

<b><u>Customer Info</u></b>	
Name	Mike & Vicky Assell
Address	48457 US Highway 169 Palisade, MN 56469
Phone	612-402-6666

<b><u>Drainfield Info</u></b>	
Type of System:	Mound
System Width (in feet):	10
System Length (in feet):	37.5
Depth of Rock:	6 inches
Number of Lines in Bed:	3
Sand Lift (in feet):	3

<b><u>Float settings</u></b>	
<b>*** Measure from bottom of pump upwards. ***</b>	
Pump float OFF:	14.1
Pump float ON:	22.7
Alarm float OFF:	24.7
Alarm float ON:	26.7

<b><u>Elevations</u></b>		
Bottom of Septic Tank Hole (in feet):	-8.3	Lower than Benchmark Reading
Bottom of drainfield (before rock) (in feet):	1.9	Higher Than Benchmark Reading
Pipes in drainfield (in feet):	2.4	Higher Than Benchmark Reading



## 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	Email
Property Address	Property ID
System Designer	Contact Info
System Installer	Contact Info
Service Provider/Maintainer	Contact Info
Permitting Authority	Contact Info
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:

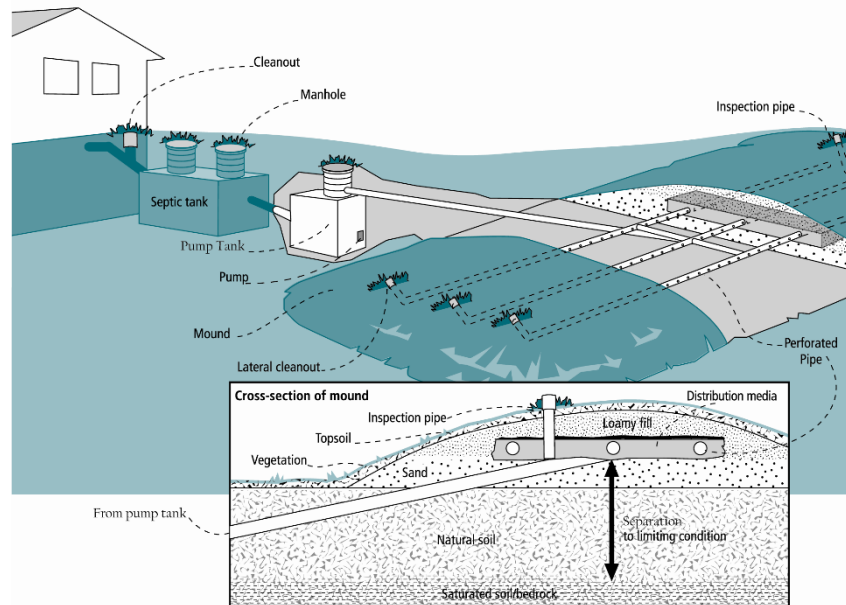
- Attach permit information, designer drawings and as-built of your system, if they are available.
- Keep copies of all pumping records and other maintenance and repair invoices with this document.
- Review this document with your maintenance professional at each visit; discuss any changes in product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

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

**For more information see <http://septic.umn.edu>**



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	<input type="checkbox"/> System is subject to operating permit* <input type="checkbox"/> System uses UV disinfection unit* Type of advanced treatment unit _____

Dwelling Type	Well Construction
Number of bedrooms: _____ System capacity/ design flow (gpd): _____ Anticipated average daily flow (gpd): _____ Comments _____ Business? :    Y    N    What type? _____	Well depth (ft): _____ <input type="checkbox"/> Cased well Casing depth: _____ <input type="checkbox"/> Other (specify): _____ Distance from septic (ft): _____ Is the well on the design drawing?    Y    N

Septic Tank	
<input type="checkbox"/> First tank    Tank volume: _____ gallons Does tank have two compartments?    Y    N <input type="checkbox"/> Second tank    Tank volume: _____ gallons <input type="checkbox"/> Tank is constructed of _____ <input type="checkbox"/> Effluent screen:    Y    N    Alarm    Y    N	<input type="checkbox"/> Pump Tank    _____ gallons <input type="checkbox"/> Effluent Pump    make/model: _____ Pump capacity _____ GPM TDH _____ Feet of head <input type="checkbox"/> Alarm location _____

Soil Treatment Area (STA)	
Mound/At-Grade area (width x length): _____ ft x _____ ft Rock bed size (width x length): _____ ft x _____ ft Location of additional STA: _____ Type of distribution media: _____	<input type="checkbox"/> Inspection ports <input type="checkbox"/> Cleanouts <input type="checkbox"/> Surface water diversions <input type="checkbox"/> Additional STA not available



## Homeowner Management Tasks

These *operation and maintenance* activities 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 \_\_\_\_\_ 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 through 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: \_\_\_\_\_ gallons: Pump run time: \_\_\_\_\_ 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**

<b>Appliance</b>	<b>Impacts on System</b>	<b>Management Tips</b>
Garbage disposal	<ul style="list-style-type: none"> <li>• Uses additional water.</li> <li>• Adds solids to the tank.</li> <li>• Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.</li> </ul>	<ul style="list-style-type: none"> <li>• Use of a garbage disposal is not recommended.</li> <li>• Minimize garbage disposal use. Compost instead.</li> <li>• To prevent solids from exiting the tank, have your tank pumped more frequently.</li> <li>• Add an effluent screen to your tank.</li> </ul>
Washing machine	<ul style="list-style-type: none"> <li>• Washing several loads on one day uses a lot of water and may overload your system.</li> <li>• Overloading your system may prevent solids from settling out in the tank. Unsettled solids can exit the tank and enter the soil treatment area.</li> </ul>	<ul style="list-style-type: none"> <li>• Choose a front-loader or water-saving top-loader, these units use less water than older models.</li> <li>• 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.</li> <li>• Install a lint filter after the washer and an effluent screen to your tank</li> <li>• Wash only full loads and think even – spread your laundry loads throughout the week.</li> </ul>
Dishwasher	<ul style="list-style-type: none"> <li>• Powdered and/or high-phosphorus detergents can negatively impact the performance of your tank and soil treatment area.</li> <li>• New models promote “no scraping”. They have a garbage disposal inside.</li> </ul>	<ul style="list-style-type: none"> <li>• Use gel detergents. Powdered detergents may add solids to the tank.</li> <li>• Use detergents that are low or no-phosphorus.</li> <li>• Wash only full loads.</li> <li>• Scrape your dishes anyways to keep undigested solids out of your septic system.</li> </ul>
Grinder pump (in home)	<ul style="list-style-type: none"> <li>• Finely-ground solids may not settle. Unsettled solids can exit the tank and enter the soil treatment area.</li> </ul>	<ul style="list-style-type: none"> <li>• Expand septic tank capacity by a factor of 1.5.</li> <li>• Include pump monitoring in your maintenance schedule to ensure that it is working properly.</li> <li>• Add an effluent screen.</li> </ul>
Large bathtub (whirlpool)	<ul style="list-style-type: none"> <li>• Large volume of water may overload your system.</li> <li>• Heavy use of bath oils and soaps can impact biological activity in your tank and soil treatment area.</li> </ul>	<ul style="list-style-type: none"> <li>• Avoid using other water-use appliances at the same time. For example, don’t wash clothes and take a bath at the same time.</li> <li>• Use oils, soaps, and cleaners in the bath or shower sparingly.</li> </ul>
<b>Clean Water Uses</b>	<b>Impacts on System</b>	<b>Management Tips</b>
High-efficiency furnace	<ul style="list-style-type: none"> <li>• Drip may result in frozen pipes during cold weather.</li> </ul>	<ul style="list-style-type: none"> <li>• Re-route water directly out of the house. Do not route furnace discharge to your septic system.</li> </ul>
Water softener Iron filter Reverse osmosis	<ul style="list-style-type: none"> <li>• Salt in recharge water may affect system performance.</li> <li>• Recharge water may hydraulically overload the system.</li> </ul>	<ul style="list-style-type: none"> <li>• These sources produce water that is not sewage and should not go into your septic system.</li> <li>• Reroute water from these sources to another outlet, such as a dry well, draitile or old drainfield.</li> </ul>
Surface drainage Footing drains	<ul style="list-style-type: none"> <li>• Water from these sources will overload the system and is prohibited from entering septic system.</li> </ul>	<ul style="list-style-type: none"> <li>• When replacing, consider using a demand-based recharge vs. a time-based recharge.</li> <li>• Check valves to ensure proper operation; have unit serviced per manufacturer directions</li> </ul>



**Homeowner Maintenance Log**

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

Activity	Date accomplished									
<b>Check frequently:</b>										
Leaks: check for plumbing leaks*										
Soil treatment area check for surfacing**										
Lint filter: check, clean if needed*										
Effluent screen (if owner-maintained)***										
Alarm**										
<b>Check annually:</b>										
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: \_\_\_\_\_

Certification # \_\_\_\_\_

Permitting Authority: \_\_\_\_\_

# Preliminary Evaluation Worksheet

v 03.15.2023

## 1. Contact Information

Property Owner/Client:  Date Completed:

Site Address:  Project ID:

Email:  Phone:

Mailing Address:  Alt Phone:

Legal Description:

Parcel ID:  SEC:  TWP:  RNG:

## 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:  Dwelling sq.ft.:  Unfinished sq.ft.:

# Adults:  # Children:  # Teenagers:

In-home business (Y/N):  If yes, describe:

Water-using devices: (check all that apply)

<input type="checkbox"/> Garbage Disposal/Grinder	<input checked="" type="checkbox"/> Dishwasher	<input type="checkbox"/> Hot Tub*
<input type="checkbox"/> Sewage pump in basement	<input type="checkbox"/> Water Softener*	<input type="checkbox"/> Sump Pump*
<input type="checkbox"/> Large Bathtub >40 gallons	<input type="checkbox"/> Iron Filter*	<input type="checkbox"/> Self-Cleaning Humidifier*
<input checked="" type="checkbox"/> Clothes Washing Machine	<input checked="" type="checkbox"/> High Eff. Furnace*	<input type="checkbox"/> Other: <input type="text"/>

\* 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:  GPD Anticipated Waste Type:

Maximum Concentration BOD:  mg/L TSS  mg/L Oil & Grease  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:





# Preliminary Evaluation Worksheet

Site within 200' of noncommunity transient well (Y/N)  Yes, source:

Site within a drinking water supply management area (Y/N)  Yes, source:

Site in Well Head Protection inner wellhead management zone (Y/N)  Yes, source:

Buried water supply pipes within 50 ft of proposed system (Y/N)

**B. Site located in a shoreland district/area?**  Yes, name:

Elevation of ordinary high water level:  ft Source:

Classification:  Tank Setback:  ft. STA Setback:  ft.

**C. Site located in a floodplain?**  Yes, Type(s):

Floodplain designation/elevation (10 Year):  ft Source:

Floodplain designation/elevation (100 Year):  ft Source:

**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:  Slope Range:  %

List landforms:

Landform position(s):

Parent materials:

Depth to Bedrock/Restrictive Feature:  in Depth to Watertable:  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:

LGU Contact:

LGU-specific setbacks:

LGU-specific design requirements:

LGU-specific installation requirements:

Notes:

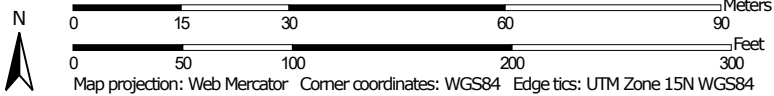
<b>1. Project Information</b>		v 03.15.2023	
Property Owner/Client:	<input type="text" value="Mike &amp; Vicky Assell"/>	Project ID: <input type="text" value="D24031"/>	
Site Address:	<input type="text" value="48457 US Highway 169 Palisade, MN 56469"/>	Date Completed: <input type="text" value="5/10/2024"/>	
<b>2. Utility and Structure Information</b>			
Utility Locations Identified	<input type="checkbox"/> Gopher State One Call # <input type="text"/>	<input type="checkbox"/> Any Private Utilities: <input type="text"/>	
Locate and Verify ( <i>see Site Evaluation map</i> )	<input checked="" type="checkbox"/> Existing Buildings	<input type="checkbox"/> Improvements <input type="checkbox"/> Easements <input checked="" type="checkbox"/> Setbacks	
<b>3. Site Information</b>			
Vegetation type(s):	<input type="text" value="Grass"/>	Landscape position: <input type="text" value="Plain"/>	
Percent slope:	<input type="text" value="0"/> %	Slope shape: <input type="text" value="Linear, Linear"/> Slope direction: <input type="text"/>	
Describe the flooding or run-on potential of site:	<input type="text" value="Moderate flooding potential. Low land - minimal elevation dif."/>		
Describe the need for Type III or Type IV system:	<input type="text" value="Redoximorphic features found directly beneath topsoil"/>		
Note:	<input type="text"/>		
Proposed soil treatment area protected? (Y/N):	<input type="text" value="Yes"/>	If yes, describe: <input type="text" value="Staked and flagged"/>	
<b>4. General Soils Information</b>			
Filled, Compacted, Disturbed areas (Y/N):	<input type="text" value="No"/>		
If yes, describe:	<input type="text"/>		
Soil observations were conducted in the proposed system location (Y/N):	<input type="text" value="Yes"/>		
A soil observation in the most limiting area of the proposed system (Y/N):	<input type="text" value="Yes"/>		
Number of soil observations:	<input type="text" value="3"/>	Soil observation logs attached (Y/N): <input type="text" value="Yes"/>	
Percolation tests performed & attached (Y/N):	<input type="text" value="No"/>		
<b>5. Phase I. Reporting Information</b>			
	Depth	Elevation	
<b>Limiting Condition*:</b>	<input type="text" value="0"/> in	<input type="text" value="98.9"/> ft	<i>*Most Restrictive Depth Identified from List Below</i>
Periodically saturated soil:	<input type="text" value="0"/> in	<input type="text" value="98.9"/> ft	Soil Texture: <input type="text" value="Clay Loam"/>
Standing water:	<input type="text"/> in	<input type="text"/> ft	Percolation Rate: <input type="text"/> min/inch
Bedrock:	<input type="text"/> in	<input type="text"/> ft	Soil Hyd Loading Rate: <input type="text" value="0.45"/> gpd/sq.ft
Benchmark Elevation:	<input type="text" value="100.0"/> ft	Elevations and Benchmark on map? (Y/N):	<input type="text" value="Yes"/>
Benchmark Elevation Location:	<input type="text" value="Screw in tree (flagged in blue)"/>		
Differences between soil survey and field evaluation:	<input type="text" value="Differences in depth to restrictive feature"/>		
Site evaluation issues / comments:	<input type="text"/>		
Anticipated construction issues:	<input type="text"/>		

Soil Map—Aitkin County, Minnesota



Soil Map may not be valid at this scale.

Map Scale: 1:1,050 if printed on A landscape (11" x 8.5") sheet.



## 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	1.7	36.7%
346	Talmoon fine sandy loam	2.6	56.2%
B546A	Lupton-Lupton, ponded, complex, 0 to 1 percent slopes	0.3	7.1%
<b>Totals for Area of Interest</b>		<b>4.5</b>	<b>100.0%</b>

## Aitkin County, Minnesota

### 346—Talmoon fine sandy loam

#### Map Unit Setting

*National map unit symbol:* gjgp  
*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:* Prime farmland if drained

#### Map Unit Composition

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

#### Description of Talmoon

##### Setting

*Landform:* Swales on moraines  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Parent material:* Loamy lacustrine deposits over loamy till

##### Typical profile

*A - 0 to 10 inches:* fine sandy loam  
*Eg - 10 to 17 inches:* loam  
*BE,Btg - 17 to 31 inches:* clay loam  
*Cg - 31 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:* 30 percent  
*Available water supply, 0 to 60 inches:* High (about 10.5 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2w  
*Hydrologic Soil Group:* C/D  
*Ecological site:* F057XY015MN - Wet Mixed Forest  
*Forage suitability group:* Level Swale, Acid (G090AN005MN)  
*Other vegetative classification:* Level Swale, Acid (G090AN005MN)

*Hydric soil rating: Yes*

### **Minor Components**

#### **Rifle**

*Percent of map unit: 5 percent*

*Landform: Bogs*

*Hydric soil rating: Yes*

#### **Sandwick**

*Percent of map unit: 5 percent*

*Landform: Flats*

*Hydric soil rating: Yes*

#### **Stuntz**

*Percent of map unit: 5 percent*

*Hydric soil rating: No*

## **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

## Aitkin County, Minnesota

### B546A—Lupton-Lupton, ponded, complex, 0 to 1 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2v0ls  
*Elevation:* 590 to 1,710 feet  
*Mean annual precipitation:* 23 to 30 inches  
*Mean annual air temperature:* 36 to 46 degrees F  
*Frost-free period:* 90 to 140 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Lupton and similar soils:* 55 percent  
*Lupton, ponded, and similar soils:* 45 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Lupton

##### Setting

*Landform:* Depressions  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Woody organic material

##### Typical profile

*Oa1 - 0 to 16 inches:* muck  
*Oa2 - 16 to 79 inches:* muck

##### Properties and qualities

*Slope:* 0 to 1 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:* None  
*Frequency of ponding:* None  
*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Very high (about 23.9 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7w  
*Hydrologic Soil Group:* A/D  
*Ecological site:* F088XY005MN - Forestland Peatland  
*Forage suitability group:* Not Suited (G088XN024MN)  
*Other vegetative classification:* Not Suited (G088XN024MN)

*Hydric soil rating:* Yes

## **Description of Lupton, Ponded**

### **Setting**

*Landform:* Depressions

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Woody organic material

### **Typical profile**

*Oa1 - 0 to 16 inches:* muck

*Oa2 - 16 to 79 inches:* muck

### **Properties and qualities**

*Slope:* 0 to 1 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:* None

*Frequency of ponding:* Frequent

*Maximum salinity:* Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

*Available water supply, 0 to 60 inches:* Very high (about 23.9 inches)

### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8w

*Hydrologic Soil Group:* A/D

*Ecological site:* F088XY002MN - Marsh

*Forage suitability group:* Not Suited (G088XN024MN)

*Other vegetative classification:* Not Suited (G088XN024MN)

*Hydric soil rating:* Yes

## **Data Source Information**

Soil Survey Area: Aitkin County, Minnesota

Survey Area Data: Version 24, Sep 9, 2023



# Soil Observation Log

Project ID: D24031

v 03.15.2023

Client: Mike & Vicky Assell Location / Address: 48457 US Highway 169 Palisade, MN 56469

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

Landscape Position: Flat Slope %: 0.0 Slope shape: Linear, Linear Flooding/Run-On potential: Yes

Vegetation: Grass Soil survey map units: 346-Talmoon fsl Surface Elevation-Relative to benchmark: 98.9

Date/Time of Day/Weather Conditions: 5/10/2024 1:00PM Sunny Limiting Layer Elevation: 98.9

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
0-3	Medium Sandy Loam	0	10YR	2/2	None		None	None	Granular	Moderate	Friable
3-10	Medium Loamy Sand	0	10YR	4/4	10YR	5/6	Concentrations	S2	Single grain	Weak	Loose
10-15	Medium Sand	0	10YR	5/4	None		None	None	Single grain	Weak	Loose
15-20	Clay Loam	0	10YR	5/3	10YR	6/8	Concentrations	S2	Blocky	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 5/13/2024  
 (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)



# Soil Observation Log

Project ID: D24031

v 03.15.2023

Client: Mike & Vicky Assell Location / Address: 48457 US Highway 169 Palisade, MN 56469

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

Landscape Position: Flat Slope %: 0.0 Slope shape: Linear, Linear Flooding/Run-On potential: Yes

Vegetation: Grass Soil survey map units: 346-Talmoon fsl Surface Elevation-Relative to benchmark: 98.7

Date/Time of Day/Weather Conditions: 5/10/2024 1:00PM Sunny Limiting Layer Elevation: 98.7

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
0-3	Medium Sandy Loam	0	10YR	2/2	None		None	None	Granular	Moderate	Friable
3-10	Medium Loamy Sand	0	10YR	4/4	10YR	5/6	Concentrations	S2	Single grain	Weak	Loose
10-15	Medium Sand	0	10YR	5/4	None		None	None	Single grain	Weak	Loose
15-20	Clay Loam	0	10YR	5/3	10YR	6/8	Concentrations	S2	Blocky	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 5/13/2024  
 (Designer/Inspector) (Signature) (License #) (Date)

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



# Soil Observation Log

Project ID: D24031

v 03.15.2023

Client: Mike & Vicky Assell Location / Address: 48457 US Highway 169 Palisade, MN 56469

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

Landscape Position: Flat Slope %: 0.0 Slope shape: Linear, Linear Flooding/Run-On potential: Yes

Vegetation: Grass Soil survey map units: 346-Talmoon fsl Surface Elevation-Relative to benchmark: 98.7

Date/Time of Day/Weather Conditions: 5/10/2024 1:00PM Sunny Limiting Layer Elevation: 98.7

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
0-3	Medium Sandy Loam	0	10YR	2/2	None		None	None	Granular	Moderate	Friable
3-10	Medium Loamy Sand	0	10YR	4/4	10YR	5/6	Concentrations	S2	Single grain	Weak	Loose
10-15	Medium Sand	0	10YR	5/4	None		None	None	Single grain	Weak	Loose
15-20	Clay Loam	0	10YR	5/3	10YR	6/8	Concentrations	S2	Blocky	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 5/13/2024  
 (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)

<b>1. PROJECT INFORMATION</b>		v 03.15.2023
Property Owner/Client:	Mike & Vicky Assell	Project ID: D24031
Site Address:	48457 US Highway 169 Palisade, MN 56469	Date: 05/13/24
Email Address:	assell1203@hotmail.com	Phone: 612-402-6666

