FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE 11/2023, FIELD EVALUATION DATE 2/14/2024
PROPERTY OWNER: John & Nicole Swanson PHONE
ADDRESS: 49832 405th Pl CITY,STATE,ZIP: Palisade, MN 56469
LEGAL DESCRIPTION: Lot 3 Blk 1 Northwoods Shores
PIN# 52-1-044300 SEC 13 T 49 R 27 TWP NAME
FIRE# 49832 (LAKE)/RIVER Esquagamah LAKE CLASS RD OHWL N/A FT.

DESCRIPTION OF SOIL TREATMENT AREAS

REFERENCE BM ELEV. N/A FT.
REFERENCE BM DESCRIPTION

	AREA #1	AREA #2
DISTURBED AREAS	YES ___ NO X	YES ___ NO ___
COMPACTED AREAS	YES ___ NO X	YES ___ NO ___
FLOODING	YES ___ NO X	YES ___ NO ___
RUN ON POTENTIAL	YES X NO ___	YES ___ NO ___
SLOPE %	7	
DIRECTION OF SLOPE	NW	
LANDSCAPE POSITION	side slope	
VEGETATION TYPES	lawn	

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 14, 1A 16, 2 ____, 2A ____

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

SOIL SIZING FACTOR: SITE #1 1.27, SITE #2 ____

CONSTRUCTION RELATED ISSUES: system replacement

LIC# 2205 SITE EVALUATOR SIGNATURE: Daniel C Switzer

SITE EVALUATOR NAME: Dan Switzer TELEPHONE# 218-838-8369

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
0-2	ORGANIC	3/2 10YR
2-16	SANDY LOAM	5/3 10YR
+16	CLAY LOAM	6/4 10YR
	Mottle	6/2 10YR

2 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-4	ORGANIC	3/2 10YR
4-18	SANDY CLAY LOAM	4/4 10YR
+18	CLAY LOAM	6/4 10YR
	Mottle	6/2 10YR

1 ~~(ALTERNATE)~~ PROPOSED SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-4	ORGANIC	3/2 10YR
4-18	SANDY LOAM	4/4 10YR
+18	CLAY LOAM	6/4 10YR
		6/2 10YR

