

June 2, 2014

SEPTIC SYSTEM INSPECTION NORTH YARMOUTH MEMORIAL SCHOOL

On April 24, 2014 I conducted an investigation of the septic system at the North Yarmouth Memorial School. This was done at the request of the North Yarmouth Selectmen to determine the existing condition of the system and to estimate the future capacity of the system. The original septic system design by Wayne Britton, dated March 16, 1976, was used as a guide to locate the various system components and a backhoe was used to dig test pits into the disposal field. The septic system was designed to receive 12,000 gallons per day.

The system components consist of a septic tank, a dual siphon in a dosing tank, two distribution boxes and four disposal fields. A description of the components follows:

SEPTIC TANK:

- The septic tank capacity is 10,000 gallons and is located under the wood chip play area, as shown on the attached site plan.
- The top of the tank is 4 feet below the surface and a single riser made of bricks is located over the septic tank outlet cover. The steel cover at the top of the riser is 3 inches below the base of the wood chips.
- Because of the location of the riser and the depth of the tank, it was not possible to determine the sewer line(s) entry point into the tank.

DOSING TANK AND PUMP:

- According to the original septic system design, a dual siphon pump is located in a 400 gallon concrete dosing tank several feet beyond the septic tank. The dosing tank was found and is shown located on the attached site plan.
- A bricked riser and cover similar to the riser found on the septic tank is located over the access cover to the dosing tank.

DISTRIBUTION BOXES:

- Two distribution boxes were found and are located as shown on the site plan.
- Each box has a 4 inch diameter effluent pipe connecting the dosing tank to the inlet end of the box. There are two 6 inch diameter outlet pipes which discharge effluent to two disposal fields.

DISPOSAL FIELDS:

Each of the four disposal fields are 30 feet by 100 feet and consist of 12 inches of stone covered with sand and loam. The bottom of the stone is 24 inches below the surface and a network of perforated PVC pipe is positioned in the top of the stone at 5 foot intervals and connected at both ends by a PVC manifold.

The disposal fields were tested by digging test pits along the edge of each of the four disposal fields in two locations near the ends of each disposal field. The test pits were dug to the bottom of the stone and the elevation of the water and stained stone and soil were noted in each bed.

WATER QUALITY:

A sample of the wastewater was taken for laboratory testing for the following parameters: BOD, TSS, TKN, ammonia, nitrate, and chloride. The sample was taken from the inside of the septic tank outlet baffle. The siphon pump structure was in the way for testing the water in the siphon pump tank and the distribution boxes were too shallow to provide enough water for the test.

RESULTS:

Observation of the septic tank was limited to looking into the brick riser and observing the outlet tee baffle. The riser was in good condition and no cracking was obvious on the top of the tank in the limited area investigated. The floating scum was less than 2 inches thick and did not need to be pumped.

Access into the siphon tank is similar to the septic tank. The water level in the siphon tank is 3 to 4 inches deep. The pump mechanism was not observed due to the narrow riser opening.

The covers were removed from both distribution boxes. The box closest to the dosing tank was found to be 75 percent full of sand. The sand was plugging the inlet pipe and both 6 inch diameter PVC outlet pipes. No water was found in the box. There was no way to determine how long the pipes have been plugged, but it has likely been years. It is clear that at least one of the siphons in the the dosing chamber is not working. The distribution box closest to Route 9 is receiving all the water from the school. This box is approximately 33 percent filled with sand. The source of the sand in the two distribution boxes is unknown at this time. Both boxes including the covers show corrosion of the concrete and both boxes should be replaced.

The test pits dug into the edge of the beds revealed 14 inches of loam overlying sand above the top of the stone. The stone was 8 to 12 inches thick and the perforated pipe in the bed was located in the upper portion of the stone. No water was found in any of the 8 test pits and no black sulfide was found to be coating the stone. It is not likely that effluent has ever covered the full bottom on any of the 4 beds.

The water records for the school covering a one year period were received from the Yarmouth Water District. The records are:

April 2013	12,000 cubic feet
July 2013	14,000 cubic feet
Oct. 2013	7,000 cubic feet
Jan. 2014	15,000 cubic feet
Mar. 2014	13,000 cubic feet

The calculated daily flow using the highest quarterly flow of 15,000 and five days per week usage is 1,726 gallons per day. A recent daily reading was made over a four day period as a check against the quarterly readings and those readings were the following:

May 12, 2014	072318 0
May 13, 2014	072347 0
May 14, 2014	072375 0
May 15, 2014	072395 0

The average flow for the three days is 1,920 gallons per day which is close to the quarterly daily reading. If the daily flow is assumed to be approximately 1,800 gallons per day and the design flow for the septic system is 12,000 gallons per day, the actual use is 15 percent of the expected design flow or in other words the septic system is oversized by 85 percent.

