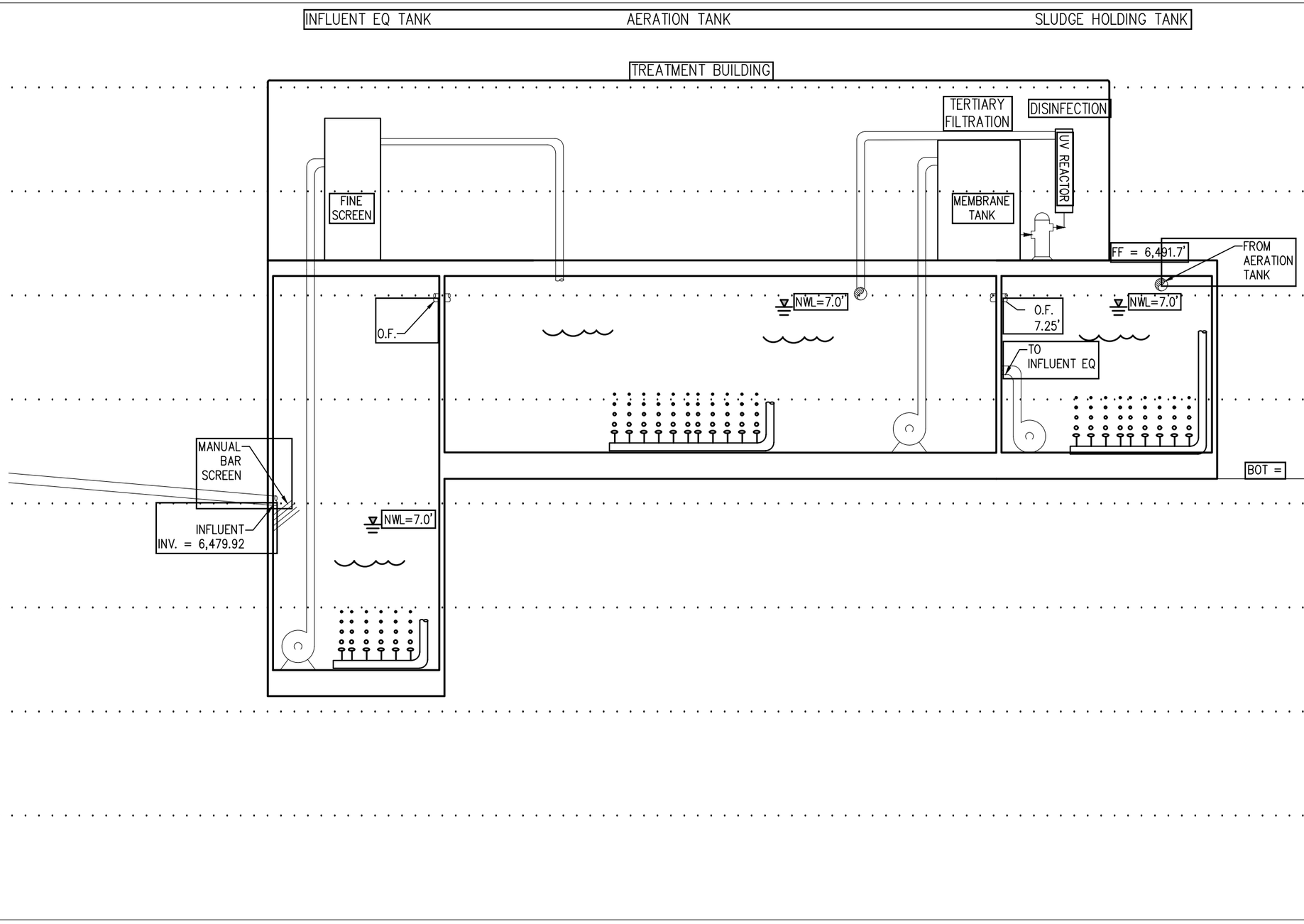
ENGINEER: AQUAWORKS DBO, INC.
3252 WILLIAMS STREET
DENVER, COLORADO 80205
(303) 477-5915

SHEET TITLE: PROCESS FLOW DIAGRAM

PROJECT NUMBER: #2479

SCALE: NOT TO SCALE

SHEET: 3



HYDRAULIC PROFILE
NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

REV. No:	DATE:	BY:	REVISION DESCRIPTION:

DRAWN BY: AS
DESIGNED BY: AS
FILE PRINTED ON: 7/8/2022 2:18:28 PM

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

AquaWorks DBO INC
DESIGN BUILD OPERATE

PROJECT: WWTP IMPROVEMENT PROJECT
COMMUNITY OF MILNER
ROUTT COUNTY, COLORADO

ENGINEER: AQUAWORKS DBO, INC.
3252 WILLIAMS STREET
DENVER, COLORADO 80205
(303) 477-5915

SHEET TITLE: HYDRAULIC PROFILE
PROJECT NUMBER: #2479
SCALE: NOT TO SCALE
SHEET: 4

APPENDIX Q

SOLAR STUDY

Routt County PV Study 2022

Communities of Milner & Phippsburg
Wastewater Treatment Plants

STRAIGHTEDGE
The Connecting Line Between Design / Build
14526 W. 57th Place Arvada, CO 303-403-0531

William Brunner P.E.
Straightedge, Inc.
bill@str8edge.com

Electrical Solar PV Study Table of Contents

I. Study Executive Summary:

The goal for the Routt County Solar PV system is to offset Yampa Valley Electric utility costs for the wastewater plants in Milner and Phippsburg. The system study size and production are based on the YVEA maximum input for their net metering program, which is capped at 120% of present electrical consumption. From the YVEA and Colorado State information, the projects do not qualify for a solar energy rebate or tax deduction for the installation. The open market for renewable energy credits (RECs) might be an option to enter into a power purchase agreement (PPA) with a third-party aggregator, thereby altering the payback analysis we included in the study. Prior PPA projects we have worked on for Xcel Energy are typically 10-100 times as large as this project, so we are unsure of this opportunity.

The PV system design and cost opinions in the study are straightforward and can be reviewed by others. On the critical calculation of the cost and possible payback of the PV systems, we believe that it will be approximately 20 years each to recover the initial capital outlay. The life of the PV System components will be at or near their end in these scenarios and require the recycling and replacement of panels and parts. These projects make sense if the County can sell RECs to offset the initial costs of the installation. If RECs are unavailable, we would not recommend installing the PV systems from a cost and maintenance standpoint.

II. Analysis of Existing Plant Energy Usage and YVEA Data

A. YVEA PV Solar Standards, Procedures & Rates.
B. YVEA Milner Energy Usage 2021.
C. YVEA Phippsburg Energy Usage 2021.
D. Future Plant Energy Usage.

A. YVEA PV Solar Standards, Procedures & Rates

Qualifying Facility Energy System

The system size limits are set by the type of service the member now has or would qualify for with new construction. A medium or large service is allowed a system that is capable of producing up to 120% of the member's annual usage or 150 kW, whichever is less. The proposed PV design for each facility is under 120% of the yearly usage tables in this section.

Net Metering of PV System:

From the YVEA standards, net-metering is the process whereby energy usage and generation is resolved. This is an automated process through YVEA's revenue meters. For any generation above a given month's usage, the Producer will retain a credit and this credit will be applied to their next months bill. At the end of the calendar year, the Producer will be paid at the current rate for any generation above their usage of the previous year.

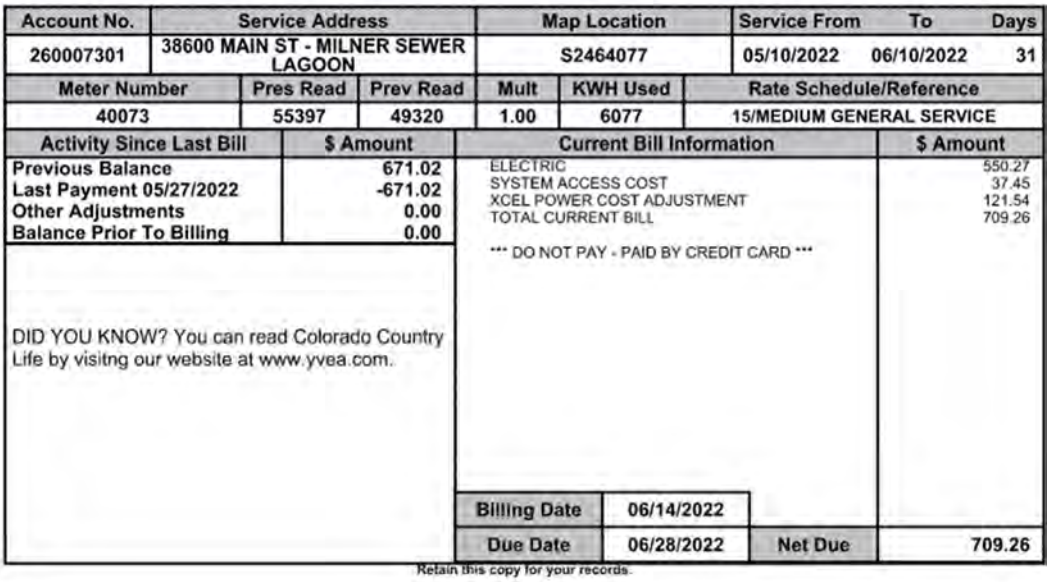
Since the PV can produce energy above the usage level, the generated kWh above the usage would be credited at “rate 50” which is $0.033 per generated kWh above that which was used during a calendar year.

B. YVEA Milner Energy Usage 2021.

The table below shows the past 12 months of energy usage for the Milner site:

Milner Lagoon/Sewer			
YVEA Account #	260007301		
Energy Consumption Period	Usage kWH (kiloWattHours)	Cost	Avg Daily kWH
May-21	5,773	522.75	186
Jun-21	5,657	512.24	189
Jul-21	5,862	530.8	189
Aug-21	4,690	424.68	151
Sep-21	3,685	333.68	123
Oct-21	4,773	432.2	154
Nov-21	6,420	581.33	214
Dec-21	4,306	389.91	139
Jan-22	4,019	363.92	130
Feb-22	6,114	553.62	218
Mar-22	6,173	602.18	199
Apr-22	6,301	633.57	210
12 Month Avg Totals	63,773	5,880.88	175
YVEA 120% Maximum	76,528		
Maximum Size PV	76.53		

The current electric bill for Milner is below:



Account No.	Service Address		Map Location		Service From	To	Days
260007301	38600 MAIN ST - MILNER SEWER LAGOON		S2464077		05/10/2022	06/10/2022	31
Meter Number	**Pres Read**	**Prev Read**	**Mult**	**KWH Used**	**Rate Schedule/Reference**		
40073	55397	49320	1.00	6077	15/MEDIUM GENERAL SERVICE		

Activity Since Last Bill	$ Amount
Previous Balance	671.02
Last Payment 05/27/2022	-671.02
Other Adjustments	0.00
Balance Prior To Billing	0.00

DID YOU KNOW? You can read Colorado Country Life by visitng our website at www.yvea.com.

Current Bill Information	$ Amount
ELECTRIC	550.27
SYSTEM ACCESS COST	37.45
XCEL POWER COST ADJUSTMENT	121.54
TOTAL CURRENT BILL	709.26

*** DO NOT PAY - PAID BY CREDIT CARD ***

Billing Date	06/14/2022		
Due Date	06/28/2022	Net Due	709.26

Retain this copy for your records.

Notes from the typical bill:

- There are no demand charges for this facility which are charged separately to supply peak power to the facility and will not be reduced by PV System.
- The system access cost and Xcel power cost adjustment could remain a charge even if the PV system supplies all of the electricity for the month.

C. YVEA Phippsburg Energy Usage 2021.

The table below shows the past 12 months of energy usage for the Phippsburg site:

Phippsburg Sewer Plant			
YVEA Account #	10067601		
Energy Consumption Period	Usage kWH (kiloWattHours)	Cost	Avg Daily kWH
May-21	7,536	682.38	243
Jun-21	8,640	782.35	288
Jul-21	8,256	747.58	266
Aug-21	8,640	782.35	279
Sep-21	7,536	682.38	251
Oct-21	7,632	691.08	246
Nov-21	9,600	869.28	320
Dec-21	2,832	256.44	91
Jan-22	4,464	404.22	144
Feb-22	4,800	434.64	171
Mar-22	3,264	318.41	105
Apr-22	3,840	386.11	128
12 Month Totals	77,040	7,037.22	211
YVEA 120% Maximum	92,448		
Maximum Size PV	92.45		

The current electric bill for Phippsburg is below:

Account No.	Service Address		Map Location		Service From	To	Days
10067601	SEWER PBURG		S29409005		05/06/2022	06/07/2022	32
Meter Number	**Pres Read**	**Prev Read**	**Mult**	**KWH Used**	**Rate Schedule/Reference**		
47153	10119	10016	48.00	4944	15/MEDIUM GENERAL SERVICE		

Activity Since Last Bill	$ Amount
Previous Balance	423.56
Last Payment 05/25/2022	-423.56
Other Adjustments	0.00
Balance Prior To Billing	0.00

DID YOU KNOW? You can read Colorado Country Life by visitng our website at www.yvea.com.

Current Bill Information	$ Amount
ELECTRIC	447.68
SYSTEM ACCESS COST	37.45
XCEL POWER COST ADJUSTMENT	98.88
TOTAL CURRENT BILL	584.01

*** DO NOT PAY - PAID BY CREDIT CARD ***

Billing Date	06/09/2022		
Due Date	06/23/2022	Net Due	584.01

Retain this copy for your records.

It appears that the electric rate per kHW from YVEA now stands at approximately @ $.11.

D. Future Plant Energy Usage and Rates

Future Plant Usage Based on Newterra Replacement System

The following energy usage is from Newterra for each site:

2207813 – Milner
15,000 GPD – 167 kWh/day
32,500 GPD – 261 kWh/day

2207814 - Phippsburg
10,000 GPD – 149 kWh/day
30,000 GPD – 286 kWh/day
Note, does not include power for HVAC

At the low GPD numbers above, the PV system will produce more than the original design values of 120%, and excess energy above usage will be credited at $.033 per kWh compared to offsetting the $.11 per kWh rate. As the daily GPD increases over time, the PV credit will be larger.

III. Solar PV Production Calculations and Design.

A. PVsys Site Calculations for Milner Plant.
B. PVsys Site Calculations for Phippsburg Plant.
C. PV System Design for Milner Plant.
D. PV System Design for Phippsburg Plant.

A. PVsys Site Calculations for Milner Plant.

Basis of Design

We determined the following PV system design made the most sense for the facilities that are remote from significant PV installation markets:

1. The PV system will be fixed tilt with a south-facing array layout.
2. The PV modules will be mid-range wattage and presently available in the marketplace.
3. The inverters will be standard wattage and available in the US
4. The system will include DC optimizers to allow the capture of the most solar energy.
5. The modules will sit on fixed racking with concrete precast ballast blocks for support.