2 (ALTERNATE) SOILS DATA

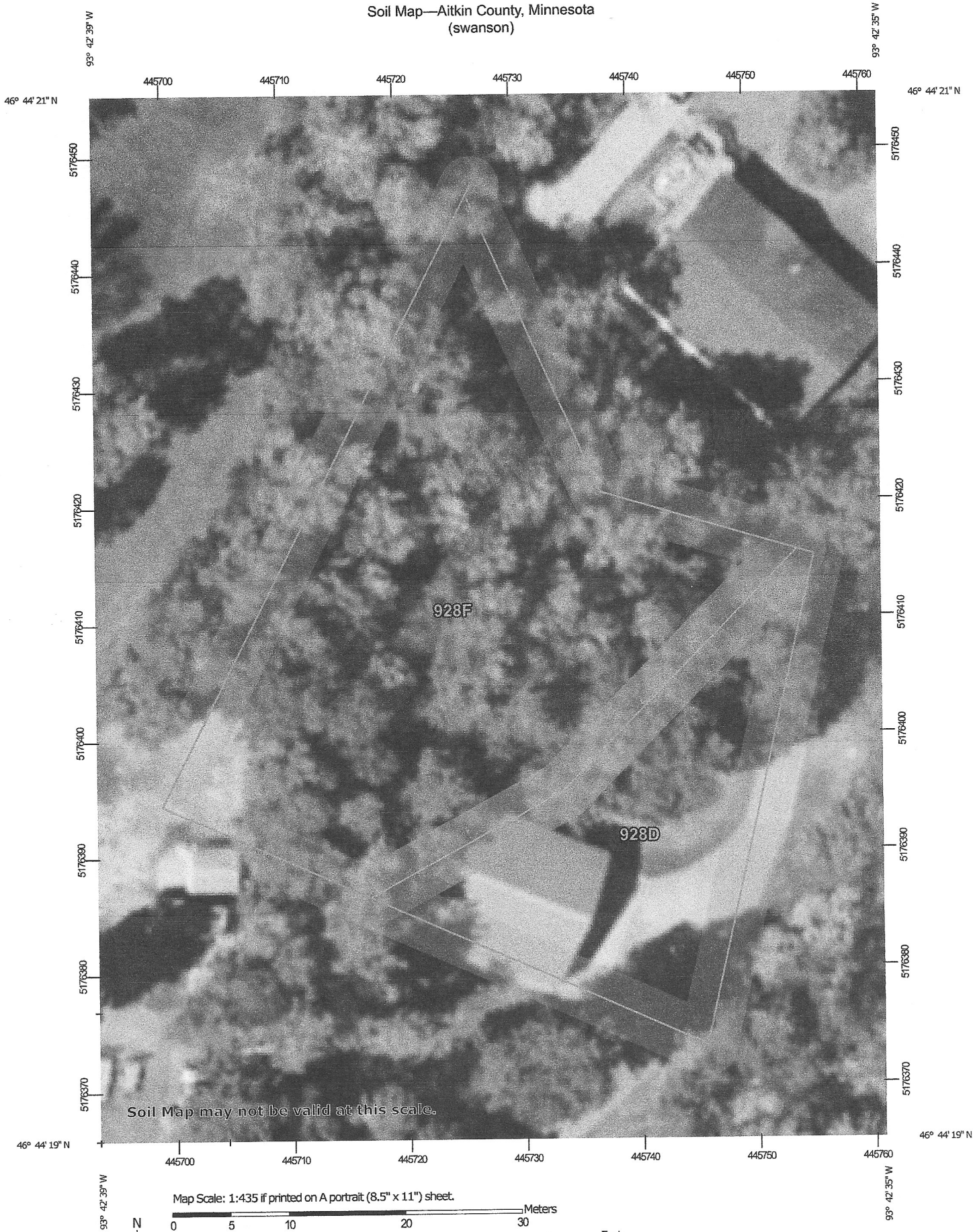
DEPTH (INCHES)	TEXTURE	MUNSELL COLOR

ADDITIONAL SOIL BORINGS MAY BE REQUIRED

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
928D	Cushing-Mahtomedi complex, 10 to 25 percent slopes	0.2	29.9%
928F	Cushing-Mahtomedi complex, 25 to 40 percent slopes	0.4	70.1%
Totals for Area of Interest		**0.5**	**100.0%**

Soil Map—Aitkin County, Minnesota
(swanson)



Map Scale: 1:435 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 20 40 80 120

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

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

A. Average Design FLOW

Estimated 4150 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% of the values in the Class I, II, or III columns.
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

B. SEPTIC TANK Capacity

1500 COMBINATION
1000 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 = 1.34 feet 16"
2. Depth of percolation tests = ✓ feet
3. Texture Sandy Loam
   Percolation rate ✓ mpi
4. Soil loading rate 1.27 gpd/sqft *(see figure D-33)*
5. Percent land slope 7 %

D. ROCK LAYER DIMENSIONS

1. Multiply average design flow (A) by 0.83 to obtain required rock layer area.
   4.50 gpd x 0.83 sqft/gpd = 373.5 sqft
2. Determine rock layer width = 0.83 sqft/gpd x linear Loading Rate (LLR)
   0.83 sqft/gpd x _____ gpd/sqft = 1.2 ft
3. Length of rock layer = area ÷ width =
   373.5 sqft (D1) ÷ 10 ft (D2) = 38 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
   380 sqft x 1 ft = 380 cuft
2. Divide cuft by 27 cuft/cuyd to get cubic yards
   _____ cuft ÷ 27 cuyd/cuft = 14 cuyd
3. Multiply cubic yards by 1.4 to get weight of rock in tons
   _____ cuyd x 1.4 ton/cuyd = 19.7 tons

F. SEWAGE ABSORPTION WIDTH

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

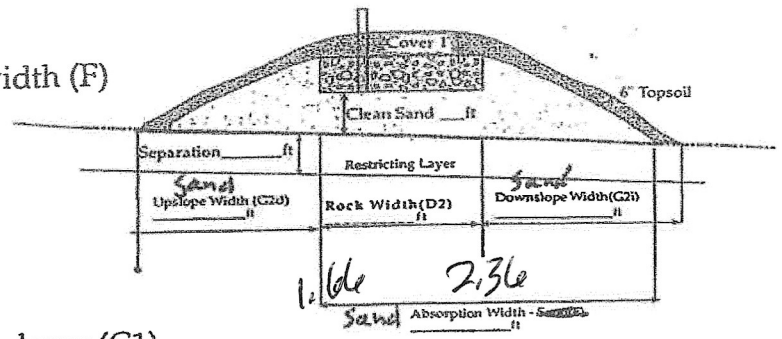
10 ~~380~~ x 1.5 ft = 15 ft

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	0.79	1.50
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)
10 ft - 15 ft = 5 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 - 1.34 ft = 1.66 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)
1.66 ft + 1ft + 1ft = 3.66 ft

c. Upslope berm multiplier based on land slope
2.48 *(see figure D-34)*

d. Upslope width = berm multiplier (G2c) x upslope mound height (G2b):
3.66 x 2.48 ft = 9 ft

