BRISTOL, VERMONT
ANNUAL WASTEWATER SYSTEM EVALUATION
2023-2024

INDIRECT DISCHARGE PERMIT ID 9-0208-1

Prepared By: VTM Engineering, PLC

Date: Revised May 28, 2024

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APPENDICIES

1.0 BACKGROUND

The Town of Bristol, Vermont owns and operates a sewage collection, treatment and disposal system located in the downtown core of Bristol village. The system collects and treats wastewater from approximately thirty-four (34) individual commercial and residential properties within the "core" business district. The wastewater collection and disposal systems (collectively wastewater system) are governed by Indirect Discharge Permit number 9-0208-1. The Permit was re-issued in November 2022.

The wastewater system has been operating since September 1, 1993. The system consists of a wastewater collection system, a septic tank, disposal fields and associated appurtenances. An annual inspection of the collection and disposal system by a registered professional engineer is required to be conducted during the month of April as a condition of the Indirect Discharge Permit. The Town of Bristol contracted with VTM Engineering, PLC (VTM) of Hinesburg, Vermont to conduct the annual wastewater inspection and evaluation.

Steven Palmer of VTM performed the annual inspection of the Bristol wastewater collection, treatment and disposal system on April 22, 2024. Mr. Palmer performed the inspection in conjunction with Cyrus Marsano of Vermont Utility Management Services (VTUMS). VTUMS is the licensed wastewater operator for the Bristol Wastewater System.

This Report outlines the items inspected, the observations made, analysis of annual sampling and testing data as well as recommendations for repairs and/or operations.

2.0 WASTEWATER SYSTEM INSPECTION

The Bristol Wastewater system is comprised of three major components:

1) a wastewater collection system comprised of collection manholes, grease traps and piping;
2) a septic tank, splitter box and dosing siphons;
3) eight separate wastewater disposal fields.

The original wastewater system design envisioned four of the eight disposal fields being in operation at any given time. The original design envisioned a flow of 5,000 gpd maximum capacity to each of four operating fields (20,000-gallon total hydraulic capacity). Later permit amendments also applied biological loading criteria limitations including TSS and $BOD^{5.}$

Figures 1, 2 and 3 Appendix A show the general location of the major system components.

2.1 Wastewater Collection System Inspection

The Discharge Permit requires inspecting the collection system including removing manhole covers to observe the condition of sewers and manholes, and noting any signs of inflow or excess infiltration.

A summary of the individual wastewater collection system observations by component are presented in Table 1.

The municipal wastewater collection system consists of twelve concrete collection manholes and approximately 1,500-feet of wastewater collection piping. It should be noted that a number of the restaurants connected to this system also have privately owned grease traps inside of each facility which are regulated by the Vermont Health Department and were not a part of this inspection. Four of the restaurants also have separate exterior grease traps as noted in Table 1. It is VTM's understanding that the exterior grease traps are pumped every other month by Clark Wright Septic Services and that the interior grease traps are maintained independently by each restaurant. VTUMS confirmed that the exterior grease traps are pumped on a quarterly schedule. It is unclear from the information available at the time of the inspection whether or not the interior grease traps are being maintained by the restaurant owners as scheduled.

Sewer manhole covers were removed and each component in the collection system was visually inspected by VTM and VTUMS. A summary of observations made during the wastewater collection system inspection are included in Table 1.

TABLE 1
BRISTOL WASTEWATER
COLLECTION SYSTEM OBSERVATIONS

ITEM A	COLLECTION SYSTEM COMPONENT
MH #1	Low flow/good condition/dead end. No flow in MH.
MH #2	Low flow/good condition.
MH #3	Low flow/good condition.
MH #4	Good condition/low flow. Shelves should be cleaned.
MH #5	Good condition, low flow/dead end.
MH #6	Car parked over MH, not accessible.
MH #7	Under stone drive. Could not find. Manhole should be found and have a riser added to bring it to surface level.
MH #8	Low flow. Excellent condition. Drop manhole.
MH #9	Low flow/good condition.
	MH #10 Excellent condition.
	MH #10A Low flow/good condition. Shelves need cleaning.
MH #11	Low flow/good condition.
South Mountain Grease Trap - Cannot inspect except during pumping. Quarterly schedule. VTUMS to pump.	
Snap's Grease Trap - Cannot inspect except during pumping. Quarterly schedule. VTUMS to pump.	
Mini-Factory Grease Trap - Cannot inspect except during pumping. Quarterly schedule. VTUMS to pump.	
Cubbers Grease Trap- Cannot inspect except during pumping. Quarterly schedule. VTUMS to pump.	
Viens Dosing Siphon – Water noted, not able to evaluate operation. VTUMS to verify operation.	

Interior Grease Traps (private) - Not Inspected. Operator reports local hauler is cleaning quarterly for the property owners under separate maintenance agreement.

2.2 Wastewater Treatment System Inspection

The Bristol wastewater treatment system consists of a 30,000 gallon septic tank, piping, splitter box, eight dosing siphons as well as eight separate wastewater disposal fields. Four of the eight wastewater disposal fields are in operation at any given time and the fields are rotated on an annual basis. Bristol's wastewater Discharge Permit requires an annual inspection of each component within the treatment system to ensure proper operation including but not limited to the septic tank including a notation of the accumulation of solids and scum in the septic tank, verification of disposal field rotation, dosing siphon operation, evaluation of the disposal fields including walking the disposal fields and checking for any signs of surfacing effluent or other signs of failure, verifying hydraulic as well as nutrient loading, and finally notation of any repairs or maintenance that needs to be performed including pumping of the structures if necessary.

2.2.1 Septic Tank Inspection

Untreated wastewater from the wastewater collection system enters an inlet structure prior to the treatment system. The inlet structure has two outlets. Wastewater can either flow from the inlet structure to the west facing side of Cell #1 of the septic tank or to the east facing side of Cell #1 by simply opening or closing one of the two flow gates. As currently set up, flow from the inlet structure is sent to the west side of compartment #1 of the septic tank. The inlet structure hatch was opened so the structure could be inspected. The inlet structure was constructed with a bricked flow trough that was noted to be in good condition.

From the inlet structure, wastewater flows to a 30,000 gallon septic tank for sludge removal. The septic tank has a baffle that effectively splits the tank into two compartments (Cell #1 and Cell #2). Each compartment has an access hatch for inspection and cleaning. Figure 4 shows the general layout of the septic tank.

All four septic tank access hatches were opened and the tank was inspected by both VTM and VTUMS personnel. Sludge and scum measurements for each of the four compartments were taken. It was also noted that significant grease layer (many inches thick) had formed on the top of the liquid in Cell #1. This observation was also made during the 2022 annual inspection. Sludge and scum observations were as follows:

Measurements/Observations Cell #1	Measurements/Observations Cell #2
Access Hatch #1 – Sludge 24", Scum 18"	Access Hatch #3 – Sludge 8", Scum 0"
Access Hatch #2 – Sludge 24", Scum 12"	Access Hatch #4 – Sludge 10", Scum 0"

Based on VTM's observations, the septic tank slide gates, safety locks and hasps on hatches appear to be in working condition. The hatches are functional but are seeing some wear and may need to be evaluated for replacement in the future. Pumping of both septic tank cells is recommended based on sludge and grease buildup.

