Subsurface Sewage Treatment System Management Plan

Property Owner: Dean & Kristin O'Neil Phone: 218-678-3419 Date: June 23, 2022

Mailing Address: 22729-435th Ave. (present) City: Aitkin, Mn. Zip: 56431

Site Address: _____ City: Aitkin, Mn. Zip: 56431

This management plan will identify the operation and maintenance activities necessary to ensure long-term performance of your septic system. Some of these activities must be performed by you, the homeowner. Other tasks must be performed by a licensed septic service provider or maintenance provider.

System Designer: Recommends SSTS check every 36 months.
Local Government: Recommends SSTS check every 36 months.
State Requirement: Requires SSTS check every 36 months.
(State requirements are based on MN Rules Chapter 7080.2450, Subp. 2 & 3)

My System needs to be checked every 36 months.

Homeowner Management Tasks:

Leaks – Check (look, listen) for leaks in toilets and dripping faucets. Repair leaks promptly.

Surfacing sewage – Regularly check for wet or spongy soil around your soil treatment area.

Effluent filter – Inspect and clean twice a year or more.

Alarms – Alarm signals when there is a problem. Contact a service or maintenance provider any time an alarm signals.

Event counter or water meter – Record your water use.

-recommend meter readings be conducted (*circle one:* DAILY WEEKLY MONTHLY N/A)

Licensed septic service provider or maintenance provider (Check all that apply):

- ☒ Check to make sure tank is not leaking
- ☒ Check and clean the in-tank effluent filter (if exists)
- ☒ Check the sludge/scum layer levels in all septic tanks
- ☒ Recommend if tank should be pumped
- ☒ Check inlet and outlet baffles
- ☒ Check the drainfield effluent levels in the rock layer
- ☒ Check the pump and alarm system functions
- ☐ Check wiring for corrosion and function
- ☐ Check dissolved oxygen and effluent temperature in tank
- ☐ Provide homeowner with list of results and any action to be taken
- ☐ Flush and clean laterals if cleanouts exist

"I understand it is my responsibility to properly operate and maintain the sewage treatment system on this property, utilizing the Management Plan. If requirements in the Management Plan are not met, I will promptly notify the permitting authority and take necessary corrective actions. If I have a new system, I agree to adequately protect the reserve area for future use as a soil treatment system."

Property Owner Signature: _____ Date: _____

Designer Signature: Tom O'Neil Date: June 23, 2022

See Reverse Side for Management Log

FIELD EVALUATION SHEET

PRELIMINARY EVALUATION DATE June 23, 2022, FIELD EVALUATION DATE June 23, 2022
PROPERTY OWNER: Dean + Kristin O'Neil PHONE 218-678-3419
ADDRESS: CITY,STATE,ZIP: Aitkin, Mn. 56431
LEGAL DESCRIPTION:
PIN# SEC 33 T 45 R 27 TWP NAME Hazelton
FIRE# LAKE/RIVER LAKE CLASS OHWL FT

DESCRIPTION OF SOIL TREATMENT AREAS

	AREA #1	AREA #2
DISTURBED AREAS	YES NO X	YES NO X
COMPACTED AREAS	YES NO X	YES NO X
FLOODING	YES NO X	YES NO X
RUN ON POTENTIAL	YES NO X	YES NO X
SLOPE %	6%	6%
DIRECTION OF SLOPE	W-E	W-E
LANDSCAPE POSITION	N-S	N-S
VEGETATION TYPES	Wooded	wooded

REFERENCE BM ELEV. 100 F
REFERENCE BM DESCRIPTION
Markon Large oak Tree

DEPTH TO STANDING WATER OR MOTTLED SOIL: BORING# 1 22", 1A 24", 2 13", 2A 20"

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

SOIL SIZING FACTOR: SITE # 1 1.27, SITE #2 2.00

CONSTRUCTION RELATED ISSUES: This site has very little rock in the soil until about 22" when the rock in the soil increases

LIC# L2132 SITE EVALUATOR SIGNATURE: Tom O'Neil

SITE EVALUATOR NAME: Tom O'Neil TELEPHONE# 218-927-6070

LUG REVIEW DATE

Comments:

SOIL BORING LOGS ON REVERSE SIDE

SOILS CHARTS FOR BOTH PROPOSED AND ALTERNATE SITES

1 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-7	loam	10yr 3/2
7-10	Sandy loam	10yr 4/3
10-22	loamy Sand	10yr 4/4
22-	Med Sand rocks	10yr 4/4-4/6

no mottles

2 (PROPOSED) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-5	loam	10yr 3/2
5-9	Sandy loam	10yr 4/3
9-24	loamy Sand	10yr 4/4
24-	Med Sand Small rocks	10yr 4/4-4/6

No Mottles

1 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-8	loam	10yr 3/2
8-13	Sandy loam	10yr 3/4
13-16	Silty loam	10yr 5/4

Mottles at 13"

2 (ALTERNATE) SOILS DATA

DEPTH (INCHES)	TEXTURE	MUNSELL COLOR
0-7	loam	10yr 3/2
7-12	Sandy loam	10yr 4/3
12-18	loamy Sand	10yr 4/4
18-20	loamy Sand	10yr 4/6

no mottles yet

ADDITIONAL SOIL BORINGS MAY BE REQUIRED

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

A. Average Design FLOW

Estimated 300 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

750 min. gallons *(see figure C-1)*
use a 1650 gallon Combo and a 760 gallon pump tank

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 = 1.75 feet
2. Depth of percolation tests = 2 feet
3. Texture Loam
   Percolation rate 16-30 mpi
4. Soil loading rate .60 gpd/sqft *(see figure D-33)*
5. Percent land slope 6 %

D. ROCK LAYER DIMENSIONS

1. Multiply average design flow (A) by 0.83 to obtain required rock layer area.
   300 gpd x 0.83 sqft/gpd = 250 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 =
   250 sqft (D1) ÷ 10 ft (D2) = 25 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
   250 sqft x 1 ft = 250 cuft
2. Divide cuft by 27 cuft/cuyd to get cubic yards
   250 cuft ÷ 27 cuyd/cuft = 10 cuyd
3. Multiply cubic yards by 1.4 to get weight of rock in tons
   10 cuyd x 1.4 ton/cuyd = 14 tons

F. SEWAGE ABSORPTION WIDTH

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

2 x 10 ft = 20 ft

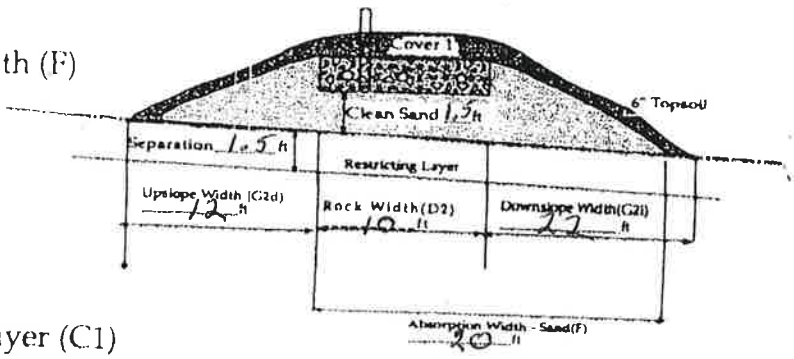
D-33: Absorption Width Sizing Table

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)
20 ft - 10 ft = 10 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 - 1.5 ft = 1.5 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)
1.5 ft + 1ft + 1ft = 3.5 ft

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

d. Upslope width = berm multiplier (G2c) times upslope mound height (G2b):
3.23 x 3.5 ft = 11.5 ft 12

DOWNSLOPE

e. Drop in elevation = rock layer width (D2) times percent landslope (C5) ÷ 100
10 ft x 6 % ÷ 100 = .6 ft

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)

f .6 ft + 3.5 ft = 4.1 ft

D-34: SLOPE MULTIPLIER TABLE

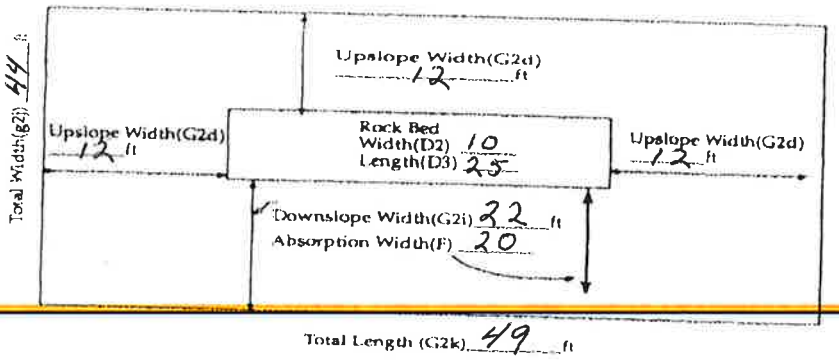
Land Slope, in %	UPSLOPE multipliers for various slope ratios						DOWNSLOPE multipliers for various slope ratios				
	3:1	4:1	5:1	6:1	7:1	8:1	3:1	4:1	5:1	6:1	7:1
0	3.0	4.0	5.0	6.0	7.0	8.0	3.0	4.0	5.0	6.0	7.0
1	2.91	3.85	4.76	5.66	6.54	7.41	3.09	4.17	5.26	6.38	7.53
2	2.83	3.70	4.56	5.36	6.14	6.90	3.19	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

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

h. Downslope width = downslope multiplier (G2g) times downslope mound height (G2f)
5.26 x 4.1 ft = 21.6 ft

i. Select the greater of G1 and G2h as the downslope width: 22 ft

Total mound width is the sum of upslope width (G2d) width plus rock layer width (D2) plus downslope width (G2i)
12 ft + 10 ft + 22 ft = 44 ft



Total mound length is the sum of upslope width (G2d) plus rock layer length (D3) plus upslope width (G2d)
K 12 ft + 25 ft + 12 ft = 49 feet

Final Dimensions:
44 x 49

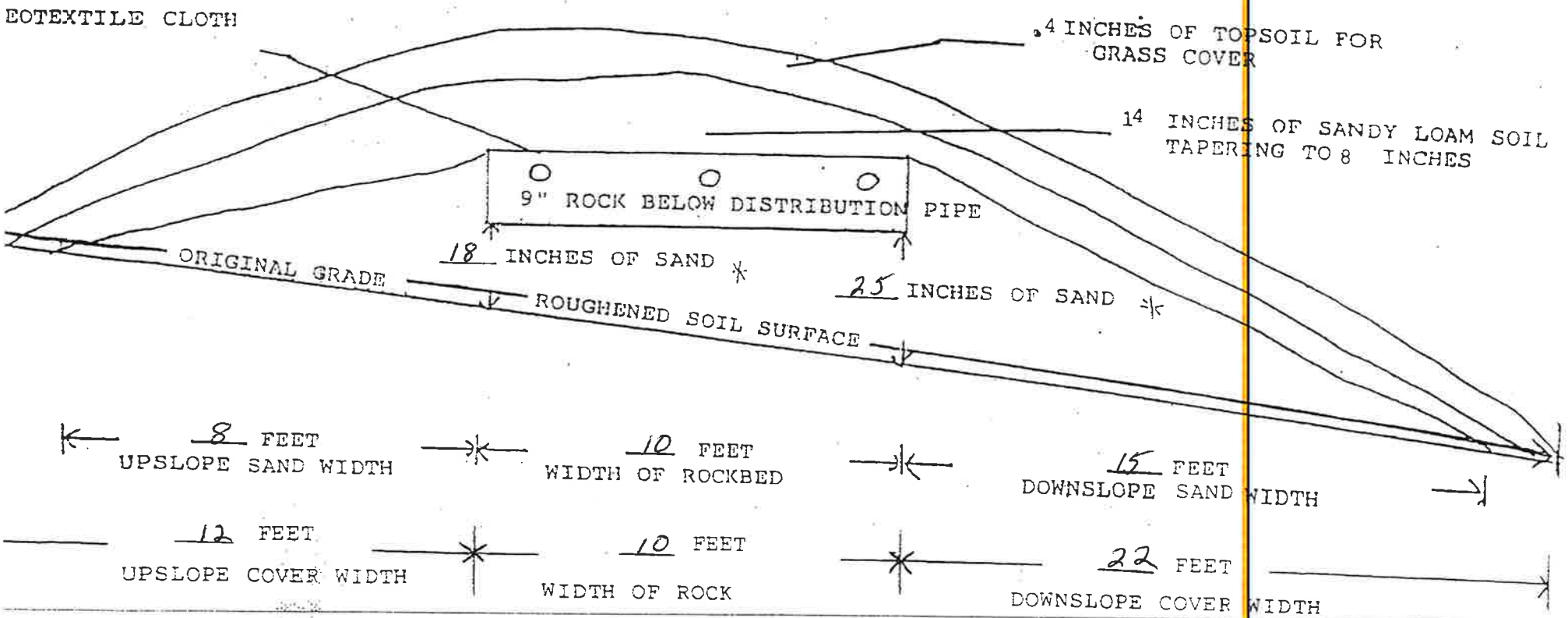
I hereby certify that I have completed this work in accordance with applicable ordinances, rules and laws.