DOWNSLOPE

e. Drop in elevation = rock layer width (D2) x percent landslope (C5) ÷ 100
10 ft x 7 % ÷ 100 = .7 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)
.7 ft + 1.66 ft = 2.36 ft

g. Downslope berm multiplier based on percent land slc
3.80 *(see figure D-34)*

h. Downslope width = downslope multiplier (G2g) times downslope mound height (G2f)
3.80 x 2.36 ft = 9 ft

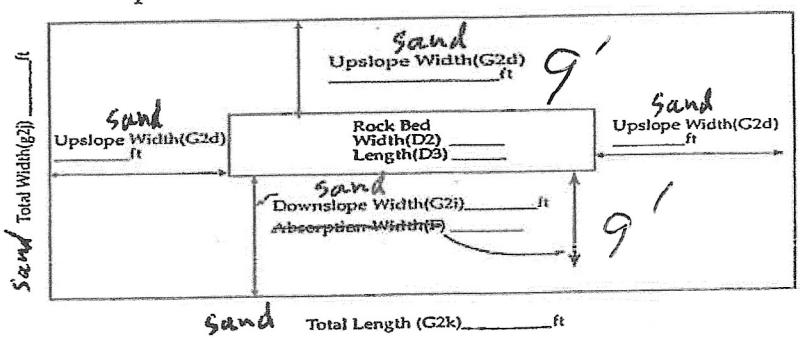
i. Select the greater of G1 and G2h as the downslope width: 9 ft

j. Total mound width is the sum of upslope width (G2d) width plus rock layer width (D2) plus downslope width (G2i)
9 ft + 9 ft + 10 ft = 28 ft

k. Total mound length is the sum of upslope width (G2d) plus rock layer length (D3) plus upslope width (G2d)
9 ft + 9 ft + 38 ft = 56 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:
28 x 56

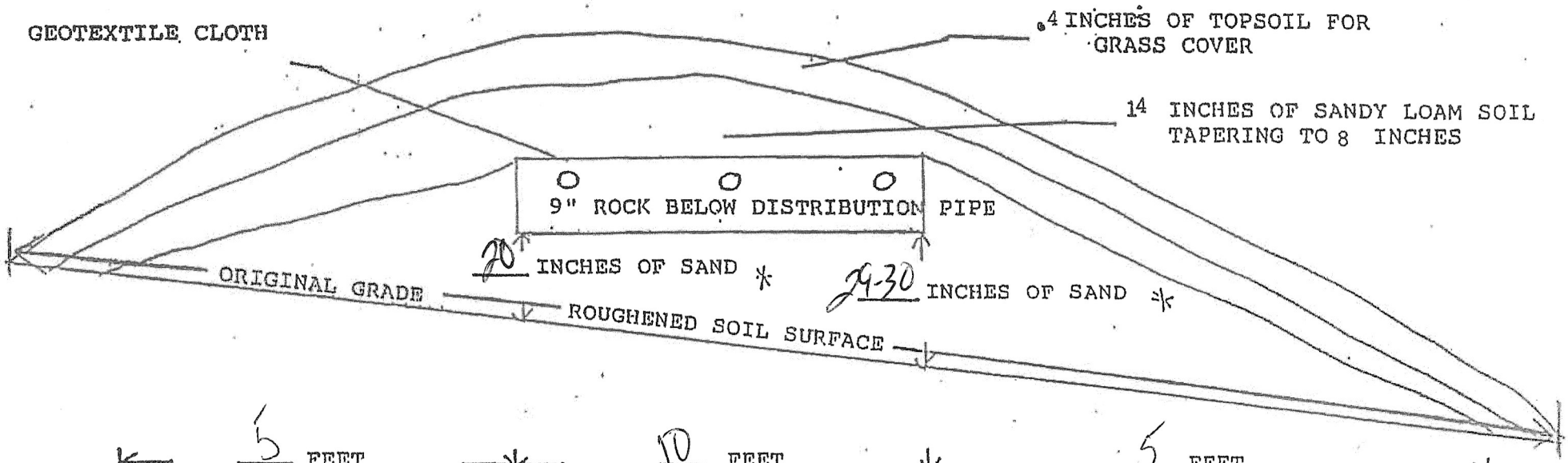
I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

