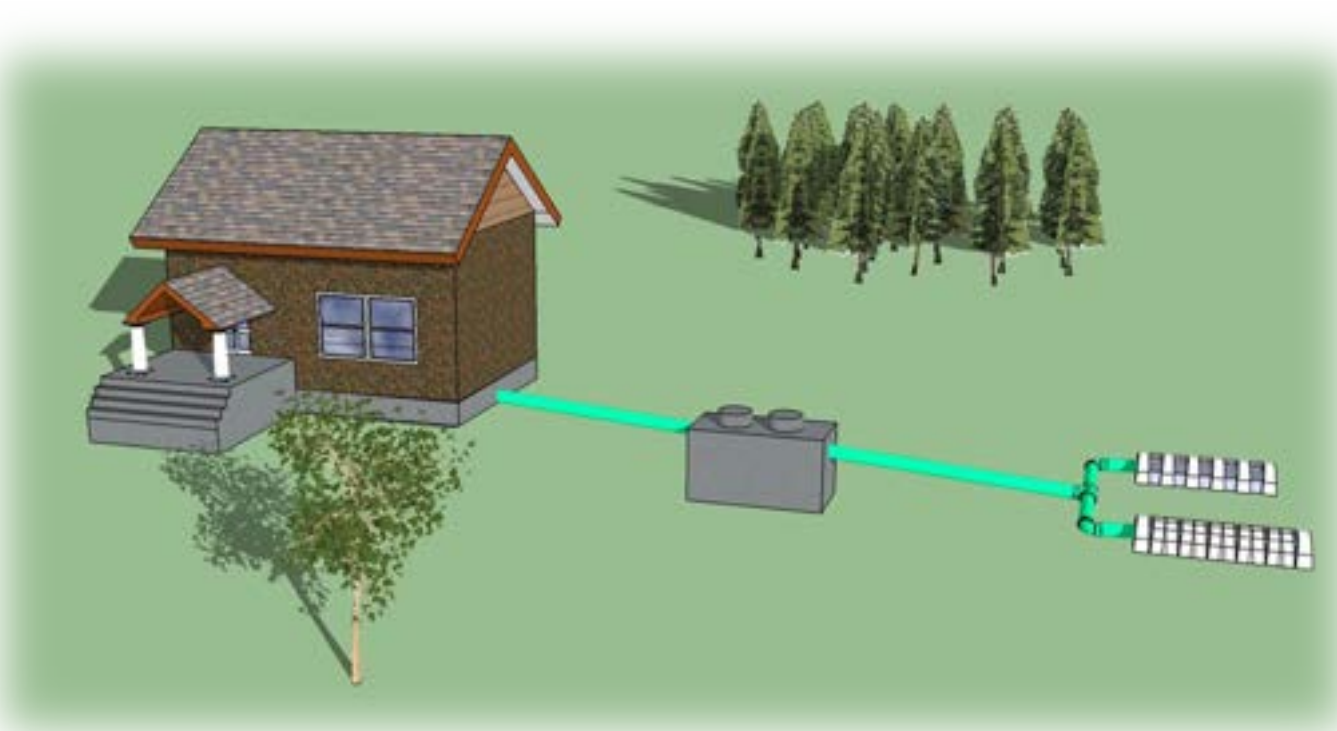
Conventional Septic Systems Application Package For a Permit To Construct



Department of Environmental Quality

WYOMING

Water Quality Division

Wyoming Water Quality Rules and Regulations, Chapter 25

May 2017

Introduction

This application package will assist you with submitting a completed application for a permit to install a conventional small wastewater treatment and disposal system. Complete and submit only those pages that are applicable to your system. If you complete the required pages using the information in this design package as accurately as possible, your small wastewater treatment permit application should comply with the minimum requirements of the Water Quality Rules and Regulation, Chapter 25.

DEQ designed this application package for conventional systems (septic tank and leachfield) only. In order to use this package, your system must meet all of the following criteria:

- wastewater flow of less than 2,000 gallons per day of waste containing domestic sewage
- standard trench or bed type disposal systems, using either stone and pipe or chambers
- seasonal high groundwater, bedrock, or impervious clay layers must be four feet or more below the bottom of the proposed leachfield
- soil percolation rates must be ≥ 5 minutes per inch (mpi) and ≤ 60 mpi

If your system does not meet all of these requirements, a non-conventional system may be required. Examples of non-conventional systems are mounded or partially mounded systems, non-discharging ponds, or evapotranspiration systems. Since these types of facilities are more difficult to design and construct, this package does NOT provide guidance in the design of non-conventional disposal systems. Please contact your district engineer if you propose to use a non-conventional system.

For systems exceeding 2,000 gallons per day or for wastewater that is not entirely domestic waste, contact the Underground Injection Control (UIC) Program at 307-777-5623 or refer to: http://deq.wyoming.gov/wqd/underground-injection-control/.

This permit application has been prepared under the direction of Ryan McBride, P.E. # 15068, a registered professional engineer employed by the Wyoming Department of Environmental Quality, Water Quality Division. DEQ maintains a signed and sealed copy on file at the DEQ Cheyenne office.

Table of Contents

Reviewed By _____ App. No. _____

Small Wastewater Treatment Facility Application for Permit to Construct

Use this application **ONLY** for small wastewater treatment facilities treating less than 2,000 gallons per day. For facilities exceeding 2,000 gallons per day, contact the Underground Injection Control Program (UIC) at 307-777-5623.

For Converse (commercial systems only), Carbon, Niobrara, and Platte counties, submit completed packages to: DEQ/ Water Quality Division 200 W 17th Street Cheyenne, WY 82002 (307) 777-7781	**WQD Date Stamp**
For Campbell (commercial systems only), Crook, and Weston counties, submit completed packages to: DEQ/Water Quality Division 152 North Durbin Street, Suite 100 Casper, WY 82601 (307) 473-3465	**WQD Authorization Stamp**
For all other counties: contact the Small Wastewater Permitting Authority for the correct forms. http://deq.wyoming.gov/wqd/permitting-2/resources/small-wastewater-permitting-authority/	

Name of Project:	
Project Description:	

Location:

County:							
¼ ¼ Section:		Section:		Township:		Range:	
Decimal Latitude:			Decimal Longitude:				
Subdivision Name:				Lot and Block:			

Real Estate Owner		**Engineer/Geologist**	
Printed Name:		**Printed Name:**	
Title:		**Title:**	
Mailing Address:		Mailing Address:	
City, State:	Zip:	City, State:	Zip:
Phone Number:		Phone Number:	
Email:		Email:	
		WY P.E.#	WY P.G.#

Installer Information

Name:		
Mailing Address:		
City, State, Zip:		
Phone:		Email:

Property Information		
	County:	
	Physical Address:	
	Lot Size:	_____ feet by _____ feet **OR** _____ acres
	Type of Building:	(single family dwelling, mobile home, commercial, etc.)
	Water Source: (Check One)	☐ Cistern
		☐ Private Well SEO Well Permit Number: _____
		☐ Community Well Name: _____
		☐ Municipal Well Name: _____
	Is this a replacement small wastewater treatment facility? If yes, what are you replacing?	☐ Yes ☐ No Type replaced:
	Will this small wastewater treatment facility be located within a delineated source water protection area?	☐ Yes ☐ No
	Does the county approved plat require enhanced septic systems? If yes, do NOT proceed with this application. Contact your district engineer to discuss other options.	☐ Yes ☐ No

Provide legal description of property (from sales contract or deed) below and attach a copy of the county approved plat.

Access Route

As part of this application, the applicant shall certify under penalty of perjury that the applicant has secured and shall maintain permission for Department of Environmental Quality personnel and their invitees to access the permitted site, including (i) permission to access the land where the site is located, (ii) permission to collect resource data as defined by Wyoming Statute § 6-3-414, and (iii) permission to enter and cross all properties necessary to access the site if the site cannot be directly accessed from a public road. A map of the access route(s) to the site shall accompany this application. **Attach map as a separate sheet.**

Signatures

All undersigned certify under penalty of perjury that the owner or applicant has secured and shall maintain permission for Department of Environmental Quality personnel and their invitees to access the permitted site, including (i) permission to access the land where the site is located, (ii) permission to collect resource data as defined by Wyoming Statute § 6-3-414, and (iii) permission to enter and cross all properties necessary to access the site if the site cannot be directly accessed from a public road. All undersigned agree to comply with all applicable Wyoming Statutes and Regulations and to allow the activities described in this application.

Real Estate Owner (Signature Required)	Engineer/Geologist
Signature:	**Signature:**
Printed Name:	**Printed Name:**
Title:	**Title:**

Site Suitability

The owner must be aware of the depth of any impermeable soil layers, high groundwater levels, and slope when considering the septic system location. The septic system must meet the criteria listed in the Introduction (Page 2) for a conventional system to work properly. **If your site does not meet these criteria, stop filling out this form and contact your district engineer to discuss other options.** The questions below will ensure you have gathered the information necessary to determine if a conventional septic system is appropriate.