TABLE 2
BRISTOL WASTEWATER SYSTEM
SUMMARY OF TREATMENT SYSTEM OBSERVATIONS

Description	Comments
Septic Tank Compartment #1	Needs Pumping
Septic Tank Compartment #2	Needs Pumping
Septic Tank Inlet Structure	Good condition. No issues noted
Septic Tank Outlet Structure	Brick flow trough needs maintenance
Splitter Box	Good physical condition. Outlet valve #? needs replacement.
Dosing Siphon #1	VTUMS to Check Operation
Dosing Siphon #2	VTUMS to Check Operation
Dosing Siphon #3	VTUMS to Check Operation
Dosing Siphon #4	VTUMS to Check Operation
Dosing Siphon #5	VTUMS to Check Operation
Dosing Siphon #6	VTUMS to Check Operation
Dosing Siphon #7	VTUMS to Check Operation
Dosing Siphon #8	VTUMS to Check Operation
Disposal Fields #1-8	No issues noted

Wastewater from the septic tank flows through an outlet structure prior to being piped to the splitter box. The access hatch to the septic tank outlet structure was opened to conduct an inspection. The outlet structure consists of a rectangular concrete structure with a brick bottomed flow trough. It was noted that the flow trough is deteriorating and in need of repair.

2.2.2 Splitter Box Inspection and Disposal Field Rotation

From the septic tank, liquids flow through piping to a splitter box. The splitter box separates flow to one or more of eight disposal fields. The intent is to have four of the eight disposal fields in operation at any given time and to rotate the fields annually.

The splitter box has an access hatch that was opened for inspection. Observations were as follows:

1. Fields #3, #5, #7 and #8 were observed to be off
2. Fields #1, #2, #4 and #6 were observed to be in operation
3. Appeared to be even flow between the fields, very little grease observed in splitter box
4. The splitter box and associated piping inside the box appeared to be in good condition.

VTUMS indicated that they conduct regular verification of even flow to the four fields and conduct skimming of grease in the splitter box if needed. During the inspection of the splitter box, VTUMS conducted the annual rotation of the disposal fields. Valves to operating fields #1, #2, #4, and #6 were closed. Valves to previously dormant fields #3, #5, #7 and #8 were opened and will now be in operation for the next 12 months. Even flow was observed to each of the four new operating fields. No issues of concern were noted within the splitter box.

2.2.3 Dosing Siphon Inspection

The dosing siphons were visually inspected by VTM and VTUMS personnel. Insufficient flow existed in fields #3, #5, #7 & #8 to determine if the siphons were properly functioning at the time of the inspection. VTM recommends that VTUMS verify that the siphons are operating properly once they receive sufficient flow.

The siphon counters do not appear to be operational. Green Mountain Engineering (GME) who originally designed the system indicated that the counters have never seemed to function properly. Green Mountain Engineering noted in their final Annual Inspection Report that that there were issues with the existing counters and they should be replaced with new mechanical counters when practical. VTM would support this recommendation as it would assist in verifying whether or not each of the siphon's is operating properly.

2.3 Wastewater Disposal Field Inspection

VTM and VTUMS personnel walked each of the eight disposal fields. The disposal field area is neat and clean and appears to be mowed on a regular basis. During last previous inspections, VTM noted that sumac and box alder trees were encroaching on the disposal fields. Trees bring the potential for root damage to the disposal fields. In the spring of 2023, VTUMS removed much the sumac and graded and re-seeded the impacted areas. A box alder tree has fallen on the east side of the disposal area. Annual maintenance should continue to be conducted each year around the perimeter of the disposal area to ensure that tree encroachment into the disposal area is kept in check. During the inspection several box alder trees were noted to be still encroaching on the disposal fields. These trees should be removed as time allows. Regular mowing of the disposal fields and surrounding areas should be continued.

Several discharge pipes for private stormwater drain lines were noted to exist. These stormwater lines originate from buildings located above the wastewater treatment area and daylight along the bottom of the bank adjacent to the northwest side of disposal Fields #1 and #2. VTM recommends that a small diversion ditch be installed west of disposal field #1 and #2 to encourage the water to flow in a northwesterly direction toward the New Haven River, away from the disposal fields.

Locks were noted to be absent from each of the three deep monitoring well cases. Locks should be added.

Each disposal field contains 3-4 shallow observation/monitoring ports to assist in monitoring potential standing water within the disposal fields. Each of the shallow monitoring ports is approximately 1.5' – 2.0' deep. Each shallow monitoring port contains a cover which was removed during the inspection. A flashlight was utilized to visually identify whether each port was dry or if standing water was visible. No standing water was noted in any of the shallow monitoring ports in all eight disposal fields. VTM's observations are further summarized in Table 3.

TABLE 3
BRISTOL WASTEWATER SYSTEM
SHALLOW MONITORING PORT OBSERVATIONS

Disposal Field	Observation
#1	Dry
#2	Dry
#3	Dry
#4	Dry
#5	Dry
#6	Dry
#7	Dry
#8	Dry

Three deep monitoring wells surround the eight wastewater disposal fields (wells #2, #3 and #4). These wells are used to monitor existing depth to groundwater as well as groundwater elevations within the vicinity of the eight disposal fields. This information is utilized to verify vertical separation between the bottom of the disposal fields and the existing groundwater table. Top of Casing (TOC) elevations for the three groundwater monitoring wells were obtained by VTM. Groundwater levels in the three wells were obtained and reported by VTUMS personnel during June and September 2023. Table 4 summarizes the

information obtained. Based on the information provided, there is adequate separation between the bottom of the disposal fields and the existing water table.

TABLE 4
BRISTOL WASTEWATER SYSTEM
WATER TABLE MEASUREMENTS [1, 2]

Date	Well #	Top of Casing Elevation (ft)	Depth to Groundwater (ft)	Groundwater Elevation (ft)
6/2/23	2	507.45	18.4	489.05
	3	505.60	35.8	469.8
	4	502.72	40.2	462.52
6/9/23	2	507.45	18.5	488.95
	3	505.60	35.9	469.7
	4	502.72	40.3	462.42
6/16/23	2	507.45	18.1	489.35
	3	505.60	32.8	472.8
	4	502.72	39.9	462.82
6/23/23	2	507.45	18.3	489.15
	3	505.60	33.2	472.4
	4	502.72	40.1	462.62
6/30/23	2	507.45	18.1	489.35
	3	505.60	33.1	472.5
	4	502.72	40.0	462.72
9/8/23	2	507.45	17.6	489.85
	3	505.60	32.3	473.3
	4	502.72	39.3	463.42
9/15/23	2	507.45	17.5	489.95
	3	505.60	32.9	472.7
	4	502.72	39.4	463.32
9/22/23	2	507.45	17.8	489.65
	3	505.60	32.8	472.8
	4	502.72	39.6	463.12
9/29/23	2	507.45	18.3	489.15
	3	505.60	33.8	471.8
	4	502.72	39.8	462.92

1. Groundwater level measurements provided by VTUMS.
2. TOC elevations provided by VTM Engineering.

3.0 WASTEWATER SAMPLING & EFFLUENT TESTING

Effluent sampling was performed by VTUMS during June and September 2023. As outlined in the Discharge Permit, VTUMS obtained representative wastewater samples from the Splitter

Box. Wastewater samples were subsequently submitted to Endyne Environmental Laboratories for analysis. A summary of the most recent 2023 data as well historic laboratory data since 2021 is provided in Table 5 for reference.