Milner Site Calculations with PVSys:

The following report is from the industry-standard PVSys software version 7.2:

Version 7.2.16

PVsyst - Simulation report

Grid-Connected System

Project: Routt Milner

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 40.6 kWp

Milner - United States

Author

PVsyst V7.2.16
VC0, Simulation date:
02/07/22 14:43
with v7.2.16

Project summary

Geographical Site
Milner
United States

Situation

Latitude	40.48 °N
Longitude	-107.02 °W
Altitude	1976 m
Time zone	UTC-7

Project settings
Albedo 0.20

Meteo data
Phippsburg
Meteonorm 8.0 (1999-2015), Sat=94% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation
Fixed plane
Tilt/Azimuth 30 / 0 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	104 units	Nb. of units	2 units
Pnom total	40.6 kWp	Pnom total	40.2 kWac
		Pnom ratio	1.009

Results summary

Produced Energy	72.97 MWh/year	Specific production	1799 kWh/kWp/year	Perf. Ratio PR	89.89 %

Table of contents

General parameters

Grid-Connected System — **No 3D scene defined, no shadings**

PV Field Orientation

Orientation		Sheds configuration	Models used	
Fixed plane		No 3D scene defined	Transposition	Perez
Tilt/Azimuth	30 / 0 °		Diffuse	Perez, Meteonorm
			Circumsolar	separate

Horizon
Free Horizon

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Generic
Model	Q.Peak-Duo-L-G5.2-390
(Original PVsyst database)	
Unit Nom. Power	390 Wp
Number of PV modules	104 units
Nominal (STC)	40.6 kWp
Optimizer Array	4 Strings x 26 In series
At operating cond. (50°C)	
Pmpp	36.9 kWp
Output of optimizers	
Voper	750 V
I at Poper	49 A

Inverter

Manufacturer	Generic
Model	SE20.1K-BRA (380/220V)
(Original PVsyst database)	
Unit Nom. Power	20.1 kWac
Number of inverters	2 units
Total power	40.2 kWac
Operating voltage	750 V
Pnom ratio (DC:AC)	1.06

SolarEdge Power Optimizer

Model	P601 Worldwide
Unit Nom. Power	600 W
Input modules	One module

Total PV power

Nominal (STC)	41 kWp
Total	104 modules
Module area	210 m²

Total inverter power

Total power	40.2 kWac
Number of inverters	2 units
Pnom ratio	1.01

Array losses

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

DC wiring losses
Global array res. 208 mΩ
Loss Fraction 1.5 % at STC

Module Quality Loss
Loss Fraction -0.8 %

Module mismatch losses
Loss Fraction (Fixed voltage) 0.0 %

IAM loss factor
Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

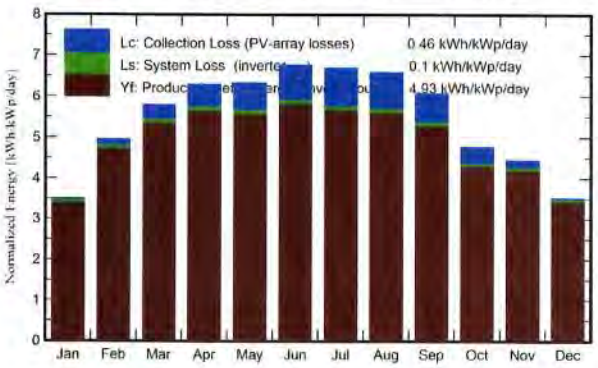
0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

Main results

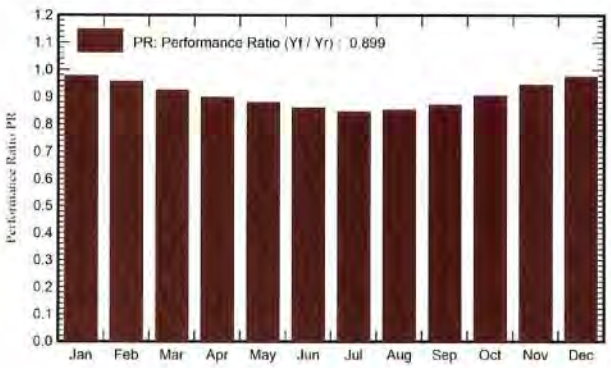
System Production

Produced Energy	72.97 MWh/year	Specific production	1799 kWh/kWp/year
		Performance Ratio PR	89.89 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

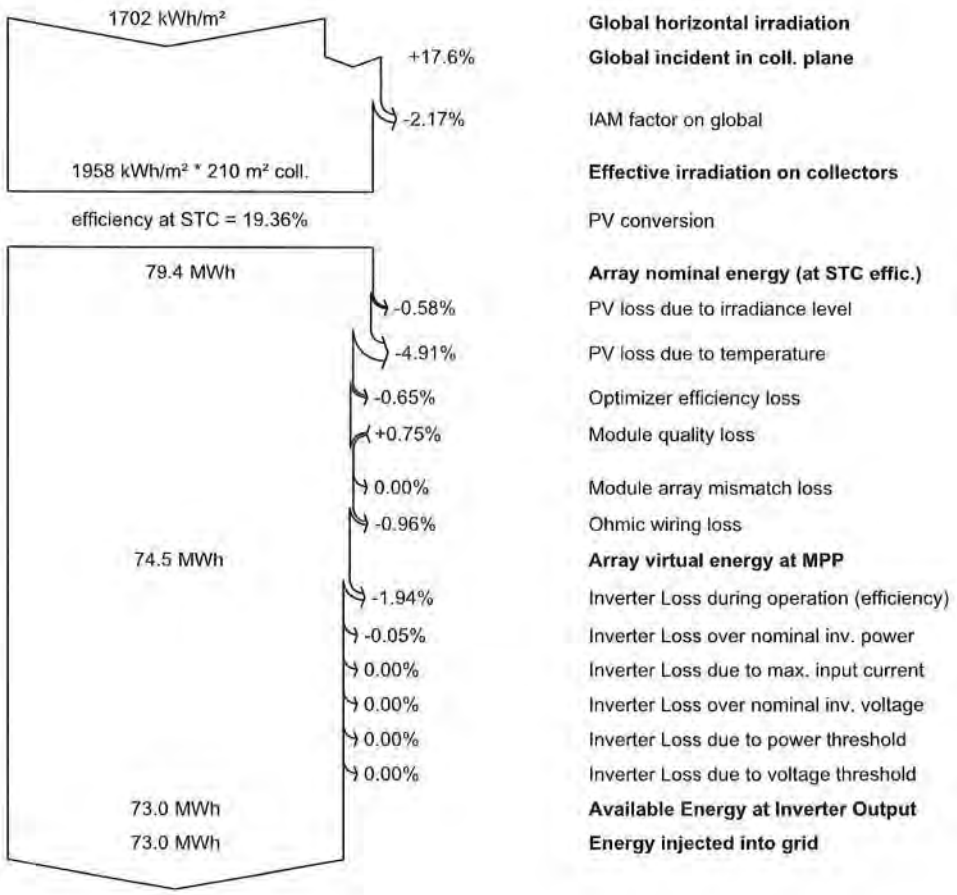
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	65.4	27.22	-7.29	108.6	106.7	4.389	4.304	0.977
February	92.3	27.65	-5.47	138.8	136.7	5.497	5.392	0.958
March	140.8	47.82	-0.28	179.7	176.0	6.878	6.745	0.926
April	172.2	53.08	5.64	189.1	184.4	7.030	6.893	0.899
May	199.3	67.03	10.61	196.8	191.7	7.157	7.016	0.879
June	216.7	65.83	15.85	203.4	198.2	7.233	7.092	0.860
July	216.4	72.84	20.68	208.0	202.9	7.289	7.147	0.847
August	195.1	64.65	18.92	204.2	199.2	7.201	7.062	0.853
September	152.4	45.72	13.27	182.3	178.2	6.571	6.444	0.872
October	108.7	41.09	6.82	148.1	145.3	5.540	5.432	0.905
November	80.6	27.30	-1.00	133.5	131.3	5.224	5.124	0.946
December	62.5	24.90	-6.63	109.3	107.5	4.407	4.323	0.975
Year	1702.4	565.11	5.99	2001.6	1958.2	74.416	72.974	0.899

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

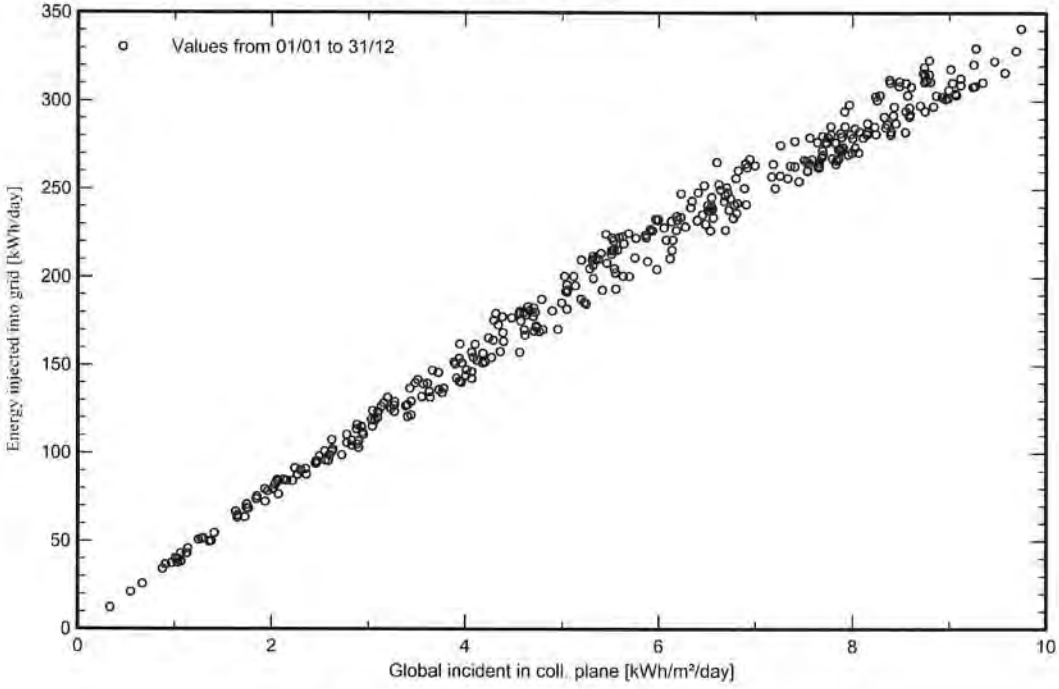
PVsyst V7.2.16
VC0, Simulation date:
02/07/22 14:43
with v7.2.16

Loss diagram

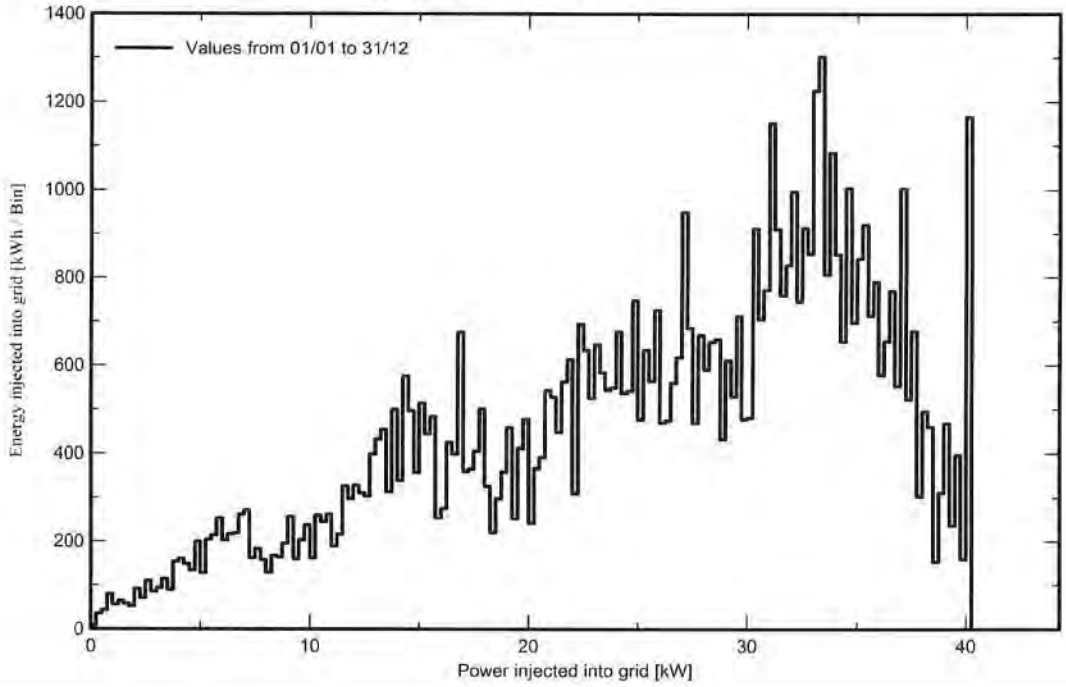


Special graphs

Daily Input/Output diagram



System Output Power Distribution



B. PVsys Site Calculations for Phippsburg Plant.

Phippsburg Site Calculations with PVSys:

Version 7.2.16

PVsyst - Simulation report

Grid-Connected System

Project: Routt Phippsburg

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 48.4 kWp

Phippsburg - United States

Author

PVsyst V7.2.16
VC0, Simulation date:
02/07/22 11:25
with v7.2.16

Project summary

Geographical Site
Phippsburg
United States

Situation

Latitude	40.23 °N
Longitude	-106.94 °W
Altitude	2265 m
Time zone	UTC-7

Project settings
Albedo 0.20

Meteo data
Phippsburg
Meteonorm 8.0 (1999-2015), Sat=87% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation
Fixed plane
Tilt/Azimuth 30 / 0 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	124 units	Nb. of units	2 units
Pnom total	48.4 kWp	Pnom total	66.6 kWac
		Pnom ratio	0.726

Results summary

Produced Energy	87.94 MWh/year	Specific production	1819 kWh/kWp/year	Perf. Ratio PR	89.21 %

Table of contents

General parameters

Grid-Connected System — **No 3D scene defined, no shadings**

PV Field Orientation

Orientation		Sheds configuration	Models used	
Fixed plane		No 3D scene defined	Transposition	Perez
Tilt/Azimuth	30 / 0 °		Diffuse	Perez, Meteonorm
			Circumsolar	separate

Horizon
Free Horizon

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Generic
Model	Q.Peak-Duo-L-G5.2-390
(Original PVsyst database)	
Unit Nom. Power	390 Wp
Number of PV modules	124 units
Nominal (STC)	48.4 kWp
Optimizer Array	4 Strings x 31 In series
At operating cond. (50°C)	
Pmpp	44.0 kWp
Output of optimizers	
Voper	710 V
I at Poper	62 A

Inverter

Manufacturer	Generic
Model	SE100K-JP Unit (400V)
(Original PVsyst database)	
Unit Nom. Power	33.3 kWac
Number of inverters	2 units
Total power	66.6 kWac
Operating voltage	710 V
Pnom ratio (DC:AC)	0.77

SolarEdge Power Optimizer

Model	P601 Worldwide
Unit Nom. Power	600 W
Input modules	One module

Physical inverters

SE100K-JP Unit (400V)
Inverter #1 with 3 strings
3 strings of 31 optimizers P601 Worldwide
SE100K-JP Unit (400V)
Inverter #2 with one string
1 strings of 31 optimizers P601 Worldwide

Total PV power

Nominal (STC)	48 kWp
Total	124 modules
Module area	250 m²

Total inverter power

Total power	66.6 kWac
Number of inverters	2 units
Pnom ratio	0.73

Array losses

Thermal Loss factor
Module temperature according to irradiance

Uc (const)	20.0 W/m²K
Uv (wind)	0.0 W/m²K/m/s

DC wiring losses

Global array res.	156 mΩ
Loss Fraction	1.5 % at STC

Module Quality Loss
Loss Fraction -0.8 %

Module mismatch losses
Loss Fraction (Fixed voltage) 0.0 %

Array losses

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

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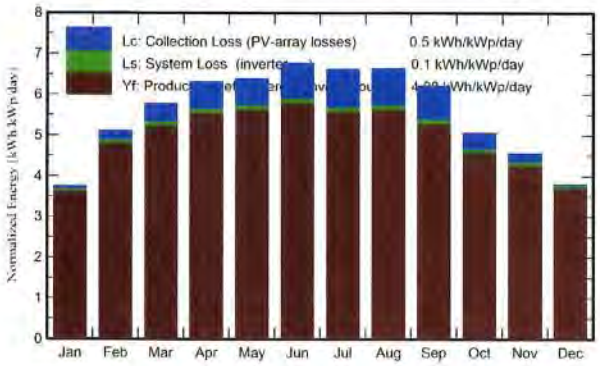
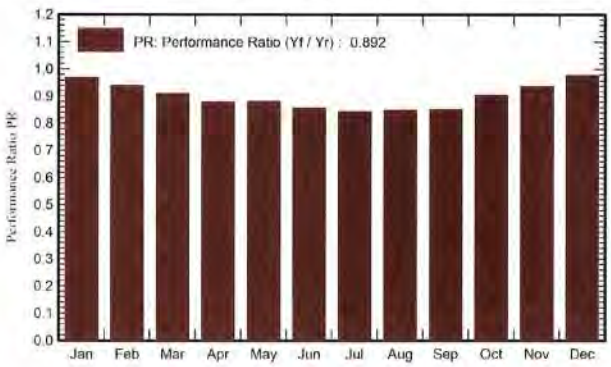
System Production