<b>2. DESIGN FLOW &amp; WASTE STRENGTH</b>		<i>Attach waste strength data/estimated strength for Other Establishments</i>	
Design Flow:	450	GPD	Anticipated Waste Type: Residential
BOD:	170	mg/L	TSS: 60 mg/L
			Oil & Grease: 25 mg/L
Treatment Level:	C	<i>Select Treatment Level C for residential septic tank effluent</i>	

<b>3. HOLDING TANK SIZING</b>	
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:	

<b>4. SEPTIC TANK SIZING</b>	
<b>A. Residential dwellings:</b>	
Number of Bedrooms (Residential):	3
Code Minimum Septic Tank Capacity:	Gallons with Tanks or Compartments
Recommended Septic Tank Capacity:	Gallons with Tanks or Compartments
Effluent Screen & Alarm (Y/N):	Yes Model/Type: SJE Rhombus PS Patrol
<b>B. Other Establishments:</b>	
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 *	

<b>5. PUMP TANK SIZING</b>			
<b>Soil Treatment Dosing Tank</b>	<b>Other Component Dosing Tank:</b>		
Pump Tank Capacity (Minimum):	500 Gal	Pump Tank Capacity (Minimum):	Gal
Pump Tank Capacity (Recommended):	520 Gal	Pump Tank Capacity (Recommended):	Gal
Pump Req:	27.0 GPM Total Head 14.2 ft	Pump Req:	GPM Total Head ft
Supply Pipe Dia.	2.00 in Dose Vol: 100.0 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 *			

<b>6. SYSTEM AND DISTRIBUTION TYPE</b>		Project ID:	D24031
Soil Treatment Type:	<input type="text" value="Mound"/>	Distribution Type:	<input type="text" value="Pressure Distribution-Level"/>
Elevation Benchmark:	<input type="text" value="100.0"/> ft	Benchmark Location:	<input type="text" value="Screw in tree (flagged in blue)"/>
MPCA System Type:	<input type="text" value="Type III"/>	Distribution Media:	<input type="text" value="Rock"/>
Type III/IV/V Details:	<input type="text" value="3' sand lift"/>		<input type="text"/>

**7. SITE EVALUATION SUMMARY:**

Describe Limiting Condition:

Layers with >35% Rock Fragments? (yes/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:	<input type="text" value="0"/> inches	<input type="text" value="0.0"/> ft	<input type="text" value="98.90"/> ft	<b>Critical for system compliance</b>
Minimum Req'd Separation:	<input type="text" value="36"/> inches	<input type="text" value="3.0"/> ft		<i>Distribution Elevation &gt;Code Max Depth</i>
Code Max System Depth*:	<input type="text" value="Mound"/> inches	<input type="text" value="-3.0"/> ft	<input type="text" value="101.90"/> 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:  ft    Minimum Sand Depth:  inches

---

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

C. Soil Hyd. Loading Rate:  GPD/ft<sup>2</sup>    D: Percolation Rate:  MPI

E. Contour Loading Rate:     Note:

F. Measured Land Slope:  %    Note:

Comments:

**8. SOIL TREATMENT AREA DESIGN SUMMARY**

**Trench:**

Dispersal Area	<input type="text"/> sq.ft	Sidewall Depth	<input type="text"/> in	Trench Width	<input type="text"/> ft
Total Lineal Feet	<input type="text"/> ft	No. of Trenches	<input type="text"/>	Code Max. Trench Depth	<input type="text"/> in
Contour Loading Rate	<input type="text"/> ft	Minimum Length	<input type="text"/> ft	Designed Trench Depth	<input type="text"/> in

**Bed:**

Dispersal Area	<input type="text"/> sq.ft	Sidewall Depth	<input type="text"/> in	Maximum Bed Depth	<input type="text"/> in
Bed Width	<input type="text"/> ft	Bed Length	<input type="text"/> ft	Designed Bed Depth	<input type="text"/> in

**Mound:**

Dispersal Area	<input type="text" value="0.0"/> sq.ft	Bed Length	<input type="text" value="0.0"/> ft	Bed Width	<input type="text" value="10.0"/> ft
Absorption Width	<input type="text" value="10.0"/> ft	Clean Sand Lift	<input type="text" value="3.0"/> ft	Berm Width (0-1%)	<input type="text"/> ft
Upslope Berm Width	<input type="text" value="0.0"/> ft	Downslope Berm	<input type="text" value="4.0"/> ft	Endslope Berm Width	<input type="text" value="15.0"/> ft
Total System Length	<input type="text"/> ft	System Width	<input type="text" value="14.0"/> ft	Contour Loading Rate	<input type="text" value="12.0"/> gal/ft



Project ID: **D24031**

**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       Lateral Diameter  in      Lateral Spacing  ft  
 Perforation Spacing  ft      Perforation Diameter  in      Drainback Volume  gal  
 Min Dose Volume  gal      Max Dose Volume  gal      Total Dosing Volume  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)	Minimum Dose Volume <input type="text"/> gal
Lateral 1								
Lateral 2								Maximum Dose Volume
Lateral 3								<input type="text"/> gal
Lateral 4								
Lateral 5								Total Dosing Volume
Lateral 6								<input type="text"/> 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:**

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

Walker Maasch	<i>Walker Maasch</i>	4199	5/13/2024
(Designer)	(Signature)	(License #)	(Date)



# Mound Design Worksheet

## <1% Slope



1. SYSTEM SIZING: Project ID: D24031 v 03.15.2023

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

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/ft <sup>2</sup> )	Mound Absorption Ratio	Absorption Area Loading Rate (gpd/ft <sup>2</sup> )	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	-	-	-	-

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*

\*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)

$$\frac{450 \text{ GPD}}{1.2 \text{ GPD/sqft}} = 375 \text{ sq.ft}$$

### Organic Sizing (OPTIONAL)

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

$$\text{[ ] lbs BOD} \div \text{[ ] lbs BOD/sq.ft} = \text{[ ] sq.ft}$$

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

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

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

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

$$10 \text{ ft} \times 1.2 \text{ GPD/sq.ft} = 12.0 \text{ gal/ft} \quad \text{Can not exceed Table 1}$$

G. Calculate Minimum Dispersal Bed Length: Dispersal Media Area(2D) ÷ Bed Width (2E)

$$\frac{375 \text{ sqft}}{10 \text{ ft}} = 37.5 \text{ ft}$$

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)

$$\boxed{10.0} \text{ ft} \times \boxed{1.0} = \boxed{10.0} \text{ ft}$$

B. For slopes from 0 to 1%, the Absorption Width is measured from the bed equally in both directions.

Absorption Width Beyond the Bed: Absorption Width(3A) - Bed Width(2E) ÷ 2

$$(\boxed{10.0} \text{ ft} - \boxed{10.0} \text{ ft}) \div 2 = \boxed{0.0} \text{ ft}$$

### 4. DISTRIBUTION MEDIA

Project ID: D24031

Select Dispersal Media:  Enter Either 4A or 4B

A. Rock Depth Below Distribution Pipe

$$\boxed{6} \text{ in}$$

B. Registered Media

$$\boxed{0}$$

Registered Media Height  in

*Check registered product information for specific application details and design*

Specific Media Comments:

### 5. MOUND SIZING

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

$$\boxed{3.0} \text{ ft} - \boxed{\phantom{00.0}} \text{ ft} = \boxed{3.0} \text{ ft} \quad \text{Design Sand Lift (optional): } \boxed{3.0} \text{ ft}$$

B. Upslope Height = Clean Sand Lift(5A) + Depth of Media(4AorB) + Depth to Cover Pipe + Depth of Cover (1 ft)

$$\boxed{3.0} \text{ ft} + \boxed{0.50} \text{ ft} + \boxed{0.5} \text{ ft} + \boxed{1.00} \text{ ft} = \boxed{5.0} \text{ ft}$$

C. Berm Width = Upslope Mound Height(5B) X 4 (4 is recommended, but could be 3-12)

$$\boxed{5.0} \text{ ft} \times \boxed{3.0} = \boxed{15.0} \text{ ft}$$

D. Total Landscape Width = Berm Width(5C) + Dispersal Bed Width(2B) + Berm Width(5C)

$$\boxed{15.0} \text{ ft} + \boxed{10.0} \text{ ft} + \boxed{15.0} \text{ ft} = \boxed{40.0} \text{ ft}$$

E. Additional Berm Width if necessary for absorption area - Absorption Width(2A) - Total Landscape Width(5D)

$$\boxed{10.0} \text{ ft} - \boxed{40.0} \text{ ft} = \boxed{0} \text{ ft} \quad \text{if number is negative (<0), value is ZERO}$$

F. Final Berm Width = Additional Berm Width(5E) + Berm Width(5C)

$$\boxed{0} \text{ ft} + \boxed{15.0} \text{ ft} = \boxed{15.0} \text{ ft}$$

G. Total Mound Width = Final Berm Width(5F) + Dispersal Bed Width(2B) + Final Berm Width(5F)

$$\boxed{15.0} \text{ ft} + \boxed{10.0} \text{ ft} + \boxed{15.0} \text{ ft} = \boxed{40.0} \text{ ft}$$

H. Total Mound Length = Final Berm Width(5F) + Dispersal Bed Length(2D) + Final Berm Width(5F)

$$\boxed{15.0} \text{ ft} + \boxed{37.5} \text{ ft} + \boxed{15.0} \text{ ft} = \boxed{67.5} \text{ ft}$$

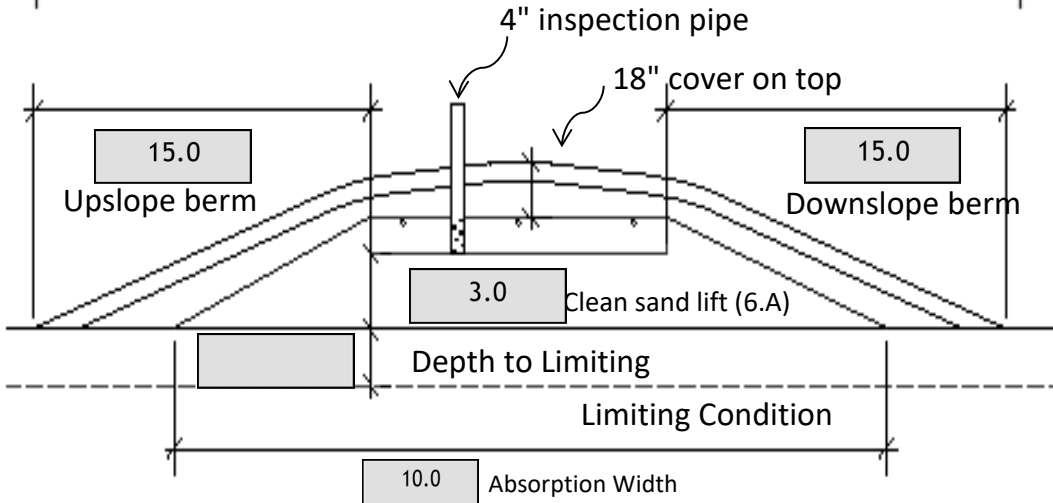
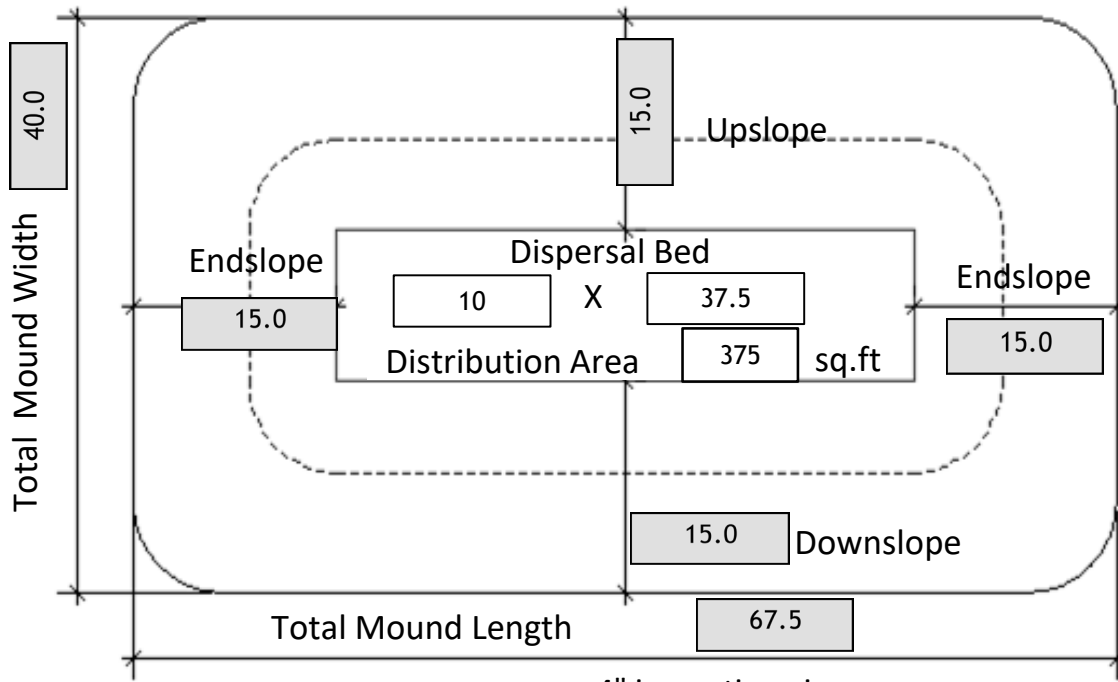
I. Setbacks from the Bed: Absorption Width (3A) - Dispersal Bed Width(2B) divided by 2

$$(\boxed{10.0} \text{ ft} - \boxed{10.0}) / 2 = \boxed{\phantom{00.0}} \text{ ft}$$

6. MOUND DIMENSIONS (Feet)

Project ID:

D24031



Elevation to Benchmark

Required Separation	<input type="text" value="36"/> (in)	Elevation Limiting Layer:	<input type="text" value="98.9"/> ft
Distribution Media	<input type="text" value="Rock"/>	Elevation required Separation:	<input type="text" value="101.9"/> ft
Media Depth	<input type="text" value="6.0"/> (in)	Elevation Distribution Media Bottom:	<input type="text" value="101.9"/> ft
Manifold Connection	<input type="text" value="End"/>	Elevation Top of Media(min):	<input type="text" value="102.9"/> ft
Lateral Pipe Diameter:	<input type="text" value="2.00"/> (in)	Elevation Top of System(min):	<input type="text" value="103.9"/> ft
Perforation Size:	<input type="text" value="1/4"/> (in)	Perforation Spacing:	<input type="text" value="36.0"/> (in)

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

Comments:

Project ID: D24031

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

$$( \boxed{6} \text{ in} + \boxed{5.0} \text{ in} ) \div 12 \times \boxed{37.5} \text{ ft} \times \boxed{10.0} \text{ ft} = \boxed{343.8} \text{ cu.ft}$$

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards:  $\boxed{343.8} \text{ cu.ft} \div 27 = \boxed{12.7} \text{ cu.yd}$

Add 30% for constructability:  $\boxed{12.7} \text{ cu.yd} \times 1.3 = \boxed{16.6} \text{ cu.yd}$

**B. Calculate Clean Sand Volume:**

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

$$\boxed{3.0} \text{ ft} \times \boxed{10.0} \text{ ft} \times \boxed{37.5} \text{ ft} = \boxed{1125} \text{ cu.ft}$$

**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)

$$\boxed{5.00} \text{ ft} - 1) \times \boxed{\phantom{000}} \times \boxed{37.5} \text{ ft} = \boxed{6.0}$$

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

$$\boxed{5.00} \text{ ft} - 1) \times \boxed{\phantom{000}} \times \boxed{10} \text{ ft} = \boxed{6.0}$$

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

$$\boxed{6.0} \text{ cu.ft} + \boxed{6.0} \text{ cu.ft} + \boxed{1125.0} \text{ cu.ft} = \boxed{1137.0} \text{ cu.ft}$$

**For a Mound on a slope greater than 1%**

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

$$((\boxed{5.0} \text{ ft} - 1) \times 3.0 \text{ ft} \times \boxed{\phantom{000}}) \div 2 = \boxed{\phantom{000}} \text{ cu.ft}$$

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

$$((\boxed{5.0} \text{ ft} - 1) \times \boxed{\phantom{000}} \text{ ft} \times \boxed{\phantom{000}}) \div 2 = \boxed{\phantom{000}} \text{ cu.ft}$$

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

$$(\boxed{5.0} \text{ ft} - 1) \times 3.0 \text{ ft} \times \boxed{10.0} \text{ ft} = \boxed{120.0} \text{ cu.ft}$$

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

$$\boxed{\phantom{000}} \text{ cu.ft} + \boxed{\phantom{000}} \text{ cu.ft} + \boxed{120.0} \text{ cu.ft} + \boxed{1125.0} \text{ cu.ft} = \boxed{1245.0} \text{ cu.ft}$$

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards:  $\boxed{1245.0} \text{ cu.ft} \div 27 = \boxed{46.1} \text{ cu.yd}$

Add 30% for constructability:  $\boxed{46.1} \text{ cu.yd} \times 1.3 = \boxed{59.9} \text{ cu.yd}$

**C. Calculate Sandy Berm Volume:**

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

$$(\boxed{5.0} - 0.5) \text{ ft} \times \boxed{40.0} \text{ ft} \times \boxed{67.5} \text{ ft} \div 2 = \boxed{6075.0} \text{ cu.ft}$$

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

$$\boxed{6075.0} \text{ cu.ft} - \boxed{1245.0} \text{ cu.ft} - \boxed{343.8} \text{ cu.ft} = \boxed{4486.3} \text{ cu.ft}$$

Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards:  $\boxed{4486.3} \text{ cu.ft} \div 27 = \boxed{166.2} \text{ cu.yd}$

Add 30% for constructability:  $\boxed{166.2} \text{ yd}^3 \times 1.3 = \boxed{216.0} \text{ cu.yd}$

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

$$\boxed{40.0} \text{ ft} \times \boxed{67.5} \text{ ft} \times 0.5 \text{ ft} = \boxed{1350.0} \text{ cu.ft}$$

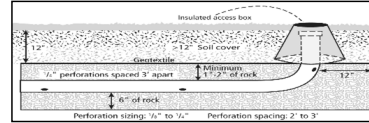
Divide cu.ft by 27 cu.ft/cu.yd to calculate cubic yards:  $\boxed{1350.0} \text{ cu.ft} \div 27 = \boxed{50.0} \text{ cu.yd}$

Add 30% for constructability:  $\boxed{50.0} \text{ cu.yd} \times 1.3 = \boxed{65.0} \text{ cu.yd}$

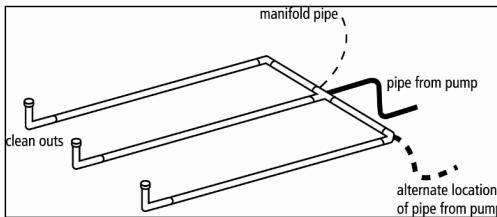
Project ID: D24031

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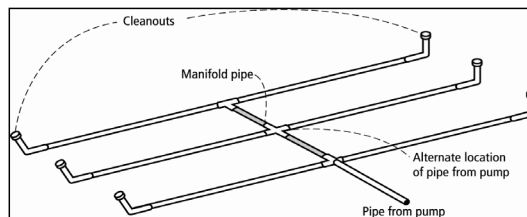
1. Media Bed Width:  ft
2. Minimum Number of Laterals in system/zone = Rounded up number of  $[(\text{Media Bed Width} - 4) \div 3] + 1$ .  
 $[(\text{  } - 4) \div 3] + 1 = \text{  } \text{ laterals}$  *Does not apply to at-grades*
3. Designer Selected Number of Laterals:  laterals  
*Cannot be less than line 2 (Except in at-grades)*
4. Select Perforation Spacing:  ft
5. Select Perforation Diameter Size:  in
6. Length of Laterals = Media Bed Length(1.) - 2 Feet.  
 - 2ft =  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 =  ft  $\div$   ft =  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 =  Spaces + 1 =  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	1 1/4	1 1/2	2	3		1	1 1/4	1 1/2	2	3
2	10	13	18	30	60	2	11	16	21	34	68
2 1/2	8	12	16	28	54	2 1/2	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	1 1/4	1 1/2	2	3		1	1 1/4	1 1/2	2	3
2	12	18	26	46	87	2	21	33	44	74	149
2 1/2	12	17	24	40	80	2 1/2	20	30	41	69	135
3	12	16	22	37	75	3	20	29	38	64	128



END Connection



CENTER Connection

Perf Per Lateral:

Perf Per Lateral Equal Split:  |

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.)  
 Perf. Per Lat. X  Number of Perf. Lat. =  Total Number of Perf.
10. Spacing of laterals; Must be greater than 1 foot and no more than 3 feet:  ft
11. Select Type of Manifold Connection (End or Center):  *If Center Manifold Connection the max number of perfs per lateral in the table can be doubled.*
12. Select Lateral Diameter (See Table):  in

13. Calculate the *Square Feet per Perforation*.

*Recommended value is 4-11 ft<sup>2</sup> per perforation, Does not apply to At-Grades*

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

ft X  ft =  sq.ft

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

sqft ÷  perf =  sq.ft/perf

14. Select *Minimum Average Head* :

ft

15. Select *Perforation Discharge* based on Table:

GPM per Perf

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

Perfs X  GPM per Perforation =  GPM

17. *Volume of Liquid Per Foot of Distribution Piping (Table II)* :

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.)

X  ft X  gal/ft =  Gallons

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

gals X 4 =  Gallons

20. Maximum Delivered Volume = Design flow x 25%

gpd X 25% =  Gallons

21. Minimum Delivered vs Maximum Delivered evaluation:

Perforation Discharge (GPM)				
Head (ft)	Perforation Diameter			
	1/8	3/16	7/32	1/4
1.0 <sup>a</sup>	0.18	0.41	0.56	0.74
1.5	0.22	0.51	0.69	0.9
2.0 <sup>b</sup>	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 <sup>c</sup>	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:

1. PUMP CAPACITY Project ID: D24031 v 03.15.2023

Pumping to Gravity or Pressure Distribution:

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:  GPM

C. Enter pump description:

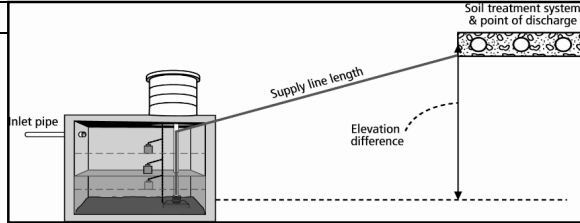
2. HEAD REQUIREMENTS

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

B. Distribution Head Loss:  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:  in

2. Supply Pipe Length:  ft

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

Friction Loss =  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*

ft X 1.25 =  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 =  ft per 100ft X  ft ÷ 100 =  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)*

ft +  ft +  ft +  ft =  ft

3. PUMP SELECTION

A pump must be selected to deliver at least **27.0** GPM with at least **14.2** feet of total head.

Comments:



<b>DETERMINE TANK CAPACITY AND DIMENSIONS</b>		Project ID: D24031	v 03.15.2023																
1.	A. Design Flow (Design Sum. 1A): <input style="width: 100px;" type="text" value="450"/> GPD B. Min. required pump tank capacity: <input style="width: 100px;" type="text" value="500"/> Gal	C. Tank Use: <input style="width: 150px;" type="text" value="Dosing"/> D. Recommended pump tank capacity: <input style="width: 100px;" type="text" value="520"/> Gal																	
2.	A. Tank Manufacturer: <input style="width: 150px;" type="text" value="Jacobson Precast"/> C. Capacity from manufacturer: <input style="width: 100px;" type="text" value="520"/> Gallons D. Gallons per inch from manufacturer: <input style="width: 100px;" type="text" value="12.7"/> Gallons per inch E. Liquid depth of tank from manufacturer: <input style="width: 100px;" type="text" value="45.5"/> inches	B. Tank Model: <input style="width: 150px;" type="text" value="1,650 Gallon Combo Tank"/>  <i>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.</i>																	
<b>DETERMINE DOSING VOLUME</b>																			
3. Calculate <i>Volume to Cover Pump</i> (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) ( <input style="width: 50px;" type="text" value="16.1"/> in + 2 inches ) X <input style="width: 50px;" type="text" value="12.7"/> Gallons Per Inch = <input style="width: 50px;" type="text" value="230"/> Gallons																			
4. <i>Minimum Delivered Volume</i> = 4 X Volume of Distribution Piping: -Item 19 of the Pressure Distribution STA or Item 11 of Non-level STA <input style="width: 50px;" type="text" value="72"/> Gallons (Minimum dose) <input style="width: 50px;" type="text" value="5.7"/> inches/dose																			
5. Calculate <i>Maximum Pumpout Volume</i> (25% of Design Flow(1A)) Design Flow: <input style="width: 50px;" type="text" value="450"/> GPD X 0.25 = <input style="width: 50px;" type="text" value="113"/> Gallons (Maximum dose) <input style="width: 50px;" type="text" value="8.9"/> inches/dose																			
6. Select a pumpout volume that meets both Minimum and Maximum: <input style="width: 50px;" type="text" value="100"/> Gallons																			
7. Calculate <i>Doses Per Day</i> = Design Flow(1A) ÷ Delivered Volume(6.) <input style="width: 50px;" type="text" value="450"/> gpd ÷ <input style="width: 50px;" type="text" value="100"/> gal = <input style="width: 50px;" type="text" value="4.50"/> Doses* * Doses need to be equal to or greater than 4																			
8. Calculate Drainback:																			
A. Diameter of Supply Pipe = <input style="width: 50px;" type="text" value="2"/> inches B. Length of Supply Pipe = <input style="width: 50px;" type="text" value="50"/> feet C. Volume of Liquid Per Lineal Foot of Pipe = <input style="width: 50px;" type="text" value="0.170"/> Gallons/ft D. Drainback = Length of Supply Pipe(8B) X Volume of Liquid Per Lineal Foot of Pipe(8C) <input style="width: 50px;" type="text" value="50"/> ft X <input style="width: 50px;" type="text" value="0.170"/> gal/ft = <input style="width: 50px;" type="text" value="8.5"/> Gallons																			
9. Total Dosing Volume = Delivered Volume(6.) + Drainback (8D) <input style="width: 50px;" type="text" value="100"/> gal + <input style="width: 50px;" type="text" value="8.5"/> gal = <input style="width: 50px;" type="text" value="109"/> Gallons																			
10. Minimum Alarm Volume = Depth of alarm (2 or 3 inches) X gallons per inch of tank(2D) <input style="width: 50px;" type="text" value="2"/> in X <input style="width: 50px;" type="text" value="12.7"/> gal/in = <input style="width: 50px;" type="text" value="25.4"/> Gallons																			
11. Reserve Capacity Volume = [Tank Liquid Depth(2E) - Alarm Float Depth(10.)] x gallons per inch of tank(2D) [ <input style="width: 50px;" type="text" value="45.5"/> in - <input style="width: 50px;" type="text" value="28.7"/> in ] X <input style="width: 50px;" type="text" value="12.7"/> gal/in = <input style="width: 50px;" type="text" value="213.8"/> Gallons																			
<b>DEMAND DOSE FLOAT SETTINGS</b> Alarm and Pump are to be wired on separate circuits and inspected by the electrical inspector																			
12. Calculate <i>Float Separation Distance</i> using Dosing Volume . Total Dosing Volume(9.) ÷ Gallons Per Inch(2D) <input style="width: 50px;" type="text" value="109"/> gal ÷ <input style="width: 50px;" type="text" value="12.7"/> gal/in = <input style="width: 50px;" type="text" value="8.6"/> inches																			
13. Measuring from bottom of tank:																			
A. Distance to set Pump Off Float = Pump + block height + 2 inches <input style="width: 50px;" type="text" value="16.1"/> in + 2 in = <input style="width: 50px;" type="text" value="18"/> inches																			
B. Distance to set Pump On Float=Distance to Set Pump-Off Float(13A) + Float Separation Distance(12.) <input style="width: 50px;" type="text" value="18"/> in + <input style="width: 50px;" type="text" value="8.6"/> in = <input style="width: 50px;" type="text" value="27"/> inches																			
C. Distance to set Alarm Float = Distance to set Pump-On Float(13B) + Alarm Depth (2-3 inches)(10.) <input style="width: 50px;" type="text" value="27"/> in + <input style="width: 50px;" type="text" value="2.0"/> in = <input style="width: 50px;" type="text" value="29"/> inches																			
			<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Volume of Liquid in Pipe</th> </tr> <tr> <th>Pipe Diameter (inches)</th> <th>Liquid Per Foot (Gallons)</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.045</td></tr> <tr><td>1.25</td><td>0.078</td></tr> <tr><td>1.5</td><td>0.110</td></tr> <tr><td>2</td><td>0.170</td></tr> <tr><td>3</td><td>0.380</td></tr> <tr><td>4</td><td>0.661</td></tr> </tbody> </table>	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
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1. Tank Specifications