TABLE 5
BRISTOL WASTEWATER SYSTEM
EFFLUENT TESTING SUMMARY
(Sampling Conducted in Splitter Box)

Sampling Date	June 21, 2021	Sept. 9, 2021	June 7, 2022	Sept 13, 2022	June 21, 2023	Sept.19, 2023
pH	6.28	6.48	6.32	6.6	6.3	6.5
Chloride	82	64	60	67	43	68
Nitrogen, Ammonia	NR	NR	NR	NR	NR	NR
Nitrogen, Nitrite	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Nitrogen, Nitrate	<0.20	<0.20	<0.20	<0.20	0.37	<0.20
TKN	74	<0.64	50	69	39	65
Tot. Dissolved Phosphorous	9.7	7.0	4.8	7.2	4.5	8.6
Biochemical Oxygen Demand (5-day)	640	420	670	430	330	510
Total Suspended Solids	90	66	86	124	48	80
Oil and Grease	37.1	37.1	31.3	32.2	44.1	<3.3

Notes:
1. *Wastewater quality results are reported in milligrams per liter (ppm) unless otherwise specified.*
2. *Wastewater quality results are for samples from the splitter box (after septic tank).*
3. *NR = Not reported*
4. *Laboratory sampling conducted by Vermont Utility Management Services (VTUMS)*
5. Copies of the laboratory testing data sheets are contained in Appendix B.

Historic laboratory testing data shows that all parameters are well withing the anticipated normal ranges for commercial/residential wastewater. No significant variations in parameters were noted from year to year which would indicate a substantive change in the wastewater makeup or strength over this time period.

Nitrite levels in the groundwater samples have significant variability. No clear trend appears to be visible. It is advised to continue to monitor these levels for substantive changes or trend lines.

4.0 GROUNDWATER SAMPLING & TESTING

The Discharge Permit requires that groundwater sampling and testing be performed on deep monitoring wells #3 and #4 during June and September of each year. Groundwater sampling was performed by VTUMS during June and September 2023. Representative water samples from Monitoring Wells #3 and #4 were submitted to Endyne Environmental Laboratories for analysis. A summary of the laboratory data from 2021 - 2023 is provided in Table 6. Copies of the individual laboratory testing data sheets for 2023 are contained in Appendix B.

TABLE 6
BRISTOL WASTEWATER SYSTEM
GROUNDWATER WELL TESTING SUMMARY
(Sampling Conducted in Monitoring Wells #3 & #4)

Monitoring Well # & Date Sampled	pH	E. Coli (MPN/100ml)	Chloride	Nitrate as N	Tot. Dissolved Phosphorous
MW-3 (June 21, 2021)	6.93	<1.0	11	1.4	0.007
MW-3 (Sept. 9, 2021)	6.68	<1.0	9.0	<0.20	0.008
MW-3 (June 7, 2022)	6.92	<1.0	13	4.4	0.011
MW-3 (Sept. 13, 2022)	6.8	5.2	8.9	.34	0.011
MW-3 (June 21, 2023)	7.05	4.1	6.0	2.0	0.10
MW-3 (Sept. 19, 2023)	7.1	<1.0	6.0	0.63	0.080
MW-4 (June 21, 2021)	7.49	<1.0	15	1.0	<.005
MW-4 (Sept 9, 2021)	6.71	2.0	27	4.5	0.010
MW-4 (June 7, 2022)	7.47	<1.0	29	0.39	0.011
MW-4 (Sept. 13, 2022)	6.6	16	36	10	0.014
MW-4 (June 21, 2023)	7.2	<1.0	13	0.83	0.047
MW-4 (Sept. 19, 2023)	7.21	<1.0	14	1.1	0.011

Notes:
1. Wastewater quality results are reported in milligrams per liter (ppm) unless otherwise specified.
2. Wastewater quality results are for samples from the splitter box (after septic tank).
3. NR = Not reported

4. Laboratory information from 2020 as reported by Green Mountain Engineering.
5. Laboratory sampling conducted by Vermont Utility Management Services (VTUMS)

5.0 WASTEWATER FLOW DATA

The treatment system average daily flows are estimated using individual water meter readings for each of the 34 customers connected to the system. The individual water meter readings for the 34 users connected to the Bristol Wastewater system were provided by the Town of Bristol. A summary of that data presented in Appendix C.

The average daily flow for the system for the 2022/2023 reporting period as measured from April 14, 2022 to April 11, 2023 was 7,793 gpd. Current and historic average daily flow information is summarized below in Table 7.

TABLE 7
BRISTOL WASTEWATER SYSTEM
HISTORIC AVERAGE DAILY FLOW

Year	Average Daily Flow (GPD)
2021-2022	8,362
2022-2023	7,793
2023-2024	8,264

Three Year Average Daily Flow = 8,140 gpd

6.0 UNCOMMITTED RESERVE CAPACITY

The uncommitted reserve capacity of the system is based upon a three-year average daily flow, BOD^5 and TSS loading. The calculations utilized for loading capacity are outlined in the Permit. A copy of the 2024 Uncommitted Reserve Capacity calculations are contained in Appendix D. The design hydraulic capacity is 20,000 gpd. The maximum allowable BOD^5 AND TSS loadings per the Permit are 33.4 lb/day and 25.0 lb/day respectively.

It was noted that there is substantive variability in the BOD5 and TSS data over time. BOD5 will generally be lower when Fats, Oils and Grease (FOG) as well as TSS are reduced. Based upon water meter information for the businesses and residential units connected to the wastewater system, the three-year average daily hydraulic flow is 8,140 gpd. Using this data, the average BOD^5 and TSS loading was calculated as outlined in the Permit. The calculated BOD^5 and TSS loadings were 33.9 lb/day and 5.6 lb/day respectively. The three-year average BOD^5

loading rate of 33.9 lb/day exceeds the permitted limit. As a result, there is no additional uncommitted reserve capacity remaining in the system.

This is a relatively small system with only a handful of restaurants and one grocery store. These types of businesses traditionally generate high levels of organics (often food waste) and FOG that are generally associated with higher levels of BOD^5. As an initial recommendation, VTM suggests that the Town of Bristol develop and implement a monitoring and testing program to identify which users are generating higher levels of FOG and BOD^5. Following that work, alternatives can be developed to help reduce BOD^5 at its source(s) and prevent it from entering the wastewater collection system. As a rule, it is generally more cost effective to reduce BOD5 at the source than it is to treat BOD5 at the municipal treatment end of the system.

7.0 SUMMARY AND CONCLUSION

The wastewater system is in its 31st year of operation. The wastewater collection, treatment and disposal portions of the system are generally in good working condition. Some minor maintenance work is necessary as summarized herein.

The largest concern is the levels of BOD^5 in the wastewater effluent which have slightly exceeded the current permit limits. Laboratory testing results show that the other effluent and groundwater sampling parameters are within permit limits as well as the historical range of values. Nitrite levels in the groundwater samples in particular should continue to be monitored to note any spikes or an increasing trend line.

