

Seeley Lake Sewer District
REGULAR BOARD MEETING AGENDA

DATE: Thursday, December 16, 2021
PLACE: Virtual Meeting via Zoom
Computer: <https://us02web.zoom.us/j/8563339071?pwd=Z0NhbmRoWitlUFpyME8vTWJlOQlZ0Zz09>
Telephone: 1 669 900 6833
Meeting ID: 856 333 9071
Password: 123528
TIME: 6:00 p.m.

ROLL CALL

Tom Morris, President	O	05/2024
Pat Goodover, Vice President	O	05/2022
Jason Gilpin, Director	O	05/2024
Cheri Thompson, Director	O	05/2022
Vacant, Director	O	05/2022
Felicity Derry, Secretary	O	

1. OPENING: Scheduled for 6:00 PM Via Zoom
2. APPROVAL OF AGENDA:
3. EXECUTIVE SESSION: Hiring Interim Manager - *Discussion*
4. PRESIDENT'S COMMENTS:
5. PUBLIC COMMENT: On Items not on the Agenda of the Meeting and within the Jurisdiction of the Sewer District [MCA 2-3-103 (1)a]
6. CORRESPONDENCE: None
7. MINUTES: November 18, 2021 - *Action*
8. FINANCIAL REPORTS:
 - a} Invoices - *Action*
 - b} October 2021
9. MANAGER'S REPORT: Status Report
10. UNFINISHED BUSINESS:
 - a} Vote to Hire a Manager - *Discussion/Action*
 - b} Sewer System Presentations, BioMicrobics - *Discussion/Action*
 - c} Action Plan for 2021-2022
 - i. Committee Reports - *Discussion/Action*
 - d} Mission Update - *Discussion/Action*
 - e} Income Survey - *Discussion*
 - f} Board Appointee Interview - *Discussion/Action*
11. NEW BUSINESS:
 - a} Resolution 12162021 - Nutrient Budget Analysis - *Discussion/Action*
 - b} Finalize Questions - Sewer System Presentations - *Discussion/Action*
 - b} Amendments to the Website - *Discussion/Action*
12. NEXT SCHEDULED MEETING: January 20, 2021
13. AGENDA ITEMS FOR NEXT SCHEDULED MEETING:
14. ADJOURNMENT:

**SEELEY LAKE SEWER DISTRICT
REGULAR BOARD MEETING
November 18, 2021**

Tom Morris	President	PRESENT	Jason Gilpin	Director	PRESENT
Pat Goodover	Vice President	PRESENT	Cheri Thompson	Director	PRESENT
	Director	VACANT	Felicity Derry	Secretary	PRESENT
	Manager	VACANT	Kim Myre	Missoula Co	PRESENT

Public Attendance - Appendix A

CALL TO ORDER:

The meeting was called to order at 6:05pm and was held remotely via Zoom. Tom Morris requested that every who had joined the meeting identify themselves for the record.

APPROVAL OF AGENDA:

Pat Goodover requested that the Orenco presentation be moved prior to Unfinished Business. The Board agreed to the amendment of the agenda.

Tom Morris moved to approve the agenda as amended. Pat Goodover seconded the motion. There was no further discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

PRESIDENT'S COMMENTS:

Tom Morris requested that everybody be respectful of everybody's time and one another.

PUBLIC COMMENT:

None.

CORRESPONDENCE:

TSEP Project Closeout (Appendix B)

Tom Morris noted that TSEP had accepted the closeout of the grant.

Don Larson (Appendix C)

Tom Morris noted that Don Larson had received the District's letter and continued to argue that he should be reimbursed.

MINUTES:

October 21, 2021 Regular Meeting

The Board had no amendments to the October 21, 2021 minutes.

Jason Gilpin moved to approve the minutes of the October 21, 2021 Board Meeting. Cheri Thompson seconded the motion. There was no discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

FINANCIAL REPORTS:

Invoices – October 2021

Tom Morris reviewed the October invoices.

Cheri Thompson moved to approve the invoices and pay them. Tom Morris seconded the motion. There was no discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

September 2021 Financial Reports

The Board had no questions regarding the September financial reports.

Felicity Derry noted that the annual financial reports needed to be submitted to the state and the required form should be signed by the President. The Board reviewed the document.

Jason Gilpin moved that Tom (Morris) sign the document. Cheri Thompson seconded the motion. There was no discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

MANGERS REPORT:

Currently there is no manager to present a report.

UNFINISHED BUSINESS:

Sewer System Presentations - Orenco

Mike Saunders and John Honeywell from Orenco introduced themselves. Mike Saunders gave some background on the company and noted that their systems had been approved for use in Montana. Mike Saunders shared his screen and gave a presentation with an overview of some of the Orenco liquid only products and how they could be utilized as an affordable option for the Seeley Lake community.

Mike Saunders reviewed the systems for individual homes, noting that their products had the flexibility for hybrid systems, as well as scaling systems to meet the community's specific needs.

Mike Saunders noted that cold temperatures did slow down treatment in the systems and what measures had been taken to control system temperatures in colder climates. How the Orenco systems could meet some lower levels of nitrogen was reviewed. Discussion followed on using an Orenco step collection system in conjunction with a different treatment system.

Mike Saunders estimated that a baseline system, which treated 7,500 gallons would cost approximately \$80-100,000. However, if other technologies were added for denitrification the cost would escalate quickly.

The Board discussed how to get questions to Orenco and agreed that Pat Goodover would be the go between for the Board's questions.

Tom with Glacier Precast added that he had been involved with projects in Florence and Bonner, and was available to answer questions.

Action Plan for 2021-2022

Committee Reports

Pat Goodover noted that he had not heard back from Beth Hutchinson and concluded that she was not interested in pursuing an income survey.

The Board discussed what the next step should be after the sewer presentations and agreed that at the December meeting the Board would finalize the questions, which would then be sent to all three of the companies that had presented to the District.

Tom Morris noted that the interlocal agreement was on the agenda for the County Commissioners and would then be drafted by their attorney.

Cheri Thompson noted that the brochure and the next article for the Pathfinder had been circulated. The Board discussed removing the name brand from the article.

Jason Gilpin moved to accept the lowdown bulletin and the article. Pat Goodover seconded the motion. There was no discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

Nutrient Budget Analysis

The Board discussed the two different proposals from CRC and that if either option were approved the 2022 budget would need to be amended. The 2022 budget was reviewed and where the funds for the testing might come from.

The timeline for the CRC/Missoula County project that had been submitted to the Bureau of Mines was reviewed. The Board discussed the proposed testing locations and the possibility of additional locations. Discussion followed on reallocating the test well funds to pay for the testing or using the unspent manager funds to date.

Pat Goodover moved to authorize spending \$5,515 for the eDNA testing and take the unspent money from the manager. Caryn Miske noted that the testing could show infiltration between the groundwater and surface water, as well as a direct connection between septic systems and surface water. Cheri Thompson seconded the motion. There was no further discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Nay
Cheri Thompson	Aye
Director	Vacant

New Agreement with Seeley Swan High School

Tom Morris noted that the current MOU would continue unless one party decided to terminate the agreement.

Pat Goodover moved to continue with the agreement. Cheri Thompson seconded the motion. Cheri Thompson requested that all of the testing needed to be consolidated. The motion failed.

Tom Morris	Nay
Pat Goodover	Aye
Jason Gilpin	Nay
Cheri Thompson	Aye
Director	Vacant

Amend 2022 Budget

Tom Morris noted that there had already been much discussion on this item.

Cheri Thompson moved to move the unspent money from the manager to pay for the nutrient budget analysis. Pat Goodover seconded the motion. There was no discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

Mission Update

There was no new information for this item.

Income Survey

Previously covered in the Action Plan Committee Reports.

Approve Manager Interview Questions

The Board reviewed and discussed the questions that had been circulated. The Board agreed to remove the second and third questions.

Tom Morris moved to approve the eight questions. Cheri Thompson seconded the motion. There was no further discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

NEW BUSINESS:

Manager Interviews

The Board discussed how to interview the candidates and agreed to interview one candidate at a time. David Losee stayed in the meeting, while Bill Decker was placed in the Zoom waiting room.

The Board asked David Losee the approved questions, which he answered as follows:

David Losee had been involved intermittently with the Woods Bay project and wanted to help Seeley Lake. He had 45 years of experience in the military and corporate environment. David Losee felt that the eminent domain law could get drawn out. So, in the past he had worked to understand what the objections and needs of the holdout property owner were and by getting to know him, he was able to successfully negotiate an easement across his property. David Losee was uncertain if he

would be investing within the District at this time. His managerial style was to be flexible and to understand issues and concerns. He set clear objectives and expectations and then was hands off and monitored progress. His hobbies were hiking, fishing, hunting, woodworking and grandkids. David Losee felt that his experience on a large number of projects was his biggest strength and his weakness was not wanting to give up. David Losee had been involved with many different kinds of wastewater systems and listed some examples.

Bill Decker returned to the meeting, while David Losee was placed in the Zoom waiting room.

The Board asked Bill Decker the approved questions, which he answered as follows:

Bill Decker lived in Seeley Lake and had attended a meeting to learn more and although it did not affect him, as he was out of the District, he understood the issues and wanted to get involved. Bill Decker had been involved with easements and encroachments personally and felt that you could not just force somebody to give up their property for the good of the system. He did not anticipate buying property within the District anytime soon, but he could not rule it out. Bill Decker had operated a water and wastewater system with several people and his managerial style was that he expected people to take responsibility, show up and do their job. His hobbies were an old Jeep, going up in the mountains with his dog, boating and a riding his motorcycle. It was his dream to retire here. His strengths were his commitment to his job and being able to listen and learn from those who knew more than he did. He was a team builder and liked to work with people and come to an agreement as to how things would get done. His weakness was that he cared too much, but thought that he would have no weaknesses regarding the responsibilities of this job. Bill Decker had been involved in two projects. One was to annex an area of high-density septic systems into the City of Great Falls for water and wastewater. He then outlined the projects. He had also owned a trailer park that started out as a public water system and eventually hooked up to the City of Great Falls. The job of an operator and manager was to comply with the regulations.