(signature) 2205 (license #) 3/10/24 (date)

MOUND CROSS-SECTION

7 PERCENT SLOPE OF ORIGINAL SOIL

10 FT. x 34 FT. SIZE OF ROCKBED 15 FT. x 48 FT. SIZE OF SANDBASE



5 FEET UPSLOPE SAND WIDTH

10 FEET WIDTH OF ROCKBED

5 FEET DOWNSLOPE SAND WIDTH

14 FEET UPSLOPE COVER WIDTH

10 FEET WIDTH OF ROCK

14 FEET DOWNSLOPE COVER WIDTH

56

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: _____ gpm

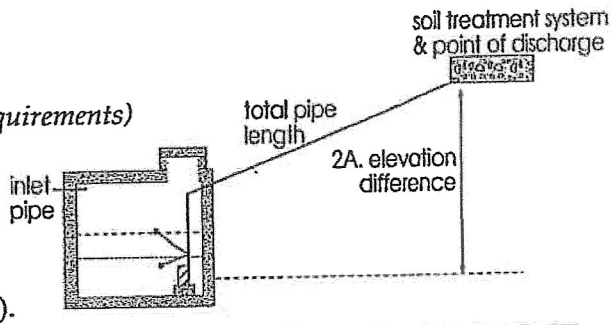
2. Determine pump head requirements:

A. Elevation difference between pump and point of discharge?

8 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 = 1.55 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
   60 feet x 1.25 = 75 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.
   = 1.55 ft/100ft x 75 ÷100 = 1.8 ft

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

13 ft + 1.8 ft+ _____ ft =

Total head: 14.8 feet

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

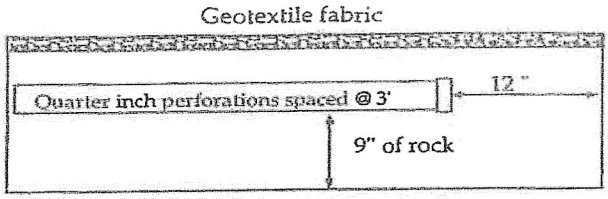
3. Pump selection

A pump must be selected to deliver at least 28 gpm (2B or C) with at least 14.8 feet of total head (2D)

I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

Daniel Clapp (signature) 2205 (license #) 3/11/24 (date)

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.

   38 (Rock layer length) - 2 ft = 36 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 = 36 ft ÷ 3 ft = 12 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.*

   12 spaces + 1 = 13 perforations/lateral

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

   13 perfs/lat x 3 lat = 39 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 38 ft = 380 sqft
   Square foot per perforation = Rock bed area ÷ number of perfs (6)
   380 sqft ÷ 39 perfs = 9 sqft/perf

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

   39 perfs x .74 gpm/perfs = 28.86 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 = 1.25 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 = 1 inches.

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

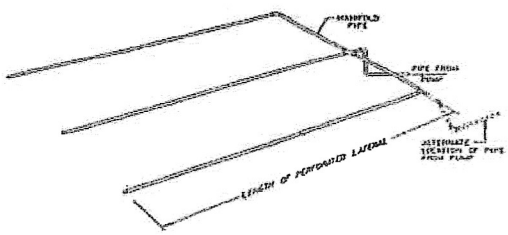
perforation spacing (feet)	1 inch	1.25 inch	1.5 inch	2.0 inch
2.5	8	14	18	28
3.0	8	13	17	26
3.3	7	12	16	25
4.0	7	11	15	23
5.0	6	10	14	22

E-6: Perforation Discharge in gpm

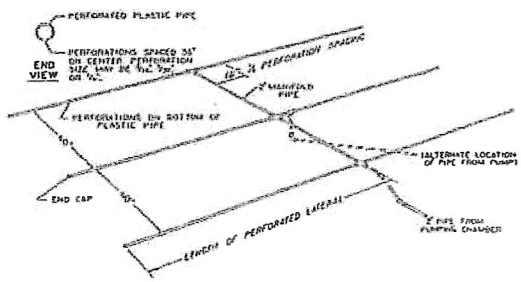
head (feet)	perforation diameter (inches) 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.42	0.56	0.74
2.0[b]	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

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

MANIFOLD LOCATED AT END OF PRESSURE DISTRIBUTION SYSTEM



LAYOUT OF PERFORATED PIPE LATERALS FOR PRESSURE DISTRIBUTION IN MOUND



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Daniel Clark (signature) 2205 (license #) 3/11/24 (date)