Maintenance and Repair Recommendations:

1. Develop a sampling and monitoring plan to evaluate which customers are contributing high levels of FOG and BOD^5.

2. Continue to utilize the routine system maintenance checklists outlined in the O&M Manual

3. Add a riser to MH #7.

4. Complete the recommended collection and treatment system maintenance items listed in Tables 2 & 3.

5. Compartments #1 and #2 of the septic tank should be pumped.

6. Conduct quarterly visual monitoring of the grease and sludge levels in the septic tank to assist with lowering FOG and TSS levels. If sludge and grease levels exceed 12" in any portion of the tank, the septic tank should be pumped.

7. Confirmation that all restaurants and other commercial businesses where grease generation would be anticipated, have a properly sized grease trap appropriate for their daily flows and verification that they are maintaining their grease traps on a regular basis.

8. When pumping the exterior restaurant grease traps, confirm and document the size, configuration and condition of each of the grease traps. Confirm that the grease traps contain baffles and are designed to function as grease traps, not septic tanks.

9. Re-build the septic tank outlet structure trough to the splitter box.

10. Replacement of splitter box valve #?

11. Remove the remaining box alder and sumac trees that continue to encroach on the disposal fields.

12. A number of stormwater or groundwater drainage lines were observed to be discharging near the west side of disposal fields #1 and #2. Ditching or some other method of re-directing the stormwater should be conducted to encourage the stormwater to flow away from the disposal fields.

13. Replace the existing dosing siphon counters with mechanical counters when practical.

14. Verify proper operation of the dosing syphons.

15. Continue regular mowing and trimming of the disposal field area.

16. Install locks on the covers of the three deep monitoring wells.

APPENDIX A

Figures

Figures 1 & 2 - Collection System Component Locations
Figure 3 - Disposal Area Components
Figure 4 - Septic Tank Detail

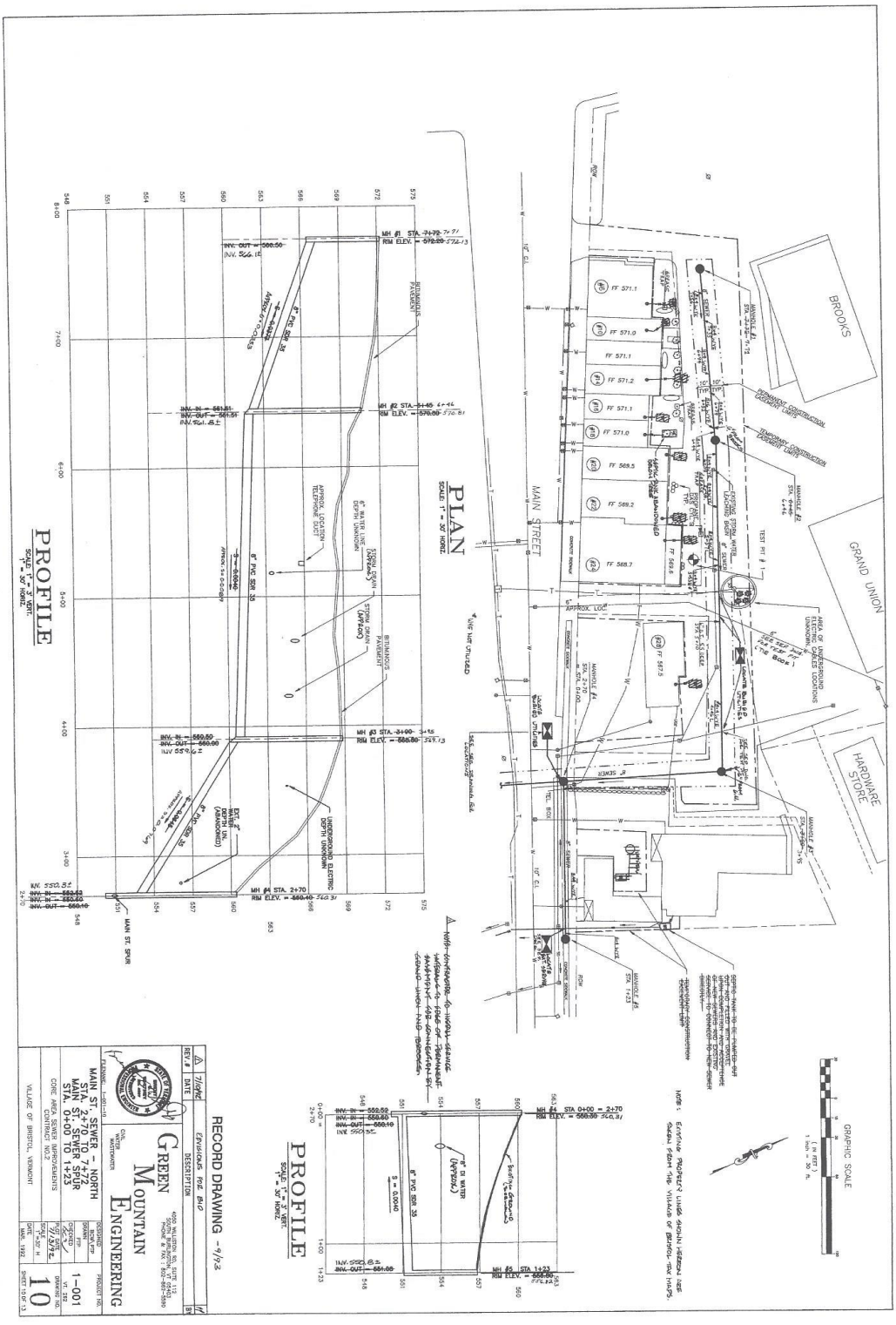

FIGURE 1

VTM ENGINEERING, PLC
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spalmer@vtmengineering.com (802) 233-7531

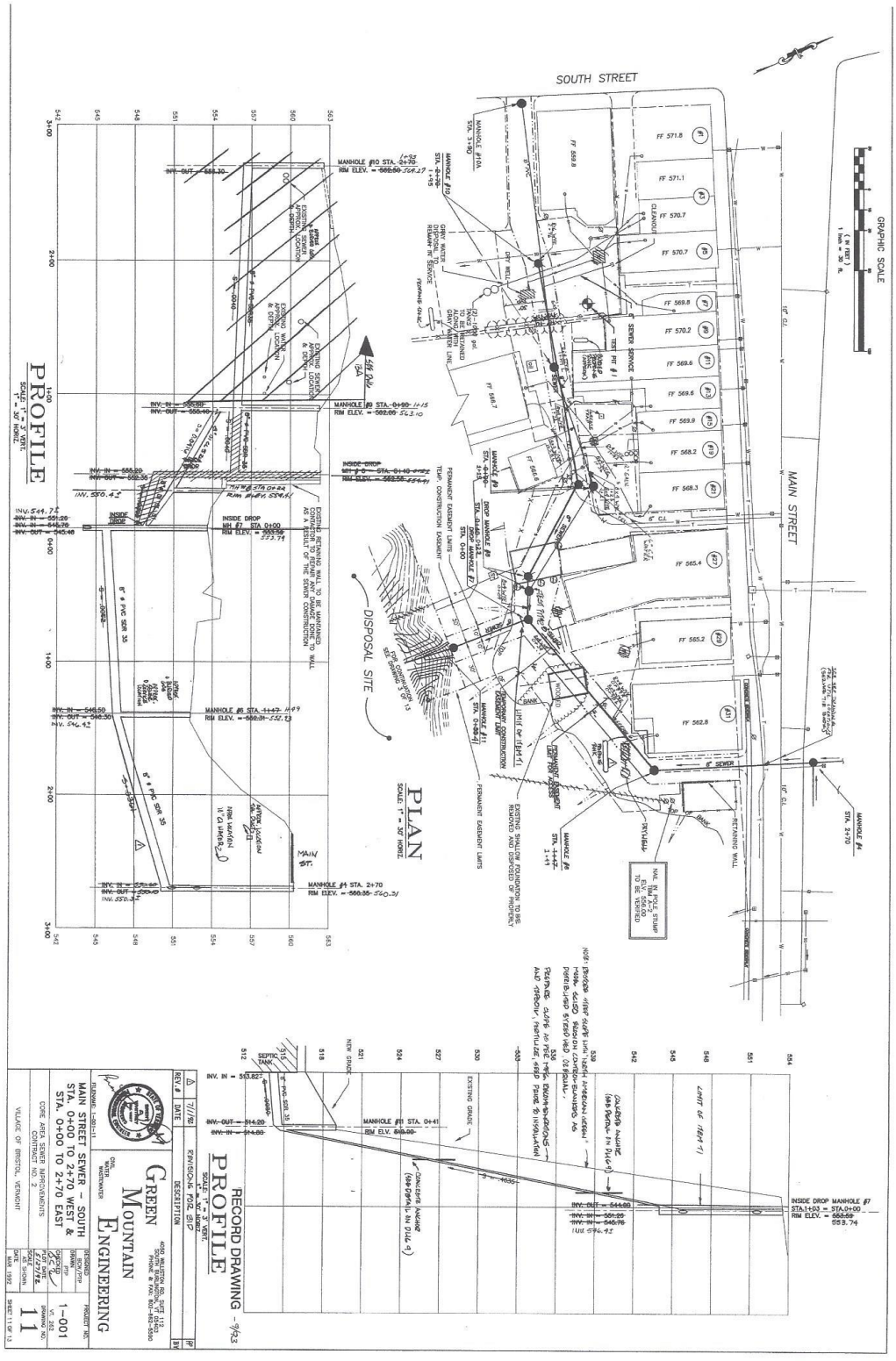

SOUTH STREET
MAIN STREET
DISPOSAL SITE
PLAN
SCALE: 1" = 30' HORIZ.
PROFILE
SCALE: 1" = 30' HORIZ.
1" = 30' VERT.
GRAPHIC SCALE
RECORD DRAWING - 9/93
GREEN MOUNTAIN ENGINEERING
MAIN STREET SEWER - SOUTH
STA. 0+00 TO 2+70 WEST &
STA. 0+00 TO 2+70 EAST
CORE AREA SEWER IMPROVEMENTS
CONTRACT NO. 2
VILLAGE OF BRISTOL, VERMONT
1-001
11
MAY 1995

FIGURE 2

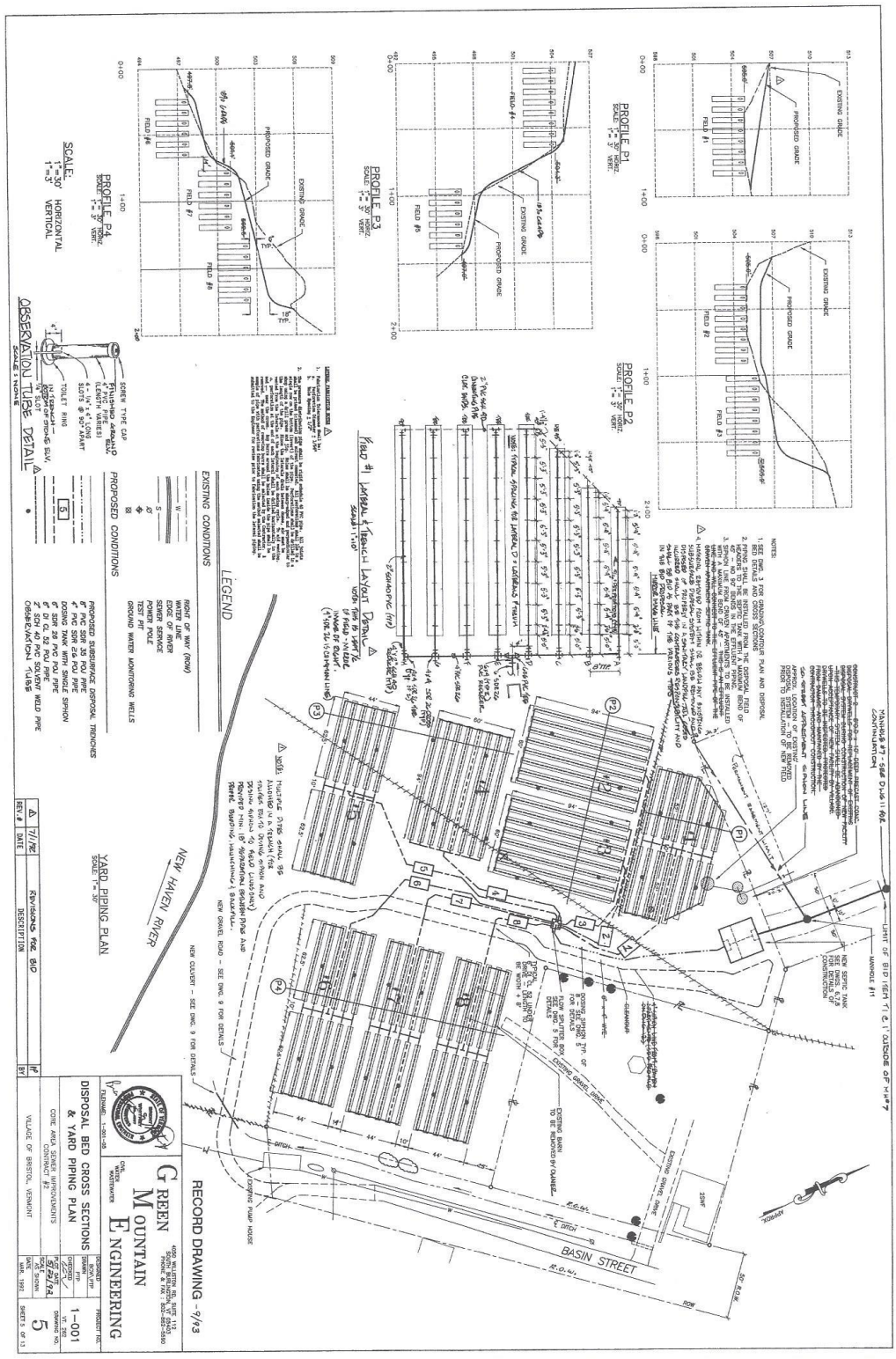
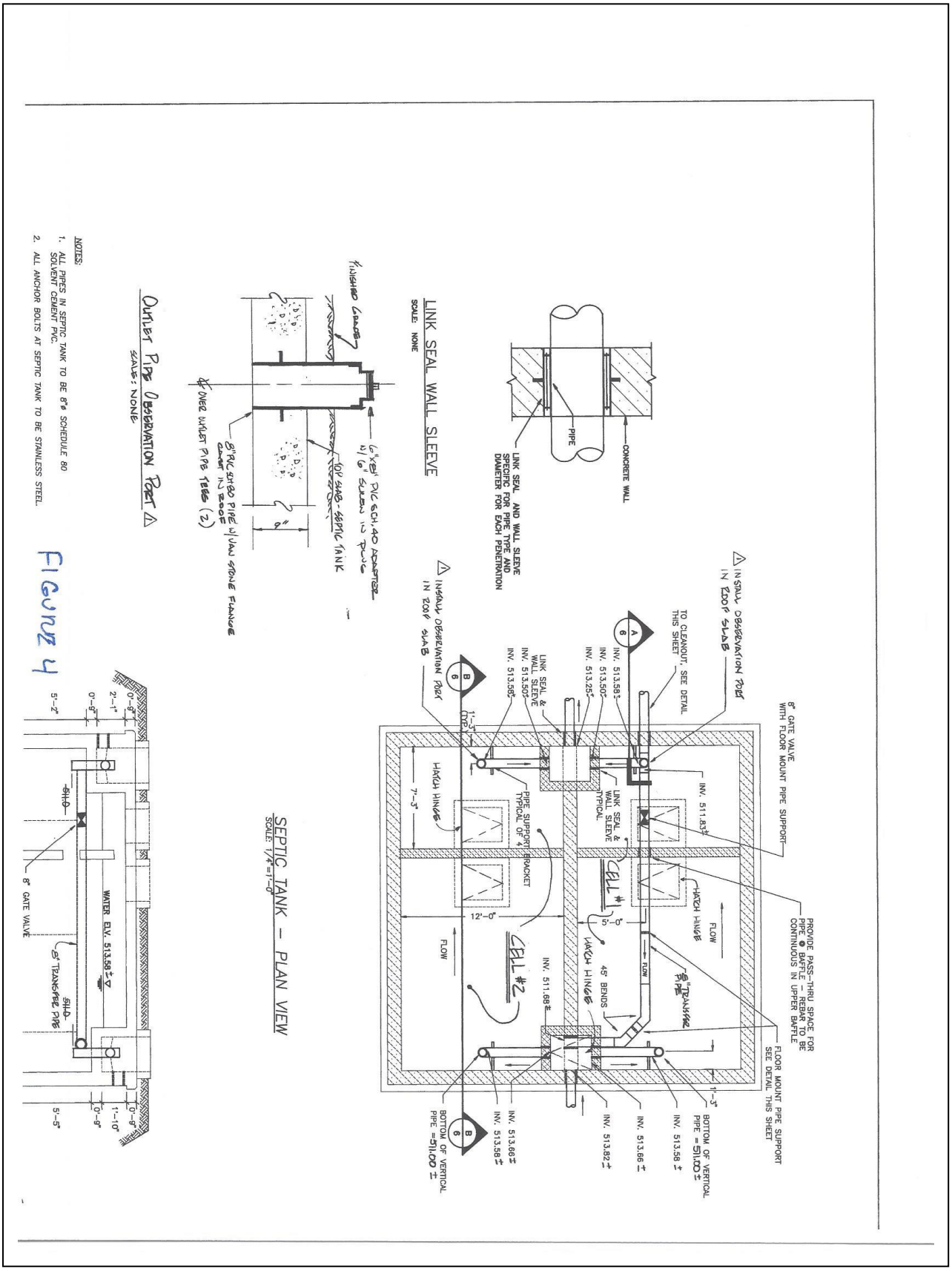