Tom Oliver (license) 4,2132 June 23, 2022

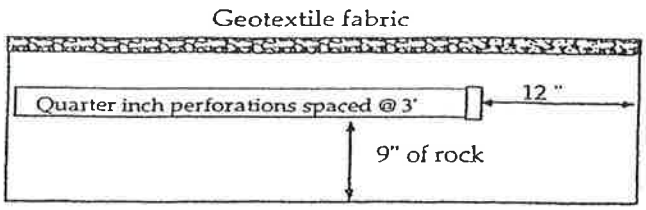
MOUND CROSS-SECTION

6 PERCENT SLOPE OF ORIGINAL SOIL

10 FT. x 25 FT. SIZE OF ROCKBED 33 FT. x 41 FT. SIZE OF SANDBASE



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 = 2.5 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.

   25 (Rock layer length) - 2 ft = 23 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 = 23 ft ÷ 2.5 ft = 9 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.*

   9 spaces + 1 = 10 perforations/lateral

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

   10 perfs/lat x 3 lat = 30 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 25 ft = 250 sqft
   Square foot per perforation = Rock bed area ÷ number of perfs (6)
   250 sqft ÷ 30 perfs = 8 sqft/perf

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

   30 perfs x .74 gpm/perfs = 23 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 = _____ inches.

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

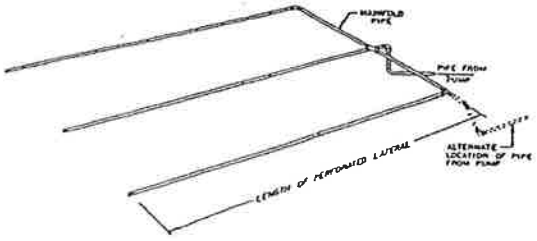
perforation spacing (feet)	1 inch	1.25 inch	1.5 inch	2.0 inch
2.5	8	14	18	28
3.0	8	13	17	26
3.3	7	12	16	25
4.0	7	11	15	23
5.0	6	10	14	22

E-6: Perforation Discharge in gpm

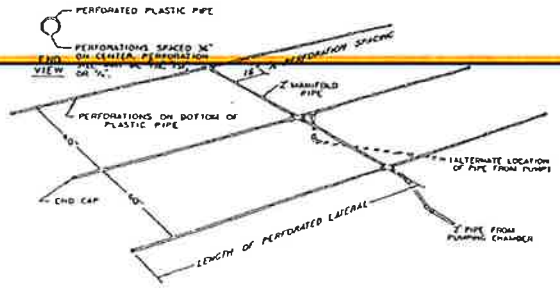
head (feet)	perforation diameter (inches) 1/8	3/16	7/32	1/4
1.0[a]	0.18	0.42	0.56	0.74
2.0[b]	0.26	0.59	0.80	1.04
5.0	0.41	0.94	1.26	1.65

[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



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

Tom Dixon (signature) L2132 (license #) June 23, 2022 (date)

PUMP SELECTION PROCEDURE

A. Determine pump capacity

Gravity distribution

1. Minimum is 10 GPM
2. Maximum is 45 GPM

Pressure Distribution

3. a. Select number of perforated laterals 3.
   b. Select perforation spacing = 2.5 ft.
   c. Subtract 2 ft from rock layer length:
   25 - 2 = 23 feet. (Length of laterals)

ROCK LAYER LENGTH

   d. Determine the number of spaces between perfs:
   23 / 2.5 = 9 spaces
   (length of lateral) / (perf. spacing)
   e. 9 spaces + 1 = 10 perforations per lateral
   f. Multiply perforations per lateral by number of laterals to get total number of perforations:
   10 x 3 = 30
   (perfs/lateral) x (laterals) = (perforations)
   g. 30 X .74 = 23 GPM
   (Perforations) x (gpm/perfs)

SELECTED PUMP CAPACITY 23 GPM

B. Determine head requirements:

1. Elevation difference beteween pump & point of discharge:
   9 feet
2. If pumping to a pressure distribution system, add 5 feet; for gravity add zero: 5 feet
3. Friction Loss
   a. Enter friction loss table with GPM and pipe diameter. Read friction loss in feet per 100 ft in table.
   F.L. = 1.11 ft/100 of pipe
   b. Determine total pipe length from pump to discharge point. Add 25% to pipe length for fitting loss.
   20' length x 1.25 25 feet.
   c. Calculate total friction loss by multiplying friction loss in 100 ft. of pipe by equivalent pipe length (B):

Total friction loss = 1.11 x 25 /100 = 1 feet

4. Total head required is the sum of the elevation difference, special head requirements and total friction loss:

9 + 5 + 1 **TOTAL HEAD** 15'
(1) (2) (3e)

SELECT A PUMP TO DELIVER AT LEAST 23 GPM WITH AT LEAST 15 FEET OF TOTAL HEAD.

If laterals are connected to a header pipe in a pressure system, select the minimum size lateral diameter; enter the table with perforation spacing and the number of perforations per lateral.

Select minimum size of lateral 1.25"
For a center manifold system the values will be ½ of above.

Perforation Discharges in GPM

Head (feet)	Perforation diameter (inches)	
	7/32	1/4
1.0a	0.56	0.74
1.5	0.69	0.90
2.0b	0.80	1.04