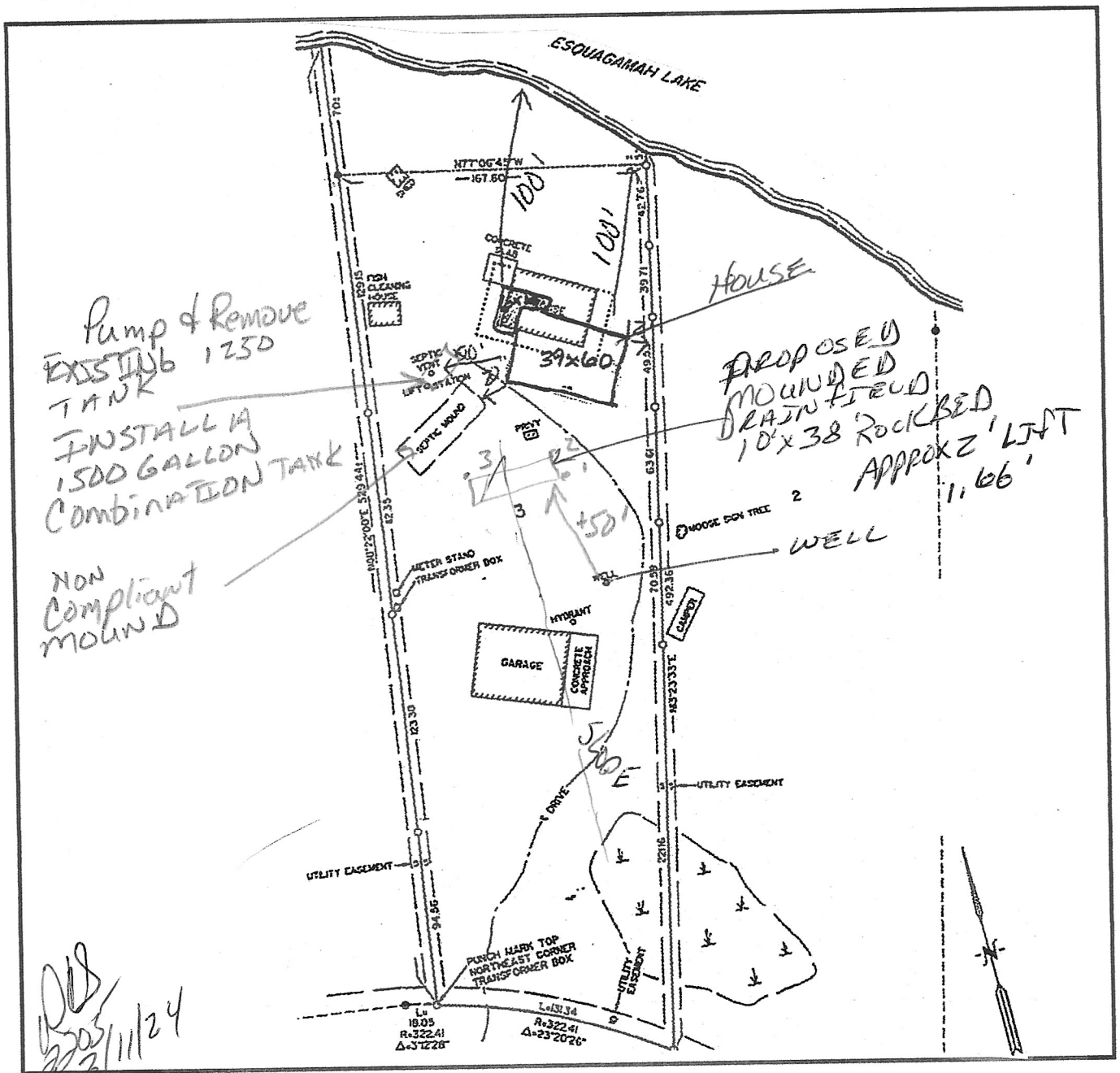
University of Minnesota Onsite Sewage Treatment Program

Proposed Design Map

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: v 03.15.2023

Property Owner/Client:



Map scale: ☐ Indicated north ☐ Show slope/contours

Elevations in feet Benchmark: ft

System Corners:

NW:	ft	#1:	ft	Tank Outlet:	ft
NE:	ft	#2:	ft	Other:	
SW:	ft	#3:	ft		ft
SE:	ft	#4:	ft		ft

Date Completed: