Soderstrom Septic LLC.

6/18/2024

Greg Dorau

12405 State Hwy. 18

Finlayson, MN 55735

PID: 34-0-023700

I have completed the septic design for your home located at 12405 State Hwy. 18 Finlayson, in Wagner Township, Aitkin County.

I have sized the system for a 4-bedroom home with more than two water using appliances. The septic tank will be a 1,600-gallon septic tank, followed by a 1,000-gallon pump tank. The pump that is required for this system must have the ability to deliver 38 gpm with at least 17.55 feet of head. The soil treatment area will utilize a type III mound pressure distribution system.

Being a type III system, a monitoring and mitigation plan will need to be followed. Inspections will be required every 3, 6, 12, and 24 months. After the two-year time period if the system is operating correctly it may be signed off as operating effectively by a licensed professional. An event count meter will need to be installed on the pump tank side of the tank to monitor how much effluent is being dosed to the mound system.

The tank and mound area have been staked. The property lines will need to be verified that they are at least 10 feet from these stakes.

This system is designed for domestic septic waste from the home. Clean water from footing drains, water softening units, or furnaces must not enter this system.

I recommend to pump the septic and pump tank out every 2 years, and regularly mow the mound and tank area keeping them as part of your lawn. Thank you for your business, and I am sure you will be pleased with this new septic system.

Sincerely,

Angela Tvedt

Angela Tvedt

Soderstrom Septic LLC.

License #: 4146

1400 Maple Ave. E. Mora, MN 55051 Phone: 320-515-1081 Soderstromseptic@gmail.com

Installation Notes

1. There are 2 existing systems that will need to be pumped out and properly abandoned.
2. The new septic tank will be a 1,600-gallon septic tank, followed by a 1,000-gallon pump tank.
3. A clean out will need to be installed just outside the house.
4. An event count meter will need to be installed on the pump line to monitor how much effluent is being dosed to the mound system.
5. The pump line will need to have a maintenance loop inside the pump tank for easier maintenance access that comes up within a foot of the bottom of the lid.
6. An outdoor pedestal with outlet and alarm will need to be installed, so an electrician can come and hook up the alarm and outlet for the pump and floats.
7. The mound will need to be built with 4:1 slope, so it can be mowed and maintained as part of the lawn.
8. Once the system is installed the site will need to be covered with topsoil and grass seeded.

FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE 6/18/2024, FIELD EVALUATION DATE 6/18/2024
PROPERTY OWNER: Greg Dorau PHONE 651-210-8415
ADDRESS: 12405 Hwy. 18 CITY,STATE,ZIP: Finlayson, MN 55735
LEGAL DESCRIPTION: NW of NE 40 acres
PIN# 34-0-023700 SEC 15 T 43 R 22 TWP NAME Wagner
FIRE# LAKE/RIVER N/A LAKE CLASS N/A OHWL N/A FT.

DESCRIPTION OF SOIL TREATMENT AREAS

	AREA #1	AREA #2
DISTURBED AREAS	YES NO x	YES NO N/A
COMPACTED AREAS	YES NO x	YES NO N/A
FLOODING	YES NO x	YES NO N/A
RUN ON POTENTIAL	YES NO x	YES NO N/A
SLOPE %	1.5	N/A
DIRECTION OF SLOPE	SE	N/A
LANDSCAPE POSITION	Footslope	
VEGETATION TYPES	Grass	

REFERENCE BM ELEV. 100 FT.
REFERENCE BM DESCRIPTION
transit by pump tank

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 3", 1A 3", 2 3", 2A 3"

BOTTOM ELEVATION--FIRST TRENCH OR BOTTOM OF ROCK BED: #1 103 FT., #2 N/A FT.