a. Use 1.0 foot single homes
b. Use 2.0 feet for anything else

FRICTION LOSS IN PLASTIC PIPE

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

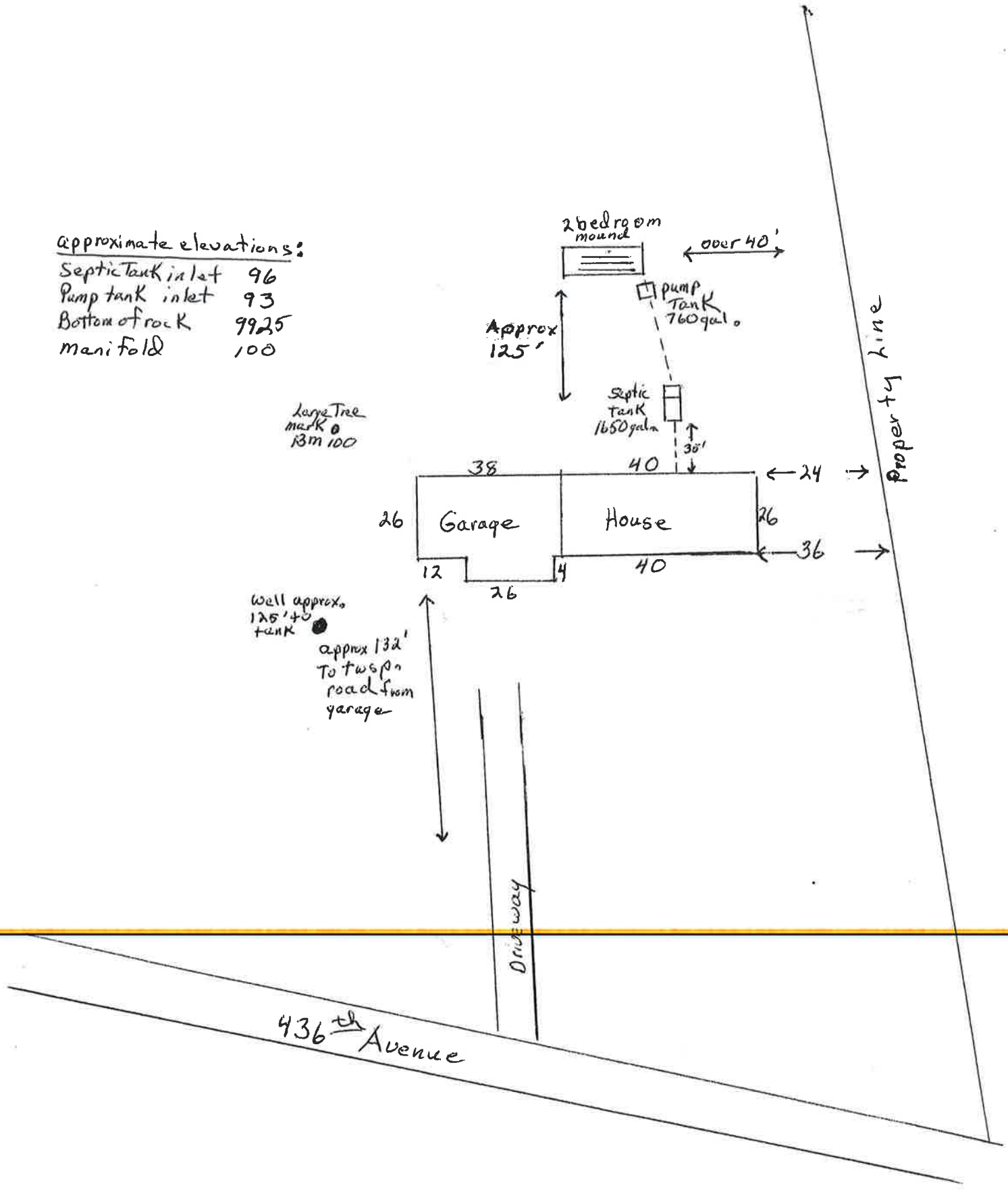
Max. No. of 1/4" perfs per lateral. (10%var)

Perforation spacing. (feet)	1 1/4"	1 1/2"`	2"
2.5 feet	14	18	28
3.0 feet	13	17	26
3.3 feet	12	16	25
4.0 feet	11	15	23
5.0 feet	10	14	22