Project ID: D24031

v 03.15.2023

A. Tank Manufacturer:  Tank Model:

B. Outside Tank Dimensions and Specifications: Tank Use:

Length:  in Width:  in Height:  in Diameter:  in

Length:  ft Width:  ft Height:  ft Radius of Tank:  in

2. Outside Volume of Tank

Rectangular Tank	Circular Tank
A. Area of Tank = Length (ft) X Width (ft) <input type="text" value="12.2"/> ft X <input type="text" value="5.6"/> ft = <input type="text" value="67.9"/> sq.ft	A. Area of Tank = $\pi r^2 = (3.14 \times (\text{Radius of Tank})^2)$ 3.14 X ( <input type="text"/> ft) <sup>2</sup> = <input type="text"/> sq.ft
B. Volume of Tank = Area of Tank (2.A) X Height (ft) <input type="text" value="67.9"/> sq.ft X <input type="text" value="4.9"/> ft = <input type="text" value="334.0"/> cu.ft	B. Volume of Tank = Area of Tank X Height (ft) <input type="text"/> sq.ft X <input type="text"/> ft = <input type="text"/> cu.ft

3. Force of Tank Weight (F<sub>TW</sub>)

Weight of Tank (provided by manufacturer)  lbs

4. Force of Soil Weight Over Tank (F<sub>SW</sub>)

A. Depth of Cover Over Tank:  in  ft

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

C. Volume of Soil Over Tank = Depth of Cover(4A) (ft) X Area of Tank(2A) (ft<sup>2</sup>)  
 ft X  sq.ft =  cu.ft

D. Weight of Soil Over Tank = Volume of Soil Over Tank(4C) X Weight of Soil Per Cubic Foot  
 cu.ft X  lbs/cu.ft =  lbs *Note: Assumes saturation does not get over the lid of the tank*

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

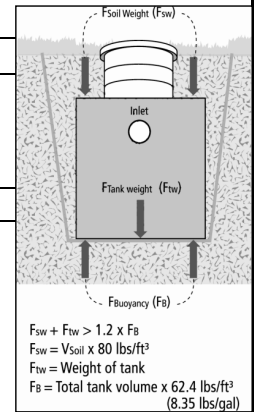
5. Buoyant Force (F<sub>B</sub>)

Buoyant Force (F<sub>B</sub>) = Outside Volume of Tank(2B) X Weight of Water Per Cubic Foot (62.4 lbs/ft<sup>3</sup>) X 1.2 (Safety Factor)  
 X 62.4 lbs/cu.ft X 1.2 =  lbs

6. Evaluation of Net Forces

A. Downward Force = Force of Tank Weight (F<sub>TW</sub>)(3.) + Force of Soil Weight of Soil (F<sub>SW</sub>)(4.)  
 lbs +  lbs =  lbs

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

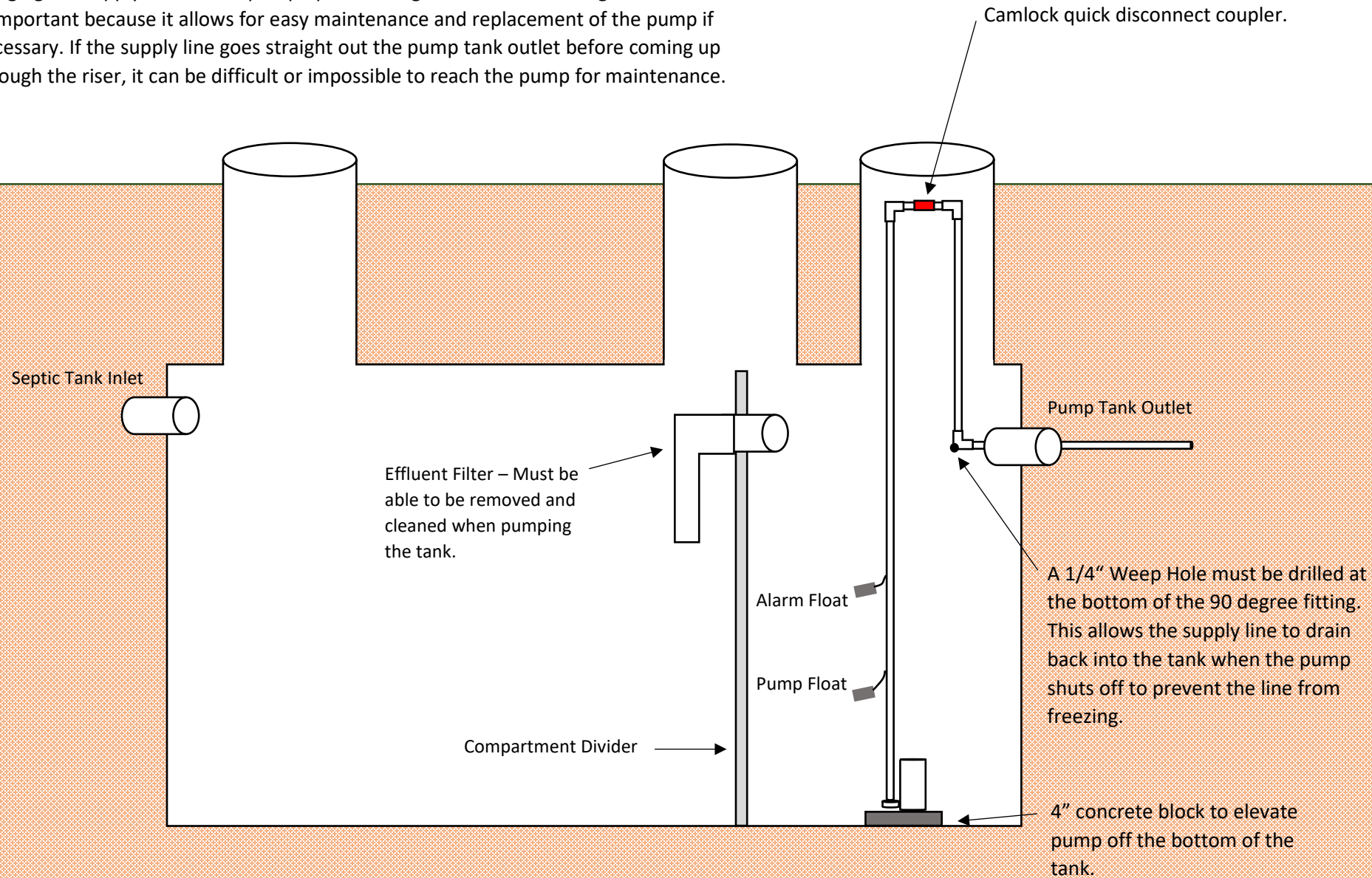


If the Net Difference is negative, counter measures will need to be taken to prevent the tank from floating out of the ground.  
Comments/Solution:

The septic tank should be buried with at least 24" of soil on top of it to remain in the ground when emptied. The tank should not have more than 48" of soil on top of it.

## 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.



Michael & Vicky Assell – 48457 US Highway 169 Palisade, MN 56469  
PID: 35-0-039100

System Location





Michael & Vicky Assell – 48457 US Highway 169 Palisade, MN 56469  
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Michael & Vicky Assell – 48457 US Highway 169 Palisade, MN 56469  
PID: 35-0-039100



**Elevations:**

-  Benchmark (screw in tree—flagged in blue): 100'
- SB 1: 98.9'
- SB 2: 98.7'
- SB 3: 98.7'
- Distribution media: 101.9'
- Saturated soil: 98.9'

**Map Key:**

- **A:** House
- **B:** Pole Building
- **C:** 1,650-gallon combo tank
- **D:** New 40' x 55' mound with 10' x 37.5' rock bed

