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	Cheryl Vessels	Email	
Property Address	35640 600th Street Hill City, MN 55748	Property ID	20-0-037602
System Designer	Walker Maasch	Contact Info	218-256-0139
System Installer	Craig McNeil	Contact Info	218-259-6364
Service Provider/Maintainer		Contact Info	
Permitting Authority	Aitkin County Planning & Zoning	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.

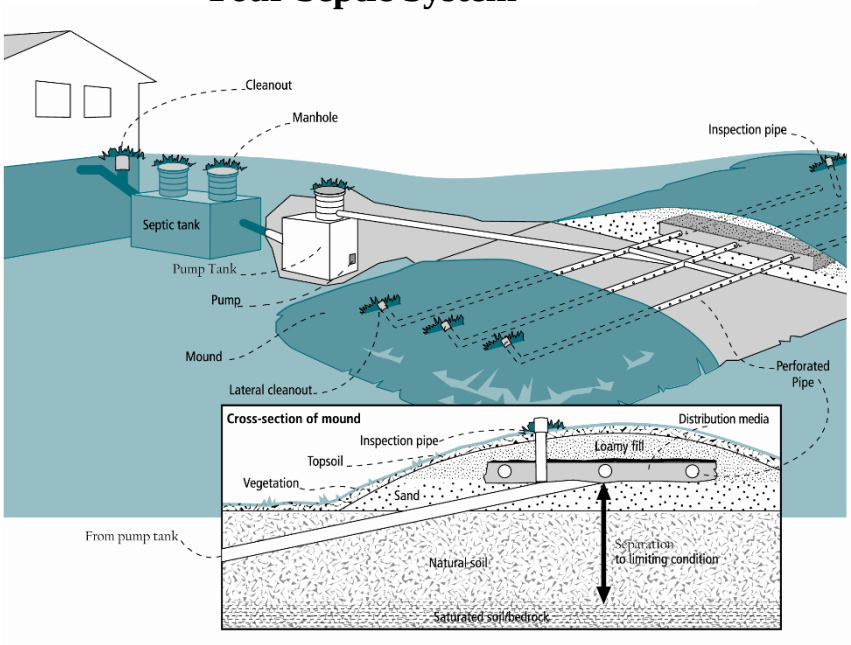
For more information see http://septic.umn.edu

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): Unknown - Deep well

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

Distance from septic (ft): 75'

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 650 *gallons*
- ❑ Effluent Pump *make/model*: Goulds PE31P1
  Pump capacity 53 GPM
  TDH 25 Feet of head
- ❑ Alarm location Near pump tank lid

Soil Treatment Area (STA)

Mound/At-Grade area (width x length): 35.2 ft x 50.8 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 24 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: 60 gallons: Pump run time: 1.13 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 Planning & Zoning

University of Minnesota Onsite Sewage Treatment Program

Preliminary Evaluation Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

1. Contact Information

v 04.01.2021

Property Owner/Client:	Cheryl Vessels	Date Completed:	5/31/2023
Site Address:	35640 600th Street Hill City, MN 55748	Project ID:	D23015
Email:		Phone:	763-568-3383
Mailing Address:	17311 Bataan Street NE Ham Lake, MN 55304	Alt Phone:	
Legal Description:	3.8 Ac of SE OF SW In Doc 441657		

Parcel ID:	20-0-037602	SEC:	23	TWP:	51	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: 2 campers

* 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 Information

Attach additional information as necessary.

Design Flow: 300 GPD Anticipated Waste Type: Residential

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	Deep 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:	Moose River
Elevation of ordinary high water level:	ft	Source:	
Classification:	Tank Setback: ft.	STA Setbk:	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: D458C—Menahga loamy sand Slope Range: 8-15 %

List landforms: Hillslopes

Landform position(s): Backslope, side slope

Parent materials: Sandy outwash

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:	Main line: 218-927-7342 (email: aitkinpz@co.aitkin.mn.us)
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 04.01.2021

Property Owner/Client: Cheryl Vessels | Project ID: D23015

Site Address: 35640 600th Street Hill City, MN 55748 | Date Completed:

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: 3 % | Slope shape: Linear, Linear | Slope direction: southeast

Describe the flooding or run-on potential of site: Low flooding potential.

Describe the need for Type III or Type IV system:

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): No

If yes, describe:

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*:	12	in	**94.8**	ft	**Most Restrictive Depth Identified from List Below*
Periodically saturated soil:	12	in	94.8	ft	Soil Texture: fine sand
Standing water:		in		ft	Percolation Rate: min/inch
Bedrock:		in		ft	Soil Hyd Loading Rate: 0.6 gpd/ft^2
Benchmark Elevation:	100.0	ft			Elevations and Benchmark on map? (Y/N): Yes

Benchmark Elevation Location: Top of electrical box post near mound system.