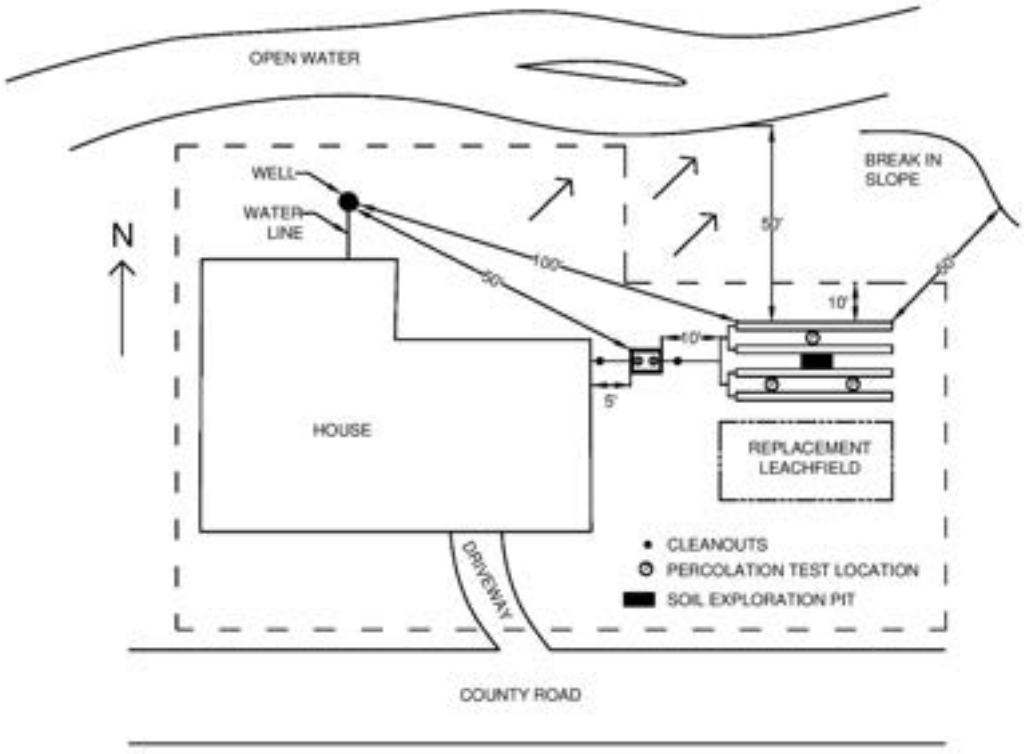
Excavation	Does the soil exploration pit lie within the area of the proposed leachfield?	☐ Yes ☐ No
	Was the bottom of the required soil exploration pit at least **4 feet below** the bottom of the proposed leachfield, usually a minimum of 7-8 feet total depth? **This is required.**	☐ Yes ☐ No
	Take a color photograph of the excavation, showing a tape measure against the sidewall of the trench. Submit a color copy of the photograph as a separate sheet. **Photo included in packet?**	☐ Yes ☐ No
	Depth of the excavation?	
	Who conducted the excavation?	Date:
Impermeable Layers	Did the excavator observe a rock layer below the surface?	☐ Yes ☐ No
	If yes, at what depth below the ground surface?	
	Did the excavator observe a clay layer below the surface?	☐ Yes ☐ No
	If yes, at what depth below the ground surface?	
High Groundwater	Was groundwater present in the excavation?	☐ Yes ☐ No
	If yes, at what depth below the ground surface?	
	Does the soil have an alkali crust at the surface, a rotten egg smell, or a blue-gray or greenish-gray (gley) color that may indicate frequent/continuous saturation?	☐ Yes ☐ No
	If yes, at what depth below the ground surface?	
	Does the soil have a mottled appearance with areas around roots or cracks that look like rust, or is the soil stained a dark red-black or red-brown color, which may indicate periods of saturation?	☐ Yes ☐ No
	If yes, at what depth below the ground surface?	
Slope	What is the estimated slope of the proposed leachfield area? **Take a color photograph of the proposed leachfield area and attach a copy as a separate sheet.**	
	How far away is the nearest break in slope (the side of a hill or where the slope becomes abruptly steeper) from the proposed leachfield area?	
Other	How far away is the nearest surface water body, such as a lake, river, pond, creek, ditch, or wetland from the proposed leachfield area?	
	How far away are areas where the soil may be compacted by vehicles, such as roads or parking spaces, from the proposed leachfield area?	
	How far away are water supply wells (drinking or irrigation wells), cisterns, or water supply lines from the proposed leachfield area?	
	Do surface drainage features (ditches, depressions, or swales) direct runoff from paved areas such as roofs, patios, or driveways, away from the leachfield?	☐ Yes ☐ No

Site Plan Drawing

Attach a sketch of your site as a separate sheet, showing each of the items in the table below if applicable.

Check Box If Shown On Site Plan	Element	Required Setback Distance To Septic Tank (feet)	Required Setback Distance To Leachfield (feet)	Is the Setback Distance Satisfied?
☐	Property lines	10	10	☐ Yes ☐ No
☐	All buildings, roads, and driveways	—	—	—
☐	Setback to buildings w/out a foundation drain	5	10	☐ Yes ☐ No
☐	Setback to buildings with a foundation drain	5	25	☐ Yes ☐ No
☐	Private wells (including neighbors)	50	100	☐ Yes ☐ No
☐	Public water supply wells	100	200	☐ Yes ☐ No
☐	Potable water supply lines	25	25	☐ Yes ☐ No
☐	Surface water (ditch, pond, Intermittent waterways, etc.)	50	50	☐ Yes ☐ No
☐	Septic tank	—	10	☐ Yes ☐ No
☐	Break in slope (where slope gets abruptly steeper)	15	15	☐ Yes ☐ No
☐	Cisterns	25	25	☐ Yes ☐ No
☐	Leachfield & Replacement Leachfield	10	—	☐ Yes ☐ No
☐	North arrow	—	—	—
☐	Slope (arrow pointing downslope)	—	—	—
☐	Location of numbered percolation test holes (numbered)	—	—	—
☐	Location of soil exploration pit	—	—	—
☐	Location of cleanout port(s)	—	—	—

Example site plan: Please see our [Site Plan Mapping Tool] on our website!



Septic Tank and Piping Worksheet

Septic Tank

Manufacturer:		
Model No./Number of Chambers:		
Size (gallons):		
Tank Material:	☐ Concrete ☐ Fiberglass ☐ Thermoplastic ☐ Other (please describe): _____	
Is this septic tank on the approved list?	☐ Yes ☐ No ☐ Don't Know	

If no, provide a tank diagram from the manufacturer. If you cannot locate a diagram from the manufacturer, complete the following 3 rows. See Page 8 for septic tank design requirements and a diagram of a septic tank.

Please complete for tanks NOT on approved list.

Internal Dimensions: Length (in): _____ Width (in): _____ Height (in): _____			
Liquid Depth (in):		**Amount of Air Space Between Top of Liquid and Chamber Ceiling (in)**	
Operating Capacity	**(** _____ * _____ * _____ **) ÷ 231 =** _____ **gallons** Length (in) Width (in) Liquid Depth (in) Operating Capacity		

Depth of backfill over tank (minimum of 6" required)		**Number of bedrooms, if a residence:**	

If more than 4 bedrooms: Does the tank have additional capacity of 150 gallons per additional bedroom above 1,000 gallons?	☐ Yes ☐ No
Does the tank have a 20-inch access opening in **EACH** compartment of the tank and a riser from the access opening that terminates at a max of six (6) inches below the ground surface?	☐ Yes ☐ No
Is septic tank installed on a level grade, with firm bedding to prevent settling, and without rock or other obstructions touching the tank as per WQRR Chapter 25, Section 10(a)(ii)?	☐ Yes ☐ No
If installing two tanks in a series, install the downstream tank a minimum of 2 inches lower than the first to insure proper flow. Will the installer use a series of tanks as described?	☐ Yes ☐ No
Do access openings have a locking device?	☐ Yes ☐ No

Piping

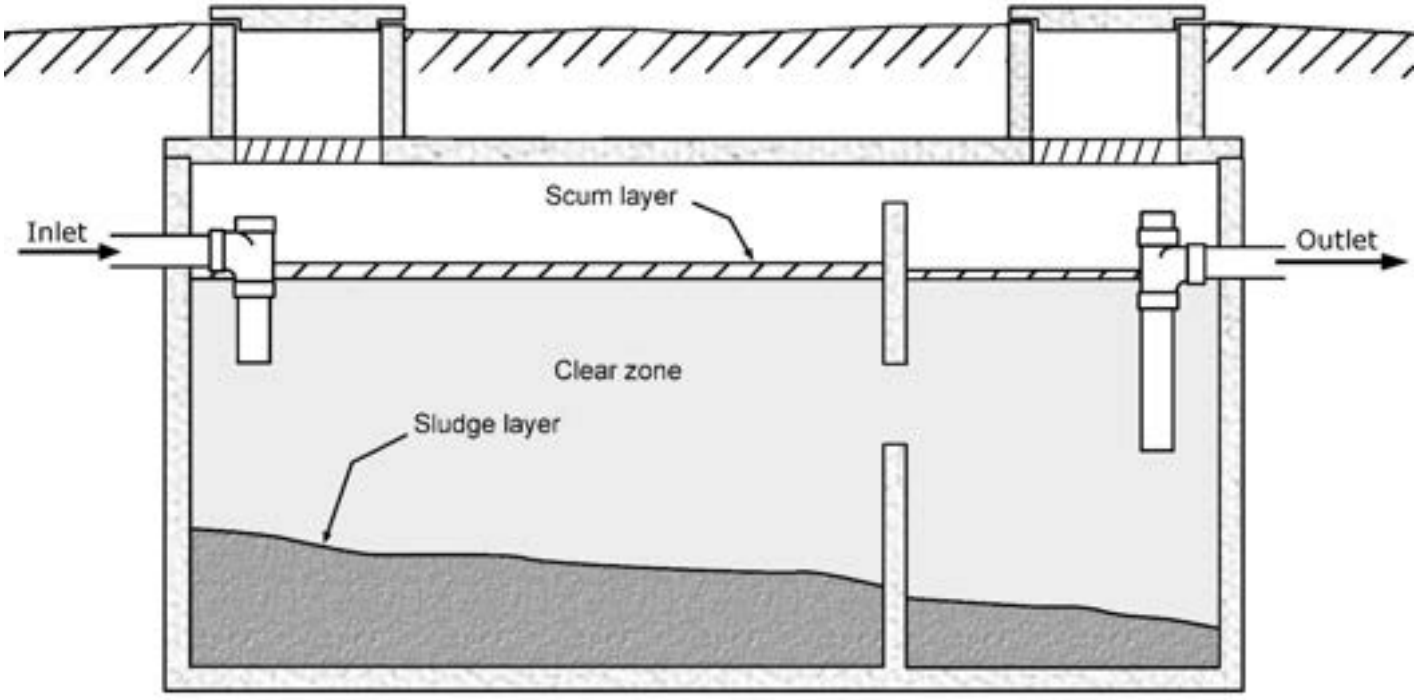
What will the piping material between the house and the septic tank be?		What is the proposed pipe size (diameter)?	

Will the installer lay the pipe from the house to the septic tank in a straight line?	☐ Yes ☐ No
If no, will the installer include the **required** cleanout ports at any alignment change greater than 22.5 degrees?	☐ Yes ☐ No
Will the pipe from the house to the septic tank be more than 100 feet long?	☐ Yes ☐ No
If yes, will the **required** cleanout ports be spaced along the line every 100 feet or less?	☐ Yes ☐ No
DEQ recommends a cleanout port facing each direction between the building and the tank. If only one is used, which direction does the **required** cleanout port face?	☐ Toward Building ☐ Toward Tank
Will the piping have a minimum slope of ¼ inch per foot (2%)?	☐ Yes ☐ No
If the installer uses more than one trench, they must use a distribution box or flow divider tee to equalize flow. Will the system include a distribution box or flow divider tee?	☐ Yes ☐ No
Will the leachfield trenches be less than 100 feet long? **This is required.**	☐ Yes ☐ No

Basic Design Requirements for Septic Tanks

1. Tanks must have a minimum of a 1,000-gallon capacity for residences with up to four bedrooms; add 150 gallons of capacity for each additional bedroom.
2. The tank must be watertight, including all joints and connections, and constructed of a durable, non-corrodible material such as concrete, fiberglass, thermoplastic or other approved material. DEQ regulations do not allow steel tanks.
3. The liquid depth shall be between three (3) and six (6) feet deep.
4. A single chamber tank shall have at least a 2:1 length to width ratio or be partitioned to prevent short-circuiting.
5. The first chamber in any two-chambered tank must accommodate at least 50 percent of the capacity.
6. Each chamber must have an access opening with a minimum dimension of 20 inches, from which both inlet and outlet tees shall be accessible.
7. Each chamber must have a cleanout riser that extends to a maximum of six (6) inches below the ground surface.
8. The inlet and outlet tees should be 4-inch diameter, schedule 40 PVC or equivalent, and should extend into undisturbed soil.
9. Install tanks used in a series such that the inlet to each successive tank shall be at least two (2) inches below the outlet of the preceding tank.

Diagram of a Typical Two-Chambered Septic Tank



Drawing modified from CIDWT. 2009. *Installation of Wastewater Treatment Systems*. Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT). Iowa State University, Midwest Plan Service. Ames, IA.

Percolation Test Instructions

In order for a septic system to perform properly, the wastewater must move through the soil at an ideal rate, neither too fast nor too slow. A percolation test estimates the rate at which the water will percolate, or move, through the soil. The information provided by percolation tests is necessary to design leachfields correctly. Follow the steps below to complete a percolation test.

1. Location of Percolation Test Holes. The percolation (perc) test holes must be spaced uniformly over the proposed leachfield site. A minimum of three (3) test holes are required, although you can use more if desired.

2. Test Hole Preparation. Dig or bore each hole 12 inches wide and as deep as the proposed depth of the leachfield (usually between 30 and 40 inches). Make sure the sides are vertical and scrape the sides and bottom of the hole with a sharp pointed instrument to restore a natural soil surface. Remove loose soil from the hole and place 2 inches of course sand, washed gravel, or crushed stone in the bottom in order to prevent scouring or sealing.

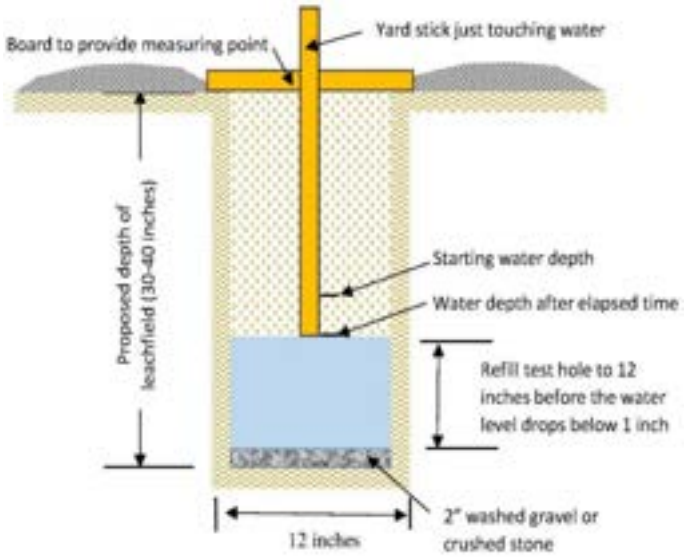
3. Presoaking. Presoaking is ***absolutely*** required to get valid percolation test results. Presoaking allows the water conditions in the test hole to reach a stable condition that is similar to a leachfield. Presoaking time varies with soil conditions, but presoak holes for at least 4 hours. Maintain at least 18 inches of water in the test holes for at least 4 hours, then allow the soil to swell for 12 hours (overnight is good) before starting the perc test.

For sandy or loose soils, add 18 inches of water above the gravel or coarse sand. If the 18 inches of water seeps away in 18 minutes or less, add 18 inches of water a second time. If the second filling of 18 inches of water seeps away in 18 minutes or less, the soil is excessively permeable and the site is unsuitable for a conventional disposal system. If this is the case, contact your county small wastewater permitting authority or DEQ district office.

4. Perc Rate Measurements. Fill each hole with 12 inches of water and let the soil re-hydrate for 15 minutes prior to taking any measurements. Establish a fixed reference point such as a flat board placed across the top of the hole to measure the incremental water level drop at the constant time intervals. Measure the water level drop to the nearest 1/8 of an inch with a minimum time interval of 10 minutes. Normal time intervals are usually 10 or 15 minutes.

Refill the test hole to 12 inches above the gravel before starting the measurements. Measure down to the water from the fixed reference point. Record this value on the first line in the perc test data sheet (Page 10). Take another measurement after the time interval has elapsed and record on the second line of the table. Calculate the water level drop and record in the table.

Continue the test until the water level drop rate has stabilized, i.e. three consecutive measurements within 1/8 inch of each other. Before the water level drops below 1 inch above the gravel, refill the test hole to 12 inches. Some test holes may take longer to stabilize than others. If the drop rate continues to fluctuate, use the smallest drop rate out of the last six intervals for your calculations.



Percolation Test Data Sheet

Owner/Project Name: _____ Date: _____

Test holes were pre-soaked for: _____ (hours/minutes) Time Interval:_____ min

Do not perform percolation test if ground is frozen or if groundwater is present in holes. Holes must be 12 inches in diameter and evenly spaced over the leachfield area. Roughen sides and bottoms of holes and place 2 inches of gravel in each hole.

		Hole #1 (Required)		Hole #2 (Required)		Hole #3 (Required)		Hole #4 (Optional)		Hole #5 (Optional)		Hole #6 (Optional)	
Depth of Hole:													
Time of Day	**Time (Min)**	**Measure to nearest 1/8 inch**		**Measure to nearest 1/8 inch**		**Measure to nearest 1/8 inch**		**Measure to nearest 1/8 inch**		**Measure to nearest 1/8 inch**		**Measure to nearest 1/8 inch**	
		Water Level	**Drop**	**Water Level**	**Drop**	**Water Level**	**Drop**	**Water Level**	**Drop**	**Water Level**	**Drop**	**Water Level**	**Drop**
			—		—		—		—		—		—
Time Interval (minutes)													
Final Interval Drop (inches)													
Perc Rate (min/inch)													
								Design Perc Rate (min/inch)					

To calculate drop: Subtract the water level measurement at the start of your time interval from the water level measurement at the end. The "Drop" is how far the water level went down during the stated time interval. Time intervals must be consistent for each hole throughout the test.

Leachfield percolation (Perc) rate: If 3 to 5 holes were tested, use the slowest (highest number) rate of the holes tested. If six or more holes were tested, use the average rate.

Helpful Conversions: 1/8 = 0.125 1/4 = 0.25 3/8 = 0.375 1/2 = 0.50 5/8 = 0.625 3/4 = 0.75 7/8 = 0.875

To calculate perc rate (minutes per inch): Time Interval (min) ÷ Final Interval Drop (in)

$$Example\ Perc\ Rate = \frac{Time\ Interval\ (min)}{Final\ Interval\ Drop\ (in)} = \frac{10\ min}{1\ \frac{1}{8}\ in} = 8.9\ \frac{min}{in}$$

I certify that this perc test was done in accordance with WQRR Chapter 25, Appendix A and the instructions on the previous page.

Test Performed by: _____ **Signature:** _____

Leachfield Sizing Worksheet

Design Flow (gpd)

Please Select Building Type:

☐	**Residential Building (Including Mobile Homes)**	**How many bedrooms does the residence have?** _____ bedrooms **Does the residence have an unfinished basement?** ☐ Yes ☐ No If yes, add 2 more bedrooms to the number above. **_____ Total bedrooms**	**Enter the number of gallons per day (gpd) of wastewater generated that corresponds with the number of bedrooms in Box 1 below.** 1 bedroom 150 gpd 2 bedrooms 280 gpd 3 bedrooms 390 gpd 4 bedrooms 470 gpd 5 bedrooms 550 gpd 6 bedrooms* 630 gpd *Add an additional 80 gallons per day for each bedroom over 6.
☐	**Non-residential Building**	Refer to Chapter 25, Table 2. Show calculations and attach a separate sheet if necessary.	

Design Flow (gpd):
Enter value from cells above or Chapter 25, Table 2 (attached):

Box 1

Loading Rate (gpd/ft²)

Check Perc Rate Obtained from Perc Test Data Sheet (page 10)

Perc. Rate min/inch	Loading Rate gpd/ft²	Perc. Rate min/inch	Loading Rate gpd/ft²	Perc. Rate min/inch	Loading Rate gpd/ft²
○ 5	0.80	○ 16	0.50	○ 30-31	0.39
○ 6	0.75	○ 17	0.49	○ 32-33	0.38
○ 7	0.71	○ 18	0.48	○ 34-35	0.37
○ 8	0.68	○ 19	0.47	○ 36-37	0.36
○ 9	0.65	○ 20	0.46	○ 38-40	0.35
○ 10	0.62	○ 21	0.45	○ 41-43	0.34
○ 11	0.60	○ 22	0.44	○ 44-46	0.33
○ 12	0.58	○ 23-24	0.43	○ 47-50	0.32
○ 13	0.56	○ 25	0.42	○ 51-55	0.31
○ 14	0.54	○ 26 - 27	0.41	○ 56-60	0.30
○ 15	0.52	○ 28 - 29	0.40		

Loading Rate (gpd/ft²):
Enter loading rate for your percolation rate from above table.

Box 2

Leachfield Sizing (ft²)

Required Leachfield Area (ft²)
Divide design flow (Box 1) by loading rate (Box 2). Round **up** to the nearest whole number.

Box 3

_____ ÷ _____ = _____
Design Flow (Box 1) ÷ Loading Rate (Box 2) = Leachfield Area (Box 3)

Example: 300 gpd ÷ 0.62 gpd/ft² = 483.87 or 484 ft²

Leachfield Design Instructions

Arrange conventional septic system leachfields using either a trench or a bed layout. Construct either trench or bed layouts using either perforated pipe or open-bottom chamber systems. DEQ prefers trench layouts because they provide more surface area for absorption of wastewater into the soil. Trenches also treat wastewater more efficiently because the undisturbed soil between the trenches allows more oxygen to reach the microbes that break down and treat the wastewater. For this reason, trenches are also more effective when soils have lower or "slower" percolation rates. Use bed layouts where space for a leachfield is limited and only where soils have higher or "faster" percolation rates. DEQ considers trenches spaced less than three (3) feet apart as bed layouts.

