UNIVERSITY OF MINNESOTA

Septic System Management Plan for Above Grade Systems

The goal of a septic system is to protect human health and the environment by properly treating wastewater before returning it to the environment. Your septic system is designed to kill harmful organisms and remove pollutants before the water is recycled back into our lakes, streams and groundwater.

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 maintainer or service provider. However, it is **YOUR** responsibility to make sure all tasks get accomplished in a timely manner.

The University of Minnesota's *Septic System Owner's Guide* contains additional tips and recommendations designed to extend the effective life of your system and save you money over time.

Proper septic system design, installation, operation and maintenance means safe and clean water!

Property Owner	Kevin & Ann Strasser	Email	strasserfamily@live.com
Property Address	67179 348th Place Hill City, MN 55748	Property ID	12-1-073800
System Designer	Walker Maasch	Contact Info	218-256-0139
System Installer	TBD	Contact Info	
Service Provider/Maintainer		Contact Info	
Permitting Authority	Aitkin County Environmental Services	Contact Info	218-927-7342
Permit #		Date Inspected	

Keep this Management Plan with your Septic System Owner's Guide. The Septic System Owner's Guide includes a folder to hold maintenance records including pumping, inspection and evaluation reports. Ask your septic professional to also:

- Attach permit information, designer drawings and as-built of your system, if they are available.
- Keep copies of all pumping records and other maintenance and repair invoices with this document.
- Review this document with your maintenance professional at each visit; discuss any changes in product use, activities, or water-use appliances.

For a copy of the *Septic System Owner's Guide*, visit www.bookstores.umn.edu and search for the word "septic" or call 800-322-8642.

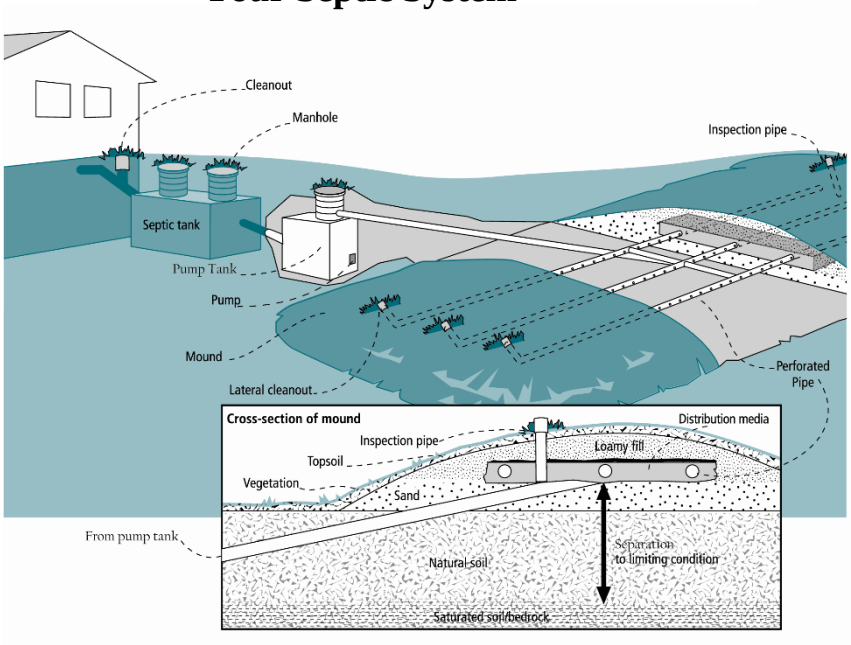
For more information see http://septic.umn.edu

Version: August 2015

UNIVERSITY OF MINNESOTA

Septic System Management Plan for Above Grade Systems

Your Septic System



Septic System Specifics

System Type: ◯ I ◯ II ◉ III ◯ IV* ◯ V*

(*Based on MN Rules Chapter 7080.2200 – 2400)*

**Additional Management Plan required*

☐ System is subject to operating permit*

☐ System uses UV disinfection unit*

Type of advanced treatment unit _____

Dwelling Type

Number of bedrooms: 2

System capacity/ design flow (gpd): 300

Anticipated average daily flow (gpd): 300

Comments_____

Business? : ◯ Y ◉ N What type? _____

Well Construction

Well depth (ft): >50'

- ❑ Cased well Casing depth: _____
- ❑ Other (specify): _____

Distance from septic (ft): 80'

Is the well on the design drawing? ◉ Y ◯ N

Septic Tank

- ❑ First tank *Tank volume:* 1,000 *gallons*
  Does tank have two compartments? ◉ Y ◯ N
- ❑ Second tank *Tank volume:* Pump tank *gallons*
- ❑ Tank is constructed of Concrete
- ❑ Effluent screen: ◉ Y ◯ N Alarm ◉ Y ◯ N

- ❑ Pump Tank 500 *gallons*
- ❑ Effluent Pump *make/model*: Goulds PE41P1
  Pump capacity 18 GPM
  TDH 20.5 Feet of head
- ❑ Alarm location Near pump tank lid

Soil Treatment Area (STA)

Mound/At-Grade area (width x length): 43.2 ft x 58.6 ft

Rock bed size (width x length): 10 ft x 25 ft

Location of additional STA: _____

Type of distribution media: Rock

☑ Inspection ports ☑ Cleanouts

☐ Surface water diversions

☐ Additional STA not available

Homeowner Management Tasks

These op*eration and maintenance ac*tivities are your responsibility. *Chart on page 6 can help track your activities.*

Your toilet is not a garbage can. Do not flush anything besides human waste and toilet paper. No wet wipes, cigarette butts, disposal diapers, used medicine, feminine products or other trash!

The system and septic tanks needs to be checked every 12 months

Your service provider or pumper/maintainer should evaluate if your tank needs to be pumped more or less often.

Seasonally or several times per year

- *Leaks.* Check (listen, look) for leaks in toilets and dripping faucets. Repair leaks promptly.
- *Soil treatment area.* Regularly check for wet or spongy soil around your soil treatment area. If surfaced sewage or strong odors are not corrected by pumping the tank or fixing broken caps and leaks, call your service professional. *Untreated sewage may make humans and animals sick.* Keep bikes, snowmobiles and other traffic off and control borrowing animals.
- *Alarms.* Alarms signal when there is a problem; contact your service professional any time the alarm signals.
- *Lint filter.* If you have a lint filter, check for lint buildup and clean when necessary. If you do not have one, consider adding one after washing machine.
- *Effluent screen.* If you do not have one, consider having one installed the next time the tank is cleaned along with an alarm.

Annually

- *Water usage rate.* A water meter or another device can be used to monitor your average daily water use. Compare your water usage rate to the design flow of your system (listed on the next page). Contact your septic professional if your average daily flow over the course of a month exceeds 70% of the design flow for your system.
- *Caps.* Make sure that all caps and lids are intact and in place. Inspect for damaged caps at least every fall. Fix or replace damaged caps before winter to help prevent freezing issues.
- *Water conditioning devices.* See Page 5 for a list of devices. When possible, program the recharge frequency based on *water demand (gallons)* rather than *time (days)*. Recharging too frequently may negatively impact your septic system. Consider updating to demand operation if your system currently uses time,
- *Review your water usage rate.* Review the Water Use Appliance chart on Page 5. Discuss any major changes with your service provider or pumper/maintainer.

During each visit by a service provider or pumper/maintainer

- Make sure that your service professional services the tank through the manhole. (NOT though a 4" or 6" diameter inspection port.)
- Ask how full your tank was with sludge and scum to determine if your service interval is appropriate.
- Ask your pumper/maintainer to accomplish the tasks listed on the Professional Tasks on Page 4.

Professional Management Tasks

These are the operation and maintenance activities that a pumper/maintainer performs to help ensure long-term performance of your system. At each visit a written report/record must be provided to homeowner.

Plumbing/Source of Wastewater

- Review the Water Use Appliance Chart on Page 5 with homeowner.
  Discuss any changes in water use and the impact those changes may have on the septic system.
- Review water usage rates (if available) with homeowner.

Septic Tank/Pump Tanks

- *Manhole lid*. A riser is recommended if the lid is not accessible from the ground surface. Insulate the riser cover for frost protection.
- *Liquid level*. Check to make sure the tank is not leaking. The liquid level should be level with the bottom of the outlet pipe. (If the water level is below the bottom of the outlet pipe, the tank may not be watertight. If the water level is higher than the bottom of the outlet pipe of the tank, the effluent screen may need cleaning, or there may be ponding in the soil treatment area.)
- *Inspection pipes*. Replace damaged or missing pipes and caps.
- *Baffles*. Check to make sure they are in place and attached, and that inlet/outlet baffles are clear of buildup or obstructions.
- *Effluent screen*. Check to make sure it is in place; clean per manufacturer recommendation. Recommend retrofitted installation if one is not present.
- *Alarm*. Verify that the alarm works.
- *Scum and sludge*. Measure scum and sludge in each compartment of each septic and pump tank, pump if needed.

Pump

- *Pump and controls*. Check to make sure the pump and controls are operating correctly.
- *Pump vault*. Check to make sure it is in place; clean per manufacturer recommendations.
- *Alarm*. Verify that the alarm works.
- *Drainback*. Check to make sure it is draining properly.
- *Event counter or elapsed time meter*. Check to see if there is an event counter or elapsed time meter for the pump. If there is one or both, calculate the water usage rate and compare to the anticipated use listed on Design and Page 2. Dose Volume: 75 gallons: Pump run time: 1 Minutes

Soil Treatment Area

- *Inspection pipes*. Check to make sure they are properly capped. Replace caps and pipes that are damaged.
- *Surfacing of effluent*. Check for surfacing effluent or other signs of problems.
- *Lateral flushing*. Check lateral distribution; if cleanouts exist, flush and clean at recommended frequency.
- *Vegetation* - Check to see that a good growth of vegetation is covering the system.

All other components – evaluate as listed here:

Water-Use Appliances and Equipment in the Home

Appliance	Impacts on System	Management Tips
Garbage disposal	• Uses additional water. • Adds solids to the tank. • Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Use of a garbage disposal is not recommended. • Minimize garbage disposal use. Compost instead. • To prevent solids from exiting the tank, have your tank pumped more frequently. • Add an effluent screen to your tank.
Washing machine	• Washing several loads on one day uses a lot of water and may overload your system. • Overloading your system may prevent solids from settling out in the tank. Unsettled solids can exit the tank and enter the soil treatment area.	• Choose a front-loader or water-saving top-loader, these units use less water than older models. • Limit the addition of extra solids to your tank by using liquid or easily biodegradable detergents. Limit use of bleach-based detergents and fabric softeners. • Install a lint filter after the washer and an effluent screen to your tank • Wash only full loads and think even – spread your laundry loads throughout the week.
Dishwasher	• Powdered and/or high-phosphorus detergents can negatively impact the performance of your tank and soil treatment area. • New models promote “no scraping”. They have a garbage disposal inside.	• Use gel detergents. Powdered detergents may add solids to the tank. • Use detergents that are low or no-phosphorus. • Wash only full loads. • Scrape your dishes anyways to keep undigested solids out of your septic system.
Grinder pump (in home)	• Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.	• Expand septic tank capacity by a factor of 1.5. • Include pump monitoring in your maintenance schedule to ensure that it is working properly. • Add an effluent screen.
Large bathtub (whirlpool)	• Large volume of water may overload your system. • Heavy use of bath oils and soaps can impact biological activity in your tank and soil treatment area.	• Avoid using other water-use appliances at the same time. For example, don’t wash clothes and take a bath at the same time. • Use oils, soaps, and cleaners in the bath or shower sparingly.
Clean Water Uses	**Impacts on System**	**Management Tips**
High-efficiency furnace	• Drip may result in frozen pipes during cold weather.	• Re-route water directly out of the house. Do not route furnace discharge to your septic system.
Water softener Iron filter Reverse osmosis	• Salt in recharge water may affect system performance. • Recharge water may hydraulically overload the system.	• These sources produce water that is not sewage and should not go into your septic system. • Reroute water from these sources to another outlet, such as a dry well, draintile or old drainfield. • When replacing, consider using a demand-based recharge vs. a time-based recharge. • Check valves to ensure proper operation; have unit serviced per manufacturer directions
Surface drainage Footing drains	• Water from these sources will overload the system and is prohibited from entering septic system.	

Homeowner Maintenance Log

Track maintenance activities here for easy reference. See list of management tasks on pages 3 and 4.

Activity	Date accomplished									
Check frequently:										
Leaks: check for plumbing leaks*										
Soil treatment area check for surfacing**										
Lint filter: check, clean if needed*										
Effluent screen (if owner-maintained)***										
Alarm**										
Check annually:										
Water usage rate (maximum gpd _____)										
Caps: inspect, replace if needed										
Water use appliances – review use										
Other:										

*Monthly

**Quarterly

***Bi-Annually

Notes:

"As the owner of this SSTS, 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 this 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

Management Plan Prepared By: Walker Maasch Certification # 9835

Permitting Authority: Aitkin County Environmental Services

Customer Info	
Name	Kevin & Ann Strasser
Address	67179 348th Place Hill City, MN 55748
Phone	763-350-2171

Drainfield Info	
Type of System:	Mound
System Width (in feet):	10
System Length (in feet):	25
Depth of Rock:	6 inches
Number of Lines in Bed:	3
Sand Lift (in feet):	3

Float settings	
***** Measure from bottom of pump upwards. *****	
Pump float OFF:	14.1
Pump float ON:	21.2
Alarm float OFF:	23.2
Alarm float ON:	25.2

Elevations		
Bottom of Septic Tank Hole (in feet):	-18.0	Lower than Benchmark Reading
Bottom of drainfield (before rock) (in feet):	0.4	Higher Than Benchmark Reading
Pipes in drainfield (in feet):	0.9	Higher Than Benchmark Reading

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 03.15.2023

Property Owner/Client:	Kevin & Ann Strasser	Date Completed:	5/27/2024
Site Address:	67179 348th Place Hill City, MN 55748	Project ID:	D24038
Email:	strasserfamily@live.com	Phone:	763-350-2171
Mailing Address:	4420 137th Lane NE Ham Lake, MN 55304	Alt Phone:	
Legal Description:	Lot 11, Hill Lake Terrace		

Parcel ID:	12-1-073800	SEC:	13	TWP:	52	RNG:	26

2. Flow and General System Information

A. Client-Provided Information

Project Type: ☑ New Construction ☐ Replacement ☐ Expansion ☐ Repair

Project Use: ☑ Residential ☐ Other Establishment:

Residential use: # Bedrooms: 2 Dwelling sq.ft.: Unfinished sq.ft.:

Adults: # Children: # Teenagers:

In-home business (Y/N): No If yes, describe:

Water-using devices: *(check all that apply)*

☐ Garbage Disposal/Grinder	☑ Dishwasher	☐ Hot Tub*
☐ Sewage pump in basement	☐ Water Softener*	☐ Sump Pump*
☑ Large Bathtub >40 gallons	☐ Iron Filter*	☐ Self-Cleaning Humidifier*
☑ Clothes Washing Machine	☐ High Eff. Furnace*	☐ Other:

* Clear water source - should not go into system

Additional current or future uses:

Anticipated non-domestic waste:

The above is complete & accurate: ***Client signature & date***

B. Designer-determined Flow and Anticipated Waste Strength Information

Attach additional information as necessary.

Design Flow: 300 GPD Anticipated Waste Type: Residential

Maximum Concentration BOD: 170 mg/L TSS 60 mg/L Oil & Grease 25 mg/L

3. Preliminary Site Information

A. Water Supply Wells

#	Description	Mn. ID#	Well Depth (ft.)	Casing Depth (ft.)	Confining Layer	STA Setback	Source
1	Drilled well						
2							
3							
4							

Additional Well Information:

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Site within 200' of noncommunity transient well (Y/N)	No	Yes, source:	
Site within a drinking water supply management area (Y/N)	No	Yes, source:	
Site in Well Head Protection inner wellhead management zone (Y/N)	No	Yes, source:	
Buried water supply pipes within 50 ft of proposed system (Y/N)	No		
B. Site located in a shoreland district/area?	Yes	Yes, name:	Hill Lake
Elevation of ordinary high water level:	ft	Source:	
Classification: Lake - General Development	Tank Setback: 75 ft.	STA Setback: 75 ft.	
C. Site located in a floodplain?	No	Yes, Type(s):	N/A
Floodplain designation/elevation (10 Year):	N/A ft	Source:	N/A
Floodplain designation/elevation (100 Year):	N/A ft	Source:	N/A

D. Property Line Id / Source: ☐ Owner ☐ Survey ☑ County GIS ☐ Plat Map ☐ Other:

E. ID distance of relevant setbacks on map: ☑ Water ☐ Easements ☑ Well(s) ☑ Building(s) ☑ Property Lines ☑ OHWL ☐ Other:

4. Preliminary Soil Profile Information From Web Soil Survey (attach map & description)

Map Units: 204C—Cushing loam — Slope Range: 6-12 %

List landforms: Moraines

Landform position(s): Backslope

Parent materials: Loamy till

Depth to Bedrock/Restrictive Feature: >80 in — Depth to Watertable: >80 in

Map Unit Ratings

Septic Tank Absorption Field- At-grade:	
Septic Tank Absorption Field- Mound:	
Septic Tank Absorption Field- Trench:	

5. Local Government Unit Information

Name of LGU:	Aitkin County Environmental Services
LGU Contact:	218-927-7342
LGU-specific setbacks:	
LGU-specific design requirements:	
LGU-specific installation requirements:	

Notes:

Field Evaluation Worksheet

University of Minnesota Onsite Sewage Treatment Program

MINNESOTA POLLUTION CONTROL AGENCY

1. Project Information

v 03.15.2023

Property Owner/Client:	Kevin & Ann Strasser	Project ID:	D24038
Site Address:	67179 348th Place Hill City, MN 55748	Date Completed:	5/7/2024

2. Utility and Structure Information

Utility Locations Identified ☐ Gopher State One Call # ☐ Any Private Utilities:

Locate and Verify (*see Site Evaluation map*) ☑ Existing Buildings ☐ Improvements ☐ Easements ☑ Setbacks

3. Site Information

Vegetation type(s):	Grass	Landscape position:	Back/ Side Slope
Percent slope:	6 %	Slope shape:	Linear, Linear
Slope direction:	west		

Describe the flooding or run-on potential of site: Mild flooding potential

Describe the need for Type III or Type IV system: Disturbed soils/high water table

Note:

Proposed soil treatment area protected? (Y/N): Yes If yes, describe: Staked and flagged

4. General Soils Information

Filled, Compacted, Disturbed areas (Y/N): Yes

If yes, describe: Disturbed soils on the edge of the hill that was created for fill for the pole building.

Soil observations were conducted in the proposed system location (Y/N): Yes

A soil observation in the most limiting area of the proposed system (Y/N): Yes

Number of soil observations: 3 Soil observation logs attached (Y/N): Yes

Percolation tests performed & attached (Y/N): No

5. Phase I. Reporting Information

	Depth		Elevation		
Limiting Condition*:	0	in	**97.4**	ft	**Most Restrictive Depth Identified from List Below*
Periodically saturated soil:	0	in	97.4	ft	Soil Texture: Loam
Standing water:		in		ft	Percolation Rate: min/inch
Bedrock:		in		ft	Soil Hyd Loading Rate: 0.6 gpd/sq.ft
Benchmark Elevation:	100.0	ft			Elevations and Benchmark on map? (Y/N): Yes

Benchmark Elevation Location: Screw in tree (flagged in blue)

Differences between soil survey and field evaluation: Differences in depth to restrictive layer & water table.

Site evaluation issues / comments:

Anticipated construction issues: Tank setting will likely be difficult due to a high water table.

Map Scale: 1:893 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 24, Sep 9, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 13, 2021—Aug 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
204B	Branstad loam, 2 to 6 percent slopes	0.8	24.8%
204C	Cushing loam, 6 to 12 percent slopes	2.3	73.3%
W	Water	0.1	1.9%
Totals for Area of Interest		**3.2**	**100.0%**

Aitkin County, Minnesota

204C—Cushing loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: gjfy
Elevation: 980 to 1,640 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cushing and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cushing

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

E - 0 to 12 inches: loam
B/E - 12 to 25 inches: loam
Bt1,Bt2 - 25 to 44 inches: loam
C - 44 to 60 inches: loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: High (about 9.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F090AY015WI - Loamy Upland with Carbonates
Forage suitability group: Sloping Upland, Acid (G090AN006MN)

Other vegetative classification: Sloping Upland, Acid (G090AN006MN)
Hydric soil rating: No

Minor Components

Alstad
Percent of map unit: 3 percent
Hydric soil rating: No

Cromwell
Percent of map unit: 3 percent
Hydric soil rating: No

Cutaway
Percent of map unit: 3 percent
Hydric soil rating: No

Hamre
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Seelyeville
Percent of map unit: 2 percent
Landform: Bogs
Hydric soil rating: Yes

Talmoon
Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 24, Sep 9, 2023

Aitkin County, Minnesota

204B—Branstad loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: gjfx
Elevation: 980 to 1,640 feet
Mean annual precipitation: 25 to 30 inches
Mean annual air temperature: 39 to 45 degrees F
Frost-free period: 120 to 140 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Branstad and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Branstad

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope, summit
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy till

Typical profile

A - 0 to 2 inches: loam
E,Bw,E',E/B - 2 to 17 inches: fine sandy loam
Bt1,Bt2 - 17 to 36 inches: loam
Bt3 - 36 to 43 inches: loam
C - 43 to 60 inches: loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 30 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F090AY015WI - Loamy Upland with Carbonates

Forage suitability group: Sloping Upland, Neutral (G090AN002MN)
Other vegetative classification: Sloping Upland, Neutral (G090AN002MN)
Hydric soil rating: No

Minor Components

Alstad
Percent of map unit: 3 percent
Hydric soil rating: No

Cromwell
Percent of map unit: 3 percent
Hydric soil rating: No

Cutaway
Percent of map unit: 3 percent
Hydric soil rating: No

Hamre
Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Seelyeville
Percent of map unit: 2 percent
Landform: Bogs
Hydric soil rating: Yes

Talmoon
Percent of map unit: 2 percent
Landform: Swales
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 24, Sep 9, 2023

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: D24038 v 03.15.2023

Client:	Kevin & Ann Strasser	Location / Address:	67179 348th Place Hill City, MN 55748

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill

Landscape Position:	Back/Side Slope	Slope %:	6.0	Slope shape:	Linear, Linear	Flooding/Run-On potential:	Yes
Vegetation:	Grass	Soil survey map units:	204C—Cushing loam			Surface Elevation-Relative to benchmark:	97.4
Date/Time of Day/Weather Conditions:		5/7/2024	12:00PM	Sunny		Limiting Layer Elevation:	97.4
Observation #/Location:	1	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	I-------- Structure----------I		
									Shape	Grade	Consistence
0-4	Loam	0	10YR	3/2	None		None	None	Granular	Moderate	Friable
4-10	Loam	0	10YR	4/4	10R	5/6	Concentrations	S2	Granular	Moderate	Friable
10-14	Loam	0	10YR	7/1	10R	4/6	Concentrations Depletions	S2	Granular	Moderate	Friable

Comments:

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

Walker Maasch	Walker Maasch	4199	5/7/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

Optional Verification: I hereby certify that this soil observation was verified according to Minn. R. 7082.0500 subp. 3 A. The signature below represents an infield verification of the periodically saturated soil or bedrock at the proposed soil treatment and dispersal site.

(LGU/Designer/Inspector)	(Signature)	(Cert #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: D24038 v 03.15.2023

Client:	Kevin & Ann Strasser	Location / Address:	67179 348th Place Hill City, MN 55748

Soil parent material(s): (Check all that apply) ☐ Outwash ☐ Lacustrine ☐ Loess ☑ Till ☐ Alluvium ☐ Bedrock ☐ Organic Matter ☐ Disturbed/Fill

Landscape Position:	Back/Side Slope	Slope %:	6.0	Slope shape:	Linear, Linear	Flooding/Run-On potential:	Yes
Vegetation:	Grass	Soil survey map units:	204C—Cushing loam			Surface Elevation-Relative to benchmark:	97.4
Date/Time of Day/Weather Conditions:		5/7/2024	12:00PM	Sunny		Limiting Layer Elevation:	97.4
Observation #/Location:	2	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	I-------- Structure----------I		
									Shape	Grade	Consistence
0-4	Loam	0	10YR	3/2	None		None	None	Granular	Moderate	Friable
4-10	Loam	0	10YR	4/4	10R	5/6	Concentrations	S2	Granular	Moderate	Friable
10-14	Loam	0	10YR	7/1	10R	4/6	Concentrations Depletions	S2	Granular	Moderate	Friable

Comments:

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

Walker Maasch	Walker Maasch	4199	5/7/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

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University of Minnesota Onsite Sewage Treatment Program

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Project ID: D24038 v 03.15.2023

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Landscape Position:	Back/Side Slope	Slope %:	6.0	Slope shape:	Linear, Linear	Flooding/Run-On potential:	Yes
Vegetation:	Grass	Soil survey map units:	204C—Cushing loam			Surface Elevation-Relative to benchmark:	97.4
Date/Time of Day/Weather Conditions:		5/7/2024	12:00PM	Sunny		Limiting Layer Elevation:	97.4
Observation #/Location:	3	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)		Mottle Color(s)		Redox Kind(s)	Indicator(s)	I-------- Structure----------I		
									Shape	Grade	Consistence
0-4	Loam	0	10YR	3/2	None		None	None	Granular	Moderate	Friable
4-10	Loam	0	10YR	4/4	10R	5/6	Concentrations	S2	Granular	Moderate	Friable
10-14	Loam	0	10YR	7/1	10R	4/6	Concentrations Depletions	S2	Granular	Moderate	Friable

Comments:

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Walker Maasch	Walker Maasch	4199	5/7/2024
(Designer/Inspector)	(Signature)	(License #)	(Date)

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(LGU/Designer/Inspector)	(Signature)	(Cert #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

1. PROJECT INFORMATION

v 03.15.2023

Property Owner/Client:	Kevin & Ann Strasser	Project ID:	D24038
Site Address:	67179 348th Place Hill City, MN 55748	Date:	05/07/24
Email Address:	strasserfamily@live.com	Phone:	763-350-2171

2. DESIGN FLOW & WASTE STRENGTH

Attach waste strength data/estimated strength for Other Establishments

Design Flow: 300 GPD Anticipated Waste Type: Residential

BOD: 170 mg/L TSS: 60 mg/L Oil & Grease: 25 mg/L

Treatment Level: C *Select Treatment Level C for residential septic tank effluent*

3. HOLDING TANK SIZING

Minimum Capacity: Residential =1000 gal or 400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

Code Minimum **Holding Tank** Capacity: _____ Gallons with _____ Tanks or Compartments

Recommended **Holding Tank** Capacity: _____ Gallons with _____ Tanks or Compartments

Type of High Level Alarm: _____ (Set @ 75% tank capacity)

Comments: _____

4. SEPTIC TANK SIZING

A. Residential dwellings:

Number of Bedrooms (Residential): 2

Code Minimum **Septic Tank** Capacity: 1000 Gallons with 1 Tanks or Compartments

Recommended **Septic Tank** Capacity: 1000 Gallons with 1 Tanks or Compartments

Effluent Screen & Alarm (Y/N): Yes Model/Type: SJE Rhombus PS Patrol

B. Other Establishments:

Waste received by: _____ _____ GPD x _____ Days Hyd. Retention Time

Code Minimum **Septic Tank** Capacity: _____ Gallons with _____ Tanks or Compartments

Recommended **Septic Tank** Capacity: _____ Gallons with _____ Tanks or Compartments

Effluent Screen & Alarm (Y/N): _____ Model/Type: _____

*** Other Establishments Require Department of Labor and Industry Approval and Inspection for Building Sewer ***

5. PUMP TANK SIZING

Soil Treatment Dosing Tank				Other Component Dosing Tank:			
Pump Tank Capacity (Minimum):	500	Gal		Pump Tank Capacity (Minimum):		Gal	
Pump Tank Capacity (Recommended):	500	Gal		Pump Tank Capacity (Recommended):		Gal	
Pump Req:	18.0 GPM	Total Head	20.5 ft	Pump Req:	GPM	Total Head	ft
Supply Pipe Dia.	2.00 in	Dose Vol:	75.0 gal	Supply Pipe Dia.	in	Dose Vol:	Gal

*** Flow measurement device must be incorporated for any system with a pump: Elapsed Time Meter and/or Event Counter ***

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

6. SYSTEM AND DISTRIBUTION TYPE

Project ID: D24038

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	100.0 ft	Benchmark Location:	Screw in tree (flagged in blue)
MPCA System Type:	Type III	Distribution Media:	Rock
Type III/IV/V Details:	3' sand lift		

7. SITE EVALUATION SUMMARY:

Describe Limiting Condition: Redoximorphic Features/Saturated Soils

Layers with >35% Rock Fragments? (yes/no) No If yes, describe below: % rock and layer thickness, amount of soil credit and any additional information for addressing the rock fragments in this design.

Note:

	Depth		Depth		Elevation of Limiting Condition		
Limiting Condition:	0	inches	0.0	ft	97.40	ft	***Critical for system compliance***
Minimum Req'd Separation:	36	inches	3.0	ft			*Distribution Elevation >Code Max Depth*
					Elevation		
Code Max System Depth*:	Mound	inches	-3.0	ft	100.40	ft	**Elevation OK**

*This is the maximum depth to the bottom of the distribution media for required separation. Negative Depth (ft) requires a mound.

Designed Distribution Elevation: 100.4 ft Minimum Sand Depth: 36.0 inches

A. Soil Texture: Loam B. Organic Loading Rate (optional): lbs/sq.ft/day **0**

C. Soil Hyd. Loading Rate: 0.60 GPD/ft^2 D: Percolation Rate: MPI

E. Contour Loading Rate: 12 Note:

F. Measured Land Slope: 6.0 % Note:

Comments:

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area		sq.ft	Sidewall Depth		in	Trench Width	ft
Total Lineal Feet		ft	No. of Trenches			Code Max. Trench Depth	in
Contour Loading Rate		ft	Minimum Length		ft	Designed Trench Depth	in

Bed:

Dispersal Area		sq.ft	Sidewall Depth		in	Maximum Bed Depth	in
Bed Width		ft	Bed Length		ft	Designed Bed Depth	in

Mound:

Dispersal Area	250.0	sq.ft	Bed Length	25.0	ft	Bed Width	10.0 ft
Absorption Width	10.0	ft	Clean Sand Lift	3.0	ft	Berm Width (0-1%)	ft
Upslope Berm Width	12.7	ft	Downslope Berm	20.5	ft	Endslope Berm Width	16.8 ft
Total System Length	58.6	ft	System Width	43.2	ft	Contour Loading Rate	12.0 gal/ft

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: D24038

At-Grade:

Dispersal Area		sq.ft	Bed Length		ft	Bed Width		ft
Upslope Berm		ft	Downslope Berm		ft	Finished Height		ft
System Length		ft	Endslope Berm		ft	System Width		ft

Level & Equal Pressure Distribution Soil Treatment Area

No. of Laterals	3		Lateral Diameter	2.00	in	Lateral Spacing	3	ft
Perforation Spacing	3	ft	Perforation Diameter	1/4	in	Drainback Volume	7	gal
Min Dose Volume	47	gal	Max Dose Volume	75	gal	Total Dosing Volume	82	gal

Non-Level and Unequal Pressure Distribution Soil Treatment Area

	Elevation (ft)	Pipe Size (in)	Pipe Volume (gal/ft)	Pipe Length (ft)	Perf Size (in)	Spacing (ft)	Spacing (in)
Lateral 1							
Lateral 2							
Lateral 3							
Lateral 4							
Lateral 5							
Lateral 6							

Minimum Dose Volume: gal

Maximum Dose Volume: gal

Total Dosing Volume: gal

9. Organic Loading and Additional Info for At-Risk, HSW or Type IV Design

Organic Loading to Soil Treatment

A. Starting BOD Concentration = Design Flow X 0.7 X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

gpd X mg/L X 8.35 ÷ 1,000,000 = lbs. BOD/day (Organic Loading Design)

B. Organic Loading to Soil Treatment Area: (enter loading value in 7B)

mg/L X gpd X 0.7 X 8.35 ÷ 1,000,000 ÷ sq.ft = lbs./day/sqft

HSW Technology Strength Reduction

A. Starting BOD Concentration = Design Flow X Starting BOD (mg/L) X 8.35 ÷ 1,000,000

gpd X mg/L X 8.35 ÷ 1,000,000 = lbs. BOD/day (HSW Technology Design)

B. Target BOD Concentration = Design Flow X Target BOD (mg/L) X 8.35 ÷ 1,000,000

gpd X mg/L X 8.35 ÷ 1,000,000 = lbs. BOD/day (HSW Technology Design)

Lbs. BOD To Be Removed: lbs. BOD/day (HSW Technology Design)

Pretreatment Technology: *Must Meet or Exceed Target

Disinfection Technology: *Required for Levels A & B

10. Comments/Special Design Considerations:

The design is for a future 2-bedroom cabin/dwelling to be built. The system will serve an existing camper in the meantime.

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

Walker Maasch	Walker Maasch	4199	5/27/2024
(Designer)	(Signature)	(License #)	(Date)

Mound Design Worksheet
≥1% Slope

University of Minnesota Onsite Sewage Treatment Program

Minnesota Pollution Control Agency

1. SYSTEM SIZING: Project ID: D24038 v 03.15.2023

A. Design Flow:	300	GPD
B. Soil Loading Rate:	0.60	GPD/sqft
C. Depth to Limiting Condition	0.0	ft
D. Percent Land Slope:	6.0	%
E. Media (Sand) Loading Rate:	1.2	GPD/sqft
F. Mound Absorption Ratio:	1.00	

Table I
MOUND CONTOUR LOADING RATES:

Measured Perc Rate	← OR →	Texture - derived mound absorption ratio		Contour Loading Rate:
≤ 60mpi		1.0, 1.3, 2.0, 2.4, 2.6	→	≤12
61-120 mpi	← OR →	5.0	→	≤12
≥ 120 mpi*		>5.0*	→	≤6*

TABLE IXa
LOADING RATES FOR DETERMINING BOTTOM ABSORPTION AREA AND ABSORPTION RATIOS USING PERCOLATION TESTS

Percolation Rate (MPI)	Treatment Level C		Treatment Level A, A-2, B,	
	Absorption Area Loading Rate (gpd/ft²)	Mound Absorption Ratio	Absorption Area Loading Rate (gpd/ft²)	Mound Absorption Ratio
<0.1	-	1	-	1
0.1 to 5	1.2	1	1.6	1
0.1 to 5 (fine sand and loamy fine sand)	0.6	2	1	1.6
6 to 15	0.78	1.5	1	1.6
16 to 30	0.6	2	0.78	2
31 to 45	0.5	2.4	0.78	2
46 to 60	0.45	2.6	0.6	2.6
61 to 120	-	5	0.3	5.3
>120	-	-	-	-

*Systems with these values are not Type I systems. Contour Loading Rate (linear loading rate) is a recommended value.

2. DISPERSAL MEDIA SIZING

A. Hydraulic Absorption Required Bottom Area: Design Flow (1A) ÷ Design Media Loading Rate(1E)

300 GPD ÷ 1.2 GPD/sqft = 250 sq.ft

Organic Sizing (OPTIONAL)

B. Organic Absorption Bed Area = Organic Loading (Summary 9A) ÷ Organic Soil Loading Rate (Summary 7B)

lbs BOD ÷ lbs BOD/sq.ft = sq.ft

C. Required Bed Area = Greater of Hydraulic (1D) or Organic Bed Area (1E) 250 sq.ft

D. Designed Dispersal Media Area: 250 sq.ft *Optional upsizing of area to be larger than 2C*

B. Enter Dispersal Bed Width: 10.0 ft *Can not exceed 10 feet*

C. Calculate Contour Loading Rate: Bed Width(2B) X Design Media Loading Rate(1E)

10 ft X 1.2 GPD/sqft = 12.0 gal/ft *Can not exceed Table 1*

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area(2A) ÷ Bed Width(2B)

250 sqft ÷ 10.0 ft = 25.0 ft

If a larger dispersal media Length is desired, enter size: ft

3. ABSORPTION AREA SIZING

A. Calculate Absorption Width: Bed Width(2B) X Mound Absorption Ratio(1F)

10.0 ft X 1.0 = 10.0 ft

B. For slopes >1%, the Absorption Width is measured downhill from the upslope edge of the Bed.

Calculate Downslope Absorption Width: Absorption Width(1F) - Bed Width(2B)

10.0 ft - 10.0 ft = ft

4. DISTRIBUTION MEDIA:

Project ID: D24038

Select Dispersal Media: Rock — Enter Either 4A or 4B

A. Rock Depth Below Distribution Pipe

6 in

B. Registered Media

Registered Media Depth in

Check registered product information for specific application details and design

Specific Media Comments:

5. MOUND SIZING

Project ID: D24038

A. Clean Sand Lift: Required Separation - Depth to Limiting Condition = Clean Sand Lift (1 ft minimum)

3.0 ft - ft = 3.0 ft Design Sand Lift (optional): 3 ft

B. Upslope Height: Clean Sand Lift(6A) + Depth of Media(4AorB) +Depth to Cover Pipe+ Depth of Cover (1 ft)

3.0 ft + 0.50 ft + 0.5 ft + 1.0 ft = 5.0 ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Upslope Berm Ratio	3:1	3.00	2.91	2.83	2.75	2.68	2.61	2.54	2.48	2.42	2.36	2.31	2.26	2.21
	4:1	4.00	3.85	3.70	3.57	3.45	3.33	3.23	3.12	3.03	2.94	2.86	2.78	2.70

C. Select Upslope Berm Multiplier (based on land slope): 2.54

D. Calculate Upslope Berm Width: Multiplier (5C) X Upslope Mound Height (5B)

2.54 X 5.0 ft = 12.7 ft

E. Calculate Drop in Elevation Under Bed: Bed Width(2B) X Land Slope(1D) ÷ 100 = Drop (ft)

10.0 ft X 6.0 % ÷ 100 = 0.60 ft

F. Calculate Downslope Mound Height: Upslope Height(5B) + Drop in Elevation(5E)

5.0 ft + 0.60 ft = 5.6 ft

Land Slope %		0	1	2	3	4	5	6	7	8	9	10	11	12
Downslope Berm Ratio	3:1	3.00	3.09	3.19	3.30	3.41	3.53	3.66	3.80	3.95	4.11	4.29	4.48	4.69
	4:1	4.00	4.17	4.35	4.54	4.76	5.00	5.26	5.56	5.88	6.25	6.67	7.14	7.69

G. Select Downslope Berm Multiplier (based on land slope): 3.66

H. Calculate Downslope Berm Width: Downslope Multiplier(5G) X Downslope Height (5F)

3.66 x 5.6 ft = 20.5 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width(3A) + 4 feet

ft + 4 ft = 4.0 ft

J. Design Downslope Berm = greater of 5H and 5I: 20.5 ft

K. Select Endslope Berm Multiplier: 3.00 *(usually 3.0 or 4.0)*

L. Calculate Endslope Berm Width = Endslope Berm Multiplier(5K) X Downslope Mound Height(5F)

3.00 X 5.6 ft = 16.8 ft

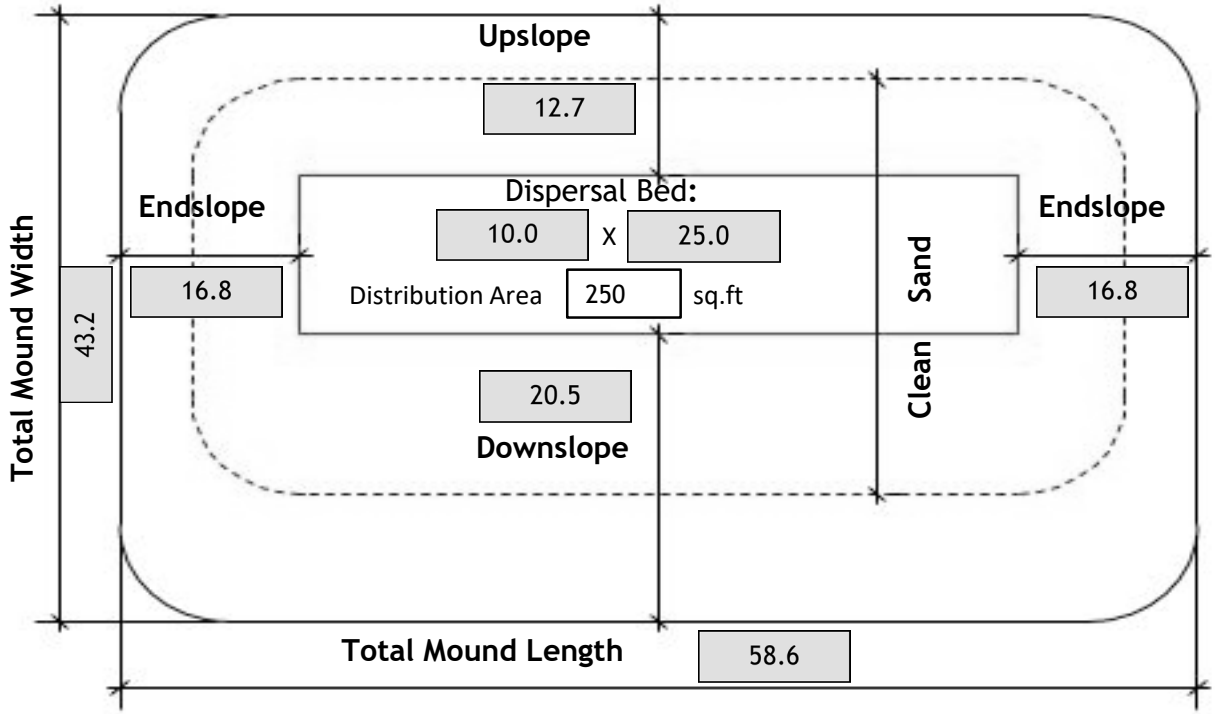
M. Calculate Mound Width: Upslope Berm Width(5D) + Bed Width(2B) + Downslope Berm Width(5J)

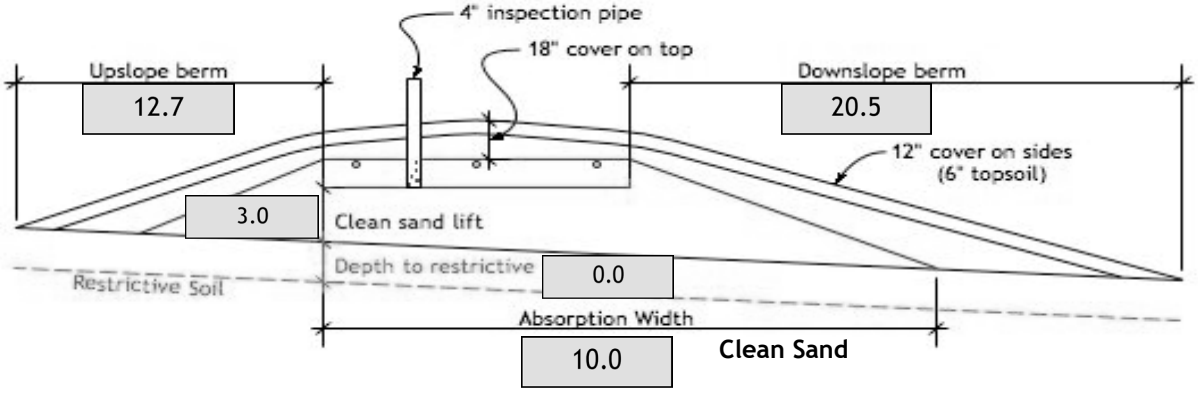
12.7 ft + 10.0 ft + 20.5 ft = 43.2 ft

N. Calculate Mound Length: Endslope Berm Width (5L) + Bed Length(2D) + Endslope Berm Width(5L)

16.8 ft + 25.0 ft + 16.8 ft = 58.6 ft

6. MOUND DIMENSIONS (Feet) Project ID: D24038





Elevation to Benchmark

Required Separation:	36	(in)	Elevation Limiting Layer:	97.4	ft
Distribution Media:	Rock		Elevation required Separation:	100.4	ft
Media Depth:	6.0	(in)	Elevation Distribution Media Bottom:	100.4	ft
Manifold Connection:	End		Elevation Top of Media(min):	101.4	ft
Lateral Pipe Diameter:	2.00	(in)	Elevation Top of System(min):	102.4	ft
Perforation Size:	1/4	(in)	Perforation Spacing:	36.0	(in)

If Split and Non-Level Pressure Distribution Used: See Non-Level Pressure Distribution Form

Comments:

University of Minnesota Onsite Sewage Treatment Program

Mound Materials Worksheet

Minnesota Pollution Control Agency

Project ID: D24038 v 03.15.2023

A. Rock *Volume* : (Rock Below Pipe + Rock to cover pipe (*pipe outside dia + ~2 inch)*) X *Bed Length* X *Bed Width* = *Volume*

(6 in + 5.0 in) ÷ 12 X 25.0 ft X 10.0 ft = 229.2 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 229.2 cu.ft ÷ 27 = 8.5 cu.yd

Add 30% for constructability: 8.5 cu.yd X 1.3 = 11.0 cu.yd

B. Calculate *Clean Sand Volume:*

Volume Under Rock bed : *Average Sand Depth* x *Media Width* x *Media Length* = cubic feet

3.3 ft X 10.0 ft X 25 ft = 825 cu.ft

For a Mound on a slope from 0-1%

Volume from Length = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Length)

5.00 ft - 1) X X ft = 6.0

Volume from Width = ((Upslope Mound Height - 1) X Absorption Width Beyond Bed X Media Bed Width)

5.00 ft - 1) X X 10 ft = 6.0

Total Clean Sand Volume : *Volume from Length + Volume from Width + Volume Under Media*

6.0 cu.ft + 6.0 cu.ft + 825.0 cu.ft = 837.0 cu.ft

For a Mound on a slope greater than 1%

Upslope Volume : ((*Upslope Mound Height - 1*) x 3 x *Bed Length*) ÷ 2 = cubic feet

((5.0 ft - 1) X 3.0 ft X 25.0) ÷ 2 = 150.0 cu.ft

Downslope Volume : ((*Downslope Height - 1)* x Downslope Absorption Width x *Media Length*) ÷ 2 = cubic feet

((5.6 ft - 1) X ft X 25.0) ÷ 2 = cu.ft

Endslope Volume : (*Downslope Mound Height - 1)* x 3 x *Media Width* = cubic feet

(5.6 ft - 1) X 3.0 ft X 10.0 ft = 138.0 cu.ft

Total Clean Sand Volume : *Upslope Volume + Downslope Volume + Endslope Volume + Volume Under Media*

150.0 cu.ft + cu.ft + 138.0 cu.ft + 825.0 cu.ft = 1113.0 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 1113.0 cu.ft ÷ 27 = 41.2 cu.yd

Add 30% for constructability: 41.2 cu.yd X 1.3 = 53.6 cu.yd

C. Calculate *Sandy Berm Volume:*

Total Berm Volume (approx.) : ((Avg. Mound Height - 0.5 ft topsoil) x Mound Width x Mound Length) ÷ 2

(5.3 - 0.5)ft X 43.2 ft X 58.6) ÷ 2 = 6075.1 cu.ft

Total Mound Volume - Clean Sand volume -Rock Volume = cubic feet

6075.1 cu.ft - 1113.0 cu.ft - 229.2 cu.ft = 4732.9 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 4732.9 cu.ft ÷ 27 = 175.3 cu.yd

Add 30% for constructability: 175.3 yd^3 x 1.3 = 227.9 cu.yd

D. Calculate *Topsoil Material Volume: Total Mound Width X Total Mound Length X .5 ft*

43.2 ft X 58.6 ft X 0.5 ft = 1265.6 cu.ft

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards: 1265.6 cu.ft ÷ 27 = 46.9 cu.yd

Add 30% for constructability: 46.9 cu.yd X 1.3 = 60.9 cu.yd

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: D24038 v 03.15.2023

1. Media Bed Width: 10 ft

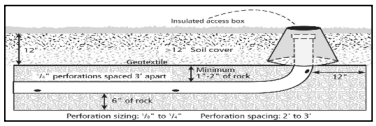
2. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width - 4) ÷ 3] + 1.

[(10 - 4) ÷ 3] + 1 = 3 laterals *Does not apply to at-grades*

3. Designer Selected *Number of Laterals*: 3 laterals
Cannot be less than line 2 (Except in at-grades)

4. Select *Perforation Spacing*: 3.00 ft

5. Select *Perforation Diameter Size:* 1/4 in



6. *Length of Laterals* = Media Bed Length(1.) - 2 Feet.

25.0 - 2ft = 23.0 ft *Perforation can not be closer then 1 foot from edge.*

7. Determine the *Number of Perforation Spaces*. Divide the *Length of Laterals(6.)* by the *Perforation Spacing* (4.) and round down to the nearest whole number.

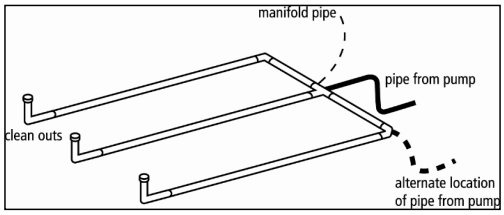
Number of Perforation Spaces = 23.0 ft ÷ 3.0 ft = 7 Spaces

8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces(7.)*. Check table below to verify the number of perforations per lateral guarantees less than a 10% discharge variation. The value is double with a center manifold.

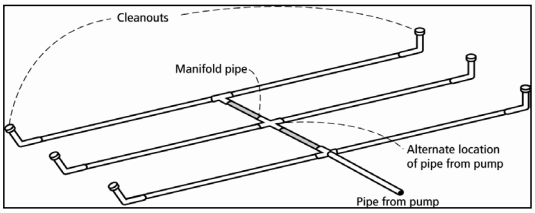
Perforations Per Lateral = 7 Spaces + 1 = 8 Perfs. Per Lateral

Maximum Number of Perforations Per Lateral to Guarantee <10% Discharge Variation

¼ Inch Perforations						7/32 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	10	13	18	30	60	2	11	16	21	34	68
2½	8	12	16	28	54	2½	10	14	20	32	64
3	8	12	16	25	52	3	9	14	19	30	60
3/16 Inch Perforations						1/8 Inch Perforations					
Perforation Spacing (Feet)	Pipe Diameter (Inches)					Perforation Spacing (Feet)	Pipe Diameter (Inches)				
	1	1¼	1½	2	3		1	1¼	1½	2	3
2	12	18	26	46	87	2	21	33	44	74	149
2½	12	17	24	40	80	2½	20	30	41	69	135
3	12	16	22	37	75	3	20	29	38	64	128



END Connection



CENTER Connection

Perf Per Lateral: 8

Perf Per Lateral Equal Split: 4 | 4

OPTIONAL Perf Per Lateral Non-Equal Split*: ____ | ____

* must not exceed maximum number perfs per lateral in table

9. *Total Number of Perforations* equals the *Number of Perforations per Lateral (8.)* multiplied by the *Number of Perforated Laterals.(3.)*

8 Perf. Per Lat. X 3 Number of Perf. Lat. = 24 Total Number of Perf.

10. Spacing of laterals; Must be greater than 1 foot and no more than 3 feet: 3.0 ft

11. Select *Type of Manifold Connection* (End or Center): End

12. *Select Lateral Diameter (See Table)*: 2.00 in

If Center Manifold Connection the max number of perfs per lateral in the table can be doubled.

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

13. Calculate the *Square Feet per Perforation.*

Recommended value is 4-11 ft2 per perforation, Does not apply to At-Grades

a. *Bed Area* = Bed Width (ft) X Bed Length (ft)

10	ft X	25	ft =	250	sq.ft

b. *Square Foot per Perforation* = *Bed Area* ÷ by the *Total Number of Perfs*

250	sqft ÷	24	perf =	10.4	sq.ft/perf

14. Select *Minimum Average Head*: 1.0 ft

15. Select *Perforation Discharge* based on Table: 0.74 GPM per Perf

16. *Flow Rate* = *Total Number of Perfs(9.) X Perforation Discharge(15.)*

24	Perfs X	0.74	GPM per Perforation =	18	GPM

17. *Volume of Liquid Per Foot of Distribution Piping (Table II)*: 0.170 Gallons/ft

18. *Volume of Distribution Piping* = *Number of Perforated Laterals(3.) X Length of Laterals(6.) X Volume of Liquid Per Foot of Distribution Piping (17.)*

3	X	23	ft X	0.170	gal/ft =	11.7	Gallons

19. Minimum Delivered Volume = Volume of Distribution Piping X 4

11.7	gals X	4	=	46.9 Gallons

20. Maximum Delivered Volume = Design flow x 25%

300.0	gpd X	25%	=	75.0 Gallons

21. Minimum Delivered vs Maximum Delivered evaluation: Volume ratio correct

Perforation Discharge (GPM)				
Head (ft)	Perforation Diameter			
	1/8	3/16	7/32	1/4
1.0[a]	0.18	0.41	0.56	0.74
1.5	0.22	0.51	0.69	0.9
2.0[b]	0.26	0.59	0.80	1.04
2.5	0.29	0.65	0.89	1.17
3.0	0.32	0.72	0.98	1.28
4.0	0.37	0.83	1.13	1.47
5.0[c]	0.41	0.93	1.26	1.65

1 foot	Dwellings with 3/16 inch to 1/4 inch perforations
2 feet	Dwellings with 1/8 inch perforations
	Other establishments and MSTS with 3/16 inch to 1/4 inch perforations
5 feet	Other establishments and MSTS with 1/8 inch perforations

Table II
Volume of Liquid in Pipe

Pipe Diameter (inches)	Liquid Per Foot (Gallons)
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

Comments/Special Design Considerations:

Basic STA Pump Selection Design Worksheet

University of Minnesota Onsite Sewage Treatment Program

Minnesota Pollution Control Agency

1. PUMP CAPACITY Project ID: D24038 v 03.15.2023

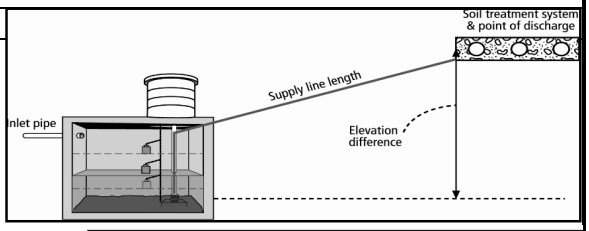
Pumping to Gravity or Pressure Distribution: Pressure

A. If pumping to gravity enter the gallon per minute of the pump: _____ GPM *(10 - 45 gpm)*

B. If pumping to a pressurized distribution system: 18.0 GPM

C. Enter pump description: Demand Dosing

2. HEAD REQUIREMENTS



A. Elevation Difference between pump and point of discharge: 15 ft

B. Distribution Head Loss: 5 ft

C. Additional Head Loss*: _____ ft (due to special equipment, etc.)

*** Common additional head loss: gate valve = 1 ft each, globe valve = 1.5 ft each, splitter valve = see manufacturers details**

Distribution Head Loss	
Gravity Distribution = 0ft	
Pressure Distribution based on Minimum Average Head Value on Pressure Distribution Worksheet:	
Minimum Average Head	**Distribution Head Loss**
1ft	5ft
2ft	6ft
5ft	10ft

Table I. Friction Loss in Plastic Pipe per 100ft

Flow Rate (GPM)	Pipe Diameter (inches)			
	1	1.25	1.5	2
10	9.1	3.1	1.3	0.3
12	12.8	4.3	1.8	0.4
14	17.0	5.7	2.4	0.6
16	21.8	7.3	3.0	0.7
18		9.1	3.8	0.9
20		11.1	4.6	1.1
25		16.8	6.9	1.7
30		23.5	9.7	2.4
35			12.9	3.2
40			16.5	4.1
45			20.5	5.0
50				6.1
55				7.3
60				8.6
65				10.0
70				11.4
75				13.0
85				16.4
95				20.1

D. 1. Supply Pipe Diameter: 2.0 in

2. Supply Pipe Length: 40 ft

E. **Friction Loss in Plastic Pipe per 100ft** from Table I:

Friction Loss = 0.92 ft per 100ft of pipe

F. Determine *Equivalent Pipe Length* from pump discharge to soil dispersal area discharge point. Estimate by adding 25% to supply pipe length for fitting loss.
Supply Pipe Length X 1.25 = *Equivalent Pipe Length*

40 ft X 1.25 = 50.0 ft

G. Calculate *Supply Friction Loss* by multiplying *Friction Loss Per 100ft(E.)* by the *Equivalent Pipe Length(F.)* and divide by 100.

Supply Friction Loss =

0.92 ft per 100ft X 50.0 ft ÷ 100 = 0.5 ft

H. *Total Head* requirement is the sum of the *Elevation Difference(2A)* + Distribution Head Loss(2B) + Additional Head Loss(2C) + Supply Friction Loss(2G)

15.0 ft + 5.0 ft + _____ ft + 0.5 ft = 20.5 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **18.0** GPM with at least **20.5** feet of total head.

Comments:

University of Minnesota Onsite Sewage Treatment Program

STA Dosing Pump Tank Design Worksheet (Demand Dose)

MINNESOTA POLLUTION CONTROL AGENCY

DETERMINE TANK CAPACITY AND DIMENSIONS Project ID: D24038 v 03.15.2023

1. A. *Design Flow (Design Sum.1A)*: 300 GPD C. Tank Use: **Dosing**
   B. Min. required pump tank capacity: 500 Gal D. Recommended pump tank capacity: 500 Gal

2. A. Tank Manufacturer: W. W. Thompson Concrete Products B. Tank Model: 1,500 Gallon Combo Tank
   C. Capacity from manufacturer: 500 Gallons
   D. Gallons per inch from manufacturer: 11.6 Gallons per inch
   E. Liquid depth of tank from manufacturer: 46.5 inches

Note: Design calculations are based on this specific tank. Substituting a different tank model will change the pump float or timer settings. Contact designer if changes are necessary.

DETERMINE DOSING VOLUME

3. Calculate *Volume to Cover Pump* (The inlet of the pump must be at least 4-inches from the bottom of the pump tank & 2 inches of water covering the pump is recommended)

   (Pump and block height + 2 inches) X *Gallons Per Inch* (2D)

   (16.1 in + 2 inches) X 11.6 Gallons Per Inch = 210 Gallons

4. ***Minimum** Delivered Volume* = 4 X Volume of Distribution Piping:

   -Item 19 of the Pressure Distribution STA or Item 11 of Non-level STA 47 **Gallons (Minimum dose)** 4.0 inches/dose

5. Calculate ***Maximum** Pumpout Volume* (25% of Design Flow(1A))

   Design Flow: 300 GPD X 0.25 = 75 **Gallons (Maximum dose)** 6.5 inches/dose

6. *Select a pumpout volume that meets both Minimum and Maximum:* 75 Gallons

7. Calculate *Doses Per Day* = Design Flow(1A) ÷ *Delivered Volume(6.)*

   300 gpd ÷ 75 gal = 4.00 *Doses**

   *** Doses need to be equal to or greater than 4**

8. Calculate Drainback:
   A. *Diameter of Supply Pipe* = 2 inches
   B. Length of Supply Pipe = 40 feet
   C. *Volume of Liquid Per Lineal Foot of Pipe* = 0.170 Gallons/ft
   D. *Drainback = Length of Supply Pipe(8B) X Volume of Liquid Per Lineal Foot of Pipe(8C)*

   40 ft X 0.170 gal/ft = 6.8 Gallons

9. *Total Dosing Volume = Delivered Volume(6.) + Drainback* (8D)

   75 gal + 6.8 gal = 82 Gallons

10. Minimum Alarm Volume = Depth of alarm (2 or 3 inches) X gallons per inch of tank(2D)

    2 in X 11.6 gal/in = 23.2 Gallons

11. Reserve Capacity Volume = [Tank Liquid Depth(2E) - Alarm Float Depth(10.)] x gallons per inch of tank(2D)

    [46.5 in - 27.2 in] X 11.6 gal/in = 224.4 Gallons

Volume of Liquid in Pipe	
Pipe Diameter (inches)	**Liquid Per Foot (Gallons)**
1	0.045
1.25	0.078
1.5	0.110
2	0.170
3	0.380
4	0.661

DEMAND DOSE FLOAT SETTINGS **Alarm and Pump are to be wired on separate circuits and inspected by the electrical inspector**

12. Calculate *Float Separation Distance* using *Dosing Volume*.

    Total Dosing Volume(9.) ÷ Gallons Per Inch(2D)

    82 gal ÷ 11.6 gal/in = 7.1 inches

13. Measuring from bottom of tank:
    A. *Distance to set Pump Off Float* = Pump + block height + 2 inches

    16.1 in + 2 in = 18 inches

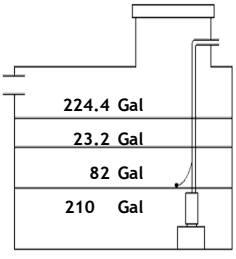
    B. *Distance to set Pump On Float=Distance to Set Pump-Off Float(13A) + Float Separation Distance(12.)*

    18 in + 7.1 in = 25 inches

    C. *Distance to set Alarm Float = Distance to set Pump-On Float(13B) + Alarm Depth* (2-3 inches)(10.)

    25 in + 2.0 in = 27 inches

Inches for Dose: 7.1 in
Alarm Depth 27.2 in
Pump On 25.2 in
Pump Off 18.1 in



University of Minnesota Onsite Sewage Treatment Program

Tank Buoyancy Worksheet

Minnesota Pollution Control Agency

1. Tank Specifications

Project ID: D24038 v 03.15.2023

A. Tank Manufacturer: W. W. Thompson Concrete Products Tank Model: 1,500-Gallon Combo Tank

B. Outside Tank Dimensions and Specifications: Tank Use: Septic/Dosing Combo

Length:	146	in	Width:	67	in	Height:	59	in	Diameter:		in
Length:	12.2	ft	Width:	5.6	ft	Height:	4.9	ft	Radius of Tank:		in

2. Outside Volume of Tank

Rectangular Tank	Circular Tank
A. Area of Tank = Length (ft) X Width (ft)	A. Area of Tank = πr^2 = (3.14 X (Radius of Tank)^2)
12.2 ft X 5.6 ft = 67.9 sq.ft	3.14 X (ft)^2 = sq.ft
B. Volume of Tank = Area of Tank (2.A) X Height (ft)	B. Volume of Tank = Area of Tank X Height (ft)
67.9 sq.ft X 4.9 ft = 334.0 cu.ft	sq.ft X ft = cu.ft

3. Force of Tank Weight (F_{TW})

Weight of Tank (provided by manufacturer) 11300 lbs

4. Force of Soil Weight Over Tank (F_{SW})

A. Depth of Cover Over Tank: 26 in 2.2 ft

B. Weight of Soil Per Cubic Foot: 100 lbs/cu.ft

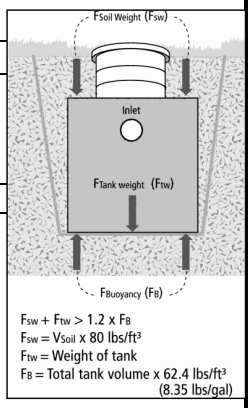
C. Volume of Soil Over Tank = Depth of Cover(4A) (ft) X Area of Tank(2A) (ft^2)

2.2 ft X 67.9 sq.ft = 147.2 cu.ft

D. Weight of Soil Over Tank = Volume of Soil Over Tank(4C) X Weight of Soil Per Cubic Foot

147.2 cu.ft X 100 lbs/cu.ft = 14,718.3 lbs *Note: Assumes saturation does not get over the lid of the tank*

Soil Type	Weight of Soil (lbs/ft^3)
Sandy	120
Loamy	100
Clay	90



5. Buoyant Force (F_B)

Buoyant Force (F_B) = Outside Volume of Tank(2B) X Weight of Water Per Cubic Foot (62.4 lbs/ft^3) X 1.2 (Safety Factor)

334 X 62.4 lbs/cu.ft X 1.2 = 25,009.3 lbs

6. Evaluation of Net Forces

A. Downward Force = Force of Tank Weight (F_{TW})(3.) + Force of Soil Weight of Soil (F_{SW})(4.)

11300 lbs + 14718 lbs = 26,018.3 lbs

B. Net Difference = Downward Force(6A) - Buoyant Force Including Safety Factor (5.)

26018 lbs - 25009 lbs = 1,009.0 lbs

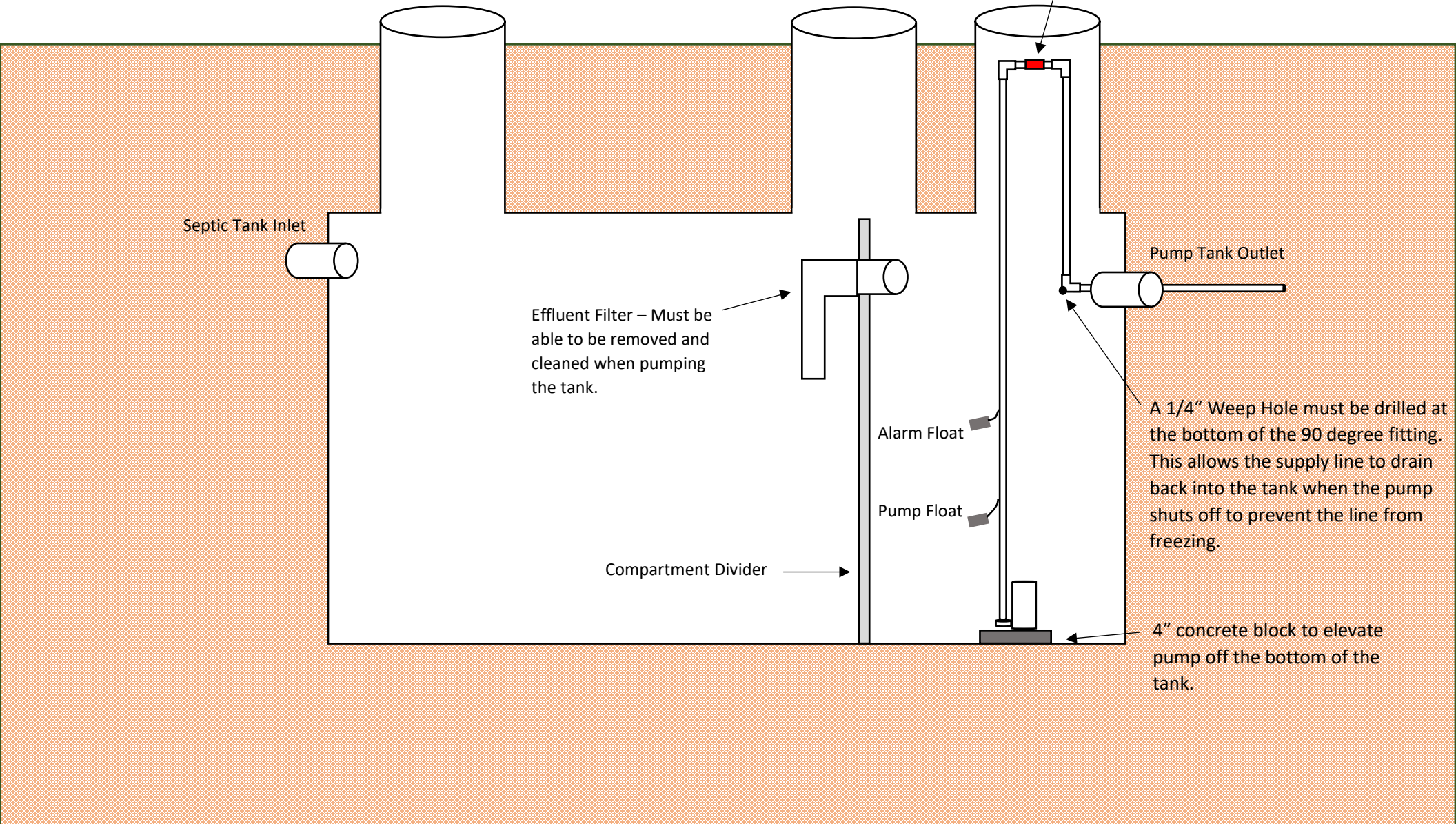
If the Net Difference is negative, counter measures will need to be taken to prevent the tank from floating out of the ground.

Comments/Solution:

The tank should have at least 26" of soil on top of it to ensure it will stay in the ground when the tank is emptied.

Septic / Pump Tank Schematic

Bringing the supply line for the pump up near the ground surface through the tank riser is important because it allows for easy maintenance and replacement of the pump if necessary. If the supply line goes straight out the pump tank outlet before coming up through the riser, it can be difficult or impossible to reach the pump for maintenance.



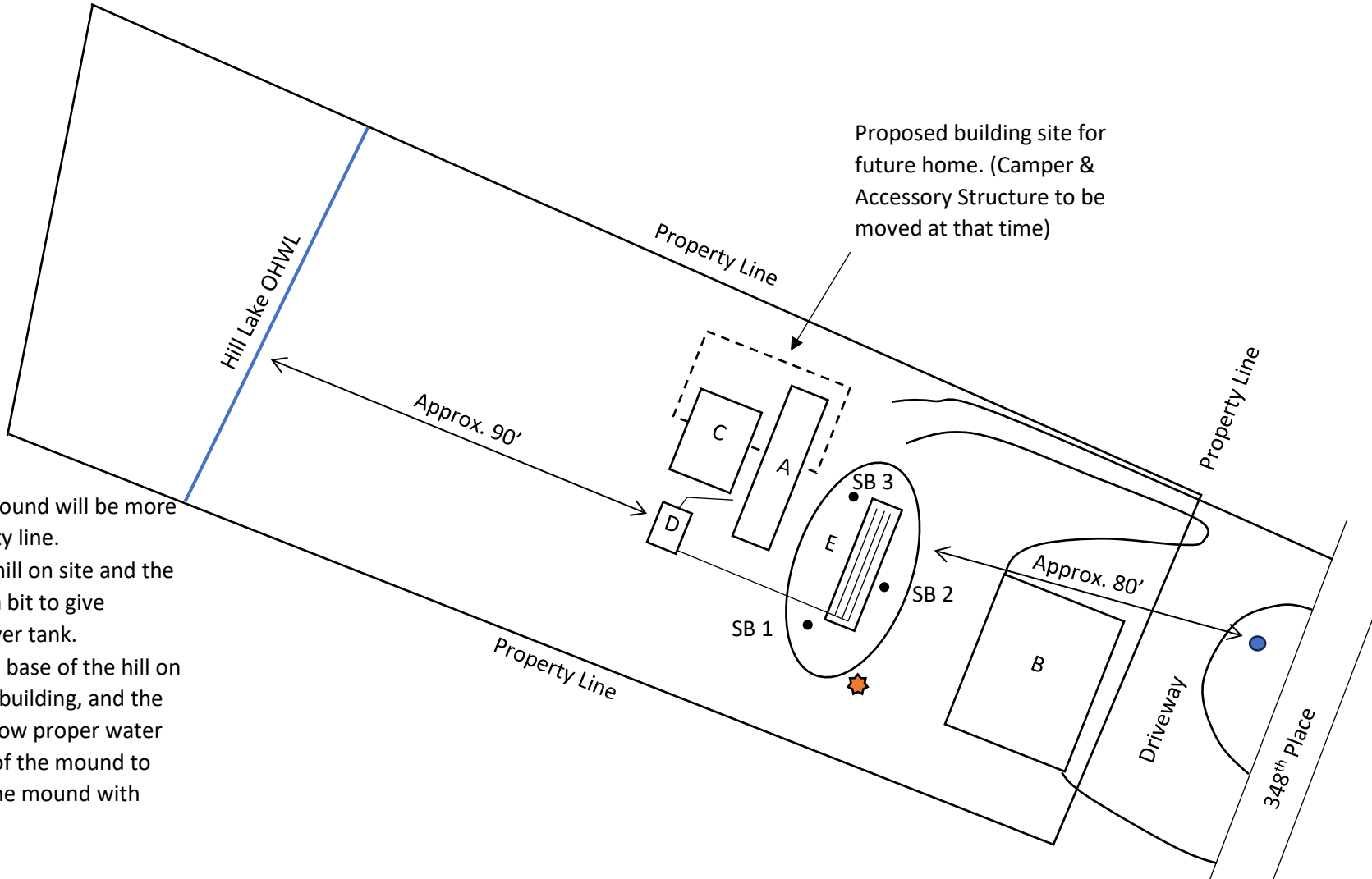
Kevin & Ann Strasser – 67179 348th Place Hill City, MN 55748
PID: 12-1-073800

Elevations:

- Benchmark (screw in tree—flagged in blue): 100’
- SB 1: 97.4’
- SB 2: 97.4’
- SB 3: 97.4’
- Distribution media: 100.4’
- Saturated soil: 97.4’

Map Key:

- **A:** House
- **B:** Pole building
- **C:** Accessory structure
- **D:** New 1,500-gallon combo tank
- **E:** New mound with 10’ x 25’ rock bed



Notes:

- Tank & Rock Bed inside mound will be more than 15’ from any property line.
- Tank will be dug into the hill on site and the hill will be extended just a bit to give adequate soil coverage over tank.
- Mound will be built at the base of the hill on the West side of the pole building, and the hill will be extended to allow proper water diversion away/over top of the mound to prevent over saturating the mound with rainwater.