Differences between soil survey and field evaluation: Differences in slope and depth to restrictive feature.

Site evaluation issues / comments:

Anticipated construction issues:

Map Scale: 1:1,180 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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 23, Sep 6, 2022

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
625	Sandwick loamy sand	0.6	7.9%
1002	Borosaprists and Fluvaquents soils, frequently flooded	1.1	15.1%
1353B	Cutaway loamy fine sand, 1 to 6 percent slopes	2.4	34.4%
D458C	Menahga loamy sand, 8 to 15 percent slopes	3.0	42.6%
Totals for Area of Interest		**7.1**	**100.0%**

Aitkin County, Minnesota

D458C—Menahga loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2t4t2
Elevation: 590 to 2,030 feet
Mean annual precipitation: 23 to 33 inches
Mean annual air temperature: 36 to 48 degrees F
Frost-free period: 90 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Menahga

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash

Typical profile

A - 0 to 3 inches: loamy sand
Bw - 3 to 17 inches: loamy sand
C - 17 to 79 inches: sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A

Ecological site: F057XY023MN - Dry Sandy Upland Coniferous Forest
Forage suitability group: Sandy (G057XN022MN)
Other vegetative classification: Sandy (G057XN022MN)
Hydric soil rating: No

Minor Components

Eagleview
Percent of map unit: 8 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Sandy (G057XN022MN)
Hydric soil rating: No

Roscommon
Percent of map unit: 2 percent
Landform: Swales
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: Level Swale, Low AWC, Acid (G057XN007MN)
Hydric soil rating: Yes

Meehan
Percent of map unit: 2 percent
Landform: Swales
Down-slope shape: Concave
Across-slope shape: Linear
Other vegetative classification: Level Swale, Low AWC, Acid (G057XN007MN)
Hydric soil rating: No

Andrusia
Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Sloping Upland, Low AWC, Acid (G057XN008MN)
Hydric soil rating: No

Leafriver, frequently ponded
Percent of map unit: 1 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Other vegetative classification: Organic (G057XN014MN)

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 23, Sep 6, 2022

Aitkin County, Minnesota

625—Sandwick loamy sand

Map Unit Setting

National map unit symbol: gjj4
Elevation: 980 to 1,310 feet
Mean annual precipitation: 20 to 27 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 95 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Sandwick

Setting

Landform: Swales on moraines
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy outwash over loamy till

Typical profile

E - 0 to 6 inches: loamy sand
Bw,E' - 6 to 34 inches: sand
2E/B,2Btg - 34 to 55 inches: loam
2Cg - 55 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F090AY006WI - Wet Loamy Lowland
Forage suitability group: Level Swale, Low AWC, Acid (G088XN007MN)

Other vegetative classification: Level Swale, Low AWC, Acid (G088XN007MN)
Hydric soil rating: Yes

Minor Components

Stuntz and similar soils
Percent of map unit: 3 percent
Hydric soil rating: No

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

Dusler and similar soils
Percent of map unit: 3 percent
Hydric soil rating: No

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

Northwood and similar soils
Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 23, Sep 6, 2022

Aitkin County, Minnesota

1002—Borosaprists and Fluvaquents soils, frequently flooded

Map Unit Setting

National map unit symbol: gjcd
Elevation: 980 to 1,310 feet
Mean annual precipitation: 20 to 27 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 95 to 105 days
Farmland classification: Not prime farmland

Map Unit Composition

Borosaprists, frequently flooded, and similar soils: 50 percent
Fluvaquents, frequently flooded, and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Borosaprists, Frequently Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Organic material

Typical profile

Oa1 - 0 to 27 inches: muck
Oa2 - 27 to 48 inches: muck
Cg - 48 to 60 inches: stratified sand to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 6.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: OccasionalFrequentRareNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very high (about 21.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7w
Hydrologic Soil Group: A/D
Ecological site: F090AY002WI - Mucky Swamp
Forage suitability group: Organic (G088XN014MN)
Other vegetative classification: Organic (G088XN014MN)

Hydric soil rating: Yes

Description of Fluvaquents, Frequently Flooded

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 16 inches: silt loam
Cg - 16 to 60 inches: stratified loamy sand to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: High (about 10.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F090AY004WI - Loamy Floodplain
Forage suitability group: Organic (G088XN014MN)
Other vegetative classification: Organic (G088XN014MN)
Hydric soil rating: Yes

Minor Components

Winterfield and similar soils

Percent of map unit: 4 percent
Hydric soil rating: No

Pengilly and similar soils

Percent of map unit: 3 percent
Landform: Flood plains
Hydric soil rating: Yes

Thinner organic

Percent of map unit: 3 percent
Landform: Flood plains

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 23, Sep 6, 2022

Aitkin County, Minnesota

1353B—Cutaway loamy fine sand, 1 to 6 percent slopes

Map Unit Setting

National map unit symbol: gjd4
Elevation: 980 to 1,310 feet
Mean annual precipitation: 20 to 27 inches
Mean annual air temperature: 37 to 41 degrees F
Frost-free period: 95 to 105 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Cutaway

Setting

Landform: Moraines
Landform position (two-dimensional): Backslope, summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy outwash over loamy till

Typical profile

A - 0 to 2 inches: loamy fine sand
E,Bw,E' - 2 to 26 inches: loamy sand
2E/B,2B/E - 26 to 49 inches: loam
2C - 49 to 60 inches: loam

Properties and qualities

Slope: 1 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 41 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B
Ecological site: F090AY015WI - Loamy Upland with Carbonates
Forage suitability group: Sloping Upland, Acid (G088XN006MN)

Other vegetative classification: Sloping Upland, Acid (G088XN006MN)
Hydric soil rating: No

Minor Components

Northwood and similar soils
Percent of map unit: 6 percent
Landform: Depressions
Hydric soil rating: Yes

Sandwick and similar soils
Percent of map unit: 6 percent
Landform: Swales
Hydric soil rating: Yes

Dusler and similar soils
Percent of map unit: 3 percent
Hydric soil rating: No

Data Source Information

Soil Survey Area: Aitkin County, Minnesota
Survey Area Data: Version 23, Sep 6, 2022

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: D23015 v 04.01.2021

Client:	Cheryl Vessels	Location / Address:	35640 600th Street Hill City, MN 55748

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

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Linear, Linear	Elevation-relative to benchmark:	95.8
Vegetation:	Grass	Soil survey map units:	D458C—Menahga loamy sand			Limiting Layer Elevation:	94.8
Weather Conditions/Time of Day:	Sunny	2:00PM		Date	05/30/23		
Observation #/Location:	1	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0-7	loamy sand	<35%	10YR 3/2				Blocky	Moderate	Loose
7-12	fine sand	<35%	10YR 7/3 10YR 6/6				Single grain	Weak	Loose
12-15	fine sand	<35%	10YR 6/4 10YR 5/6	 10R 3/6	 Concentrations	 S1	Single grain	Weak	Loose

Comments

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

Walker Maasch	Walker Maasch	4199	5/30/2023
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: D23015 v 04.01.2021

Client:	Cheryl Vessels	Location / Address:	35640 600th Street Hill City, MN 55748

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

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Linear, Linear	Elevation-relative to benchmark:	96.0
Vegetation:	Grass	Soil survey map units:	D458C—Menahga loamy sand			Limiting Layer Elevation:	94.3
Weather Conditions/Time of Day:	Sunny		2:00PM	Date	05/30/23		
Observation #/Location:	2	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure Shape	Structure Grade	Structure Consistence
0-9	loamy sand	<35%	10YR 3/2				Blocky	Moderate	Loose
9-14	fine sand	<35%	10YR 7/3 10YR 6/6				Single grain	Weak	Loose
14-20	fine sand	<35%	10YR 5/6				Single grain	Weak	Loose
20-24	fine sand	<35%	10YR 5/6	10R 3/6	Concentrations	S1			

Comments

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Walker Maasch	Walker Maasch	4199	5/30/2023
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Soil Observation Log

Project ID: D23015 v 04.01.2021

Client:	Cheryl Vessels	Location / Address:	35640 600th Street Hill City, MN 55748

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

Landscape Position: (select one)	Back/Side Slope	Slope %:	3.0	Slope shape	Linear, Linear	Elevation-relative to benchmark:	96.0
Vegetation:	Grass	Soil survey map units:	D458C—Menahga loamy sand			Limiting Layer Elevation:	94.5
Weather Conditions/Time of Day:	Sunny		2:00PM	Date	05/30/23		
Observation #/Location:	3	In STA		Observation Type:	Auger		

Depth (in)	Texture	Rock Frag. %	Matrix Color(s)	Mottle Color(s)	Redox Kind(s)	Indicator(s)	Structure: Shape	Structure: Grade	Structure: Consistence
0-10	loamy sand	<35%	10YR 3/2				Blocky	Moderate	Loose
10-18	fine sand	<35%	10YR 7/3 10YR 6/6				Single grain	Weak	Loose
18-20	fine sand	<35%	10YR 6/4 10YR 5/6	 10R 3/6	 Concentrations	 S1	Single grain	Weak	Loose

Comments

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

Walker Maasch	Walker Maasch	4199	5/30/2023
(Designer/Inspector)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

1. PROJECT INFORMATION

v 04.01.2021

Property Owner/Client:	Cheryl Vessels	Project ID:	D23015
Site Address:	35640 600th Street Hill City, MN 55748	Date:	05/30/23
Email Address:		Phone:	763-568-3383

2. DESIGN FLOW & WASTE STRENGTH

Attach data / estimate basis 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 =400 gal/bedroom, Other Establishment = Design Flow x 5.0, Minimum size 1000 gallons

Code Minimum **Holding Tank** Capacity: ____ Gallons in ____ Tanks or Compartments

Recommended **Holding Tank** Capacity: ____ Gallons in ____ 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 in 1 Tanks or Compartments

Recommended **Septic Tank** Capacity: 1000 Gallons in 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 In ____ Tanks or Compartments

Recommended **Septic Tank** Capacity: ____ Gallons In ____ Tanks or Compartments

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

5. PUMP TANK SIZING

Pump Tank 1 Capacity (Minimum):	300 Gal	Pump Tank 2 Capacity (Minimum):	Gal
Pump Tank 1 Capacity (Recommended):	650 Gal	Pump Tank 2 Capacity (Recommended):	Gal
Pump 1 18.0 GPM Total Head	14.1 ft	Pump 2 GPM Total Head	ft
Supply Pipe Dia. 2.00 in Dose Vol:	60.0 gal	Supply Pipe Dia. Dose Vol:	Gal

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

6. SYSTEM AND DISTRIBUTION TYPE

Project ID: D23015

Soil Treatment Type:	Mound	Distribution Type:	Pressure Distribution-Level
Elevation Benchmark:	100 ft	Benchmark Location:	Top of electrical box post near mc
MPCA System Type:	Type I	Distribution Media:	Rock
Type III/IV/V Details:			

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:	12	inches	1.0	ft	94.80	ft
Minimum Req'd Separation:	36	inches	3.0	ft		***Critical for system compliance***
					Elevation	
Code Max System Depth:	Mound	inches	-2.0	ft	97.80	ft

This is the maximimum depth to the bottom of the distribution media for required separation. Negative Depth (ft) means it must be a mound.

Soil Texture:	fine sand		
Soil Hyd. Loading Rate:	0.60 GPD/ft^2	Percolation Rate:	MPI
Contour Loading Rate:	12	Note:	
Measured Land Slope:	3 %	Note:	
Comments:			

8. SOIL TREATMENT AREA DESIGN SUMMARY

Trench:

Dispersal Area	ft^2	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	ft^2	Sidewall Depth	in	Maximum Bed Depth	in
Bed Width	ft	Bed Length	ft	Designed Bed Depth	in

Mound:

Dispersal Area	250.0 ft^2	Bed Length	25.0 ft	Bed Width	10.0 ft
Absorption Width	10.0 ft	Clean Sand Lift	2.0 ft	Berm Width (0-1%)	ft
Upslope Berm Width	11.0 ft	Downslope Berm	14.2 ft	Endslope Berm Width	12.9 ft
Total System Length	50.8 ft	System Width	35.2 ft	Contour Loading Rate	12.0 gal/ft

University of Minnesota Onsite Sewage Treatment Program

Design Summary Page

MINNESOTA POLLUTION CONTROL AGENCY

At-Grade:

Bed Width		ft	Bed Length		ft	Finished Height		ft
Contour Loading Rate		gal/ft	Upslope Berm		ft	Downslope Berm		ft
Endslope Berm		ft	System Length		ft	System Width		ft

Level & Equal Pressure Distribution

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

Non-Level and Unequal Pressure Distribution

	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

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

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

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

Lbs. BOD To Be Removed: _____

PreTreatment Technology: _____ *Must Meet or Exceed Target

Disinfection Technology: _____ *Required for Levels A & B

C. Organic Loading to Soil Treatment Area:

_____ mg/L X _____ gpd x 8.35 ÷ 1,000,000 ÷ _____ ft^2 = _____ $lbs./day/ft^2$

10. Comments/Special Design Considerations:

Design is for two seasonal campers. Each camper is expected to have a max daily flow of 150 gpd.

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

Walker Maasch	Walker Maasch	4199	5/30/2023
(Designer)	(Signature)	(License #)	(Date)

University of Minnesota Onsite Sewage Treatment Program

Mound Design Worksheet
≥1% Slope

MINNESOTA POLLUTION CONTROL AGENCY

1. SYSTEM SIZING: Project ID: D23015 v 04.01.2021

A. Design Flow:	300	GPD
B. Soil Loading Rate:	0.60	GPD/ft^2
C. Depth to Limiting Condition	1.0	ft
D. Percent Land Slope:	3.0	%
E. Design Media Loading Rate:	1.2	GPD/ft^2
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	← OR →	1.0, 1.3, 2.0, 2.4, 2.6	→	≤12
61-120 mpi		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: Absorption Area Loading Rate (gpd/ft^2)	Treatment Level C: Mound Absorption Ratio	Treatment Level A, A-2, B,: Absorption Area Loading Rate (gpd/ft^2)	Treatment Level A, A-2, B,: 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. Calculate Dispersal Bed Area: Design Flow ÷ Design Media Loading Rate

300 GPD ÷ 1.2 GPD/ft^2 = 250 ft^2

If a larger dispersal media area is desired, enter size: ft^2

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

C. Calculate Contour Loading Rate: Bed Width X Design Media Loading Rate

10 ft^2 X 1.2 GPD/ft^2 = 12.0 gal/ft *Can not exceed Table 1*

D. Calculate Minimum Dispersal Bed Length: Dispersal Bed Area ÷ Bed Width

250 ft^2 ÷ 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 X Mound Absorption Ratio

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 - Bed Width

10.0 ft - 10.0 ft = ft

4. DISTRIBUTION MEDIA: Project ID: D23015

Select Dispersal Media: Rock Enter Either A. or B.

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:

6. MOUND SIZING Project ID: D23015

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

3.0 ft - 1.0 ft = 2.0 ft Design Sand Lift (optional): 2 ft

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

2.0 ft + 0.50 ft + 0.5 ft + 1.0 ft = 4.0 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): 2.75

D. Calculate Upslope Berm Width: Multiplier X Upslope Mound Height

2.75 ft X 4.0 ft = 11.0 ft

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

10.0 ft X 3.0 % ÷ 100 = 0.30 ft

F. Calculate Downslope Mound Height: Upslope Height + Drop in Elevation

4.0 ft + 0.30 ft = 4.3 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): 3.30

H. Calculate Downslope Berm Width: Downslope Multiplier X Downslope Height

3.30 x 4.3 ft = 14.2 ft

I. Calculate Minimum Berm to Cover Absorption Area: Downslope Absorption Width + 4 feet

ft + 4 ft = 4.0 ft

J. Design Downslope Berm = greater of 4H and 4I: 14.2 ft

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

L. Calculate Endslope Berm X Downslope Mound Height = Endslope Berm Width

3.00 ft X 4.3 ft = 12.9 ft

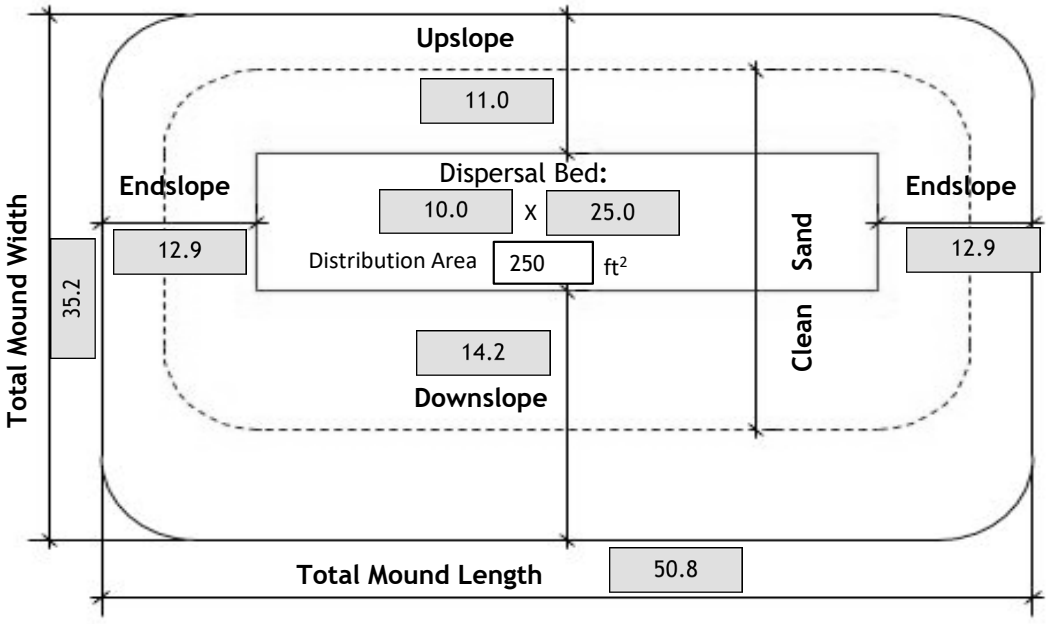
M. Calculate Mound Width: Upslope Berm Width + Bed Width + Downslope Berm Width

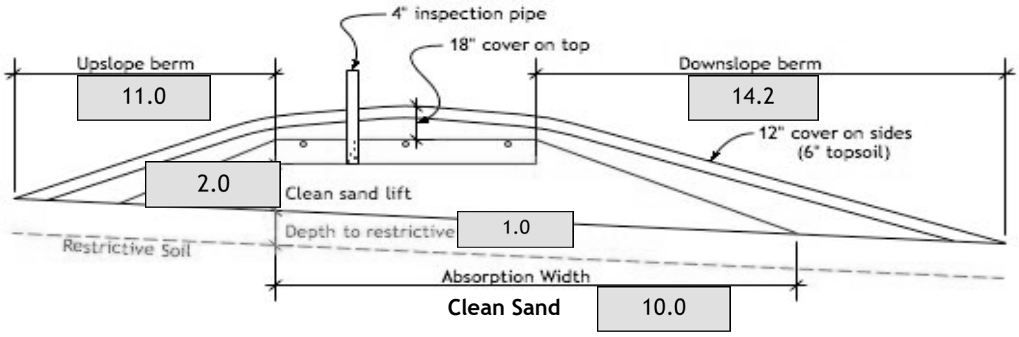
11.0 ft + 10.0 ft + 14.2 ft = 35.2 ft

N. Calculate Mound Length: Endslope Berm Width + Bed Length + Endslope Berm Width

12.9 ft + 25.0 ft + 12.9 ft = 50.8 ft

7. MOUND DIMENSIONS (Feet) Project ID: D23015





Required Separation:	36 (in)	Distribution Media:	Rock
Manifold Connection:	End	Media Depth:	6.0 (in)
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: D23015 v 04.01.2021

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 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 229.2 ft^3 ÷ 27 = 8.5 yd^3

Add 30% for constructability: 8.5 yd^3 X 1.3 = 11.0 yd^3

B. Calculate *Clean Sand Volume:*

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

2.2 ft X 10.0 ft X 25 ft = 538 ft^3

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)

(ft - 1) X X ft =

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

(ft - 1) X X ft =

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

ft^3 + ft^3 + ft^3 = ft^3

For a Mound on a slope greater than 1%

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

((4.0 ft - 1) X 3.0 ft X 25.0) ÷ 2 = 112.5 ft^3

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

((4.3 ft - 1) X ft X 25.0) ÷ 2 = ft^3

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

(4.3 ft - 1) X 3.0 ft X 10.0 ft = 99.0 ft^3

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

112.5 ft^3 + ft^3 + 99.0 ft^3 + 537.5 ft^3 = 749.0 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 749.0 ft^3 ÷ 27 = 27.7 yd^3

Add 30% for constructability: 27.7 yd^3 X 1.3 = 36.1 yd^3

C. Calculate *Sandy Berm Volume:*

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

(4.2 - 0.5)ft X 35.2 ft X 50.8) ÷ 2 = 3262.5 ft^3

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

3262.5 ft^3 - 749.0 ft^3 - 229.2 ft^3 = 2284.3 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 2284.3 ft^3 ÷ 27 = 84.6 yd^3

Add 30% for constructability: 84.6 yd^3 x 1.3 = 110.0 yd^3

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

35.2 ft X 50.8 ft X 0.5 ft = 893.8 ft^3

Divide ft^3 by 27 ft^3/yd^3 to calculate cubic yards: 893.8 ft^3 ÷ 27 = 33.1 yd^3

Add 30% for constructability: 33.1 yd^3 x 1.3 = 43.0 yd^3

University of Minnesota Onsite Sewage Treatment Program

Pressure Distribution Design Worksheet

MINNESOTA POLLUTION CONTROL AGENCY

Project ID: D23015 v 04.01.2021

1. Media Bed Width: 10 ft

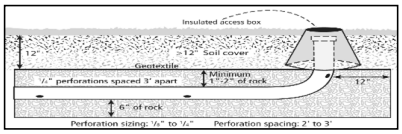
2. Minimum Number of Laterals in system/zone = Rounded up number of [(Media Bed Width - 4) ÷ 3] + 1.

[(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 - 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* by the *Perforation Spacing* and round down to the nearest whole number.

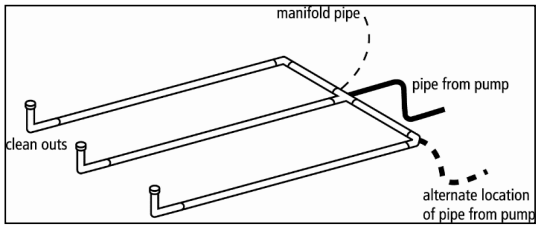
Number of Perforation Spaces = 23.0 ft ÷ 3.0 ft = 7 Spaces

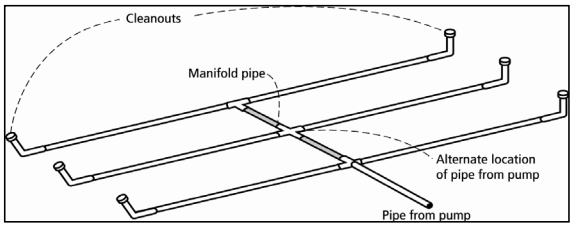
8. *Number of Perforations per Lateral* is equal to 1.0 plus the *Number of Perforation Spaces*. Check table below to verify the number of perforations per lateral guarantees less than a 10% discharge variation. The value is double with a center manifold.

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

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

1/4 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





9. *Total Number of Perforations* equals the *Number of Perforations per Lateral* multiplied by the *Number of Perforated Laterals*.

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

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 ft^2

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

250 ft^2 ÷ 24 perf = 10.4 ft^2/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 X Perforation Discharge.*

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* X *Length of Laterals* X (Volume of Liquid Per Foot of Distribution Piping]

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

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 Pump Selection Design Worksheet

Project ID: D23015 | v 04.01.2021

1. PUMP CAPACITY

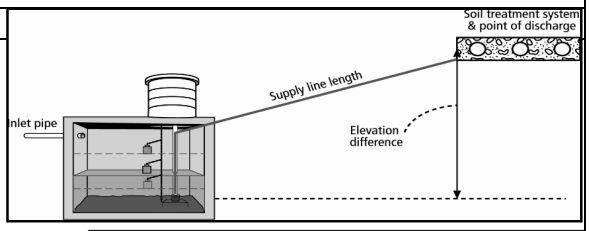
Pumping to Gravity or Pressure Distribution: Pressure

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: 8.6 ft

B. Distribution Head Loss: 5 ft

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

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

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

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

G. Calculate *Supply Friction Loss* by multiplying *Friction Loss Per 100ft* by the *Equivalent Pipe Length* 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* + Distribution Head Loss, + Additional Head Loss + Supply Friction Loss

8.6 ft + 5.0 ft + _____ ft + 0.5 ft = 14.1 ft

3. PUMP SELECTION

A pump must be selected to deliver at least **18.0** GPM with at least **14.1** feet of total head.

Comments:

University of Minnesota Onsite Sewage Treatment Program

Pump Tank Design Worksheet (Demand Dose)

Minnesota Pollution Control Agency

DETERMINE TANK CAPACITY AND DIMENSIONS Project ID: D23015 v 04.01.2021

1. A. *Design Flow (Design Sum.1A)*: 300 GPD C. Tank Use: **Dosing**
   B. Min. required pump tank capacity: 300 Gal D. Recommended pump tank capacity: 650 Gal

2. A. Tank Manufacturer: Jacobson Precast Concrete, LLC B. Tank Model: 1650 Gallon Two Compartment Tank
   C. Capacity from manufacturer: 650 Gallons
   D. Gallons per inch from manufacturer: 12.7 Gallons per inch
   E. Liquid depth of tank from manufacturer: 45.5 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*

(16.1 in + 2 inches) X 12.7 Gallons Per Inch = 230 Gallons

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

-Item 18 of the Pressure Distribution or Item 11 of Non-level 47 **Gallons (Minimum dose)** 3.7 inches/dose

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

Design Flow: 300 GPD X 0.25 = 75 **Gallons (Maximum dose)** 5.9 inches/dose

6 *Select a pumpout volume that meets both Minimum and Maximum:* 60 Gallons

7 Calculate *Doses Per Day* = Design Flow ÷ *Delivered Volume*

300 gpd ÷ 60 gal = 5.00 *Doses*

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 X Volume of Liquid Per Lineal Foot of Pipe*

40 ft X 0.170 gal/ft = 6.8 Gallons

9. *Total Dosing Volume = Delivered Volume* plus *Drainback*

60 gal + 6.8 gal = 67 Gallons

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

2 in X 12.7 gal/in = 25.4 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

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

Total Dosing Volume /Gallons Per Inch

67 gal ÷ 12.7 gal/in = 5.3 Inches

12. Measuring from bottom of tank:

A. *Distance to set Pump Off Float* = Pump + block height + 2 inches

16.1 in + 2 in = 18 Inches

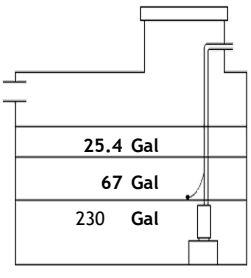
B. *Distance to set Pump On Float=Distance to Set Pump-Off Float + Float Separation Distance*

18 in + 5.3 in = 23 Inches

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

23 in + 2.0 in = 25 Inches

Inches for Dose: 5.3 in
Alarm Depth 25.4 in
Pump On 23.4 in
Pump Off 18.1 in



Cheryl Vessels – 35640 600th Street Hill City, MN 55748
PID: 20-0-037602 & 20-0-037601

Cheryl Vessels – 35640 600th Street Hill City, MN 55748
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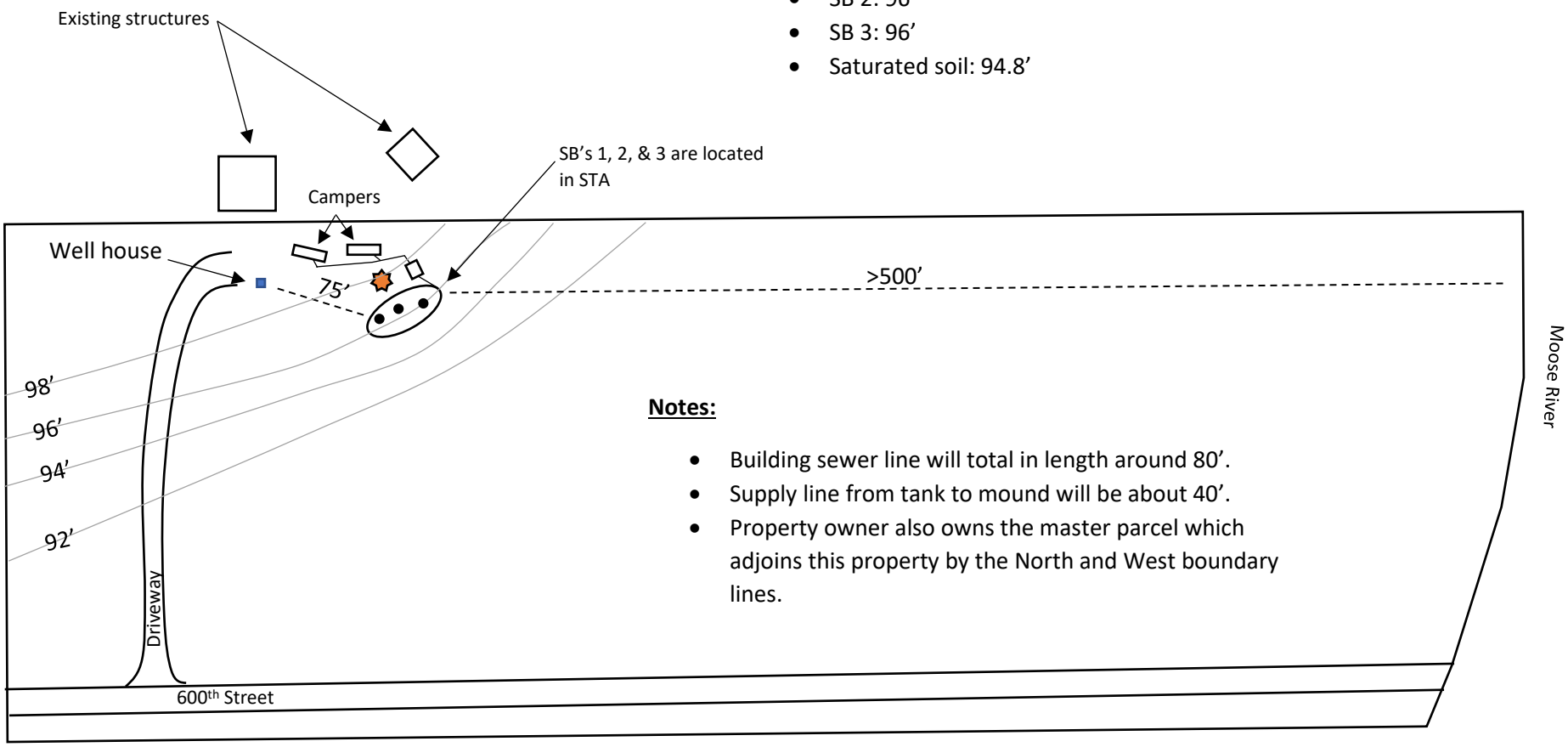
Elevations:

- Benchmark (top of electrical box post): 100’
- SB 1: 95.8’
- SB 2: 96’
- SB 3: 96’
- Saturated soil: 94.8’



Notes:

- Building sewer line will total in length around 80’.
- Supply line from tank to mound will be about 40’.
- Property owner also owns the master parcel which adjoins this property by the North and West boundary lines.