SOIL SIZING FACTOR: SITE # 1 .5, SITE #2 N/A

CONSTRUCTION RELATED ISSUES: there is an existing system to abandon

LIC# 4146 SITE EVALUATOR SIGNATURE: Angela Tvedt

SITE EVALUATOR NAME: Angela Tvedt TELEPHONE# 320-515-1081

LUG REVIEW DATE

Comments:

SOIL BORING LOGS ON REVERSE SIDE

Form des 2/20/98

SOILS CHARTS FOR BOTH PROPOSED AND ALTERNATE SITES

1 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0 - 5"	Siltloam	10YR 3/2
3"	Siltloam	10YR 3/2
10YR 6/3 Depletion 10YR 5/8 Concentration		

2 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0 - 5"	Siltloam	10YR 3/2
3"	Siltloam	10YR 3/2
10YR 6/3 Depletion 10YR 5/8 Concentration		

1 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR

2 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR

ADDITIONAL SOIL BORINGS MAY BE REQUIRED

MOUND DESIGN WORK SHEET (For Flows up to 1200 gpd)

A. Average Design FLOW

Estimated 600 gpd *(see figure A-1)*
or measured _____ x 1.5 (safety *factor*) = _____ gpd

A-1: Estimated Sewage Flows in Gallons per Day

number of bedrooms	Class I	Class II	Class III	Class IV
2	300	225	180	60%
3	450	300	218	of the
4	600	375	256	values
5	750	450	294	in the
6	900	525	332	Class I,
7	1050	600	370	II, or III
8	1200	675	408	columns.

B. SEPTIC TANK Capacity

1,600 gallons *(see figure C-1)*

C-1: Septic Tank Capacities (in gallons)

Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal	Liquid capacity with disposal & lift inside
2 or less	750	1125	1500
3 or 4	1000	1500	2000
5 or 6	1500	2250	3000
7, 8 or 9	2000	3000	4000

C. SOILS *(refer to site evaluation)*

1. Depth to restricting layer = .25 feet
2. Depth of percolation tests = N/A feet
3. Texture Siltloam
   Percolation rate N/A mpi
4. Soil loading rate .5 gpd/sqft *(see figure D-33)*
5. Percent land slope 1.5 %

D. ROCK LAYER DIMENSIONS

1. Multiply average design flow (A) by 0.83 to obtain required rock layer area.
   600 gpd x 0.83 sqft/gpd = 500 sqft
2. Determine rock layer width = 0.83 sqft/gpd x linear Loading Rate (LLR)
   0.83 sqft/gpd x 12 gpd/sqft = 10 ft
3. Length of rock layer = area ÷ width =
   500 sqft (D1) ÷ 10 ft (D2) = 50 ft

Mound LLR	
< 120 MPI	≤12
≥ 120 MPI	≤6

E. ROCK VOLUME

1. Multiply rock area (D1) by rock depth of 1 ft to get cubic feet of rock
   500 sqft x 1 ft = 500 cuft
2. Divide cuft by 27 cuft/cuyd to get cubic yards
   500 cuft ÷ 27 cuyd/cuft = 18.5 cuyd
3. Multiply cubic yards by 1.4 to get weight of rock in tons
   18.5 cuyd x 1.4 ton/cuyd = 25.9 tons

F. SEWAGE ABSORPTION WIDTH

Absorption width equals absorption ratio (See Figure D-33) times rock layer width (D2)

2.4 x 10 ft = 24 ft

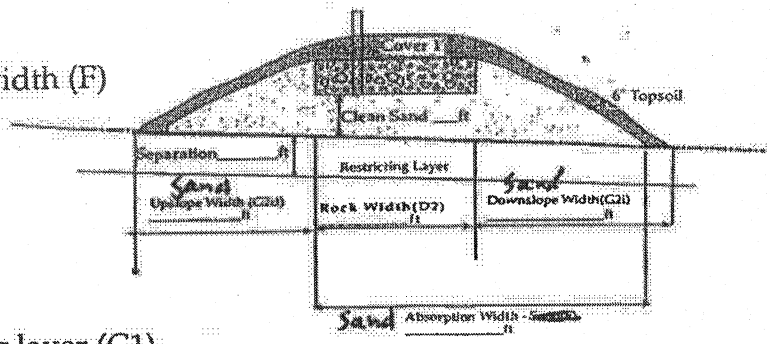
D-33: Absorption Width Sizing Table

Percolation Rate in Minutes per Inch (MPI)	Soil Texture	Loading Rate Gallons per day per square foot	Absorption Ratio
Faster than 5	Coarse Sand Medium Sand Loamy Sand Fine Sand	1.20	1.00
6 to 15	Sandy Loam	0.78	1.20
16 to 30	Loam	0.60	2.00
31 to 45	Silt Loam Silt	0.50	2.40
46 to 60	Sandy Clay Loam Silty Clay Loam Clay Loam	0.45	2.67
61 to 120	Silty Clay Sandy Clay Clay	0.24	5.00
Slower than 120*			