DISCUSSION:

Since this system has received only a small percentage of its design capacity since the system was installed, the condition of the system, in particular the disposal field, is excellent. The remaining design capacity of the disposal fields is estimated at 10,000 gallons per day.

Both distribution boxes are cracked and corroded and should be replaced if continued use of the system is planned.

The septic tank is in good condition, but only a small portion of the tank was observed due to the single deep riser over only one of the covers. If continued use of the system is planned,

two more risers should be installed on the tank to allow complete cleaning of the tank during pumping and to facilitate clearing blockages.

The alternating siphon pump is not working correctly and should be replaced by either a distribution box to distribute the effluent equally to the two distribution boxes or a duplex pump station should be installed to alternately pump to both distribution boxes.

Wastewater lab sample results are attached. All results are in the normal range of wastewater from schools. The nitrogen content is high likely due to the high urea content of the wastewater.

There has been discussion regarding the unusually low level of nitrogen in the monitoring well (MW-1) between the disposal field and Route 9 especially since the disposal field is upslope and very close to the monitoring well. A possible reason for this is that since the effluent flow into the beds is low in relation to the available pore space in both the stone of the beds and the coarse sand below and around the beds, the oxygen level is high allowing rapid nitrification in the beds. It is also possible that the carbon rich biomat is more a coating on sand grains below the bed than a solid mat under the bed. This could facilitate denitrification as the effluent infiltrates the sand below the bed on its way down to the water table. The denitrification process causes nitrogen in the nitrate molecule to gas off reducing nitrate to potentially low levels. However, because this is only a theory at this time, I recommend the installation of a monitoring well next to the distribution box closest to Route 9 to test the groundwater directly below the beds.

RECOMMENDATIONS:

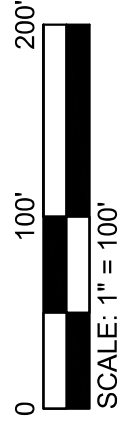
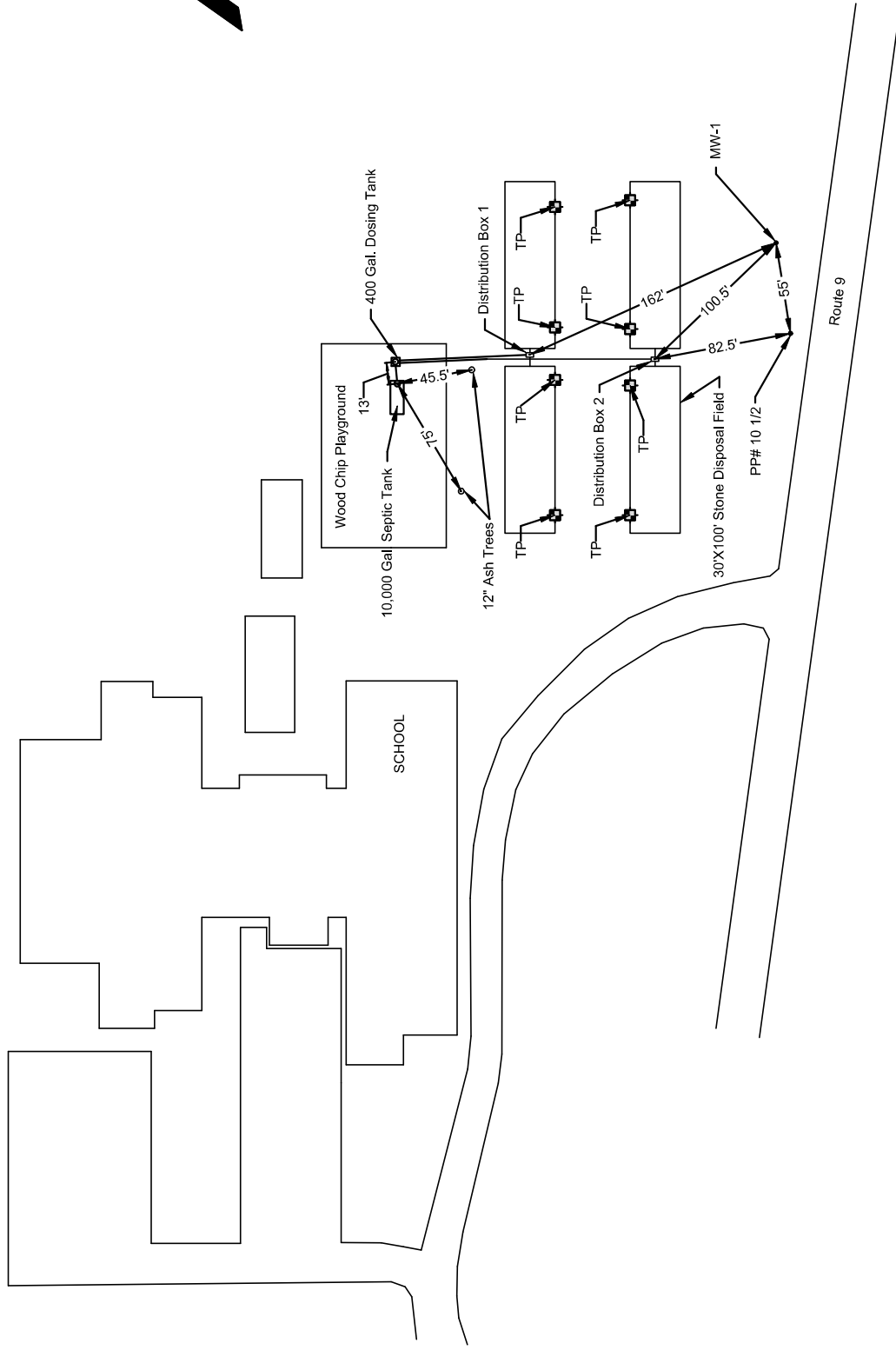
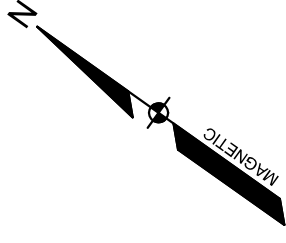
The existing disposal fields can be assumed to have a capacity of 10,000 gallons per day. If continued use is planned, the distribution boxes should be replaced, a distribution box or duplex pump station should replace the siphon pumps, and risers should be added to the septic tank, so all three covers are accessible.



Richard A. Sweet
Certified Geologist #GE100
Licensed Site Evaluator #034

RAS/smh





Septic System Inspection

North Yarmouth
Memorial School

SWEET ASSOCIATES
155 Gray Road - Falmouth, ME
Phone: (207) 797-2110



TEST PIT INTO THE DISPOSAL FIELD SHOWING A CROSS SECTION OF THE STONE
AND OVERLYING SAND



DISTRIBUTION BOX 2 (NEAREST ROUTE 9)
THIS IS THE ONLY BOX RECEIVING EFFLUENT
NOTE THE SAND IN THE BOX



DISTRIBUTION BOX 1 (CLOSEST TO DOSING TANK)
NOTE SAND IN BOX



DOSING TANK RISER



SEPTIC TANK RISER

May 28, 2014

Mr. Richard Sweet
Sweet Associates
155 Gray Rd.
Falmouth, ME 04105

RE: Katahdin Lab Number: SH3055
Project ID: North Yarmouth Memorial School
Project Manager: Ms. Shelly Brown
Sample Receipt Date(s): May 12, 2014

Dear Mr. Sweet:

Please find enclosed the following information:

- * Report of Analysis (Analytical and/or Field)
- * Chain of Custody (COC)
- * Login Report

A copy of the Chain of Custody is included in the paginated report. The original COC is attached as an addendum to this report.

Should you have any questions or comments concerning this Report of Analysis, please do not hesitate to contact the project manager listed above. The results contained in this report relate only to the submitted samples. This cover letter is an integral part of the ROA.

We certify that the test results provided in this report meet all the requirements of the NELAC standards unless otherwise noted in an attached technical narrative or in the Report of Analysis.

We appreciate your continued use of our laboratory and look forward to working with you in the future. The following signature indicates technical review and acceptance of the data.

Please go to <http://www.katahdinlab.com/cert.html> for copies of Katahdin Analytical Services Inc. current certificates and analyte lists.