David Losee returned to the meeting.

The Board discussed how to move forward and the possibility of having a closed session to discuss hiring a manager.

Cheri Thompson moved to hold a personnel meeting ahead of the meeting next month at 5:30pm to discuss hiring an Interim Manager. Discussion followed as to when the Board would take action on that discussion. Pat Goodover seconded the motion. The discussion continued on when to hold the Executive Session and holding the vote during the open public meeting. **Cheri Thompson moved to delete her old motion and then moved that prior to the meeting next month to hold an Executive Session at 5:30pm to discuss hiring an Interim Manager. No voting, just a discussion.** The Board discussed when to hold the Executive Session in relation to the Regular Meeting. **Cheri Thompson amended her motion to hold the Executive Session at the beginning of the December meeting.** Pat Goodover agreed to second the motion, as long as the Executive Session came right after the approval of the agenda and not at the very beginning of the meeting. Tom Morris restated Cheri Thompson's motion, **that there will be an Executive Session directly after the approval of the agenda at the December 16 meeting.** There was no further discussion. The motion was carried.

Tom Morris	Aye
Pat Goodover	Aye
Jason Gilpin	Aye
Cheri Thompson	Aye
Director	Vacant

Board Appointee Interview

None.

NEXT REGULARLY SCHEDULED MEETING: December 16, 2021

AGENDA ITEMS FOR NEXT SCHEDULED MEETING:

Tom Morris noted that the following items should be added to the December agenda: Action Plan – Committee Reports, Mission Update, Income Survey, Cheri Thompson requested adding making the website more in tune to people discussion/action, Board Appointee Interview, Executive Session, and Vote on Hiring a Manager.

ADJOURNMENT OF MONTHLY BOARD MEETING:

Cheri Thompson moved to adjourn the meeting at 8:37 pm. Tom Morris seconded the motion.

Attest:

Tom Morris, President

Felicity Derry, Secretary

**Seeley Lake Sewer District
Invoices for November 2021**

District:

Seeley Lake Water District - <i>Inv#203 November 2021</i>	\$95.05
Felicity Derry - <i>November/December 2021</i>	\$283.50
	<hr/>
	\$378.55

Citizens Alliance Account	\$4,666.12		\$4,666.12
Reserve	\$28,000.00		
Missoula County Account	\$107,565.94	(\$378.55)	\$107,187.39
			<hr/> <hr/>
			\$111,853.51

Seeley Lake - Missoula County Water District

PO Box 503
Seeley Lake, MT 59868-0503

Phone # 406-677-2559

Invoice

DATE	INVOICE #
12/1/2021	203

BILL TO
Seeley Lake Sewer District PO Box 403 Seeley Lake, MT 59868-0403

SHIP TO

P.O. NUMBER	TERMS	REP	SHIP	VIA	
	Due on Receipt		12/1/2021	Vince	

QUANTITY	ITEM CODE	DESCRIPTION	PRICE EACH	AMOUNT
6	MiscI	Bookkeeping & Admin November 2021	15.00	90.00
101	MiscO	Copies	0.05	5.05

THANK YOU!	Total	\$95.05
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Felicity Derry
November/December 2021

Date	Time	Subject	Hours
11/14/2021	9:00-10:30p	Admin	1.50
11/18/2021	5:30-8:45p	Meeting Prep & Meeting	3.25
11/26/2021	11:00-11:30am	Admin	0.50
12/6/2021	4:00-8:45p	Minutes & Admin	4.75
12/7/2021	5:45-8:00p	Minutes & Admin	2.25
12/8/2021	8:15-9:30p	Admin	1.25
12/9/2021	8:00-10:15p	Minutes & Admin	2.25
			<hr/>
			15.75

15.75 x \$18 = \$283.50

\$283.50

\$283.50

OPERATING BILLED INCOME	OCTOBER 2021	MTHLY BUDGET	2022 FISCAL YTD	YTD BUDGET	2022 BUDGET	% OF BUDGET
Fee Assessment	\$368.64	\$10,341.83	\$6,006.00	\$41,367.33	\$124,102.00	4.8
Interest Income CAB	\$0.00	\$0.00	\$28.37	\$0.00	\$0.00	
Interest Income Missoula County	\$27.52	\$0.00	\$99.11	\$0.00	\$0.00	
TOTAL OPERATING INCOME	\$396.16	\$10,341.83	\$6,133.48	\$41,367.33	\$124,102.00	4.9