*System designed for these soils must be other or performance

G. MOUND SLOPE WIDTH & LENGTH
(landslope greater than 1%)

Landslope > 1% slope



1. Downslope absorption width = absorption width (F) minus rock layer width (D2)

24 ft - 10 ft = 14 ft

2. Calculate mound size

UPSLOPE

a. Depth of clean sand fill at upslope edge of rock layer = 3 ft minus the distance to restricting layer (C1)

3 ft - 0 ft = 3 ft

b. Mound height at the upslope edge of rock layer = depth of clean sand for separation (G2a) at upslope edge plus depth of rock layer (1 ft) plus depth of cover (1 ft)

3 ft + 1ft + 1ft = 5 ft

c. Upslope berm multiplier based on land slope

3.70 *(see figure D-34)*

d. Upslope width = berm multiplier (G2c) x upslope mound height (G2b):

3.70 x 5 ft = 18.5 ft

DOWNSLOPE

e. Drop in elevation = rock layer width (D2) x percent landslope (C5) ÷ 100

10 ft x 1.5 % ÷ 100 = .15 ft

f. Downslope mound height = depth of clean sand for slope difference (G2e) at downslope rock edge plus the mound height at the upslope edge of rock layer (G2b)

5 ft + .15 ft = 5.15 ft

g. Downslope berm multiplier based on percent land slc

4.35 *(see figure D-34)*

h. Downslope width = downslope multiplier (G2g) times downslope mound height (G2f)

4.35 x 5.15 ft = 22.4 ft

i. Select the greater of G1 and G2h as the downslope width: 22.4 ft

j. Total mound width is the sum of upslope width (G2d) width plus rock layer width (D2) plus downslope width (G2i)

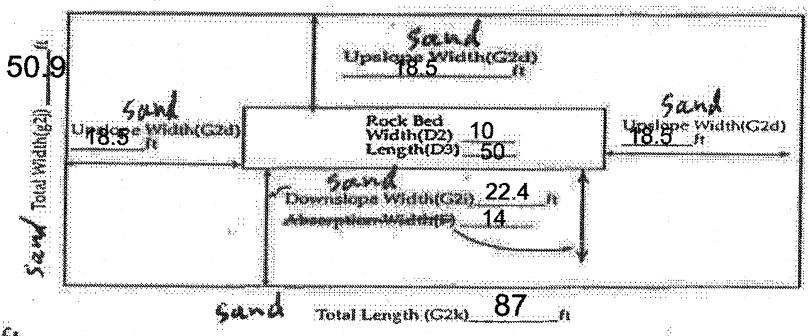
18.5 ft + 10 ft + 22.4 ft = 50.9 ft

k. Total mound length is the sum of upslope width (G2d) plus rock layer length (D3) plus upslope width (G2d)

18.5 ft + 50 ft + 18.5 ft = 87 feet

D-34: SLOPE MULTIPLIER TABLE

Land Slope in %	UPSLOPE multipliers for various slope ratios						DOWNSLOPE multipliers for various slope ratios				
	3:1	4:1	5:1	6:1	7:1	8:1	3:1	4:1	5:1	6:1	7:1
0	3.0	4.0	5.0	6.0	7.0	8.0	3.0	4.0	5.0	6.0	7.0
1	2.91	3.85	4.76	5.66	6.54	7.41	3.09	4.17	5.26	6.38	7.53
2	2.83	3.70	4.54	5.36	6.14	6.90	3.19	4.35	5.56	6.82	8.14
3	2.75	3.57	4.35	5.08	5.79	6.45	3.30	4.54	5.88	7.32	8.86
4	2.68	3.45	4.17	4.84	5.46	6.06	3.41	4.76	6.25	7.89	9.72
5	2.61	3.33	4.00	4.62	5.19	5.71	3.53	5.00	6.67	8.57	10.77
6	2.54	3.23	3.85	4.41	4.93	5.41	3.66	5.26	7.14	9.38	12.07
7	2.48	3.12	3.70	4.23	4.70	5.13	3.80	5.56	7.69	10.34	13.73
8	2.42	3.03	3.57	4.05	4.49	4.88	3.95	5.88	8.33	11.54	15.91
9	2.36	2.94	3.45	3.90	4.30	4.65	4.11	6.25	9.09	13.04	18.92
10	2.31	2.86	3.33	3.75	4.12	4.44	4.29	6.67	10.00	15.00	23.33
11	2.26	2.78	3.23	3.61	3.95	4.26	4.48	7.14	11.11	17.65	30.43
12	2.21	2.70	3.12	3.49	3.80	4.08	4.69	7.69	12.50	21.43	43.75