PROFILE P1
PROFILE P2
PROFILE P3
PROFILE P4
SCALE: 1"=30' HORIZONTAL 1"=3' VERTICAL
OBSERVATION TUBE DETAIL
FIELD #1 LATERAL & TRENCH LAYOUT DETAIL
LEGEND
EXISTING CONDITIONS
PROPOSED CONDITIONS
YARD PIPING PLAN
NEW HAVEN RIVER
BASIN STREET
RECORD DRAWING - 7/93
GREEN MOUNTAIN ENGINEERING
DISPOSAL BED CROSS SECTIONS & YARD PIPING PLAN
VILLAGE OF BRISTOL, VERMONT
CORE AREA SEWER IMPROVEMENTS CONTRACT #2

FIGURE 3



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APPENDIX B

2023 Wastewater Discharge and Monitoring Well Sampling Results

ENDYNE Inc.
Environmental Laboratories

Bristol, Town of 070294
PO Box 249
Bristol, VT 05443

Atten: Cyrus Marsano

PROJECT: Bristol Core Area Sewer
WORK ORDER: **2306-17312**
DATE RECEIVED: June 21, 2023
DATE REPORTED: July 07, 2023
SAMPLER: Jill Marsano

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and “N” the Plattsburgh, NY lab under certification ELAP 11892. “Sub” indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corres ponding NELAC and Qual fields. The Williston, VT facility is also ISO/IEC 17025:2017 accredited for Total Coliform and E coli by SM9223B.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. “A” indicates the referenced laboratory is NELAC accredited for the parameter reported. “N” indicates the laboratory is not accredited. “U” indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an “A” meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as t hey were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

_____ Harry B. Locker, Ph.D.
Laboratory Director

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NH2037

Laboratory Report DATE REPORTED: 07/07/2023

CLIENT: Bristol, Town of WORK ORDER: **2306-17312**
PROJECT: Bristol Core Area Sewer DATE RECEIVED: 06/21/2023

001 Site: Splitter Box Date Sampled: 6/21/23 Time: 11:30

Parameter	Result	NELAC	Units	Qual.	Method	Analysis Date/Time	Lab/Tech
pH per Client	6.3		SU at 18C		Client Data	6/21/23 11:30	W CLI N
BOD-5day	330		mg/L		SM 5210B(16)	6/22/23 13:32	W JSS A
Chloride	43		mg/L		EPA 300.0	6/22/23 12:20	W ECM A
Nitrate as N	0.37		mg/L		EPA 300.0	6/22/23 12:20	W ECM A
Nitrite as N	< 0.20		mg/L		EPA 300.0	6/22/23 12:20	W ECM A
TKN	39		mg/L		SM20 4500NorgC/NH3-B&C	6/28/23	R RBM A
Phosphorus, Total Dissolved	4.5		mg/L		SM20 4500 P-F	7/5/23 11:55	R RLS A
Solids, Total Suspended	48		mg/L		SM 2540 D-15	6/26/23	W JSS A
Oil & Grease Total Recoverable	44.1		mg/L		EPA 1664A	6/29/23	W CLD A

002 Site: MW #3 Date Sampled: 6/21/23 Time: 11:45

Parameter	Result	NELAC	Units	Qual.	Method	Analysis Date/Time	Lab/Tech
pH per Client	7.05		SU at 15.9C		Client Data	6/21/23 11:45	W CLI N
E. coli	4.1		MPN/100ml		SM 9223B(16)	6/21/23 16:17	W ECM A
Chloride	6.0		mg/L		EPA 300.0	6/22/23 12:39	W ECM A
Nitrate as N	2.0		mg/L		EPA 300.0	6/22/23 12:39	W ECM A