OPERATING EXPENSES

Audit	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.0
Bookeeping	\$120.00	\$583.33	\$765.00	\$2,333.33	\$7,000.00	10.9
Dues & Subscriptions	\$0.00	\$70.83	\$203.21	\$283.33	\$850.00	23.9
Election	\$0.00	\$83.33	\$0.00	\$333.33	\$1,000.00	0.0
Equipment	\$0.00	\$4.17	\$0.00	\$16.67	\$50.00	0.0
Income Survey	\$0.00	\$62.50	\$0.00	\$250.00	\$750.00	0.0
Insurance - Liability	\$0.00	\$833.33	\$0.00	\$3,333.33	\$10,000.00	0.0
Legal	\$0.00	\$1,250.00	\$0.00	\$5,000.00	\$15,000.00	0.0
Licenses & Fees	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.0
Meals, etc.	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.0
Office Supplies	\$10.95	\$29.17	\$54.25	\$116.67	\$350.00	15.5
Postage	\$0.00	\$25.00	\$0.00	\$100.00	\$300.00	0.0
Public Relations	\$0.00	\$29.17	\$114.40	\$116.67	\$350.00	32.7
Manager	\$0.00	\$2,140.42	\$0.00	\$8,561.67	\$25,685.00	0.0
Secretary	\$369.00	\$500.00	\$1,503.00	\$2,000.00	\$6,000.00	25.1
Trainng	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.0
Travel	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0.0
Water Testing	\$0.00	\$133.33	\$0.00	\$533.33	\$1,600.00	0.0
Well/Lake Monitoring	\$0.00	\$228.33	\$340.50	\$913.33	\$2,740.00	12.4
Nutrient Budget Analysis	\$0.00	\$459.58	\$0.00	\$1,838.33	\$5,515.00	0.0
Drill 5 Wells	\$0.00	\$2,083.33	\$0.00	\$8,333.33	\$25,000.00	0.0
Repay Missoula Co Loan	\$0.00	\$1,826.00	\$21,912.00	\$7,304.00	\$21,912.00	100.0
TOTAL OPERATING EXPENSES	\$499.95	\$10,341.83	\$24,892.36	\$41,367.33	\$124,102.00	20.06
NET OP. INCOME (LOSS)	(\$103.79)	\$0.00	(\$18,758.88)	\$0.00	\$0.00	

BALANCE SHEET**ASSETS****08/31/21****09/30/21****10/31/21****CURRENT ASSETS****Cash Accounts**

Citizens Alliance Bank Account

\$4,691.83

\$4,691.83

\$4,661.83

Missoula County Account

\$158,752.82

\$136,292.53

\$136,074.34

- District Reserve Funds

\$28,000.00

\$28,000.00

\$28,000.00

- General District Funds

\$130,752.82

\$108,292.53

\$108,074.34

Total Cash Assets**\$163,444.65****\$140,984.36****\$140,736.17****Accounts Receivable****\$0.00****\$0.00****\$0.00****TOTAL CURRENT ASSETS****\$163,444.65****\$140,984.36****\$140,736.17****FIXED ASSETS****Total Fixed Assets****\$2,033,813.16****\$2,033,813.16****\$2,033,813.16****TOTAL ASSETS****\$2,197,257.81****\$2,174,797.52****\$2,174,549.33**

CASH FLOW RECONCILIATION

	30-Sep	31-Oct	FISCAL YTD
TOTAL NET INCOME (LOSS)	(\$22,574.69)	(\$111.29)	(\$18,788.88)
Operating Activities			
Accounts Payable	\$114.40	(\$114.40)	(\$3,834.00)
Total Investing Activities	\$114.40	(\$114.40)	(\$3,834.00)
INCREASE (DECREASE) IN NON-CASH ASSETS			
Accounts Receivable	\$0.00	\$0.00	\$0.00
NET CASH INCREASE (DECREASE)	<u>(\$22,460.29)</u>	<u>(\$225.69)</u>	<u>(\$22,622.88)</u>
CHANGE IN ACCOUNT BALANCES			
Cash at Beginning of Period	\$163,444.65	\$140,961.86	\$163,359.05
Cash at End of Period	\$140,984.36	\$140,736.17	\$140,736.17
Change in Account Balances	<u>(\$22,460.29)</u>	<u>(\$225.69)</u>	<u>(\$22,622.88)</u>

BALANCE SHEET**LIABILITIES & EQUITY**

08/31/21

09/30/21

10/31/21

CURRENT LIABILITIES

Accounts Payable	\$0.00	\$114.40	\$0.00
Advance LOR Grant Income	\$0.00	\$0.00	\$0.00
Total Current Liabilities	\$0.00	\$114.40	\$0.00

TOTAL LIABILITIES\$0.00\$114.40\$0.00**OWNERS' EQUITY**

Retained Earnings	\$2,193,338.21	\$2,193,338.21	\$2,193,338.21
Net Income (Loss)	\$3,919.60	(\$18,655.09)	(\$18,788.88)
Total Owners' Equity	\$2,197,257.81	\$2,174,683.12	\$2,174,549.33