Final Dimensions:

50.9 x 87

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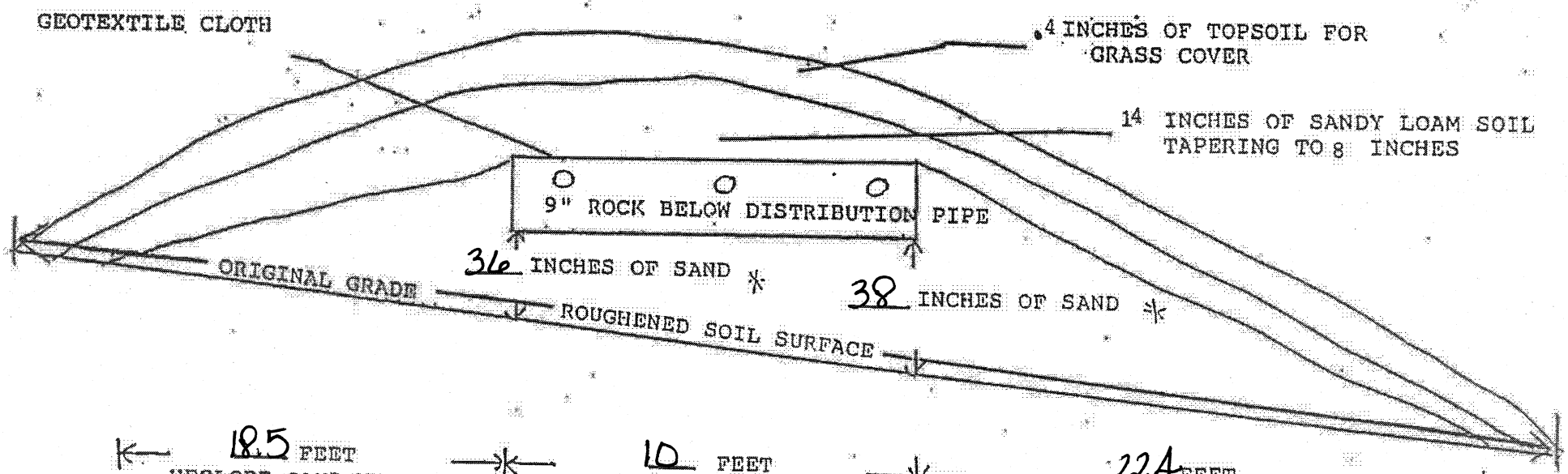
MOUND CROSS-SECTION

1.5 PERCENT SLOPE OF ORIGINAL SOIL

10 FT. x 50 FT. SIZE OF ROCKBED

24 FT. x 50 FT. SIZE OF SANDBASE



18.5 FEET
UPSLOPE SAND WIDTH

10 FEET
WIDTH OF ROCKBED

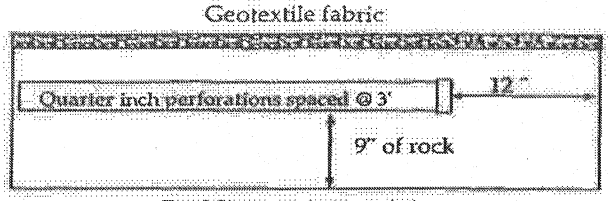
22.4 FEET
DOWNSLOPE SAND WIDTH

19.4 FEET
UPSLOPE COVER WIDTH

10 FEET
WIDTH OF ROCK

23.3 FEET
DOWNSLOPE COVER WIDTH

PRESSURE DISTRIBUTION SYSTEM



Perf Sizing 3/16" - 1/4"
Perf Spacing 1.5'- 5'

1. Select number of perforated laterals 3

2. Select perforation spacing = 3 ft

3. Since perforations should not be placed closer than 1 foot to the edge of the rock layer (see diagram), subtract 2 feet from the rock layer length.