Sincerely,
KATAHDIN ANALYTICAL SERVICES



Authorized Signature

05/28/2014

Date

TECHNICAL NARRATIVE

Wet Chemistry Analysis

Katahdin Sample No. SH3055-1 was collected at 16:55 on 05/11/14, and was received by the laboratory on 05/12/14. The laboratory does not ordinarily set up samples for the 5-day biochemical oxygen demand (BOD) analysis on Mondays or Tuesdays in order to avoid having to finish the analysis on weekends, and we were not prepared to begin the BOD analysis of Katahdin Sample No. SH3055-1 on 05/12/14. With client permission, the BOD analysis of this sample was started on 05/13/14 at 11:22, after the expiration of the method-specified 24-hour holding time for this analysis.

KATAHDIN ANALYTICAL SERVICES – INORGANIC DATA QUALIFIERS
(Refer to BOD Qualifiers Page for BOD footnotes)

The sampled date indicated on the attached Report(s) of Analysis (ROA) is the date for which a grab sample was collected or the date for which a composite sample was completed. Beginning and start times for composite samples can be found on the Chain-of-Custody.

U Indicates the compound was analyzed for but not detected above the specified level. This level may be the Limit of Quantitation (LOQ)(previously called Practical Quantitation Level (PQL)), the Limit of Detection (LOD) or Method Detection Limit (MDL) as required by the client.

Note: All results reported as “U” MDL have a 50% rate for false negatives compared to those results reported as “U” PQL/LOQ or “U” LOD, where the rate of false negatives is <1%.

E Estimated value. This flag identifies compounds whose concentrations exceed the upper level of the calibration range of the instrument for that specific analysis.

J Estimated value. The analyte was detected in the sample at a concentration less than the laboratory Limit of Quantitation (LOQ)(previously called Practical Quantitation Limit (PQL)), but above the Method Detection Limit (MDL).

I-7 The laboratory’s Practical Quantitation Level could not be achieved for this parameter due to sample composition, matrix effects, sample volume, or quantity used for analysis.

A-4 Please refer to cover letter or narrative for further information.

H_ Please note that the regulatory holding time for _____ is “analyze immediately”. Ideally, this analysis must be performed in the field at the time of sample collection. _____ for this sample was not performed at the time of sample collection. The analysis was performed as soon as possible after receipt by the laboratory.

H1 pH
H3 sulfite

H2 DO
H4 residual chlorine

T1 The client did not provide the full volume of at least one liter for analysis of TSS. Therefore, the PQL of 2.5 mg/L could not be achieved.

T2 The client provided the required volume of at least one liter for analysis of TSS, but the laboratory could not filter the full one liter volume due to the sample matrix. Therefore, the PQL of 2.5 mg/L could not be achieved.

M1 The matrix spike and/or matrix spike duplicate recovery performed on this sample was outside of the laboratory acceptance criteria. Sample matrix is suspected. The laboratory criteria was met for the Laboratory Control Sample (LCS) analyzed concurrently with this sample.

M2 The matrix spike and/or matrix spike duplicate recovery was outside of the laboratory acceptance criteria. The native sample concentration is greater than four times the spike added concentration so the spike added could not be distinguished from the native sample concentration.

R1 The relative percent difference (RPD) between the duplicate analyses performed on this sample was outside of the laboratory acceptance criteria (when both values are greater than ten times the PQL).

MCL Maximum Contaminant Level

NL No limit

NFL No Free Liquid Present

FLP Free Liquid Present

NOD No Odor Detected

TON Threshold Odor Number

Report of Analytical Results

Client: Richard Sweet
Sweet Associates
155 Gray Rd.
Falmouth, ME 04105

Lab Sample ID: SH3055-1
Report Date: 27-MAY-14
Client PO:
Project: North Yarmouth Memorial School
SDG: SH3055

Sample Description
WASTEWATER

Matrix **Date Sampled** **Date Received**
AQ 11-MAY-14 12-MAY-14

Parameter	Result	Adj PQL	Adj MDL	Anal. Method	QC Batch	Analysis Date	Prep. Method	Prep. Date	Analyst	Footnotes
Chloride	100 mg/L	4.0	0.84	SM 4500 Cl E	WG142850	13-MAY-14 12:00:00	N/A	N/A	LNP	
Nitrate As N	U0.050 mg/L	0.050	.0152	EPA 353.2	WG142670	12-MAY-14 15:56:12	N/A	N/A	DW	
Nitrogen-Ammonia As N	81. mg/L	5.0	1.6	EPA 350.1	WG143102	19-MAY-14 18:00:00	N/A	N/A	DW	
Solids-Nonfilterable Residue	400 mg/L	48.	15.	SM 2540D	WG142720	15-MAY-14 15:58:00	SM 2540D	13-MAY-14	RO	R1
Total Biochemical Oxygen Demand	270 mg/L	170	20.	SM 5210B	WG142877	18-MAY-14 13:03:00	SM 5210B	13-MAY-14 1122	ZS	
Total Kjeldahl Nitrogen	110 mg/L	2.5	1.1	EPA 351.2	WG142851	15-MAY-14 15:20:00	EPA 351.2	15-MAY-14	DW	

Katahdin Analytical Services, Inc.

Sample Receipt Condition Report

Client: <i>Sweet Associates</i>	KAS PM: <i>smP</i>	Sampled By: <i>C bent</i>
Project:	KIMS Entry By: <i>GM</i>	Delivered By: <i>C bent</i>
KAS Work Order#: <i>SH3055</i>	KIMS Review By: <i>[Signature]</i>	Received By: <i>GM</i>
SDG #:	Cooler: _____ of _____	Date/Time Rec.: <i>5-12-14/08.40</i>

Receipt Criteria	Y	N	EX*	NA	Comments and/or Resolution
1. Custody seals present / intact?		✓			
2. Chain of Custody present in cooler?	✓				
3. Chain of Custody signed by client?	✓				
4. Chain of Custody matches samples?	✓				
5. Temperature Blanks present? If not, take temperature of any sample w/ IR gun.	✓				Temp (°C): <i>5.5</i>
Samples received at <6 °C w/o freezing?	✓				Note: Not required for metals analysis.
Ice packs or ice present?	✓				The lack of ice or ice packs (i.e. no attempt to begin cooling process) or insufficient ice may not meet certain regulatory requirements and may invalidate certain data.
If yes, was there sufficient ice to meet temperature requirements?	✓				
If temp. out, has the cooling process begun (i.e. ice or packs present) and sample collection times <6hrs., but samples are not yet cool?				✓	Note: No cooling process required for metals analysis.
6. Volatiles:					
Aqueous: No bubble larger than a pea?				✓	
Soil/Sediment:				✓	
Received in airtight container?				✓	
Received in methanol?				✓	
Methanol covering soil?				✓	
D.I. Water - Received within 48 hour HT?				✓	
7. Trip Blank present in cooler?				✓	
8. Proper sample containers and volume?	✓				
9. Samples within hold time upon receipt?	✓				
10. Aqueous samples properly preserved?	✓				
Metals, COD, NH3, TKN, O/G, phenol, TPO4, N+N, TOC, DRO, TPH – pH <2				✓	
Sulfide - >9				✓	
Cyanide – pH >12				✓	

* Log-In Notes to Exceptions: document any problems with samples or discrepancies or pH adjustments

CHAIN of CUSTODY

PLEASE BEAR DOWN AND
PRINT LEGIBLY IN PEN

Page ____ of ____

Client **SWEET ASSOCIATES** Contact **R. SWEET** Phone # **(207) 797-2110** Fax # **(207) 878-2364**
RICHARD SWEET

Address **GRAY ROAD** City **FALMOUTH** State **ME** Zip Code **04105**

Purchase Order # _____ Proj. Name / No. **NORTH YARMOUTH MEMORIAL SCHOOL** Katahdin Quote # _____

Bill (if different than above) _____ Address _____

Sampler (Print / Sign) *Richard Sweet*

Copies To: _____

LAB USE ONLY WORK ORDER #: **SH3055**
KATAHDIN PROJECT NUMBER _____

REMARKS: _____

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO: _____

TEMP °C _____ ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

Filt.	Filt.	Filt.	Filt.	Filt.	Filt.	Filt.	Filt.	Filt.	Filt.
Y	N	Y	N	Y	N	Y	N	Y	N

BOD	TSS	TKN	AMMONIA	NITRATE	CHLORIDE				
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*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.
	WASTEWATER	5/11/14 4:55 PM	H ₂ O	
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COMMENTS _____

Relinquished By: (Signature) <i>R. Sweet</i>	Date / Time 5/12/14 8:40	Received By: (Signature) <i>M. Davis</i>	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

THE TERMS AND CONDITIONS ON THE REVERSE SIDE HEREOF SHALL GOVERN SERVICES, EXCEPT WHEN A SIGNED CONTRACTUAL AGREEMENT EXISTS.

ORIGINAL

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