TOTAL LIABILITIES & EQUITY\$2,197,257.81\$2,174,797.52\$2,174,549.33

Seeley Lake - Missoula County Sewer District Check Detail

October 2021

Type	Num	Date	Name	Item	Account	Paid Amount	Original Amount
Bill Pmt -Check	1955	10/28/2021	Pathfinder		1001 - Missoula County Account		-114.40
Bill	Inv#26872	09/30/2021			6670 - Public Relations	-30.00	30.00
					6670 - Public Relations	-30.00	30.00
					6670 - Public Relations	-54.40	54.40
TOTAL						-114.40	114.40
Bill Pmt -Check	1956	10/28/2021	Seeley Lake Water District		1001 - Missoula County Account		-130.95
Bill	Inv#201	10/01/2021			6652 - Bookkeeping Services	-120.00	120.00
					Copies	-10.95	10.95
TOTAL						-130.95	130.95
Check	1957	10/28/2021	Felicity Derry		1001 - Missoula County Account		-369.00
					6110 - Secretary	-369.00	369.00
TOTAL						-369.00	369.00

Interview Questions For a New Director

What are the key reasons you decided to apply to become a director for the sewer board?

What would be your goals be in the position?

What is your knowledge of the elevated nitrates in Seeley Lake and the Special Management Area established by the Health Board?

The voters did not approve the necessary bonding for the proposed project to go forward. What do you believe the board should focus on now?

\$1.8 Million dollars was spent to design a system to address the nitrate issue. Do you believe the voters did not want the designed system, or did they vote NO for other reasons?

Describe your decision-making process.

How much time do you have on a weekly basis to commit to sewer board work?

Describe your understanding of the most effective way the sewer board can serve the district over the next year; over the next 3-5 years.

Give a brief overview of sewer district history/activities for the past relevant time as you see it.

Explain what representation of district constituents means to you.

To what extent are you comfortable contacting various governmental agencies and/or technical businesses?

What educational, work or personal background would make you a valuable member of the sewer board?

What is your level of knowledge with Robert's Rules of Order?

Questions for Sewer System Presenters

1. Does your system work with a septic system or is the septic system removed?
2. Can your system be considered a neighborhood system or a district system?
3. Are you piping effluents alone, or solids as well?
4. Do you treat the waste water before piping?
5. What size pipe does your system require?
6. Based on 500 houses and businesses, how much space does the plant need or plants need?
7. What happens to the waste after treatment?
8. What are the three top reasons to choose your system?
9. What challenges might we have if we choose your system?
10. To what nitrate level does your system treat the effluent?
11. Based on 500 houses and businesses, what is the predicted cost per unit?
12. How does the design process work?

1. Does your system work with a septic system or is the septic system removed?
Yes it can, I will explain during the next online meeting.
2. Can your system be considered a neighborhood system or a district system?
Yes, they are called that or community sewer or decentralized sewer.
3. Are you piping effluents alone, or solids as well? Only the effluent water is put into the drip irrigation system.
4. Do you treat the waste water before piping? Yes, the wastewater is treated to a high standard as determined by the state prior to discharge.
5. What size pipe does your system require? What we have quoted was a 1/2" drip irrigation pipe/system.
6. Based on 500 houses and businesses, how much space does the plant need or plants need? That is to be determined by your soils report.
7. What happens to the waste after treatment? Depending on required design. Pumped by a pumper truck and disposed as septic would be or screened and dried onsite and brought to a landfill or appropriate area.
8. What are the three top reasons to choose your system? Treatment plant size, easy operation and maintenance, Price and Quality. Sorry, 4 reasons.
9. What challenges might we have if we choose your system? Can't think of any challenges. I would like to answer any questions on this that you may have on the online meeting.
10. To what nitrate level does your system treat the effluent? We custom design our system to whatever your needs are. We are designing right now to 2.5 TN in another state. Also several other systems in the same state to a 7 TN.
11. Based on 500 houses and businesses, what is the predicted cost per unit? I would have to first know how many gallons per day to figure per home x the number of homes. That would give me the size of your treatment plant. To be accurate I would also need to know the discharge standard or limit to the drip irrigation. If I have the GPD flows for the complete system I can guesstimate the discharge standard.
12. How does the design process work? Please see attached process drawing and explanation.



TOM BARTLETT

communitysewer.com

Phone: 479-530-7922

[Visit Our Website](#)

GENERAL INFORMATION

BIOREACTOR for BIOLOGICAL TREATMENT and NITRIFICATION

INTRODUCTION

Aqua Tech Systems offers wastewater treatment installations made of stainless steel with capacity from 160 GPD (0.6 m³/day) up to 80,000 GPD (300 m³/day).

The distinctive advantage of Aqua Tech Systems is the development of the highly cost-effective integrated solutions for each project. The solution covers all treatment stages and the corresponding equipment that allows to meet individual requirements of the project in the most effective and professional way.

There are several benefits to using package factory-made systems over on-site built conventional treatment facilities. These include reduced engineering and construction labor costs as well as reduced installation time.