   50 (Rock layer length) - 2 ft = 48 ft

4. Determine the number of spaces between perforations. Divide the length (3) by perforation spacing (2) and round down to nearest whole number.

   Perforation spacing = 48 ft ÷ 3 ft = 16 spaces

5. Number of perforations is equal to one plus the number of perforation spaces(4). *Check figure E-4 to assure the number of perforations per lateral guarantees <10% discharge variation.*

   16 spaces + 1 = 17 perforations/lateral

6. A. Total number of perforations = perforations per lateral (5) times number of laterals (1)

   17 perfs/lat x 3 lat = 51 perforations

   B. Calculate the square footage per perforation.
   Should be 6-10 sqft/perf. *Does not apply to at-grades.*
   Rock bed area = rock width (ft) x rock length (ft)
   10 ft x 50 ft = 500 sqft
   Square foot per perforation = Rock bed area ÷ number of perfs (6)
   500 sqft ÷ 51 perfs = 9.8 sqft/perf

7. Determine required flow rate by multiplying the total number of perforations (6A) by flow per perforation *(see figure E-6)*

   51 perfs x .74 gpm/perfs = 37.74 gpm

8. If laterals are connected to header pipe as shown on upper example, to select minimum required lateral diameter; enter figure E-4 with perforation spacing (2) and number of perforations per lateral (5) Select minimum diameter for perforated lateral = 2 inches.

9. If perforated lateral system is attached to manifold pipe near the center, lower diagram, perforated lateral length (3) and number of perforations per lateral (5) will be approximately one half of that in step 8. Using these values, select minimum diameter for perforated lateral = _____ inches.

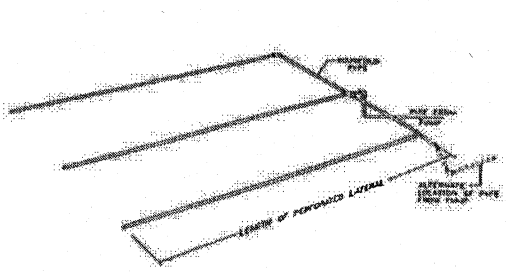
E-4: Maximum allowable number of 1/4-inch perforations per lateral to guarantee <10% discharge variation

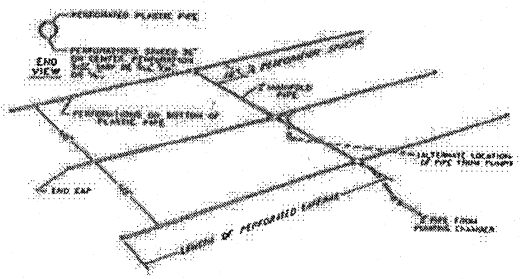
perforation spacing (feet)	1 inch	1.25 inch	1.5 inch	2.0 inch
2.5	8	14	18	28
3.0	8	13	17	26
3.3	7	12	16	25
4.0	7	11	15	23
5.0	6	10	14	22

E-6: Perforation Discharge in gpm

head (feet)	perforation diameter (inches) 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.42	0.56	0.74
2.0[b]	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

[a] Use 1.0 foot for single-family homes.
[b] Use 2.0 feet for anything else.





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PUMP SELECTION PROCEDURE

1. Determine pump capacity:

A. Gravity distribution

1. Minimum required discharge is 10 gpm
2. Maximum suggested discharge is 45 gpm. For other establishments at least 10% greater than the water supply rate, but no faster than the rate at which effluent will flow out of the distribution device.