Phosphorus, Total Dissolved	0.10	mg/L	SM20 4500 P-F	7/5/23	11:57 R RLS A

003 Site: MW #4 Date Sampled: 6/21/23 Time: 12:00

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech
	NELAC	Qual.			
pH per Client	7.2	SU at 17.3C	Client Data	6/21/23	12:00 W CLI N
E. coli	< 1.0	MPN/100ml	SM 9223B(16)	6/21/23	16:35 W ECM A
Chloride	13	mg/L	EPA 300.0	6/22/23	12:59 W ECM A
Nitrate as N	0.83	mg/L	EPA 300.0	6/22/23	12:59 W ECM A
Phosphorus, Total Dissolved	0.047	mg/L	SM20 4500 P-F	7/5/23	12:06 R RLS A

ENDYNE Inc.
www.endynelabs.com

Bristol Core Area Sewer

Endyne Inc. COC

Prepared: 6/2/23

2306-17312

2306-17312

Bristol, Town of
Bristol Core Area Sewer

Bill to:	Report to:
Pam Correia	Cyrus Marsano
Bristol, Town of	Bristol, Town of
PO Box 249	PO Box 249
Bristol VT 05443	Bristol VT 05443
Ph: (802)453-2410	town@bristolvt.org;info@vtums.com

Cust # 070

COREAREASEV

W-702

Splitter Box

Sampled Date/Time: 6 21 23 @ 11:30am Sampler: Jill Marsano

pH Client Data	~~7.05u @ 15.9°C~~ 6.3su @ 18 °C JM	
Oil & Grease	√1-1L & 1-8oz Amber Glass	<6C, HCl_____
Chloride Nitrate as N Nitrite as N	√1-2 oz-Plastics Anion	<6C
BOD-5day Solids, Total Suspended	√1 - 1/2 gal Plastic	<6C
TKN	√1 - 32 oz Plastic	<6C, H2SO4_____
Phosphorus, Total Dissolved	√1 - 4 oz Clear Glass	<6C, Filter then preserve

MW #3

Sampled Date/Time: 6 21 23 @ 11:45am Sampler: Jill Marsano

	pH Client Data	7.05u @ 15.9°C	
NON CHLORINATED	E. coli	√1 - 150ml Sterile Plastic	<10C, Na2S2O3 If Cl2
	Chloride Nitrate as N	√1-2 oz-Plastics Anion	<6C
	Phosphorus, Total Dissolved	√1 - 4 oz Clear Glass	<6C, Filter then preserve

MW #4

Sampled Date/Time: 6/21/23 @ 12:00pm Sampler: Jill Marsano

	pH Client Data	7.25u @ 17.3°C	
NON CHLORINATED	E. coli	√1 - 150ml Sterile Plastic	<10C, Na2S2O3 If Cl2
	Chloride Nitrate as N	√1-2 oz-Plastics Anion	<6C
	Phosphorus, Total Dissolved	√1 - 4 oz Clear Glass	<6C, Filter then preserve

Relinquished by: Jill Marsano 6/21/23 1137pm Date Time — Accepted by: _____ Date Time

Relinquished by: _____ Date Time — Received by: _____ 6/21/23 1340 Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Delv: C
Temp C: 3.7
Comment:

Tmpl Ck
Log by

Lab use Only

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Initial here allow Endyne to proceed with analysis if the temperature preservation requirements are not satisfied. _____ INITIAL HERE

Samples were received in the lab on ice. Y / N

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.

ENDYNE Inc.
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Fax 802-879-7103

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Lebanon, NH 03766
Ph 603-678-4891
Fax 603-678-4893

315 New York Rd.
Plattsburgh, NY 12903
Ph 518-563-1720
Fax 518-563-0052

ENDYNE Inc.
Environmental Laboratories

Bristol, Town of 070294
PO Box 249
Bristol, VT 05443

Atten: Cyrus Marsano

PROJECT: Bristol Core Area Sewer
WORK ORDER: **2309-29144**
DATE RECEIVED: September 19, 2023
DATE REPORTED: October 06, 2023
SAMPLER: L. Marsano

Laboratory Report

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. All required method quality control elements including instrument calibration were performed in accordance with method requirements and determined to be acceptable unless otherwise noted.

The column labeled Lab/Tech in the accompanying report denotes the laboratory facility where the testing was performed and the technician who conducted the assay. A "W" designates the Williston, VT lab under NELAC certification ELAP 11263; "R" designates the Lebanon, NH facility under certification NH 2037 and “N” the Plattsburgh, NY lab under certification ELAP 11892. “Sub” indicates the testing was performed by a subcontracted laboratory. The accreditation status of the subcontracted lab is referenced in the corres ponding NELAC and Qual fields. The Williston, VT facility is also ISO/IEC 17025:2017 accredited for Total Coliform and E coli by SM9223B.

The NELAC column also denotes the accreditation status of each laboratory for each reported parameter. “A” indicates the referenced laboratory is NELAC accredited for the parameter reported. “N” indicates the laboratory is not accredited. “U” indicates that NELAC does not offer accreditation for that parameter in that specific matrix. Test results denoted with an “A” meet all National Environmental Laboratory Accreditation Program requirements except where denoted by pertinent data qualifiers. Test results are representative of the samples as t hey were received at the laboratory

Endyne, Inc. warrants, to the best of its knowledge and belief, the accuracy of the analytical test results contained in this report, but makes no other warranty, expressed or implied, especially no warranties of merchantability or fitness for a particular purpose.

Reviewed by:

_____ Harry B. Locker, Ph.D.
Laboratory Director

ELAP 11263
160 James Brown Dr., Williston, VT 05495
Ph 802-879-4333 Fax 802-879-7103
www.endynelabs.com

56 Etna Road, Lebanon, NH 03766
Ph 603-678-4891 Fax 603-678-4893
NH2037

Laboratory Report DATE REPORTED: 10/06/2023

CLIENT: Bristol, Town of WORK ORDER: **2309-29144**
PROJECT: Bristol Core Area Sewer DATE RECEIVED: 09/19/2023

001 Site: Splitter Box Date Sampled: 9/19/23 Time: 11:30

Parameter	Result	NELAC	Units	Qual.	Method	Analysis Date/Time	Lab/Tech
pH per Client	6.5		SU at __C		Client Data	9/19/23 11:30	W CLI N
BOD-5day	510		mg/L		SM 5210B(16)	9/21/23 8:47	W JSS A
Chloride	68		mg/L		EPA 300.0	9/20/23 0:13	W ECM A
Nitrate as N	< 0.20		mg/L		EPA 300.0	9/20/23 0:13	W ECM A
Nitrite as N	< 0.20		mg/L		EPA 300.0	9/20/23 0:13	W ECM A
TKN	65		mg/L		EPA 351.2, R.2(1993)	9/26/23	N MAP A
Phosphorus, Total Dissolved	8.6		mg/L		SM20 4500 P-F	10/2/23 15:38	R RBM A
Solids, Total Suspended	80		mg/L		SM 2540 D-15	9/22/23	W JSS A
Oil & Grease Total Recoverable	< 3.3		mg/L		EPA 1664A	9/28/23	W CLD A

002 Site: MW #3 Date Sampled: 9/19/23 Time: 11:00

Parameter	Result	NELAC	Units	Qual.	Method	Analysis Date/Time	Lab/Tech
pH per Client	7.1		SU at __C		Client Data	9/19/23 11:00	W CLI N
E. coli	< 1.0		MPN/100 mL		SM 9223B (-16)	9/19/23 15:50	W ECM A
Chloride	6.0		mg/L		EPA 300.0	9/20/23 0:33	W ECM A
Nitrate as N	0.63		mg/L		EPA 300.0	9/20/23 0:33	W ECM A

Phosphorus, Total Dissolved	0.080	mg/L	SM20 4500 P-F	10/4/23	16:24 R RLS A

003 Site: MW #4 Date Sampled: 9/19/23 Time: 11:15

Parameter	Result	Units	Method	Analysis Date/Time	Lab/Tech
	NELAC	Qual.			
pH per Client	7.21	SU at __C	Client Data	9/19/23	11:15 W CLI N
E. coli	< 1.0	MPN/100 mL	SM 9223B (-16)	9/19/23	15:50 W ECM A
Chloride	14	mg/L	EPA 300.0	9/20/23	0:53 W ECM A
Nitrate as N	1.1	mg/L	EPA 300.0	9/20/23	0:53 W ECM A
Phosphorus, Total Dissolved	0.011	mg/L	SM20 4500 P-F	10/4/23	16:26 R RLS A

ENDYNE Inc.
www.endynelabs.com

Bristol Core Area Sewer

Endyne Inc. COC 2309-29144

Prepared: 6/2/23

2309-29144

Bristol, Town of
Bristol Core Area Sewer

Bill to:	Report to:
Pam Correia	Cyrus Marsano
Bristol, Town of	Bristol, Town of
PO Box 249	PO Box 249
Bristol VT 05443	Bristol VT 05443
Ph: (802)453-2410	town@bristolvt.org;info@vtums.com

Cust # (

COREAREAS

W-

Splitter Box

2.0 L Sampled Date/Time: 9/11/23 @ 11:30 am Sampler: L.Marsano

pH Client Data 6.5 SU@Time 11:30 am

(1)	Oil & Grease	1-1L & 1-8oz Amber Glass	<6C, HCl_____
(2)	Chloride Nitrate as N Nitrite as N	1 -2 oz-Plastics Anion	<6C
(3)	BOD-5day Solids, Total Suspended	1 - 1/2 gal Plastic	<6C
(4)	TKN	1 - 32 oz Plastic	<6C, H2SO4_____
(5)	Phosphorus, Total Dissolved	1 - 4 oz Clear Glass	<6C, Filter then preserve

MW #3

15.6 L Sampled Date/Time: 9/19/23 @ 11:00 am Sampler: L.Marsano

pH Client Data 7.1 SU@Time 11:00 am

(6A) NON CHLORINATED	E. coli	1 - 150ml Sterile Plastic	<10C, Na2S2O3 If Cl2
(6B)	Chloride Nitrate as N	1 -2 oz-Plastics Anion	<6C
(6C)	Phosphorus, Total Dissolved	1 - 4 oz Clear Glass	<6C, Filter then preserve

MW #4

17.1 L Sampled Date/Time: 9/19/23 @ 11:15 am Sampler: L.Marsano

pH Client Data 7.21 SU@Time 11:15 am

(7A) NON CHLORINATED	E. coli	1 - 150ml Sterile Plastic	<10C, Na2S2O3 If Cl2
(7B)	Chloride Nitrate as N	1 -2 oz-Plastics Anion	<6C
(7C)	Phosphorus, Total Dissolved	1 - 4 oz Clear Glass	<6C, Filter then preserve

Relinquished by: Logan Marsano 9.19.23 12:50pm Date Time

Accepted by: Eileen Sonney 9/19/23 @ 12:45 Date Time

Relinquished by: _____ Date Time

Received by: _____ Date Time

Sites/Parameters correct as listed. Client Initials _____

Client Authorization to use Subcontract lab Client Initials _____

Sample origin: VT ☐ NH ☐ NY ☐ Other ☐

Special reporting instructions: (PO#) _____

Requested Turnaround Time: Routine: Rush Due Date _____

Aqueous samples requiring metals testing require acid preservation for a 24 hr period prior to analysis.

Lab use Only

Delv: Client
Temp C: 19.3
Comment:

Tmpl Ck
Log by

One or more sample bottles in this project must be kept refrigerated or on ice until delivery at the laboratory.

Initial here allow Endyne to proceed with analysis if the temperature preservation requirements are not satisfied. _____ INITIAL HERE

Samples were received in the lab on Ice. Y / N

ENDYNE Inc.
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Fax 518-563-0052

APPENDIX C

2022/2023 Wastewater Treatment System Flow Data

2023-2024 Bristol Water Usage Summary (Wastewater District Only)

Revised 4-29-24

Month	Date Reading Started	Date Reading Ended	Total Monthly Water Usage (Gallons)
Apr-23	4/11/2023	5/15/2023	259,000
May-23	5/15/2023	6/13/2023	270,000
Jun-23	6/13/2023	7/14/2023	305,000
Jul-23	7/14/2023	8/11/2023	252,000
Aug-23	8/11/2023	9/21/2023	340,000
Sep-23	9/21/2023	10/12/2023	194,000
Oct-23	10/12/2023	11/15/2023	278,000
Nov-23	11/15/2023	12/13/2023	208,000
Dec-23	12/13/2023	1/11/2024	195,000
Jan-24	1/11/2024	2/13/2024	258,000
Feb-24	2/13/2024	3/12/2024	235,000
Mar-24	3/12/2024	4/12/2024	239,000

Total Annual Flow (Gallons) =	**3,033,000**
Monthly Average Flow (Gallons/Month) =	**252,750**
Total Number of Days in Survey =	**367**
Average Flow Per Day (Gallons/Day)=	**8,264**

APPENDIX D

Uncommitted Reserve Capacity Calculations

Town of Bristol
2024 Wastewater Reserve Capacity Calculations

Revised 4/30/24

Base Information		**Avg Annual Flow (gpd)**	**Avg Annual Flow (MGD)**
1. Average Daily Flow 2021/2022 =		8,362	0.0083620
2. Average Daily Flow 2022/2023 =		7,793	0.0077930
3. Average Daily Flow 2023/2024 =		8,264	0.0082640
	Long Term Avg. (gpd) =	**8,140**	**0.0081397**

	*** 6/18/2020**	*** 9/15/2020**	**6/21/2021**	**9/9/2021**	**6/21/2024**	**9/19/2024**	**Long Term Average (mg/l)**
3. AVG BOD 5 (mg/l) =	640	420	670	430	330	510	**500**
4. AVG TSS (mg/l) =	90	66	86	124	48	80	**82.33333333**

Calculations lbs/day Discharged
BOD 5 (lb.day) discharged = ADF x (BOD 5) x 8.34
Calculated BOD 5 (lb/day) discharged = **33.9** lb/day — **Result is > Permitted Capacity of 33.4 lb/day**
80% of BOD = **27.153928** lb/day — **Result is > 26.72 lb/day. Indicates no reserve capacity.**

TSS (lb/day) discharged = ADF x TSS x 8.34
Calculated TSS Discharged = **5.6** lb/day — Result < Permitted Capacity of 25 lb/day

* Data as reported by Green Mountain Engineering

APPENDIX E

Photographs

Overview of the wastewater distribution field

Septic tank access hatches

Splitter Box

Septic tank outlet trough

VTM ENGINEERING, PLC
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spalmer@vtmengineering.com (802) 233-7531