The package system has a very small footprint and is capable of being assembled to meet tight project schedules.

The treatment system provides:

- coarse solids and grit removal;
- primary sedimentation and phosphorus removal, if required;
- wastewater flow equalization;
- wastewater feeding;
- biological treatment, incl. nitrification, if required;
- primary sludge stabilization.

The system could be also supplied with a treated effluent UV-disinfection unit, primary sludge dewatering system, chemicals dosing equipment if that is necessary for treatment process.

All wastewater treatment processes are mechanized and automated.

APPLICATION

The Bioreactor is intended only for residential wastewater biological (secondary) treatment and similar wastewaters by loadings and composition.

Typical applications include:

- residential clusters,
- malls,
- nursing homes,
- schools,
- supermarkets,
- restaurants,
- gas stations,
- golf courses,
- hotels,
- and small communities.

It is prohibited to discharge to the Bioreactor stormwater, regeneration water from drinking water treatment plants and boiler houses, industrial wastewaters.

Treated effluent quality allows its safe discharge into environment, reuse for irrigation or other technical needs.

The sanitary and environmental safety of the treatment technology and processes provide harmonious integration in modern environment!

The Bioreactor can be designed for any treatment effluent requirements, including advanced treatment required for sensitive areas.

CONSTRUCTION

The Bioreactor represents factory made two or multi-chamber aeration tank made of stainless steel AISI-304, equipped with carriers (media) for immobilization of microorganisms, aeration system to ensure optimal oxygen conditions and other necessary technological equipment.

Air supply is provided by a compressor (submersible or dry). Air feeding pipelines are supplied to distribute air within the whole Bioreactor.

All chambers of the Bioreactor are equipped with air distribution pipelines, necessary fittings and fixing elements.

The Bioreactor is equipped with the electrical panel. Power supply cable is to be connected to the electrical panel.

PROCESS SPECIFICATION

General provisions

Applying the Bioreactor as a basis for wastewater biological treatment it is necessary to complete additionally the following tasks:

- foundations for the Bioreactor, drainage areas and access roads,
- provide connections,
- provide treated effluent discharge in accordance with regulations.

Also it is necessary to provide:

- specialized onsite treatment systems for all local technological sources of wastewaters which do not correspond to the Bioreactor application terms,
- wastewater should be primarily treated prior to be pumped to the Bioreactor. The primary treatment should include mechanical treatment (coarse solids and grit removal), FOG (fats, oils and greases) removal and wastewater settling and flowrate equalization.

FOG (fats, oils and greases) removal

FOG level should be constantly monitored, preferably by means of sensors.

Entering amount of FOG should not exceed 50 mg/l.

If FOG concentration is permanently higher than 50 mg/l in any of local discharges, then it is necessary to apply constantly specially selected biopreparation for FOG decomposition, for example, *BioEaseTM4210*.

If FOG concentration exceeds 100 mg/l, then it is necessary to build a local grease trap and use the biopreparation for FOG degradation.

Coarse solids removal

The feed pumps should be protected from coarse solids present in wastewater. Depending on a primary treatment technology Aqua Tech Systems offers a solution for the coarse solids removal.

Grit removal

Wastewater usually contains certain amount of grit and other mineral substances, which should be removed before wastewater feeding to the Bioreactor.

Primary settling

Suspended solids (SS) concentration limit for biological treatment based on the biofilm process is 105 mg/l. As raw wastewater usually has higher SS content (> 105 mg/l), a primary settling should be introduced.

Primary sludge accumulation and digestion

The accumulated primary sludge digestion is to be facilitated by means of a biopreparation, for example, *Bacti-Bio 9500*. This biopreparation provides high effect of stabilization ensuring downstream biological process stability, significant reduction of primary sludge volume and odour prevention.

The sludge level should be constantly monitored by means of an automatic sludge level sensor or manual Sludge Judge device.

The settling-digestion tank routine desludging is to be done as frequently as needed to avoid sludge overflow into the Bioreactor which is strictly forbidden.

Flowrate equalization and feeding to Bioreactor

Wastewater flowrate equalization is needed to overcome the operational problems caused by flowrate variations, to improve the performance of the downstream processes, and to reduce the size of downstream treatment facilities.

Wastewater equalization ensure the biological treatment enhancing, because shock loads are eliminated or can be minimized, inhibiting substances can be diluted, and pH can be stabilized.

The assumed wastewater feeding duration to the Bioreactor is at least 18 hours/day (12 hours/day for single family units).

The assumed feeding volume is:

$$v = Q_{\text{day}} / 18, \text{ m}^3/\text{hour},$$

where Q_{day} is wastewater amount per day.

Aqua Tech Systems provides necessary settling-digestion and wastewater flowrate equalization tanks of the required volumes which are plastic or ferro-concrete.

Phosphorus removal

If it is required to remove phosphorus, it is done at the primary settling step using a coagulant.

Biofilm cannot remove more than 1-1.5 mg/l of phosphorus. The formed biocenosis of the biofilm, being in a state of dynamic equilibrium, does not produce biomass and, accordingly, does not consume phosphorus.

Based on the world practice, wastewater processing with coagulant ensures efficient organics reduction and reduces the phosphorus parameter below 1.0 mg/l.

The technology provides coagulant applying at the primary treatment step.

BIOLOGICAL TREATMENT

General process characteristics

The biological process is based on the biofilm technology. Biofilm is a dense community of attached-growth microorganisms living on specially designed plastic carriers (media). Having direct contact with wastewater, biofilm absorbs and oxidizes pollutants thus providing treatment. Multiple biozones ensure that an appropriate biological system develops according to the nature of wastewater composition. It supports dynamic balance on its own both in mass and qualitative composition according to variations of

wastewater parameters (within the range of optimal adaptation rates and permissible values of calculated loads). Due to efficient ecosystem development in the Bioreactor there is *no excess biomass growth*.

Technology

Incoming organics is sequentially oxidised by isolated biocenoses of fixed microorganisms living on the special plastic media retained within the borders of each aeration tank's chamber.

The media is submerged in water. Oxygen supply and mixing are provided by aeration. Due to change of oxidation rate at each process stage - from high on the first stage to low on the last stage – the loads on biocenoses and water saprobity vary from high to low accordingly.

In response to changing environmental conditions and amount of dissolved oxygen, the treatment process occurs as follows:

- on the first stage – sorption and oxidation of dissolved organic matter, adsorption of suspended solids and colloids and hydrolysis (fermentation) of suspended solids and colloids;
- on the second process stage - sorption and oxidation of dissolved organics,
- on the third process stage - biofiltration (biosorption).

Oxygen conditions

Oxygen supply is provided by aeration.

The oxygen mode is a function of the following factors:

- organic load,
- thickness and density of biofilm,
- wastewater temperature.

The required amount of dissolved oxygen for each process stage should be optimized and adjusted according to the Aqua Tech Systems recommendations.

Nitrification

The Aqua Tech Systems biofilm process configuration creates conditions for simultaneous nitrification without need of recycle.

The corresponding environment allows formation of layered biocenosis. The layered biocenosis is characterized from the point of view of oxygen diffusion into the biofilm:

- aerobic layer on biofilm surface,
- anoxic internal mass of biofilm.

Aerobic zone of biofilm creates conditions for heterotrophic microorganisms development, which partially oxidize and reduce ammonium along with oxidation of organic matter.

Anoxic zone of biofilm creates conditions for development, growth and accumulation of specific autotrophic microorganisms ANAMMOX, which oxidize and reduce the main part of incoming ammonium.

Biofiltration (biosorption)

Biofiltration or biosorption occurs in the Bioreactor on a static media.

During the biofiltration the following processes take place:

- advanced clarification (reduction of suspended solids (SS)),
- additional removal of organic matter (reduction of BOD),
- biological disinfection.

The biofilter's biofilm bacteria consume remaining part of dissolved organic matter, effectively reducing BOD.

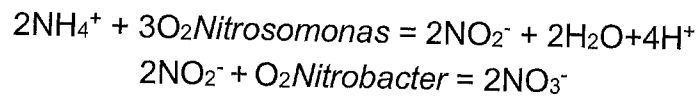
In low load conditions bacteria release a significant amount of exopolymers capable to capture and retain solids during contact. In turn, solid substances captured by the biofilm (bacteria, organic matter) serve as a food for predators and detritophages that results in reduction of suspended solids amount.

It should be noted here that bacteria and predators create symbiotic relationship after a number of successions, under which predators regulate their quantitative and qualitative composition in a strict accordance with incoming food amount.

Also the significant input in clarification comes from attached stalked ciliates (*Peritrichia*). The peritrichs provide themselves with food by filtering large amounts of water. One individual is able to consume up to 30 000 bacteria per hour. This way *Peritrichia* provide in additional high degree of biological disinfection, destroying pathogenic microorganisms.

Low organic load and high amount of dissolved oxygen in the biofilter provide partial ammonium removal.

Ammonium bio-oxidation is carried out in two stages, by two types of chemoautotrophic bacteria:



START- UP

Formation of the biofilm occurs spontaneously, without operation staff interference, based on set and maintained level of dissolved oxygen in each chamber. After a period of successions, the dynamic equilibrium is reached, which is characterized by stable treatment process performance in accordance with the project requirements.

Under conditions of actual loadings correspondence to the calculated design values and operation and maintenance performance according to the operation manuals, adapted to particular wastewater biocenoses fully mature:

- For "B" bio-oxidation process – within four weeks;
- For "N" bio-oxidation and nitrification process – within one year.

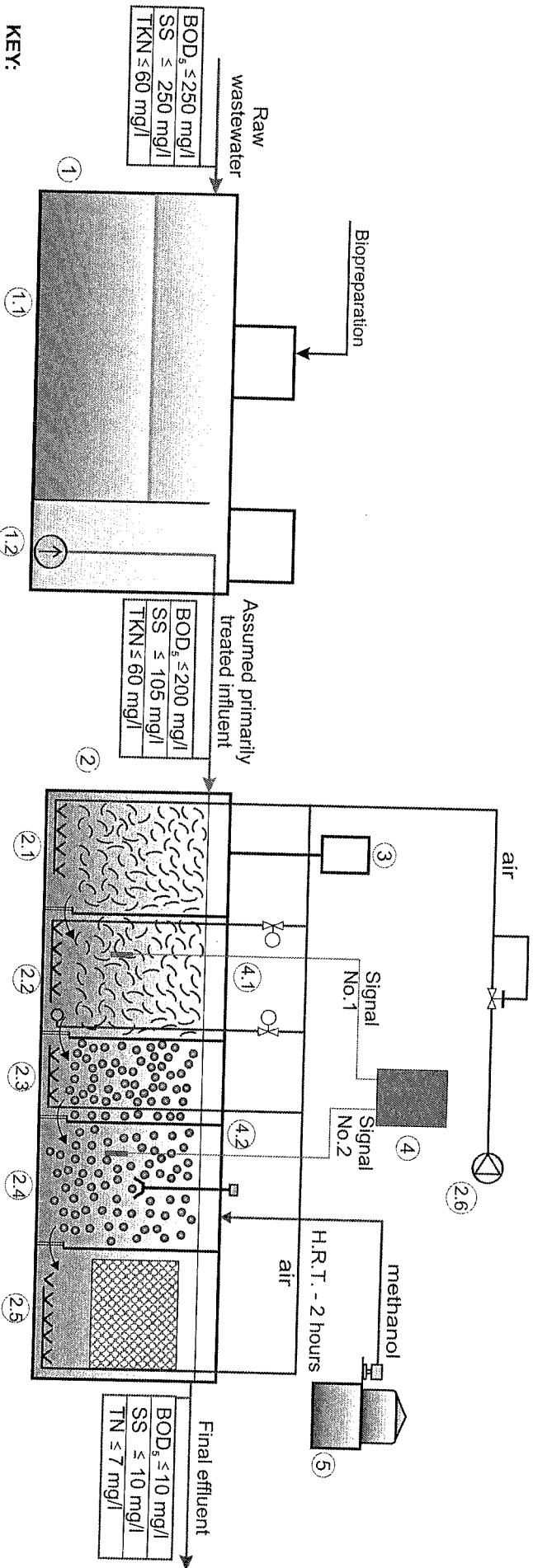
The treatment efficiency should be 95÷99% from the calculated one.

If necessary, the achievement of treatment quality for the process "N" can be accelerated by the use of methanol. The process of nitrogen reduction takes place adding methanol as a food source for heterotrophic microorganisms. Due to lack of oxygen, heterotrophic microorganisms use oxygen from nitrates, thus reducing oxidized nitrogen. In this case it is possible to achieve 90% treatment efficiency by all required parameters within 60 days from start-up.

Project:	WEST TEMPLE and DESERT ROSE 10 units of 50,000 GPD each, Apple Valley, Utah, USA
Type of project:	Residential wastewater treatment. Gravity collection system. Drip disposal system.
Source of organics:	Methanol
Offer No.	208/0812221/RWWBIO



PRINCIPAL PROCESS FLOW DIAGRAM RESIDENTIAL WASTEWATER TREATMENT SYSTEM WITH BIOLOGICAL TREATMENT PROCESS 4.N+M



- KEY:**
1. Primary treatment tanks:
 - 1.1 Settling-digestion tank
 - 1.2 Wastewater flowrate equalization tank with equipment for wastewater feeding
 2. Multi-chamber bioreactor for biological treatment and nitr-denitrification:
 - 2.1 Hydrolysis-fermentation chamber
 - 2.2 Hetero-autotrophic nitr-denitrification chamber
 - 2.3 Autotrophic nitrification chamber
 - 2.4 Denitrification chamber
 - 2.5 Polishing chamber
 - 2.6 Submersible compressor
 3. Electrical panel

4. Nitr-denitrification process control and monitoring station with control sensors:
 - 4.1 Sensor for NH₄⁺ measurement
 - 4.2 Sensor for NO₃⁻ measurement
5. Methanol storage with dosing pump for organics supply

- NOTES:**
1. The Diagram shows assumed raw and primarily treated wastewater quality.
 2. Primary treatment tanks are shown conditionally.
 3. H.R.T. - Hydraulic retention time, determined assuming wastewater feeding duration to Bioreactor at least 18 hours/day.
 4. Due to continuous improvement of wastewater treatment technologies and equipment manufacturing **Aqua Tech Systems LLC** retains the right to modify technical descriptions and equipment specifications at any time without prior notice.

- LEGEND:**
- floating media type 04
 - floating media type 03
 - block static media B-200
 - fine-bubble aeration
 - medium-bubble aeration
 - pump
 - dosing pump
 - pressure regulator
 - mixer

08.12.2021.

EL.1 Principal process flow diagram.