B. Pressure distribution

See pressure distribution work sheet

From A or B Selected pump capacity: 38 gpm

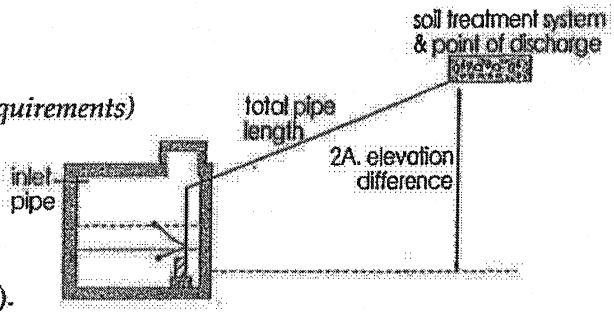
2. Determine pump head requirements:

A. Elevation difference between pump and point of discharge?

11.2 feet

B. Special head requirement? *(See Figure at right - Special Head Requirements)*

5 feet



Special Head Requirements	
Gravity Distribution	0 ft
Pressure Distribution	5 ft

C. Calculate Friction loss

1. Select pipe diameter 2 in
2. Enter *Figure E-9* with gpm (1A or B) and pipe diameter (C1).
   Read friction loss in feet per 100 feet from Figure E-9
   Friction Loss = 2.64 ft/100ft of pipe
3. Determine total pipe length from pump discharge to soil treatment discharge point. Estimate by adding 25 percent to pipe length for fitting loss. Total pipe length times 1.25 = equivalent pipe length
   41 feet x 1.25 = 51.25 feet
4. Calculate total friction loss by multiplying friction loss (C2) in ft/100 ft by the equivalent pipe length (C3) and divide by 100.
   = 2.64 ft/100ft x 51.25 ÷100 = 1.35 ft

E-9: Friction Loss in Plastic Pipe Per 100 feet			
	nominal pipe diameter		
flow rate gpm	1.5"	2"	3"
20	2.47	0.73	0.11
25	3.73	1.11	0.16
30	5.23	1.55	0.23
35	6.96	2.06	0.30
40	8.91	2.64	0.39
45	11.07	3.28	0.48
50	13.46	3.99	0.58
55		4.76	0.70
60		5.60	0.82
65		6.48	0.95
70		7.44	1.09

D. Total head required is the sum of elevation difference (A), special head requirements (B), and total friction loss (C4)

11.2 ft + 5 ft+ 1.35 ft =

Total head: 17.55 feet

3. Pump selection

A pump must be selected to deliver at least 38 gpm (1A or B) with at least 17.55 feet of total head (2D)

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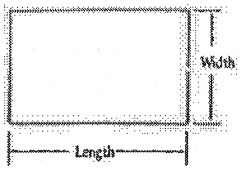
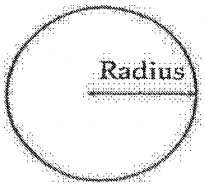
DOSING CHAMBER SIZING





1. Determine area
   A. Rectangle area = L x W
   _____ x _____ = _____ square feet
   B. Circle area = π (3.14) x radius in feet x radius in feet
   3.14 x _____ ft x _____ ft = _____ sqft
   C. Get area from manufacturer _____ sqft

2. Calculate gallons per inch
   There are 7.5 gallons per cubic foot of volume, therefore multiply the area (1A, B or C) times the conversion factor and divide by 12 inches per foot to calculate gallon per inch.
   Area x 7.5 ÷ 12 = _____ sqft x 7.5 ÷ 12 in/ft = 23 gallon per inch

3. Calculate total tank volume
   A. Depth from bottom of inlet pipe to tank bottom 44 in
   B. Total tank volume = depth from bottom of inlet pipe to tank bottom (3A) x gal/in (2)
   = 44 in x 23 gal/in = 1012 gal

Legal Tank:
500 gallons or
100% the Daily flow
or
Alternating Pumps

4. Calculate gallons to cover pump (with 2-3 inches of water covering pump)
   (Pump and block height (inch) + 2 inch) x gallon/inch
   (4 in +2 in) x 23 gal/in = 138 gallon

A-1: Estimated Sewage Flows in Gallons per Day				
number of bedrooms	Class I	Class II	Class III	Class IV
2	300	225	180	60%
3	450	300	218	of the
4	600	375	256	values
5	750	450	294	in the
6	900	525	332	Class I,
7	1050	600	370	II, or III
8	1200	675	408	columns.

5. Calculate total pumpout volume
   A. Select pump size for 4-5 does per day. Gallon per dose = gpd (see *figure A-1*)
   / doses per day = 600 gpd ÷ 5 doses/day = 120 gallons
   B. Calculate drainback
      1. Determine total pipe length, 41 feet
      2. Determine liquid volume of pipe, 0.17 gal per ft (*see figure E-20*)
      3. Drainback quantity = 41 ft (5B1) x 0.17 gal per ft (5B2) = 6.97 gal
   C. Total pump out volume = dose volume (5A) + drainback (5B3)
   120 gal + 6.97 gal = 126.97 Total gallon

E-20: Volume of Liquid in Pipe	
Pipe Diameter *inches*	Gallons per foot
1	0.045
1.25	0.078
1.5	0.11
2	0.17
2.5	0.25
3	0.38
4	0.66

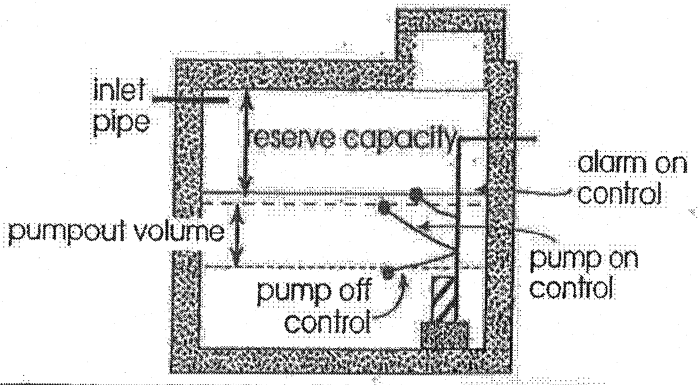
6. Float separation distance (using total pumpout volume)
   Total pumpout volume (5C) ÷ gal/inch (2)
   126.97 gal ÷ 24 gal/in= 5.29 inch

7. Calculate volume for alarm (typically 2 to 3 inches)
   Alarm depth (inch) x gallon/inch (2) = 3 in x 23 gal/in) = 69 gal

8. Calculate total gallon = gallons over pump (4) + gallons pumpout (5C) + gallons alarm (7)
   138 gal + 126.97 gal + 69 gal = 333.97 gallons

9. Total Tank Depth = total gallon (8) ÷ gallon/inch (2)
   333.97 gal ÷ 23 gal/in = 14.5 in

Recommended:
Calculate reserve capacity (75% the daily flow)
Daily flow x .75 = 600 x .75 = 450 gallons



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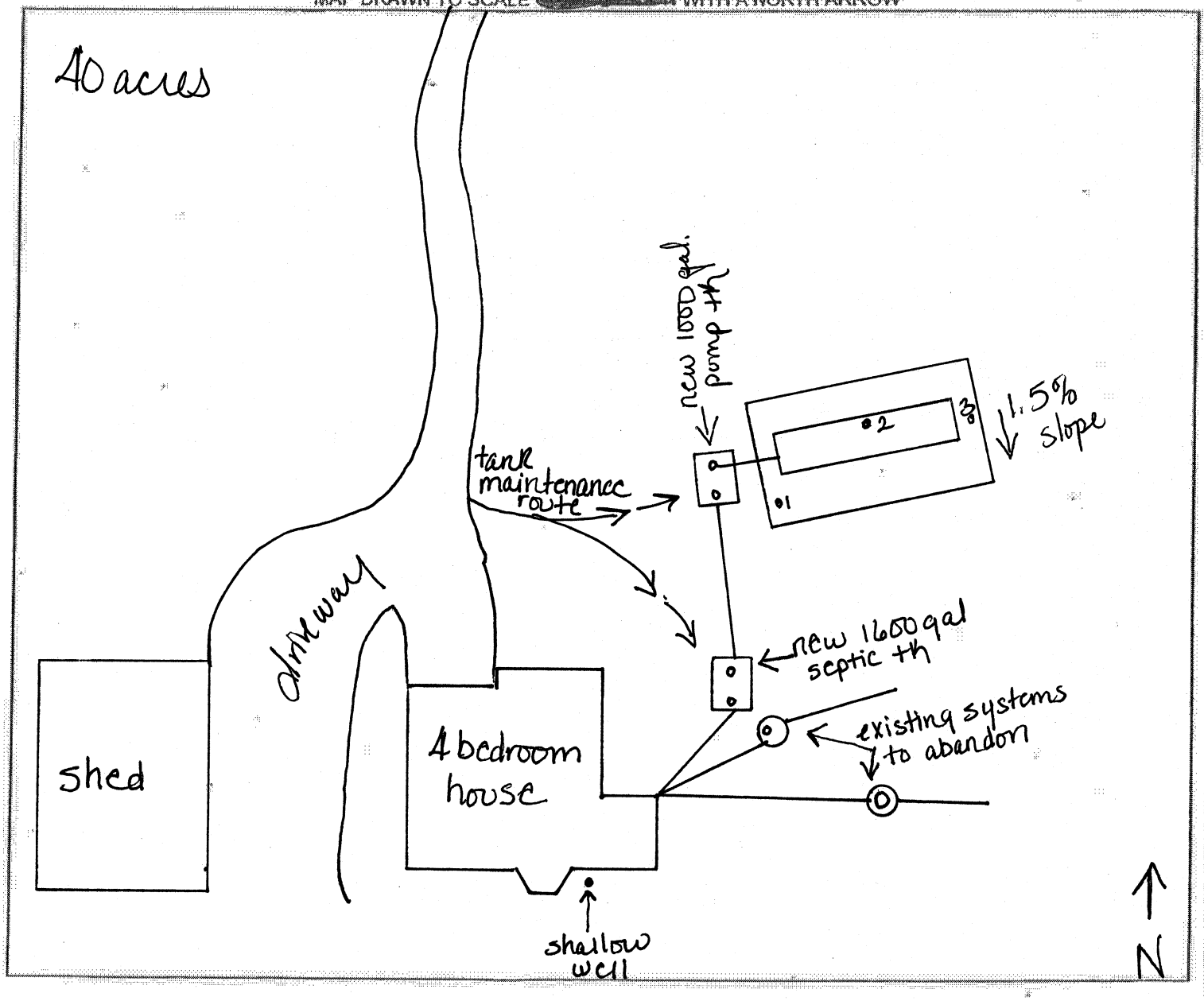
SKETCH SHEET

CLIENT: Greg Doran DATE: 6/18/24

MAP DRAWN TO SCALE [redacted] WITH A NORTH ARROW



CHECK OFF LIST--HAVE ALL OF THE FOLLOWING BEEN DRAWN ON THE MAP??

SHOW EXISTING OR PROPOSED

- [X] WATER WELLS WITHIN 100 FT OF TREATMENT AREAS
- [ ] PRESSURE WATER LINES WITHIN 10 FT OF TREATMENT AREAS
- [X] STRUCTURES
- [ ] LOT IMPROVEMENTS
- [X] ALL SOIL TREATMENT AREAS
- [X] ALL ISTS COMPONENTS
- [ ] HORIZONTAL AND VERTICALREFERENCE
- [X] POINT OF SOIL BORINGS
- [X] DIRECTION OF SLOPE
- [ ] LOT EASEMENTS
- [X] ALL LOT DIMENSIONS
- [ ] DISTURBED/ COMPACTED AREAS
- [X] SITE PROTECTION--LATHE AND RIBBON EVERY 15 FT
- [X] ACCESS ROUTE FOR TANK MAINTENANCE

REQUIRED SETBACKS

- [X] STRUCTURES
- [X] PROPERTY LINES
- [ ] OHWL

COMMENTS:

INDICATE ELEVATIONS

BENCHMARK 100 - 59"
ELEVATION OF SEWER LINE @ HOUSE 100
ELEVATION @ TANK INLET 99
ELEVATION @ BOTTOM OF ROCK LAYER 103.
ELEVATION @ BOTTOM OF BORING OR RESTRICTIVE LAYER 100
ELEVATION OF PUMP 93
ELEVATION OF DISTRIBUTION DEVICE 103.5

DESIGNER SIGNATURE Angela Tuedt
LICENSE# 4146

DATE 6/18/24

Meter Readings			
Name: Greg Dorau		Start Date:	
Address:		End Date:	
Total Average Flow:			
Date	Previous Reading	Current Reading	Total Flow