Dean & Kristin O'Neil

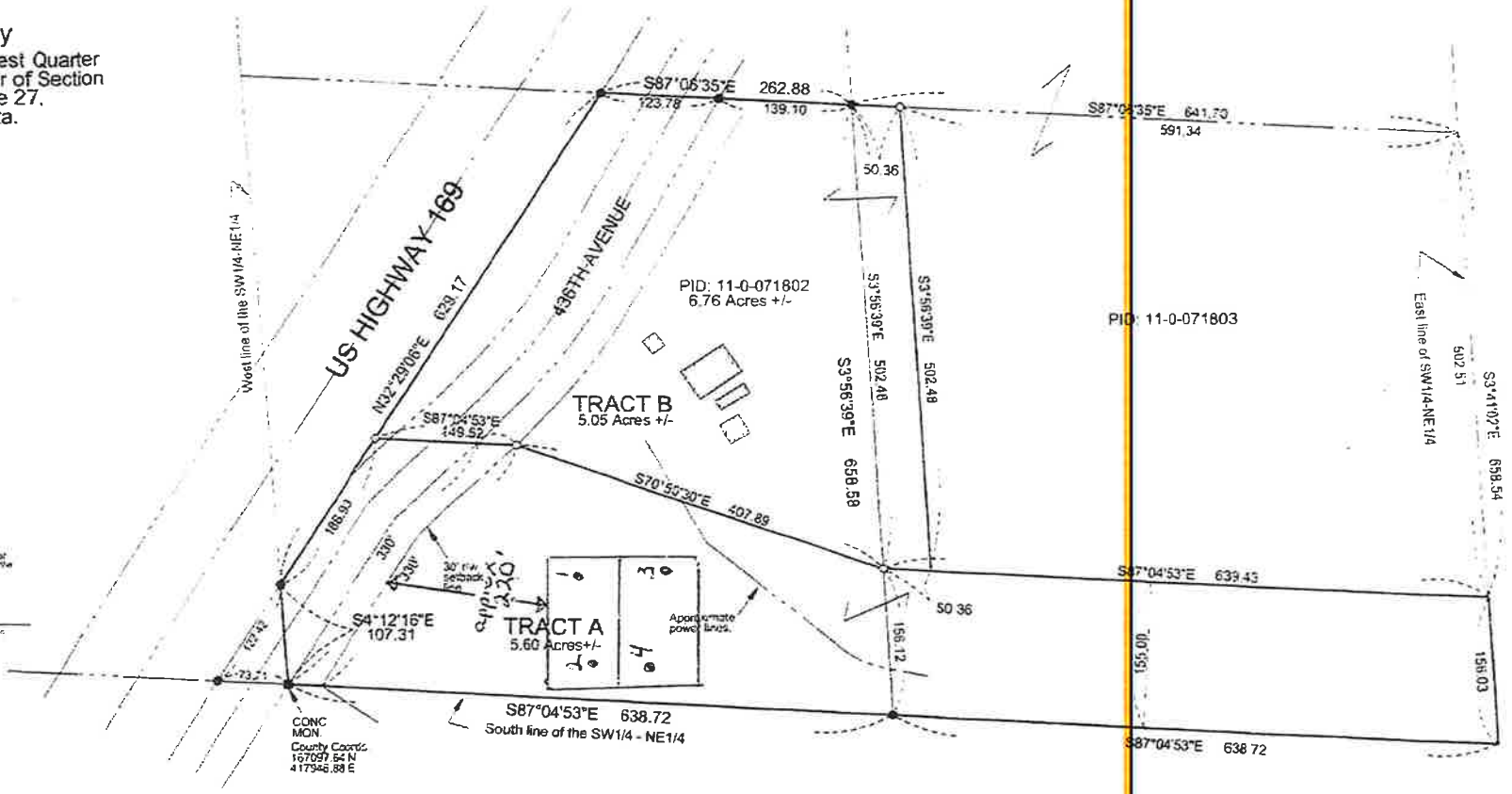
approximate elevations:

Septic Tank inlet	96
Pump tank inlet	93
Bottom of rock	9925
manifold	100



Certificate of Survey

Of a part of the Southwest Quarter of the Northeast Quarter of Section 33, Township 45, Range 27, Aitkin County, Minnesota.



Terry J. Bobby
Aitkin County Abstract Company Building
112 Third Street Northwest
Aitkin, Minnesota 56431

Graphic Scale: 1 inch = 125 feet
0 50 100 150 200

Bearing Datum based on Aitkin County coordinates.
● Denotes found iron monument
○ Denotes set iron monument.

I hereby certify that this plan, survey or report was prepared by me or under my direct supervision and that I am a duly licensed land surveyor under the laws of the State of Minnesota.

Terry J. Bobby, Minnesota Registration No. 15811
Date: November 5, 2020
REVISED APRIL 25, 2021