Produced Energy	87.94 MWh/year	Specific production	1819 kWh/kWp/year
		Performance Ratio PR	89.21 %

Normalized productions (per installed kWp)



Performance Ratio PR



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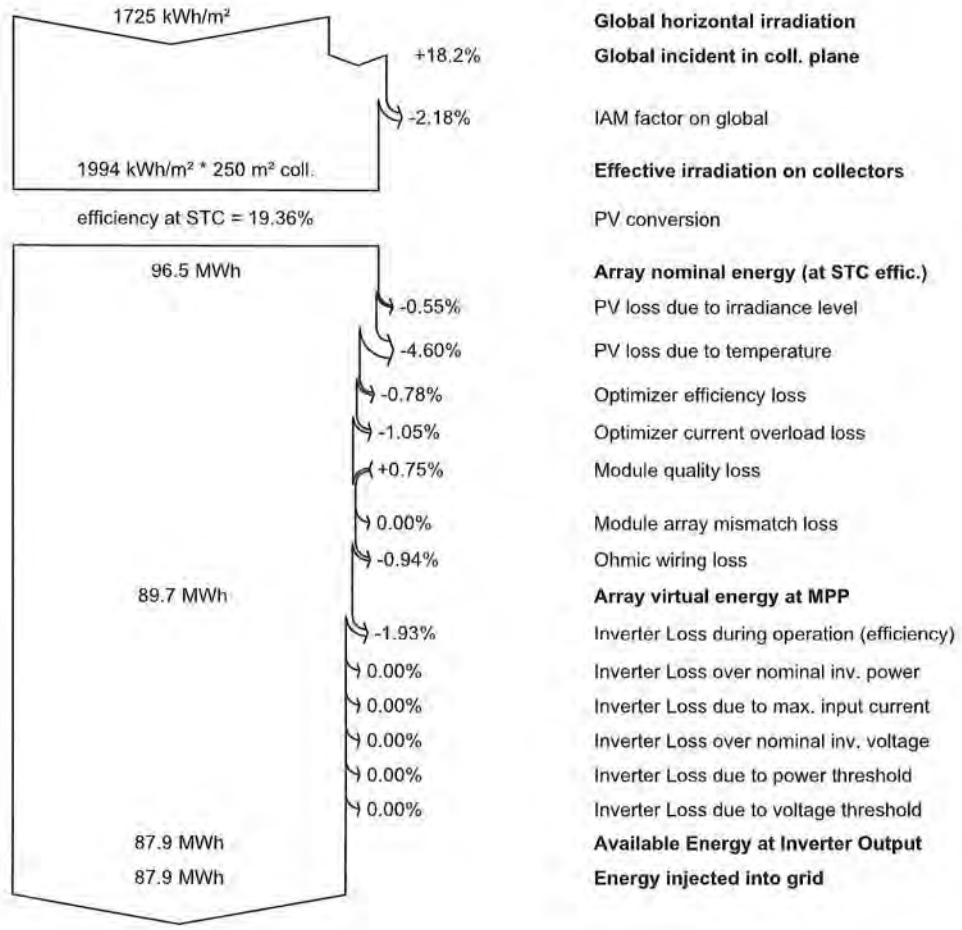
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	69.6	26.58	-8.58	116.2	114.2	5.548	5.441	0.969
February	95.5	28.01	-6.81	142.9	140.7	6.634	6.507	0.942
March	143.0	52.91	-1.48	178.9	175.0	8.024	7.871	0.910
April	173.9	64.37	4.40	189.6	184.8	8.221	8.062	0.879
May	201.9	78.50	9.36	198.4	193.3	8.628	8.460	0.882
June	216.0	69.65	14.83	203.1	198.0	8.590	8.423	0.858
July	213.0	76.53	19.65	205.5	200.3	8.545	8.379	0.843
August	194.8	60.51	17.75	205.7	200.6	8.620	8.453	0.850
September	154.8	46.72	12.23	186.5	182.4	7.835	7.683	0.852
October	112.6	41.27	5.52	157.0	154.2	7.007	6.874	0.905
November	83.7	27.88	-2.27	136.8	134.6	6.335	6.214	0.939
December	65.9	23.12	-8.08	117.9	116.1	5.684	5.576	0.978
Year	1724.6	596.05	4.78	2038.5	1994.1	89.671	87.944	0.892

Legends

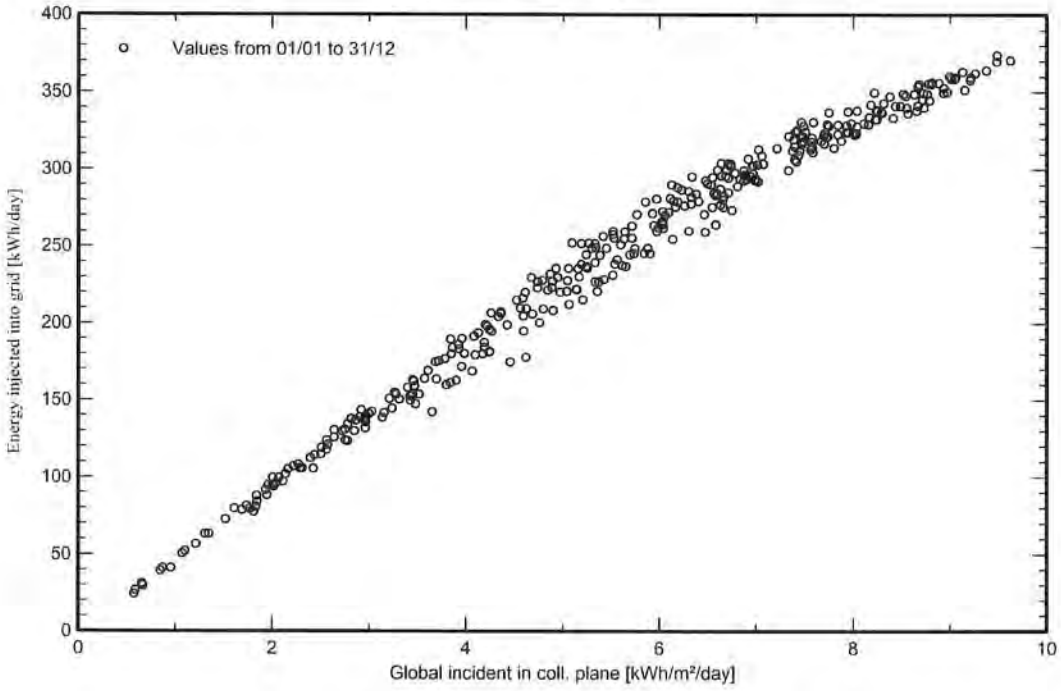
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		

Loss diagram

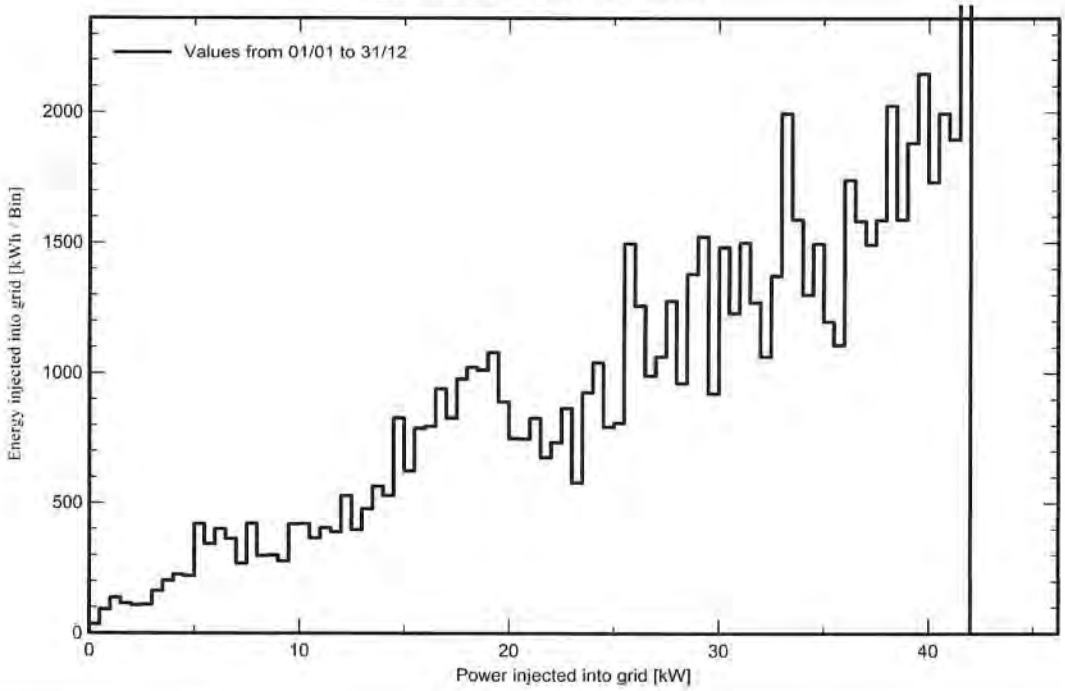


Special graphs

Daily Input/Output diagram



System Output Power Distribution



Cost of the system

Installation costs

Item	Quantity units	Cost USD	Total USD
Total			0.00
Depreciable asset			0.00

Operating costs

Item	Total USD/year
Total (OPEX)	0.00

System summary

Total installation cost	0.00 USD
Operating costs	0.00 USD/year
Produced Energy	87.9 MWh/year
Cost of produced energy (LCOE)	0.000 USD/kWh

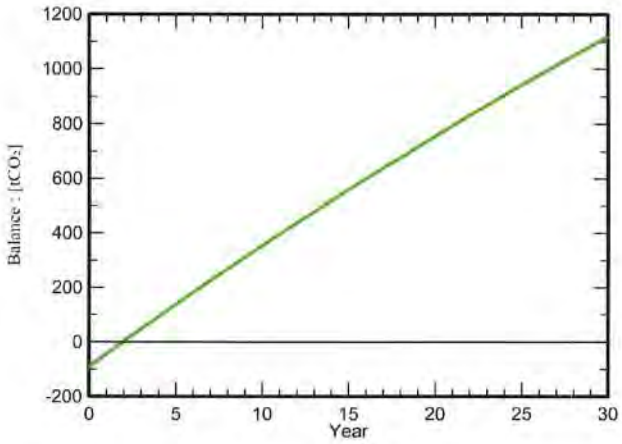
CO_2 Emission Balance

Total: 1118.0 tCO_2

Generated emissions
Total: 90.70 tCO_2
Source: Detailed calculation from table below:

Replaced Emissions
Total: 1393.0 tCO_2
System production: 87.94 MWh/yr
Grid Lifecycle Emissions: 528 gCO_2/kWh
Source: IEA List
Country: United States
Lifetime: 30 years
Annual degradation: 1.0 %

Saved CO_2 Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[$kgCO_2$]
Modules	1713 kgCO2/kWp	49.9 kWp	85499
Supports	3.52 kgCO2/kg	1280 kg	4508
Inverters	349 kgCO2/	2.00	698

C. PV System Design for Milner Plant.

The following is the PV design for the Milner Plant:

Full PV System Information			
Inverter	Item	Qty	Unit
SolarEdge SE20K-US	Module Wattage	390	W
	Number of Modules	104	EA
	Modules Per String	26	EA
	# of Strings	4	EA
	SolarEdge P601 Optimizer	104	EA
	Strings Per Inverter	2	EA
	Total DC Output	40.6	kW
	Maximum AC Output	40.0	kW

PV Site Plan Milner Routt County WWTP Option 1

Scale: 1" = 40'

PV Site Plan Milner Routt County WWTP Option 2

Scale: 1" = 40'

Milner Routt County WWTP

40.6kW AC Solar PV Project

Milner, Colorado

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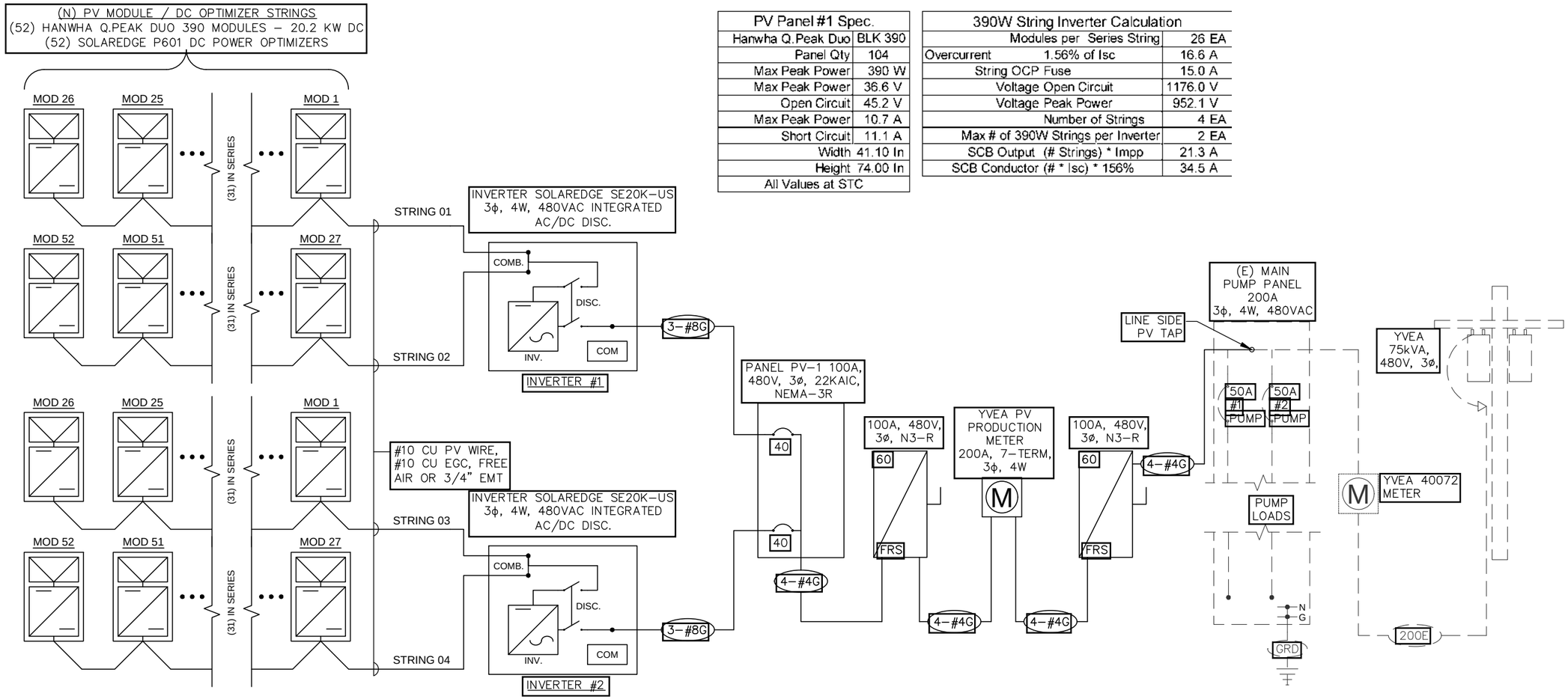
DATE:	7-1-22
SCALE:	NTS

Sheet Title

PV-1

ONE-LINE

- PANELBOARD
- WEATHERHEAD
- DRY-TYPE TRANSFORMER
- PADMOUNT UTILITY TRANSFORMER
- SHORT CIRCUIT VALUE
- WIRE SIZE
- METER AND CTs
- FUSED DISCONNECT
- NON-FUSED DISCONNECT
- MOTOR
- CIRCUIT BREAKER
- FUSED SWITCH
- MAGNETIC STARTER/CONTACTOR
- GENERATOR
- GROUND



PV Panel #1 Spec.	
Hanwha Q.Peak Duo	BLK 390
Panel Qty	104
Max Peak Power	390 W
Max Peak Power	36.6 V
Open Circuit	45.2 V
Max Peak Power	10.7 A
Short Circuit	11.1 A
Width	41.10 In
Height	74.00 In
All Values at STC	

390W String Inverter Calculation	
Modules per Series String	26 EA
Overcurrent 1.56% of Isc	16.6 A
String OCP Fuse	15.0 A
Voltage Open Circuit	1176.0 V
Voltage Peak Power	952.1 V
Number of Strings	4 EA
Max # of 390W Strings per Inverter	2 EA
SCB Output (# Strings) * Impp	21.3 A
SCB Conductor (# * Isc) * 156%	34.5 A

PV System One-Line Connection Diagram

Existing Service Equipment Is Shown As Light Dashed Line

Milner Routt County WWTP

40.6kWp AC Solar PV Project

Milner, Colorado

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Sheet Title

PV-2

solaredge

Three Phase Inverters for the 277/480V Grid for North America

SE10KUS / SE20KUS / SE33.3KUS[1]

	SE10KUS	SE20KUS	SE33.3KUS	
OUTPUT				
Rated AC Power Output	10000	20000	33300	VA
Maximum AC Power Output	10000	20000	33300	VA
AC Output Line Connections	4-wire WYE (L1-L2-L3-N) plus PE			
AC Output Voltage Minimum-Nominal-Maximum[2] (L-N)	244-277-305			Vac
AC Output Voltage Minimum-Nominal-Maximum[2] (L-L)	422.5-480-529			Vac
AC Frequency Min-Nom-Max[2]	59.3 - 60 - 60.5			Hz
Max. Continuous Output Current (per Phase)	12	24	40	A
GFDI Threshold	1			A
Utility Monitoring, Islanding Protection, Country Configurable Set Points	Yes			
INPUT				
Maximum DC Power (Module STC)	13500	27000	45000	W
Transformer-less, Ungrounded	Yes			
Maximum Input Voltage DC to Gnd	490			Vdc
Maximum Input Voltage DC+ to DC-	980			Vdc
Nominal Input Voltage DC to Gnd	420			Vdc
Nominal Input Voltage DC+ to DC-	840			Vdc
Maximum Input Current	13.5	26.5	40	Adc
Max. Input Short Circuit Current	45			Adc
Reverse-Polarity Protection	Yes			
Ground-Fault Isolation Detection	1MΩ Sensitivity		350kΩ Sensitivity[3]	
CEC Weighted Efficiency	98		98.5	%
Night-time Power Consumption	< 3		< 4	W
ADDITIONAL FEATURES				
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional)			
Rapid Shutdown – NEC 2014 690.12	Manual Rapid Shutdown[4]		Automatic Rapid Shutdown upon AC Grid Disconnect[5]	
STANDARD COMPLIANCE				
Safety	UL1741, UL1699B, UL1998, CSA 22.2			
Grid Connection Standards	IEEE1547			
Emissions	FCC part15 class B			
INSTALLATION SPECIFICATIONS				
AC output conduit size / AWG range	3/4" minimum / 12-6 AWG			
DC input conduit size / AWG range	3/4" minimum / 12-6 AWG			
Number of DC inputs	2 pairs		3 pairs (with fuses on plus & minus)[6]	
Dimensions (HxWxD)	21 x 12.5 x 10.5 / 540 x 315 x 260			in/mm
Dimensions with Safety Switch (HxWxD)	30.5 x 12.5 x 10.5 / 775 x 315 x 260			in/mm
Weight	73.2 / 33.2		99.5 / 45	lb/kg
Weight with Safety Switch	79.7 / 36.2		106 / 48	lb/kg
Cooling	Fans (user replaceable)			
Noise	< 50		< 55	dBA
Operating Temperature Range	-40 to +140 / -40 to +60			°F/°C
Protection Rating	NEMA 3R			

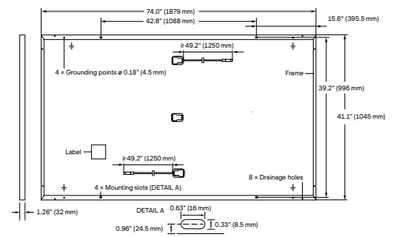
(1) For 208V inverters refer to: http://www.solaredge.com/files/pdfs/products/inverters/se-three-phase-us-inverter-208V-datasheet.pdf
(2) For other regional settings please contact SolarEdge support
(3) Where permitted by local regulations
(4) With installation of rapid shutdown kit; contact SolarEdge for kit P/N
(5) P/N of inverter with automatic rapid shutdown: SE33.3K-USR48NNF4
(6) Field replacement kit for 1 pair of inputs P/N: DCD-3PH-1TBK

SUNSPEC ALLIANCE **RoHS**

powered by Q.ANTUM DUO Z

MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 49.2 in (1250 mm), (–) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

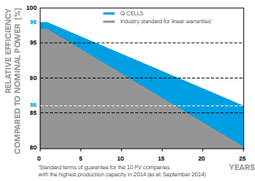


ELECTRICAL CHARACTERISTICS

POWER CLASS				385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	385	390	395	400	405
	Short Circuit Current[1]	I_{SC}	[A]	11.04	11.07	11.10	11.14	11.17
	Open Circuit Voltage[1]	V_{OC}	[V]	45.19	45.23	45.27	45.30	45.34
	Current at MPP	I_{MPP}	[A]	10.59	10.65	10.71	10.77	10.83
	Voltage at MPP	V_{MPP}	[V]	36.36	36.62	36.88	37.13	37.39
	Efficiency[1]	η	[%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	288.8	292.6	296.3	300.1	303.8
	Short Circuit Current	I_{SC}	[A]	8.90	8.92	8.95	8.97	9.00
	Open Circuit Voltage	V_{OC}	[V]	42.62	42.65	42.69	42.72	42.76
	Current at MPP	I_{MPP}	[A]	8.35	8.41	8.46	8.51	8.57
	Voltage at MPP	V_{MPP}	[V]	34.59	34.81	35.03	35.25	35.46

[1] Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2 °C, AM 1.5 according to IEC 60904-3 • [2] 800 W/m², NMOT, spectrum AM 1.5

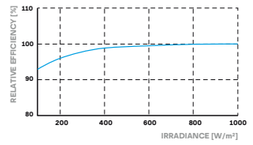
Q CELLS PERFORMANCE WARRANTY



At least 98% of nominal power during first year. Thereafter max. 0.5% degradation per year. At least 93.5% of nominal power up to 10 years. At least 86% of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS							
Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.34	Nominal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]	[lbs/ft²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs/ft²]	113 (5400 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant,
Quality Controlled PV - TÜV Rheinland,
IEC 61215:2016, IEC 61730:2016,
U.S. Patent No. 9,893,215 (solar cells),
QCPV Certification ongoing.

C Certified US UL 61730 | CE | TÜVRheinland CERTIFIED www.tuv.com ID 1111220277

PACKAGING INFORMATION

Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | **TEL** +1 949 748 59 96 | **EMAIL** inquiry@us.q-cells.com | **WEB** www.q-cells.us

Milner Routt County WWTP
40.6kW AC Solar PV Project
Milner, Colorado

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DATE:	7-1-22
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Sheet Title

PV-3

D. PV System Design for Phippsburg Plant.

The following is the PV design for the Phippsburg Plant:

Full PV System Information			
Inverter	Item	Qty	Unit
SolarEdge SE33.3K-US	Module Wattage	390	W
	Number of Modules	124	EA
	Modules Per String	31	EA
	# of Strings	4	EA
	SolarEdge P601 Optimizer	124	EA
	Strings Per Inverter	2	EA
	Total DC Output	48.4	kW
	Maximum AC Output	66.0	kW

PV Site Plan Phillipsburg Routt County WWTP

Scale: 1" = 40'

Phillipsburg Routt County WWTP

48.4kWp AC Solar PV Project

Phillipsburg, Colorado

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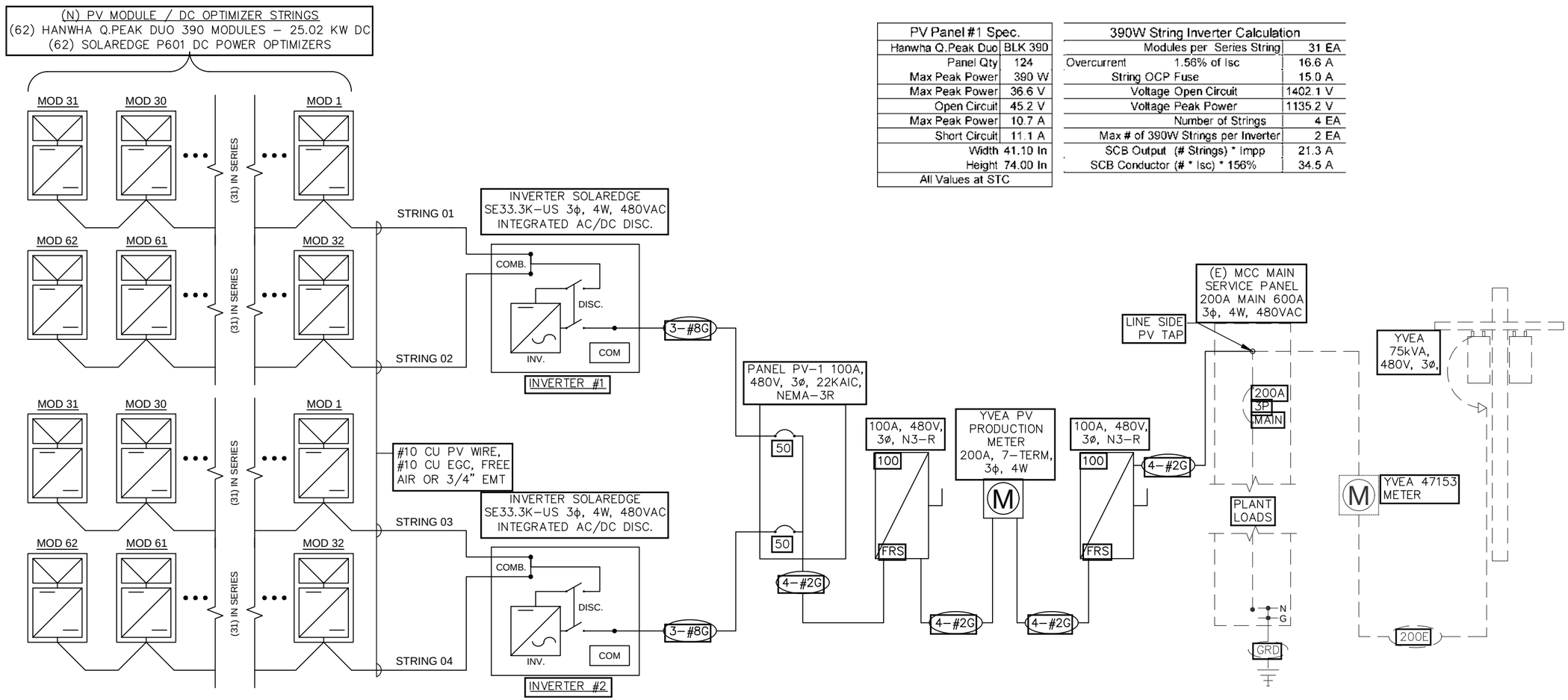
DATE:	7-1-22
SCALE:	NTS

Sheet Title

PV-1

ONE-LINE

- PANELBOARD
- WEATHERHEAD
- DRY-TYPE TRANSFORMER
- PADMOUNT UTILITY TRANSFORMER
- SHORT CIRCUIT VALUE
- WIRE SIZE
- METER AND CTs
- FUSED DISCONNECT
- NON-FUSED DISCONNECT
- MOTOR
- CIRCUIT BREAKER
- FUSED SWITCH
- MAGNETIC STARTER/CONTACTOR
- GENERATOR
- GROUND



PV Panel #1 Spec.	
Hanwha Q.Peak Duo	BLK 390
Panel Qty	124
Max Peak Power	390 W
Max Peak Power	36.6 V
Open Circuit	45.2 V
Max Peak Power	10.7 A
Short Circuit	11.1 A
Width	41.10 In
Height	74.00 In
All Values at STC	

390W String Inverter Calculation		
Modules per Series String		31 EA
Overcurrent	1.56% of Isc	16.6 A
String OCP Fuse		15.0 A
Voltage Open Circuit		1402.1 V
Voltage Peak Power		1135.2 V
Number of Strings		4 EA
Max # of 390W Strings per Inverter		2 EA
SCB Output (# Strings) * Impp		21.3 A
SCB Conductor (# * Isc) * 156%		34.5 A

PV System One-Line Connection Diagram

Existing Service Equipment Is Shown As Light Dashed Line

Phillipsburg Routt County WWTP

48.4kWp AC Solar PV Project

Phillipsburg, Colorado

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DATE:	7-1-22
SCALE:	NTS

Sheet Title

PV-2

solaredge

Three Phase Inverters for the 277/480V Grid for North America

SE10KUS / SE20KUS / SE33.3KUS[1]

	SE10KUS	SE20KUS	SE33.3KUS	
OUTPUT				
Rated AC Power Output	10000	20000	33300	VA
Maximum AC Power Output	10000	20000	33300	VA
AC Output Line Connections	4-wire WYE (L1-L2-L3-N) plus PE			
AC Output Voltage Minimum-Nominal-Maximum[2] (L-N)	244-277-305			Vac
AC Output Voltage Minimum-Nominal-Maximum[2] (L-L)	422.5-480-529			Vac
AC Frequency Min-Nom-Max[2]	59.3 - 60 - 60.5			Hz
Max. Continuous Output Current (per Phase)	12	24	40	A
GFDI Threshold	1			A
Utility Monitoring, Islanding Protection, Country Configurable Set Points	Yes			
INPUT				
Maximum DC Power (Module STC)	13500	27000	45000	W
Transformer-less, Ungrounded	Yes			
Maximum Input Voltage DC to Gnd	490			Vdc
Maximum Input Voltage DC+ to DC-	980			Vdc
Nominal Input Voltage DC to Gnd	420			Vdc
Nominal Input Voltage DC+ to DC-	840			Vdc
Maximum Input Current	13.5	26.5	40	Adc
Max. Input Short Circuit Current	45			Adc
Reverse-Polarity Protection	Yes			
Ground-Fault Isolation Detection	1MΩ Sensitivity		350kΩ Sensitivity[3]	
CEC Weighted Efficiency	98		98.5	%
Night-time Power Consumption	< 3		< 4	W
ADDITIONAL FEATURES				
Supported Communication Interfaces	RS485, Ethernet, ZigBee (optional)			
Rapid Shutdown – NEC 2014 690.12	Manual Rapid Shutdown[4]		Automatic Rapid Shutdown upon AC Grid Disconnect[5]	
STANDARD COMPLIANCE				
Safety	UL1741, UL1699B, UL1998, CSA 22.2			
Grid Connection Standards	IEEE1547			
Emissions	FCC part15 class B			
INSTALLATION SPECIFICATIONS				
AC output conduit size / AWG range	3/4" minimum / 12-6 AWG			
DC input conduit size / AWG range	3/4" minimum / 12-6 AWG			
Number of DC inputs	2 pairs		3 pairs (with fuses on plus & minus)[6]	
Dimensions (HxWxD)	21 x 12.5 x 10.5 / 540 x 315 x 260			in/mm
Dimensions with Safety Switch (HxWxD)	30.5 x 12.5 x 10.5 / 775 x 315 x 260			in/mm
Weight	73.2 / 33.2		99.5 / 45	lb/kg
Weight with Safety Switch	79.7 / 36.2		106 / 48	lb/kg
Cooling	Fans (user replaceable)			
Noise	< 50		< 55	dBA
Operating Temperature Range	-40 to +140 / -40 to +60			˚F/˚C
Protection Rating	NEMA 3R			

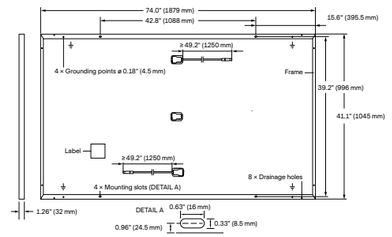
[1] For 208V inverters refer to: http://www.solaredge.com/files/pdfs/products/inverters/se-three-phase-us-inverter-208V-datasheet.pdf
[2] For other regional settings please contact SolarEdge support
[3] Where permitted by local regulations
[4] With installation of rapid shutdown kit; contact SolarEdge for kit P/N
[5] P/N of inverter with automatic rapid shutdown: SE33.3K-USR48NNF4
[6] Field replacement kit for 1 pair of inputs P/N: DCD-3PH-1TBK

ETL SUNSPEC ALLIANCE **RoHS**

powered by Q.ANTUM DUO Z

MECHANICAL SPECIFICATION

Format	74.0 in × 41.1 in × 1.26 in (including frame) (1879 mm × 1045 mm × 32 mm)
Weight	48.5 lbs (22.0 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Black anodized aluminum
Cell	6 × 22 monocrystalline Q.ANTUM solar half cells
Junction Box	2.09-3.98 in × 1.26-2.36 in × 0.59-0.71 in (53-101 mm × 32-60 mm × 15-18 mm), IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 49.2 in (1250 mm), (−) ≥ 49.2 in (1250 mm)
Connector	Stäubli MC4; IP68

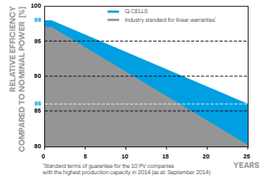


ELECTRICAL CHARACTERISTICS

POWER CLASS				385	390	395	400	405
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / −0 W)								
Minimum	Power at MPP[1]	P_{MPP}	[W]	385	390	395	400	405
Minimum	Short Circuit Current[1]	I_{SC}	[A]	11.04	11.07	11.10	11.14	11.17
Minimum	Open Circuit Voltage[1]	V_{OC}	[V]	45.19	45.23	45.27	45.30	45.34
Minimum	Current at MPP	I_{MPP}	[A]	10.59	10.65	10.71	10.77	10.83
Minimum	Voltage at MPP	V_{MPP}	[V]	36.36	36.62	36.88	37.13	37.39
Minimum	Efficiency[1]	η	[%]	≥19.6	≥19.9	≥20.1	≥20.4	≥20.6
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NMOT[2]								
Minimum	Power at MPP	P_{MPP}	[W]	288.8	292.6	296.3	300.1	303.8
Minimum	Short Circuit Current	I_{SC}	[A]	8.90	8.92	8.95	8.97	9.00
Minimum	Open Circuit Voltage	V_{OC}	[V]	42.62	42.65	42.69	42.72	42.76
Minimum	Current at MPP	I_{MPP}	[A]	8.35	8.41	8.46	8.51	8.57
Minimum	Voltage at MPP	V_{MPP}	[V]	34.59	34.81	35.03	35.25	35.46

[1] Measurement tolerances P_{MPP} ±3%; I_{SC}; V_{OC} ±5% at STC: 1000 W/m², 25±2 °C, AM 1.5 according to IEC 60904-3 • [2] 800 W/m², NMOT, spectrum AM 1.5

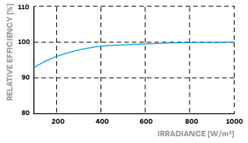
Q CELLS PERFORMANCE WARRANTY



At least 98 % of nominal power during first year. Thereafter max. 0.5 % degradation per year. At least 93.5 % of nominal power up to 10 years. At least 86 % of nominal power up to 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²)

TEMPERATURE COEFFICIENTS							
Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	Temperature Coefficient of V_{OC}	β	[%/K]	−0.27
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.34	Nominal Module Operating Temperature	NMOT	[°F]	109±5.4 (43±3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1000 (IEC) / 1000 (UL)	PV module classification	Class II
Maximum Series Fuse Rating	[A DC]	20	Fire Rating based on ANSI / UL 61730	TYPE 2
Max. Design Load, Push / Pull[3]	[lbs/ft²]	75 (3600 Pa) / 55 (2660 Pa)	Permitted Module Temperature on Continuous Duty	−40 °F up to +185 °F (−40 °C up to +85 °C)
Max. Test Load, Push / Pull[3]	[lbs/ft²]	113 (5400 Pa) / 84 (4000 Pa)		

[3] See Installation Manual

QUALIFICATIONS AND CERTIFICATES

UL 61730, CE-compliant,
Quality Controlled PV - TÜV Rheinland, IEC 61215:2016, IEC 61730:2016,
U.S. Patent No. 9,893,215 (solar cells),
QCPV Certification ongoing.

C SP US Certified UL 61730 | CE | TÜVRheinland CERTIFIED www.tuv.com ID 1111220277

PACKAGING INFORMATION

Horizontal packaging	76.4 in 1940 mm	43.3 in 1100 mm	48.0 in 1220 mm	1656 lbs 751 kg	24 pallets	24 pallets	32 modules

Note: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS America Inc.
400 Spectrum Center Drive, Suite 1400, Irvine, CA 92618, USA | **TEL** +1 949 748 59 96 | **EMAIL** inquiry@us.q-cells.com | **WEB** www.q-cells.us

Phillipsburg Routt County WWTP

48.4kWp AC Solar PV Project

Phillipsburg, Colorado

DRAWN BY:	BB
CHECKED BY:	
DATE:	7-1-22
SCALE:	NTS

Sheet Title

PV-3

IV. PV System Cost Opinions and Payback.

A. Milner PV Cost Opinions, Unit Prices & Quotes.
B. Phippsburg PV Cost Opinions, Unit Prices & Quotes
C. Possible System Payback Calculations.

A. Milner PV Cost Opinions, Unit Prices & Quotes.

Basis of the Cost Opinion

The cost opinion for PV system installation at both sites is based on:

1. The PV system is installed in a remote location far from a larger marketplace, so travel costs and per diem for labor.
2. The cost for transportation and delivery of equipment is more than a large market installation.
3. Yearly monitoring and maintenance are not included in the estimate.
4. If the Owner wants to move forward, hiring a design/build installer makes the best sense.

Milner Site PV System Cost Opinion:

The following cost is from an industry expert with over 15 years of experience:

Project Cost Summary

Project Name	*Milner Routt County WWTP*	*7/8/2022*
Project Location	*Milner, CO*	
Project Description	*Fixed Tilt System*	
System Size (DC)	*40,560.00*	
kWh/kWp		
Estimated COD		

	Description	Cost	Cost/W		Contingency	Notes
Direct-Purchased Equipment						
Modules		34,476	0.85		-	*390 Watt Modules*
Racking		18,252	0.45		-	*Fixed tilt racking mounted on concrete blocks*
Inverter(s) and Hardware		7,301	0.18		-	*Based on Solaredge SE20K*
Inverter Skid		-	0.00		-	*N/A*
Inverter Warranty		-	0.00		-	*Manufacturers Standard Warranty*
DAS		3,245	0.08		-	*Minimum System*
BOS		1,622	0.04		-	*DC Wiring, Junction Boxes etc…*
		64,896	**1.60**		-	
Subcontractor/Installation Labor and Materials						
Electrical DC Material & Installation		8,673	0.21		-	*Non-Prevailing Wage*
Electrical AC Material & Installation		11,227	0.28			*Non-Prevailing Wage*
DAS/Inverter Material & Installation		3,514	0.09			*Non-Prevailing Wage*
Module Installation		6,330	0.16			*Non-Prevailing Wage*
Racking Labor		4,944	0.12			*Non-Prevailing Wage*
		34,688	**0.86**		-	
Site Improvement Subcontracts						
Equipment Foundation/Pads/Fence		2,335	0.06			*Electrical equipment mounting*
Site/Civil Work		2,799	0.07			*Minor site work and restoration (No overseeding)*
		5,134	**0.13**		-	
Utilty Expenses						
Utility Application/Impact Study		-	0.00			*excluded*
Utility Equipment & Installation		-	0.00		-	*excluded*
		-	**0.00**		-	
Professional Services Subcontracts						
In House and Third Party Services		3,732	0.09		-	*Project Engineering*
		3,732	**0.09**		-	
General Expenses						
Permits, Fees, Equip, Etc.		5,131	0.13		-	*Excluding project bond*
		5,131	**0.13**		-	*Permit fees are assumed to be $1,000 max.*
Indirect Labor						
Preconstruction		-	0.00		-	
Project Management		5,131	0.13		-	
		5,131	**0.13**		-	
Cost + Fees						
Cost Subtotal		**118,711**	**2.93**			
Contingency		**-**	0.00		**-**	0.0%
Sales Tax	3.90%	2,961	0.07			
Cost Plus Tax & Contingency		**121,672**	**3.00**			
Markup	22.00%	26,768	0.66		18%	Margin
Total		**148,439**	**3.66**			Cost plus labor, tax, contingency and fees

B. Phippsburg PV Cost Opinions, Unit Prices & Quotes.

Phippsburg Site PV System Cost Opinion:

Project Cost Summary

Project Name	*Phippsburg Routt County WWTP*	*7/8/2022*
Project Location	*Phippsburg, CO*	
Project Description	*Fixed Tilt System*	
System Size (DC)	*48,360.00*	
kWh/kWp		
Estimated COD		

	Description	Cost	Cost/W		Contingency	Notes
Direct-Purchased Equipment						
Modules		41,106	0.85		-	*390 Watt Modules*
Racking		21,762	0.45		-	*Fixed tilt racking mounted on concrete blocks*
Inverter(s) and Hardware		8,705	0.18		-	*Based on Solaredge SE33.3K*
Inverter Skid		-	0.00		-	*N/A*
Inverter Warranty		-	0.00		-	*Manufacturers Standard Warranty*
DAS		3,245	0.07		-	*Minimum System*
BOS		1,934	0.04		-	*DC Wiring, Junction Boxes etc…*
		76,752	**1.59**		-	
Subcontractor/Installation Labor and Materials						
Electrical DC Material & Installation		10,341	0.21		-	*Non-Prevailing Wage*
Electrical AC Material & Installation		13,386	0.28			*Non-Prevailing Wage*
DAS/Inverter Material & Installation		4,093	0.08			*Non-Prevailing Wage*
Module Installation		7,547	0.16			*Non-Prevailing Wage*
Racking Labor		5,894	0.12			*Non-Prevailing Wage*
		41,261	**0.85**		-	
Site Improvement Subcontracts						
Equipment Foundation/Pads/Fence		2,784	0.06			*Electrical equipment mounting*
Site/Civil Work		2,799	0.06			*Minor site work and restoration (No overseeding)*
		5,583	**0.12**		-	
Utilty Expenses						
Utility Application/Impact Study		-	0.00			*excluded*
Utility Equipment & Installation		-	0.00		-	*excluded*
		-	**0.00**		-	
Professional Services Subcontracts						
In House and Third Party Services		3,732	0.08		-	*Project Engineering*
		3,732	**0.08**		-	
General Expenses						
Permits, Fees, Equip, Etc.		6,118	0.13		-	*Excluding project bond*
		6,118	**0.13**		-	*Permit fees are assumed to be $1,000 max.*
Indirect Labor						
Preconstruction		-	0.00		-	
Project Management		5,132	0.11		-	
		5,132	**0.11**		-	
Cost + Fees						
Cost Subtotal		**138,578**	**2.87**			
Contingency		**-**	0.00		**-**	0.0%
Sales Tax	3.90%	3,506	0.07			
Cost Plus Tax & Contingency		**142,084**	**2.94**			
Markup	22.00%	31,258	0.65		18%	Margin
Total		**173,342**	**3.58**			Cost plus labor, tax, contingency and fees

C. Possible System Payback Calculations

The below cost and payback summary for the Milner Plant:

Description	Qty	Units
PV System Design	72.97	MWH
2021 Energy Usage	63.773	MWH
Delta Usage - Production	9.197	MWH
Savings at $.11kWH	$7,043	
Credit at $.033kWH	$304	
Total YVEA Yearly Savings	$7,346	
Estimated System $	$148,439	
Straight Line Payback	20.2	Years

The below cost and payback summary for the Phippsburg Plant:

Description	Qty	Units
PV System Design	87.94	MWH
2021 Energy Usage	77.04	MWH
Delta Usage - Production	10.9	MWH
Savings at $.11kWH	$8,508	
Credit at $.033kWH	$360	
Total YVEA Yearly Savings	$8,868	
Estimated System $	$173,342	
Straight Line Payback	19.5	Years

Notes on payback analysis

Items that can reduce the overall system life-cycle costs:

1. The future value of money.
2. The future increase of energy costs.
3. The future increase of wastewater processed leading to higher energy usage.

Items that will reduce the overall system life-cycle costs:

1. Yearly maintenance and monitoring.
2. Yearly testing and troubleshooting
3. The production loss of 1% for PV panel degradation.
4. The production loss for smoke from wildfires in the air.
5. Cost to replace inverters at 10-12 years.
6. Cost to replace panels at 25 years.

We typically see the above items will create a wash in costs, so hence our straight line payback analysis.

APPENDIX R

BIOSOLIDS REPORT

MILNER LAGOON
BIOSOLIDS
REPORT


38600

Milner Lagoon Survey June 2022

	Cell 1	Cell 2	Cell 3		
	3.6	4.5	2.0		
	3.0	4.0	2.0		
	4.0	2.0	2.0		
	3.5	4.0			
	5.3				
Average	**3.9**	**3.6**	**2.0**		
Sq Ft	10,000	8,125	3,600		
Total Cu Ft Sludge	38,800	29,453	7,200		
Total Estimated Gallons in Place	290,224	220,309	53,856		
Total Estimated to Remove					564,389
Plus 10%					632,116
Amt of Excess Water to Clean out Lagoon					275,000
Total Estimated Amt To Remove					907,116
Estimated Price to Remove				$	0.40
Total Estimated Cost for Lagoon Cleaning				$	362,846.44

Prices are based upon known application site
Prices assume one mob to clean all lagoons
Prices assume the lagoons will be dewatered to within 6 inches of sludge line
Prices assume use of a sump in each lagoon to remove the sludge.

DENALI

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303-651-7070

The biosolids data for pollutant concentration and fecal are valid for 12 months aftrer the data the samples were collected.

Pollutant Concentration

Biosolids Regulation 64 and 40 CFRF 503 set the pollutant concentrations allowed in biosolids. There are nine regulated heavy metals. Table 1 is the Ceiling Limit. No biosolids that have any one parameter above Table 1 can be land applied. Table 3 is the “Clean Biosolids Values” which provides for no tracking of cumulative metals if all of the concentrations of metals are below the values set in the table.

All three generators are well below Table 3 standards with many non-detects (ND) for each generator. There is no issue with the pollutant concentrations of any of the three tested biosolids.

Class B Determination

Section 64.B (8)(a) allows for Class B determination by taking the geometric mean of seven samples from a treatment facility.

Yampa had a geometric mean of 6,797 MPN/gm and is Class B.

Milner had a geometric mean of 15,786 MON/gm and is Class B.

Phippsburg had a geometric mean of 5,861 MON/gm and is Class B.

Rule 20 – TENORM

Rule 20 requires that the source be profiled only once if the material is determined to be exempt under the rule. The exemption level for biosolids is 5 pCi/gm.

The statical analysis required for Yampa determined that the upper limit of confidence interval was 0 pCi/gm for both Ra 226 and Ra 228 and therefore is exempt.

The statical analysis required for Phippsburg determined that the upper limit of confidence interval was 0 pCi/gm for both Ra 226 and Ra 228 and therefore is exempt.

The statical analysis required for Milner determined that the upper limit of confidence interval was 0 pCi/gm for Ra 228 and 3.46 pCi/gm for Ra 226 and therefore is exempt.

Volumes of Biosolids

The depth of sludge was measured in each lagoon when samples were collected. The volume is based upon the average depth of sludge and the surface area of the lagoon. Depending how the lagoon is lined, either with an HDPE liner or compacted clay, an estimated of the amount of

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biosolids was determined that would need to be removed in order to close out the lagoon. Typically clay liners require more removal since the bottom of the lagoon has been blurred over the years. Since all of the water above the sludge can't be removed, the volumes will be inflated by 10%. In addition, wash water is required to mix the sludge and remove. In the case of a lined lagoon, less water is needed.

Yampa has an estimated 303,000 gallons in place. For budget purposes, there will be an estimated 578,000 gallons of biosolids to remove.

Milner has an estimated 632,000 gallons in place. For budget purposes, there will be an estimated 907,000 gallons of biosolids to removed.

Phippsburg has an estimated 763,000 gallons in place. For budget purposes, there will be an estimated 963,000 gallons of biosolids to remove.

Pricing

Denali has been working on permitting land application sites west of Steamboat Springs for the past few years. The sites are located about 10 miles away from Craig, CO. At this point, this is where Denali would land apply the biosolids. The one- way distance to the sites are similar for Phippsburg and Yampa. It is 65 miles for Yampa and 60 miles. Milner is closer at 41 miles. Therefore, we would have similar pricing for Yampa and Phippsburg and a lower cost for Milner.

Parameter	Table 3	Table 1	Milner
Arsenic	41	75	ND
Cadmium	39	85	ND
Copper	1500	4300	34.6
Lead	300	840	ND
Mercury	17	57	ND
Molybdenum		75	ND
Nickel	420	420	ND
Selenium	100	100	ND
Zinc	2800	7500	66

Fewcal Coliform	Milner
Sample	
1	88,300
2	111,000
3	152,000
4	2,750
5	5,630
6	8,900
7	1,190
Geo Mean	**15,786**

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ISSUE DATE
Jul 11, 2022

VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Veris Environmental Sludge Pkg

MILNER

Analysis	Level Found As Received	Level Found Dry Weight	Units	Reporting Limit	Method	Analyst-Date	Verified-Date
Sample ID: **Biosolids MILNER COMP**	Lab Number: **70138465**		Date Sampled: **2022-06-29 1330**				
Potash K2O (calculated)	76	1250	mg/kg	10	Calculation	Auto-2022/07/05	Auto-2022/07/11
Phosphate P2O5 (calculated)	103	1700	mg/kg	10	Calculation	Auto-2022/07/05	Auto-2022/07/11
Organic nitrogen	1360	22400	mg/kg	0.1	Calculation	Auto-2022/07/06	Auto-2022/07/11
Total volatile solids (TVS)	22.5		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/06
Total Kjeldahl nitrogen (TKN)	1440	23800	mg/kg	50.0	PAI-DK01 *	krg0-2022/07/06	mgn8-2022/07/06
Phosphorus (total)	45	743	mg/kg	5	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Potassium (total)	63	1040	mg/kg	10	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Sulfur (total)	87.8	1450	mg/kg	10.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Calcium (total)	232.7	3840	mg/kg	20.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Magnesium (total)	89.8	1482	mg/kg	5.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Sodium (total)	79.5	1312	mg/kg	1	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Iron (total)	169.6	2799	mg/kg	5.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Manganese (total)	1.6	26.4	mg/kg	1.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Copper (total)	2.1	34.6	mg/kg	1.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Zinc (total)	4.0	66.0	mg/kg	2.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Ammoniacal Nitrogen	80	1320	mg/kg	25.1	SM 4500-NH3 C-(1997)	krg0-2022/07/06	mgn8-2022/07/06
Nitrate/Nitrite nitrogen	n.d.	n.d.	mg/kg	0.2	EPA 353.2	jdb5-2022/07/05	mgn8-2022/07/06
Arsenic (total)	n.d.	n.d.	mg/kg	0.50	EPA 6020	ras7-2022/07/06	kkh9-2022/07/11
Barium (total)	2.87	47.4	mg/kg	0.50	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11

The result(s) issued on this report only reflect the analysis of the sample(s) submitted.

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VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Veris Environmental Sludge Pkg

Analysis	Level Found As Received	Level Found Dry Weight	Units	Reporting Limit	Method	Analyst-Date	Verified-Date
Sample ID: Biosolids MILNER COMP	Lab Number: **70138465** (con't)						
Cadmium (total)	n.d.	n.d.	mg/kg	0.50	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Chromium (total)	n.d.	n.d.	mg/kg	1.00	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Lead (total)	n.d.	n.d.	mg/kg	5.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Mercury (total)	n.d.	n.d.	mg/kg	0.05	EPA 7471	trh1-2022/07/11	kkh9-2022/07/11
Molybdenum (total)	n.d.	n.d.	mg/kg	1.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Nickel (total)	n.d.	n.d.	mg/kg	1.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Selenium (total)	n.d.	n.d.	mg/kg	0.50	EPA 6020	ras7-2022/07/06	kkh9-2022/07/11
Silver (total)	n.d.	n.d.	mg/kg	1.0	EPA 6010	ery3-2022/07/02	kkh9-2022/07/11
Percent solids	6.06		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/06
pH	6.9		S.U.	0.1	EPA 9045	Ppj2-2022/07/07	mgn8-2022/07/07

n.d. = not detected , ppm = parts per million, ppm = mg/kg

cc: Account(s) 15480 VERIS ENVIRONMENTAL LLC

For questions please contact:

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Account Manager
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BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Veris Environmental Sludge Pkg

Detailed Method Description(s)

Calculation

Analytical results are entered into applicable formulas to provide a calculated result which is reported.

ME 042

Analysis follows MWL ME 042 which is based on EPA 6010b, Inductively Coupled Plasma (ICP). A light emission technique where prepared samples are injected into a high energy plasma that forces the elements in the injected sample to emit light energies which are proportional to the level of minerals and metals present. The light is then detected and correlated to the levels of minerals and metals in the original sample.

SM 4500-NH3 C (Ammonia titrimetric)

Sample analysis follows MWL EN 068 which is based on Standard Methods (SM) 4500-NH3 C. Samples are placed in a Nessler tube and made basic with the addition of alkalai and then the solution heated to distill the ammonia into a boric acid solution. The boric acid solution is titrated automatically using a standard sulfuric acid solution to an established endpoint.

Nitrate/nitrite by Cd reduction EPA 353.2

Sample analysis follows MWL EN 004 which is based on EPA 353.2 - automated cadmium reduction. Aqueous solutions are drawn into the instrument and passed through a copperized cadmium reduction column where any nitrate present is reduced to nitrite. The nitrite is reacted with sulfanilamide to produce an azo dye which is measured colorimetrically.

ME 081

Sample analysis is conducted by ICP-MS which follows an acid digestion/preparation of the sample which destroys and solublizes the sample. The ICP-MS analysis uses a plasma to induce energy into prepared samples so as to breakdown the compounds present and create a stream of elemental ions. The ions are then separated by a mass spectrometer in to their individual elements. The mass spectrometer measures the masses of the elements present and quantifies the levels present. These results are correlated to known levels of standards and calculated back to original concentration in the sample analyzed.

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VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Veris Environmental Sludge Pkg

ME 067

Samples are analyzed for mercury using MWL ME 067 which is based upon EPA 7471, cold vapor atomic absorption (CVAA).

Samples are prepared via MWL ME 037 that uses a series of digestion steps involving hot mineral acids and oxidizers so as to destroy organic matter and solubilize mercury. The mercury is reduced by use of stannous chloride to elemental mercury that is then aerated to the light path of a mercury light of an atomic absorption spectrometer (AAS). The absorption of the mercury light at 253.7 nm is then correlated to the level of mercury present in the original sample.

pH in soils or solids

Sample analysis follows MWL EN 002 which is based on EPA 9045. A sample of soil is mixed with DI water and allowed to equilibrate. A calibrated pH meter and probe is used to measure the pH of the sample.

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VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Biosolids Fecal
MILNER

Analysis		Level Found As Received	Level Found Dry Weight	Units	Reporting Limit	Method	Analyst-Date	Verified-Date
Sample ID: **M1**	Lab Number: **70138441**	Date Sampled: **2022-06-29 1305**						
Fecal coliforms		7920		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			88300	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		8.97		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01
Sample ID: **M2**	Lab Number: **70138442**	Date Sampled: **2022-06-29 1310**						
Fecal coliforms		7920		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			111000	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		7.16		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01
Sample ID: **M3**	Lab Number: **70138443**	Date Sampled: **2022-06-29 1314**						
Fecal coliforms		7920		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			152000	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		5.21		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01
Sample ID: **M4**	Lab Number: **70138444**	Date Sampled: **2022-06-29 1320**						
Fecal coliforms		493		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			2750	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		17.9		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01
Sample ID: **M5**	Lab Number: **70138445**	Date Sampled: **2022-06-29 1322**						
Fecal coliforms		493		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			5630	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		8.75		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01

The result(s) issued on this report only reflect the analysis of the sample(s) submitted.

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VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Biosolids Fecal

Analysis		Level Found As Received	Level Found Dry Weight	Units	Reporting Limit	Method	Analyst-Date	Verified-Date
Sample ID: **M6**	Lab Number: **70138446**	Date Sampled: **2022-06-29 1330**						
Fecal coliforms		792		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			8900	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		8.90		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01
Sample ID: **M7**	Lab Number: **70138447**	Date Sampled: **2022-06-29 1333**						
Fecal coliforms		79		MPN/mL	0.2	SM 9221 E- (2006) / EPA 1681	Ljm8-2022/07/01	jzh4-2022/07/01
Fecal coliforms			1190	MPN/g	0.2	Calculation	Auto-2022/07/01	Auto-2022/07/01
Percent solids		6.65		%	0.01	SM 2540 G-(1997) *	drp0-2022/07/01	mgn8-2022/07/01

MPN = most probable number

cc: Account(s) 15480 VERIS ENVIRONMENTAL LLC

For questions please contact:

Kerri Stanek
Account Manager
kstanek@midwestlabs.com (402)590-2982

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VERIS ENVIRONMENTAL
BIOSOLIDS - LUKE BOND
53036 HWY 71
LIMON CO 80828-

REPORT OF ANALYSIS

For: (16097) VERIS ENVIRONMENTAL
Biosolids Fecal

Detailed Method Description(s)

Fecal Coliforms-MPN by SM 9221 E

Sample analysis follows MWL MI 131 which is based on Standard Methods (SM) 9221 E. A representative sample is obtained and homogenized with sterile buffers. It is aliquoted into fermentation tubes. The tubes are incubated for 22 hours and then examined for turbidity and gas production. Results are reported as most probable number per gram or mL (MPN/g or MPN/mL), which are calculated from the number of positive A-1 culture tubes and percent total solids.

Calculation

Analytical results are entered into applicable formulas to provide a calculated result which is reported.

Instructions: This spreadsheet allows an entity to enter in TENORM concentration data in order to determine the upper confidence limit of the data, establish that an appropriate number of samples have been taken and whether the materials meet the criteria related to regulatory or other thresholds, i.e exempt concentrations, registration limitations, acceptance criteria at a disposal facility, etc. According to the methods found within EPA's SW-846 document.

Step 1: Prepare your radionuclide data for entry into the "SW-846 Data Evaluation" tab within the spreadsheet

All concentration data entered into the "SW-846 Data Evaluation" tab must be net data, in other words, data must have the background value already removed, i.e. the concentration reported by the laboratory minus the established background.

You may use the tab marked "Data Preparation" to automatically subtract background from your laboratory data.

Step 2: Move to the "SW-846 Data Evaluation" tab.

Data Identification: You may enter in the facility name, isotope, and a description of the materials for your convenience.

Step 3: Establish what limit or regulatory threshold you will be comparing your data with. This may be an exempt concentration, a registration threshold, a waste acceptance value for a disposal facility, etc.

Enter the limit or threshold into the "Concentration Limit or Threshold" orange shaded cell

Step 4: Enter your net isotopic data into the Column Marked "X" in the blue shaded cells. (You may copy the data from the "Data Preparation" tab and use the "Values (V)" Paste option when right clicking in the uppermost blue shaded cell.)

Step 5: Establish whether you have an appropriate number of samples based on the varience of your data.

If the number of samples is appropriate the spreadsheet will indicate that at the top with a "Yes" next to the area marked "Appropriate number of Samples?" Additionally, the cell will be shaded green to indicate a positive and acceptable result.

If the materials meet the selected criteria for acceptance exemption registration etc. the spreadsheet will indicate that at the top with a "YES" next to the area marked "Is the Material Concentration Lower then the Threshold or Limit?" Additionally, the cell will be shaded green to indicate a positive and acceptable result.

If both of these items are shaded green and marked "YES" then your materials have been adequately characterized and have met the limits that you are using to make a determination. The upper limit of the confidence interval found in cell H10 is the value that you will use in pCi/g to describe your materials for the purposes of registration or any reporting to the department.

If the "Is the Material Concentration Lower then the Threshold or Limit?" cell is red and indicates "NO" then the upper limit of the confidence interval is in excess of the threshold value. This means that based on the data there is not sufficient confidence that the materials are less than the threshold. You may consider additional samples for analysis and addition to the existing data set.

If the "Appropriate number of Samples?" cell is red and indicates "NO" then the varience within the data is too extensive for this particular data test and more samples will likely need to be collected.

In this case the sheet will indicate the predicted number of additional samples that may be required to satisfy the statistical criteria.

Calculating Net Concentration Data

Step 1: Select your Isotope of Concern from the Drop Down
Step 2: Enter in Site Specific Background value if applicable
Step 3: Enter in your laboratory results in pCi/g
Step 4: You may use the values in the appropriate Net Concentration column for your data analysis
Please Note: Site Specific Net concentration values will be in the violet column if used

Isotope of Concern:	Ra-226

Sample	Laboratory Results (pCi/g)	Net Concentration (CDPHE Background) (pCi/g)	Net Concentration (Site Specific Background) (pCi/g)
1	0.5	0	0.5
2	0.4	0	0.4
3	5	3.6	5
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
11		0	0
12		0	0
13		0	0
14		0	0
15		0	0
16		0	0
17		0	0
18		0	0
19		0	0
20		0	0
21		0	0
22		0	0
23		0	0
24		0	0
25		0	0

Isotope	CDPHE Background Value (pCi/g)	Site Specific Background Value (pCi/g)
Pb-210	1.4	
Po-210	1.4	
Ra-226	1.4	
Ra-228	1.3	

Standard Analysis of Data to Determine Adequate Number of Samples and the Upper Limit of the Confidence Interval
SW-846 statistical determination of adequate characterization

Facility: Milner
Isotope: Radium
Materials Description:
Concentration Limit or Threshold 5

Appropriate Number of Samples? YES
Is the Material Concentration Lower then the Threshold or Limit? YES

Estimate X (x bar) / sample mean
(straight average of previous measurements)

Upper limit of the Confidence Interval (Reportable Value) 3.46 **pCi/g**

	estimated	calculated
Sample Mean equals	**6**	**1.2000**

Estimate S^2 Variance of sample

Variance of sample S^2 = **4.32**

Sample Number or Date	X	X^2	sum of X^2	sum of X	$(\text{sum of X})^2$	n (number of samples)	$(\text{sum of X})^2/n$	$(\text{sum of X}^2) - [(\text{sum of X})^2]/n$	$\{(\text{sum of X}^2) - [(\text{sum of X})^2]/n\}/ n-1$
1	0	0	12.96	3.6	12.96	3	4.32	8.64	4.32
2	0	0							
3	3.6	12.96							
4		0							
5		0							
6		0							
7		0							
8		0							
9		0							
10		0							
11		0							
12		0							
13		0							
14		0							
15		0							
16		0							
17		0							
18		0							
19		0							
20		0							
21		0							
22		0							
23		0							
24		0							
25		0							

Appropriate number of samples to be collected

Δ=RT - X bar
RT = regulatory threshold
$n = t^2_{.20} * S^2 / \Delta^2$
$t_{.20}$ from table 9-2

RT	Δ	Δ^2	$t_{.20}$	$t^2_{.20}$	S^2	n
5	3.8000	14.44	1.886	3.556996	4.32	1.064142848

Confidence interval
$S=\sqrt{S^2}$
$S_{xbar} = S/\sqrt{n}$
CI = Confidence interval
$CI = X_{bar} \pm t_{.20} * S_{Xbar}$

S	S_{xbar}	CI		
2.08	1.20	1.20	±	2.26

Upper limit of CI 3.46

TABLE 9-2. TABULATED VALUES OF STUDENT'S "t" FOR EVALUATING Solid Waste

Degrees of freedom (n-1)	Tabulated "t" Value
	80%
1	3.078
2	1.886
3	1.638
4	1.533
5	1.476
6	1.440
7	1.415
8	1.397
9	1.393
10	1.372
11	1.363
12	1.356
13	1.350
14	1.345
15	1.341
16	1.337
17	1.333
18	1.330
19	1.328
20	1.325
21	1.323
22	1.321
23	1.319
24	1.318
25	1.316
26	1.315
27	1.314
28	1.313
29	1.311
30	1.310
40	1.303
60	1.296
120	1.289
Greater than 120	1.282

Calculating Net Concentration Data

Step 1: Select your Isotope of Concern from the Drop Down

Step 2: Enter in Site Specific Background value if applicable

Step 3: Enter in your laboratory results in pCi/g

Step 4: You may use the values in the appropriate Net Concentration column for your data analysis

Please Note: Site Specific Net concentration values will be in the violet column if used

Isotope of Concern:	Ra-228

Sample	Laboratory Results (pCi/g)	Net Concentration (CDPHE Background) (pCi/g)	Net Concentration (Site Specific Background) (pCi/g)
1	0.5	0	0.5
2	0.5	0	0.5
3	0.6	0	0.6
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
11		0	0
12		0	0
13		0	0
14		0	0
15		0	0
16		0	0
17		0	0
18		0	0
19		0	0
20		0	0
21		0	0
22		0	0
23		0	0
24		0	0
25		0	0

Isotope	CDPHE Background Value (pCi/g)	Site Specific Background Value (pCi/g)
Pb-210	1.4	
Po-210	1.4	
Ra-226	1.4	
Ra-228	1.3	

Standard Analysis of Data to Determine Adequate Number of Samples and the Upper Limit of the Confidence Interval
SW-846 statistical determination of adequate characterization

Facility: Milner
Isotope: Radium 228
Materials Description: Solids
Concentration Limit or Threshold 5

Appropriate Number of Samples? YES
Is the Material Concentration Lower then the Threshold or Limit? YES

Estimate X (x bar) / sample mean
(straight average of previous measurements)

Upper limit of the Confidence Interval (Reportable Value) 0.00 **pCi/g**

	estimated	calculated
Sample Mean equals	**6**	**0.0000**

Estimate S^2 Variance of sample

S^2
Variance of sample 0

Sample Number or Date	X	X^2	sum of X^2	sum of X	$(\text{sum of X})^2$	n (number of samples)	$(\text{sum of X})^2/n$	$(\text{sum of } X^2) - [(\text{sum of X})^2]/n$	$\{(\text{sum of } X^2) - [(\text{sum of X})^2]/n\}/ n-1$
1	0	0	0	0	0	3	0	0	0
2	0	0							
3	0	0							
4		0							
5		0							
6		0							
7		0							
8		0							
9		0							
10		0							
11		0							
12		0							
13		0							
14		0							
15		0							
16		0							
17		0							
18		0							
19		0							
20		0							
21		0							
22		0							
23		0							
24		0							
25		0							

Appropriate number of samples to be collected

Δ=RT - X bar
RT = regulatory threshold
$n = t^2_{.20} * S^2 / \Delta^2$
$t_{.20}$ from table 9-2

RT	Δ	Δ^2	$t_{.20}$	$t^2_{.20}$	S^2	n
5	5.0000	25	1.886	3.556996	0	**0**

Confidence interval
$S=\sqrt{S^2}$
$S_{xbar} = S/\sqrt{n}$
CI = Confidence interval
$CI = X_{bar} \pm t_{.20} * S_{Xbar}$

S	S_{xbar}	CI		
0.00	0.00	0.00	±	0.00

Upper limit of CI 0.00

TABLE 9-2. TABULATED VALUES OF STUDENT'S "t" FOR EVALUATING Solid Waste

Degrees of freedom (n-1)	Tabulated "t" Value
	80%
1	3.078
2	1.886
3	1.638
4	1.533
5	1.476
6	1.440
7	1.415
8	1.397
9	1.393
10	1.372
11	1.363
12	1.356
13	1.350
14	1.345
15	1.341
16	1.337
17	1.333
18	1.330
19	1.328
20	1.325
21	1.323
22	1.321
23	1.319
24	1.318
25	1.316
26	1.315
27	1.314
28	1.313
29	1.311
30	1.310
40	1.303
60	1.296
120	1.289
Greater than 120	1.282

ANALYTICAL SUMMARY REPORT

August 09, 2022

Denali Water Solutions
3308 Bernice Ave
Russellville, AR 72802-8465

Work Order: C22070098

Project Name: Milner

Energy Laboratories, Inc. Casper WY received the following 3 samples for Denali Water Solutions on 7/5/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
C22070098-001	Mil 1	06/29/22 13:15	07/05/22	Solid	Metals by ICP/ICPMS, Total or Soluble Moisture Digestion, Total Metals Digestion For RadioChemistry ELI_50-169 Drying/Grinding, Radiochemistry Radium 226 Radium 228
C22070098-002	Mil 2	06/29/22 13:20	07/05/22	Solid	Same As Above
C22070098-003	Mil 3	06/29/22 13:30	07/05/22	Solid	Same As Above

The analyses presented in this report were performed by Energy Laboratories, Inc., 2393 Salt Creek Hwy., Casper, WY 82601, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager .

Report Approved By:

Alyson Degnan
Project Manager

Digitally signed by
Alyson T. Degnan
Date: 2022.08.09 19:16:34 -06:00

CLIENT: Denali Water Solutions
Project: Milner
Work Order: C22070098

Report Date: 08/09/22

CASE NARRATIVE

Tests associated with analyst identified as ELI-B were subcontracted to Energy Laboratories, 1120 S. 27th St., Billings, MT, EPA Number MT00005.

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Denali Water Solutions
Project: Milner
Lab ID: C22070098-001
Client Sample ID: Mil 1

Report Date: 08/09/22
Collection Date: 06/29/22 13:15
DateReceived: 07/05/22
Matrix: Solid

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Moisture	90.2	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
Solids, Total	9.80	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
METALS, TOTAL							
Thorium	ND	mg/kg-dry		5		SW6020	07/21/22 13:33 / eli-b
Uranium	3	mg/kg-dry		1		SW6020	07/21/22 13:33 / eli-b
Uranium, Activity	2.1	pCi/g-dry		0.7		SW6020	07/21/22 13:33 / eli-b
RADIONUCLIDES							
Radium 226	0.5	pCi/g-dry				E903.0	08/01/22 12:44 / kdk
Radium 226 precision (±)	0.1	pCi/g-dry				E903.0	08/01/22 12:44 / kdk
Radium 226 MDC	0.05	pCi/g-dry				E903.0	08/01/22 12:44 / kdk
Radium 228	0.5	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 precision (±)	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 MDC	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Denali Water Solutions
Project: Milner
Lab ID: C22070098-002
Client Sample ID: Mil 2

Report Date: 08/09/22
Collection Date: 06/29/22 13:20
DateReceived: 07/05/22
Matrix: Solid

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Moisture	88.0	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
Solids, Total	12.0	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
METALS, TOTAL							
Thorium	5	mg/kg-dry		4		SW6020	07/21/22 13:52 / eli-b
Uranium	2	mg/kg-dry		1		SW6020	07/21/22 13:52 / eli-b
Uranium, Activity	1.6	pCi/g-dry		0.7		SW6020	07/21/22 13:52 / eli-b
RADIONUCLIDES							
Radium 226	0.4	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 226 precision (±)	0.1	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 226 MDC	0.05	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 228	0.5	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 precision (±)	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 MDC	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

LABORATORY ANALYTICAL REPORT

Prepared by Casper, WY Branch

Client: Denali Water Solutions
Project: Milner
Lab ID: C22070098-003
Client Sample ID: Mil 3

Report Date: 08/09/22
Collection Date: 06/29/22 13:30
DateReceived: 07/05/22
Matrix: Solid

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL CHARACTERISTICS							
Moisture	86.5	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
Solids, Total	13.5	wt%		0.20		A2540 G	07/11/22 13:32 / eli-b
METALS, TOTAL							
Thorium	5	mg/kg-dry		4		SW6020	07/21/22 13:58 / eli-b
Uranium	2	mg/kg-dry		1		SW6020	07/21/22 13:58 / eli-b
Uranium, Activity	1.1	pCi/g-dry		0.7		SW6020	07/21/22 13:58 / eli-b
RADIONUCLIDES							
Radium 226	0.5	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 226 precision (±)	0.1	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 226 MDC	0.05	pCi/g-dry				E903.0	08/01/22 14:21 / kdk
Radium 228	0.6	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 precision (±)	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs
Radium 228 MDC	0.2	pCi/g-dry				RA-05	07/26/22 14:45 / trs

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Denali Water Solutions **Work Order:** C22070098 **Report Date:** 07/22/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **A2540 G**										Batch: R384549
Lab ID: **B22070456-001B DUP**	Sample Duplicate					Run: BAL #11_220711C				07/11/22 13:32
Moisture		95.2	wt%	0.20				0	10	
Lab ID: **B22070456-001B DUP**	Sample Duplicate					Run: BAL #11_220711C				07/11/22 13:32
Solids, Total		4.80	wt%	0.01				0.4	10	
Lab ID: **MBLK_MOISTHZW22**	Method Blank					Run: BAL #11_220711C				07/11/22 13:32
Moisture		100	wt%	0.01						
Lab ID: **MBLK_MOISTHZW22**	Method Blank					Run: BAL #11_220711C				07/11/22 13:32
Solids, Total		0.01	wt%	0.01						

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

QA/QC Summary Report

Prepared by Billings, MT Branch

Client: Denali Water Solutions **Work Order:** C22070098 **Report Date:** 07/22/22

Analyte	Count	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW6020									Analytical Run: ICPMS207-B_220720B	
Lab ID: QCS	2	Initial Calibration Verification Standard							07/21/22 11:32	
Thorium		0.0467	mg/L	0.0010	93	90	110			
Uranium		0.0476	mg/L	0.00030	95	90	110			
Lab ID: ICSA	2	Interference Check Sample A							07/21/22 11:38	
Thorium		0.0000125	mg/L	0.0010						
Uranium		0.0000257	mg/L	0.00030						
Lab ID: ICSAB	2	Interference Check Sample AB							07/21/22 11:44	
Thorium		7.22E-06	mg/L	0.0010						
Uranium		0.0000120	mg/L	0.00030						
Method: SW6020									Batch: 168299	
Lab ID: MB-168299	3	Method Blank				Run: ICPMS207-B_220720B			07/21/22 12:21	
Thorium		ND	mg/kg	0.05						
Uranium		0.007	mg/kg	0.006						
Uranium, Activity		0.005	pCi/g	0.004						
Lab ID: LCS3-168299	2	Laboratory Control Sample				Run: ICPMS207-B_220720B			07/21/22 12:27	
Thorium		48.7	mg/kg	2.0	97	80	120			
Uranium		49.9	mg/kg	1.0	100	80	120			
Lab ID: B22070646-002ADIL	3	Serial Dilution				Run: ICPMS207-B_220720B			07/21/22 14:52	
Thorium		5.44	mg/kg-dry	5.1					10	N
Uranium		0.462	mg/kg-dry	1.0					10	N
Uranium, Activity		0.313	pCi/g-dry	0.68						N
Lab ID: B22070646-002APDS1	2	Post Digestion/Distillation Spike				Run: ICPMS207-B_220720B			07/21/22 14:58	
Thorium		33.0	mg/kg-dry	1.1	104	75	125			
Uranium		28.3	mg/kg-dry	1.0	105	75	125			
Lab ID: B22070646-002AMS3	2	Sample Matrix Spike				Run: ICPMS207-B_220720B			07/21/22 15:17	
Thorium		60.1	mg/kg-dry	2.2	98	75	125			
Uranium		57.8	mg/kg-dry	1.0	103	75	125			
Lab ID: B22070646-002AMSD	2	Sample Matrix Spike Duplicate				Run: ICPMS207-B_220720B			07/21/22 15:23	
Thorium		60.7	mg/kg-dry	2.1	107	75	125	1.1	20	
Uranium		54.6	mg/kg-dry	1.0	105	75	125	5.8	20	

Qualifiers:

RL - Analyte Reporting Limit

ND - Not detected at the Reporting Limit (RL)

N - Analyte concentration was not sufficiently high to calculate a Relative Percent Difference (RPD) for the serial dilution test

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Denali Water Solutions **Work Order:** C22070098 **Report Date:** 08/04/22

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E903.0									Batch: 67563
Lab ID: LCS1-67563	Laboratory Control Sample				Run: G5000W_220720B				08/01/22 12:44
Radium 226	2.0	pCi/g-dry		79	70	130			
Radium 226 precision (±)	0.38	pCi/g-dry							
Radium 226 MDC	0.049	pCi/g-dry							
Lab ID: MB-67563	Method Blank				Run: G5000W_220720B				08/01/22 12:44
Radium 226	0.002	pCi/g-dry							U
Radium 226 precision (±)	0.02	pCi/g-dry							
Radium 226 MDC	0.03	pCi/g-dry							
Lab ID: C22070098-003AMS1	Sample Matrix Spike				Run: G5000W_220720B				08/01/22 14:21
Radium 226	2.0	pCi/g-dry		63	70	130			S
Radium 226 precision (±)	0.40	pCi/g-dry							
Radium 226 MDC	0.048	pCi/g-dry							
Lab ID: C22070098-003AMSD1	Sample Matrix Spike Duplicate				Run: G5000W_220720B				08/01/22 14:21
Radium 226	1.9	pCi/g-dry		57	70	130	7.4	30	S
Radium 226 precision (±)	0.37	pCi/g-dry							
Radium 226 MDC	0.048	pCi/g-dry							

- The RER result is 0.25.

Qualifiers:

RL - Analyte Reporting Limit

S - Spike recovery outside of advisory limits

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

QA/QC Summary Report

Prepared by Casper, WY Branch

Client: Denali Water Solutions **Work Order:** C22070098 **Report Date:** 08/04/22

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: **RA-05**									Batch: 67563
Lab ID: **MB-67563**	Method Blank				Run: TENNELEC-4_220720C				07/26/22 14:45
Radium 228	-0.02	pCi/g-dry							U
Radium 228 precision (±)	0.08	pCi/g-dry							
Radium 228 MDC	0.1	pCi/g-dry							
Lab ID: **C22070098-003AMS4**	Sample Matrix Spike				Run: TENNELEC-4_220720C				07/26/22 14:45
Radium 228	1.7	pCi/g-dry		49	70	130			S
Radium 228 precision (±)	0.36	pCi/g-dry							
Radium 228 MDC	0.24	pCi/g-dry							
Lab ID: **C22070098-003AMSD4**	Sample Matrix Spike Duplicate				Run: TENNELEC-4_220720C				07/26/22 14:45
Radium 228	1.8	pCi/g-dry		55	70	130	7.6	30	S
Radium 228 precision (±)	0.40	pCi/g-dry							
Radium 228 MDC	0.26	pCi/g-dry							
- The RER result is 0.25.									
Lab ID: **LCS4-67563**	Laboratory Control Sample				Run: TENNELEC-4_220720C				07/26/22 14:45
Radium 228	1.9	pCi/g-dry		83	70	130			
Radium 228 precision (±)	0.40	pCi/g-dry							
Radium 228 MDC	0.25	pCi/g-dry							

Qualifiers:

RL - Analyte Reporting Limit

S - Spike recovery outside of advisory limits

ND - Not detected at the Reporting Limit (RL)

U - Not detected at Minimum Detectable Concentration (MDC)

Work Order Receipt Checklist

Denali Water Solutions

C22070098

Login completed by: Kirsten L. Smith
Date Received: 7/5/2022

Reviewed by: Chantel S. Johnson
Received by: drb

Reviewed Date: 7/11/2022
Carrier name: UPS

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on all shipping container(s)/cooler(s)?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on all sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time? (Exclude analyses that are considered field parameters such as pH, DO, Res Cl, Sulfite, Ferrous Iron, etc.)	Yes ☑	No ☐	
Temp Blank received in all shipping container(s)/cooler(s)?	Yes ☐	No ☑	Not Applicable ☐
Container/Temp Blank temperature:	26.1°C No Ice		
Containers requiring zero headspace have no headspace or bubble that is <6mm (1/4").	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☐	Not Applicable ☑

Standard Reporting Procedures:

Lab measurement of analytes considered field parameters that require analysis within 15 minutes of sampling such as pH, Dissolved Oxygen and Residual Chlorine, are qualified as being analyzed outside of recommended holding time.

Solid/soil samples are reported on a wet weight basis (as received) unless specifically indicated. If moisture corrected, data units are typically noted as –dry. For agricultural and mining soil parameters/characteristics, all samples are dried and ground prior to sample analysis.

The reference date for Radon analysis is the sample collection date. The reference date for all other Radiochemical analyses is the analysis date. Radiochemical precision results represent a 2-sigma Total Measurement Uncertainty.

Contact and Corrective Action Comments:

None

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Chain of Custody & Analytical Request Record

www.energylab.com

Page _____ of _____

Account Information (Billing information)

Company/Name	Denali Water
Contact	Mike Scharp
Phone	303-886-0572
Mailing Address	
City, State, Zip	
Email	mike.scharp@denaliwater.com
Receive Invoice	☐Hard Copy ■Email
Receive Report	☐Hard Copy ■Email
Purchase Order	
Quote	
Bottle Order	

Report Information (if different than Account Information)

Company/Name	
Contact	
Phone	
Mailing Address	
City, State, Zip	
Email	
Receive Report	☐Hard Copy ☐Email
Special Report/Formats:	☐ LEVEL IV ☐NELAC ☐ EDD/EDT (contact laboratory) ☐ Other_____

Comments

Project Information

Project Name, PWSID, Permit, etc.	MILNER
Sampler Name: M Scharp	Sampler Phone: 303-886-0572
Sample Origin State: CO	EPA/State Compliance ☐ Yes ☐ No

URANIUM MINING CLIENTS MUST indicate sample type
☐ Unprocessed Ore
☐ Processed Ore (Ground or Refined) **CALL BEFORE SENDING
☐ 11(e)2 Byproduct Material (Can ONLY be Submitted to ELI Casper Location)

Matrix Codes
A - Air
W - Water
S - Soils/Solids
V - Vegetation
B - Bioassay
O - Oil
DW - Drinking Water

All turnaround times are standard unless marked as RUSH.
Energy Laboratories MUST be contacted prior to RUSH sample submittal for charges and scheduling – See Instructions Page

	Sample Identification (Name, Location, Interval, etc.)	Collection Date	Collection Time	Number of Containers	Matrix (See Codes Above)	Uranium	Thorium	Radium 226	Radium 228	% total solids	VOC	Semi VOC			See Attached	RUSH TAT	ELI LAB ID (Laboratory Use Only)
1	MIL 1	6/29/22	115	2	S	✓	✓	✓	✓	✓							C22070098
2	MIL 2	6/29/22	120	2	S	✓	✓	✓	✓	✓							
3	MIL 3	6/29/22	130	2	S	✓	✓	✓	✓	✓							
4																	
5																	
6																	
7																	
8																	
9																	

ELI is REQUIRED to provide preservative traceability. If the preservatives supplied with the bottle order were **NOT** used, please attach your preservative information with this COC.

Custody Record MUST be signed	Relinquished by (print)	Date/Time	Signature	Received by (print)	Date/Time	Signature
	Mike Scharp	6/29/22				
	Relinquished by (print)	Date/Time	Signature	Received by Laboratory (print)	Date/Time	Signature
				Natasha Bowman	7/5/22 11:38	

LABORATORY USE ONLY

Shipped By	Cooler ID(s)	Custody Seals Y N C B	Intact Y N	Receipt Temp °C	Temp Blank Y N	On Ice Y N	Payment Type CC Cash Check_____	Amount $	Receipt Number (cash/check only)

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All subcontracted data will be clearly notated on your analytical report.

APPENDIX S

DISCARGE PERMIT COG590148

COLORADO
Department of Public Health & Environment

CERTIFICATION TO DISCHARGE UNDER CDPS GENERAL PERMIT COG590000
DOMESTIC WASTEWATER TREATMENT FACILITIES DISCHARGING TO RECEIVING WATERS WITH A CHRONIC LOW FLOW: DESIGN FLOW RATIO OF 100:1 OR GREATER AND NOT DISCHARGING TO WATERS THAT ARE DESIGNATED AS THREATENED AND ENDANGERED HABITAT
Certification Number: **COG590148**

This Certification to Discharge specifically authorizes:
Routt County Department of Environmental Health
to discharge from the facility identified as

Milner Community WWTF

to: Yampa River

Eligibility Category:	Mechanical Facilities With Design Flows Of Less Than Or Equal To 0.25 MGD
Facility Address:	South Main St, Steamboat Springs, CO 80477 Routt County
Facility Latitude/Longitude:	40.482262 Latitude -107.020947 Longitude

Permitted Feature 001A External Outfall	40.4784 Latitude -107.0189 Longitude: following disinfection prior to entering the receiving water(s)
Permitted Feature 300I Influent Sampling Location	40.482262 Latitude -107.020947 Longitude: at a representative location prior to chemical, physical, or biological treatment

The permit limitations have a delayed effective date of December 1, 2024 include the projected Site Approval. The hydraulic and organic capacities, in this certification, are 0.0325 MGD and 65 lbs BOD5/day, respectively based on projected Site Approval. **Discharges under this certification are not allowed until the permittee receives an approval of the domestic wastewater treatment works through the site location and design review process.**

Permit Limitations and Monitoring Requirements apply consistent with the Permit Part I.B and Part I.C. The specific requirements that apply to this facility are outlined below.

Mechanical Facilities With Design Flows Of Less Than Or Equal To 0.25 MGD

Permitted Feature ID: 300I
Permitted Feature Type: Influent Structure for Mechanical WWTF < or = 0.25 MGD
Limit Set: 1

Mechanical Facilities With Design Flows Of Less Than Or Equal To 0.25 MGD						
ICIS Code	Parameter	Influent Monitoring			Monitoring Frequency[1]	Sample Type
		30-Day Avg.	7-Day Avg.	Daily Max.		
50050G	Flow, MGD	Report		Report	Continuous[2]	Recorder[2]
00180P	Plant Capacity (% of Hydraulic Capacity)[3]	Report			Monthly	Calculated[3]
00310G	BOD_5, mg/l	Report	Report		Monthly	Composite[4]
00310G	BOD_5, lbs/day	Report	Report		Monthly	Calculated
00180Q	Plant Capacity (% of Organic Capacity)[3]	Report			Monthly	Calculated[2]
00530G	Total Suspended Solids, mg/l	Report	Report		Monthly	Composite[4]

The hydraulic and organic capacities, applicable to Part I.B of this permit, are 0.0325 MGD and 65 lbs BOD_5/day, respectively. These values are based on the projected Site Approval.

4300 Cherry Creek Drive S., Denver, CO 80246-1530 P 303-692-2000 www.colorado.gov/cdphe/wqcd

1 Monitoring frequency reductions may be granted, in accordance with the Baseline Monitoring Frequency, Sample Type, and Reduced Monitoring Frequency Policy for Industrial and Domestic Wastewater Treatment Facilities (WQP-20).

2 The monitoring frequency and sample type for effluent flow is specified in the certification and is fully enforceable under this permit. Mechanical type treatment facilities are typically required to have both influent and effluent flow measuring and recording devices. This requirement may be waived in cases where the division determines that either influent or effluent flow measurements are impractical. For these facilities, flow measuring and sampling type will be specified in the certification. If only one device is applicable, then that device will be used to report both influent and effluent flow. However, where these devices are not in place at the time of certification, the permittee has one year from the end of the calendar month that certification was given to install the required equipment. Where such equipment is in place, the frequency and type of flow monitoring will be "Continuous" and "Recorder", respectively. Where such equipment is not in place, the frequency and type of flow monitoring, during the interim period, will be specified in the certification. For certain facilities, the use of a metered pumping rate or potable water use or may be allowed. In these cases, the monitoring frequency and sample type will be determined and specified in the certification.

3 The % capacity is to be reported against the listed capacities for the design capacity and for the organic capacities as noted in the most recent Site Approval and as listed in the certification. The percentage should be calculated using the 30-day average values divided by the corresponding capacity, times 100.

4 See the definition of "composite" in Part I.D of this permit. If the division determines that a flow-weighted composite sample is impracticable for a facility, a time composite sample of four equal aliquots collected at two-hour intervals or sampling equal aliquots will be allowed. The monitoring frequency and sample type will be specified in the certification. See Section VI.A of the fact sheet for more information.

Permitted Feature ID: 001A
Permitted Feature Type: External Outfall for Mechanical WWTF < or = 0.25 MGD
Limit Set: 1

Mechanical Facilities With Design Flows Of Less Than Or Equal To 0.25 MGD						
ICIS Code	Parameter	Discharge Limitation			Sampling	
		30-day Avg.	7-day Avg.	Daily Max	Frequency[1]	Type[2]
50050	Flow, MGD[3]	0.0325		Report	Continuous [4]	Recorder [4]
00310	BOD_5, mg/l	30	45		Monthly	Composite
81010	BOD_5, percent removal	85% (min)			Monthly	Calculated
00530	Total Suspended Solids, mg/l	30	45		Monthly	Composite
81011	TSS, percent removal	85% (min)			Monthly	Calculated
50060	Total Residual Chlorine, mg/l			0.5	Weekly	Grab
00400	pH, s.u.			6.5-9.0	Weekly	Grab
84066	Oil and Grease, mg/l			Report	Weekly	Visual
03582	Oil and Grease, mg/l			10	Contingent	Grab
51040	*E. coli*, no/100 ml [5]	2,000	4,000		Monthly	Grab
00610	Total Ammonia, mg/l as N	50		50	Monthly	Composite
	Total Dissolved Solids, mg/l					
70295	PWS Intake, mg/l [7]	Report		Report	Quarterly	Composite
70295	WWTF effluent, mg/l	Report		Report	Quarterly	Composite
81020	Sulfate (mg/l)	Report			Monthly	Composite
00940	Chloride (mg/l)	Report			Monthly	Composite
77885	Methanol, Total (µg/l)	Report			Monthly	Composite
01104	Aluminum, TR (µg/l)	Report		Report	Monthly	Composite
00680	Total Organic Carbon (mg/l)	Report		Report	Monthly	Composite
00978	Arsenic, Total Recoverable µg/l [6] (Until December 31, 2028)	Report			Monthly	Composite
00978	Arsenic, Total Recoverable µg/l [6] (Beginning January 1, 2029)	0.02			Monthly	Composite

1 Monitoring frequency reductions may be granted, in accordance with the Baseline Monitoring Frequency, Sample Type, and

Reduced Monitoring Frequency Policy for Industrial and Domestic Wastewater Treatment Facilities (WQP-20).

2 See the definition of "composite" in Part I.D of this permit. If the division determines that a flow-weighted composite sample is impracticable for a facility, a time composite sample of four equal aliquots collected at two-hour intervals will be allowed. The monitoring frequency and sample type will be specified in the certification. See Section VI.A of the fact sheet for more information.

3 The 30-day average effluent limitation for flow is identified in the certification, is generally based on the design capacity of the facility as outlined in the most recent site approval, and is enforceable under this permit. Facilities with flow equalization basin and reclaimed water configurations may be addressed differently. See 61.8(2)(f).

4 The monitoring frequency and sample type for effluent flow is specified in the certification and is fully enforceable under this permit. Mechanical type treatment facilities are typically required to have both influent and effluent flow measuring and recording devices. This requirement may be waived in cases where the division determines that either influent or effluent flow measurements are impractical. For these facilities, flow measuring and sampling type will be specified in the certification. If only one device is applicable, then that device will be used to report both influent and effluent flow. However, where these devices are not in place at the time of certification, the permittee has one year from the end of the calendar month that certification was given to install the required equipment. Where such equipment is in place, the frequency and type of flow monitoring will be "Continuous" and "Recorder", respectively. Where such equipment is not in place, the frequency and type of flow monitoring, during the interim period, will be specified in the certification. For certain facilities, the use of a metered pumping rate or potable water use or may be allowed. In these cases, the monitoring frequency and sample type are determined and specified in the certification.

5 For *E. coli* the statistic used is the Geometric Mean, which is based on Method 1: Geometric Mean = $(a*b*c*d*...)^{(1/n)}$, or Method 2: Geometric Mean = antilog([log(a)+log(b)+log(c)+log(d)+...]/n).

6 Where facilities discharge to receiving waters with a TMDL or listed on the 303(d) list of impaired waters, the effluent limitation are equal to the applicable water quality standard for the TMDL or listed parameter. See the Fact Sheet for more information.

7 TDS monitoring requirement applies to discharges in the Colorado River basin. Samples are to be of the raw water supply. If more than one source is being utilized, a composite sample proportioned to flow shall be prepared from individual grab samples.

- **Compliance Schedules**
  a. Activities to Meet Total Recoverable Arsenic Final Limits - In order to meet total recoverable arsenic limitations, the following schedule is included in the permit.

Code	Event	Description	Due Date
43699	Facility Evaluation Plan	Submit a report that identifies sources of arsenic to the wastewater treatment facility and identifies strategies to control these sources or treatment alternatives such that compliance with the final limitations may be attained.	December 31, 2025
00899	Implementation Schedule	Submit a progress report summarizing the progress in implementing the strategies to control sources such that compliance with the final limitations may be attained.	December 31, 2026
00899	Implementation Schedule	Submit a progress report summarizing the progress in implementing the strategies to control sources such that compliance with the final limitations may be attained.	December 31, 2027
CS017	Achieve Final Compliance with Emissions or Discharge Limits	Submit study results that show compliance has been attained with the final limitations.	December 31, 2028

4300 Cherry Creek Drive S., Denver, CO 80246-1530 P 303-692-2000 www.colorado.gov/cdphe/wqcd

Certification issued August 22, 2022 Effective December 1, 2024 Certification Expires: March 31, 2026

This certification under the permit requires that specific actions be performed at designated times. The certification holder is legally obligated to comply with all terms and conditions of the permit.

This certification was approved by:
Michelle DeLaria, Unit Manager
Permits Section
Water Quality Control Division

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