To design your leachfield, follow these steps:

1) Choose either a trench or a bed layout.
2) Choose either perforated pipe or open-bottomed chambers for your leachfield.
3) Fill out the layout worksheet and diagram that correspond to your selection. This worksheet will determine how many trenches you need or how large to make your bed.
4) Submit **only** the worksheet and diagram that you completed.

Trench Leachfield System:

Perforated Pipe Trench Layout Worksheet, Page 14
Chambered Trench Layout Worksheet, Page 16

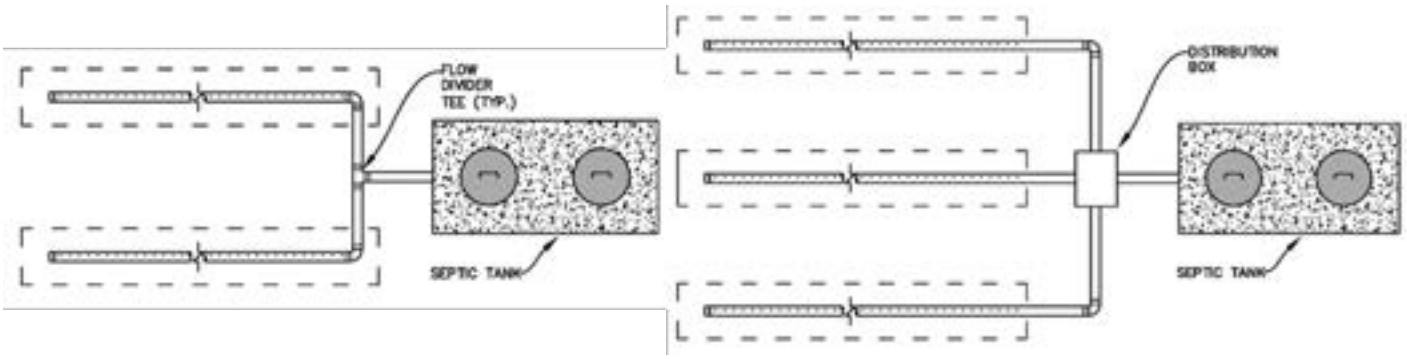
Bed Leachfield System:

Perforated Pipe Bed Layout Worksheet, Page 18
Chamber Bed Layout Worksheet, Page 20

Install leachfields to ensure equal distribution of wastewater effluent among all the trenches. Equal distribution allows the use of the entire infiltrative surface of the leachfield and prevents overloading part of the leachfield.

Use either a piping header or distribution box (D-box) to distribute wastewater effluent equally among the trenches of a leachfield. A piping header system conveys wastewater effluent to each disposal trench using a network of solid piping. Split the discharge line from the septic tank using a T-pipe fitting (see example below). If there is an odd number of trenches in the leachfield, use a distribution box to divide wastewater effluent evenly among the trenches (see example below). Distribution boxes are typically made of concrete or wastewater-grade plastics and are watertight with a single inlet set at a higher elevation than the outlets. Construct outlets so that their elevations are equal relative to one another.

Examples of Septic Systems Where the Effluent is Distributed Equally.



DEQ does not require installation of leachfield trenches in a straight line. In fact, it is always preferable to follow the contour of the land. Additionally, never install the leachfield in floodways, at the base of slopes, or in depressions where runoff water could flood the leachfield. Construct leachfields in areas with good surface drainage, where the water cannot pond over the leachfield.

Table 1. Chamber System Equivalent Areas

Wyoming DEQ Rules and Regulations Chapter 25 Section 8 allows for a 30% reduction in the leachfield area when using chambers in place of traditional pipe and stone systems. To calculate the reduction in square footage required to achieve the same amount of infiltrative surface as pipe trenches or beds, use the dimensions provided by the chamber manufacturer. In a trench configuration, the equivalent area is equal to Length * [(Chamber Width * 1.43) + (2 * Effective Sidewall Height)]. In a bed configuration the sidewall is not counted, so the equivalent area is equal to Length * (Chamber Width * 1.43). Use dimensions provided in the table below to design leachfields utilizing chamber technology on pages 16 (chamber trenches) or 20 (chamber beds) of the application package.

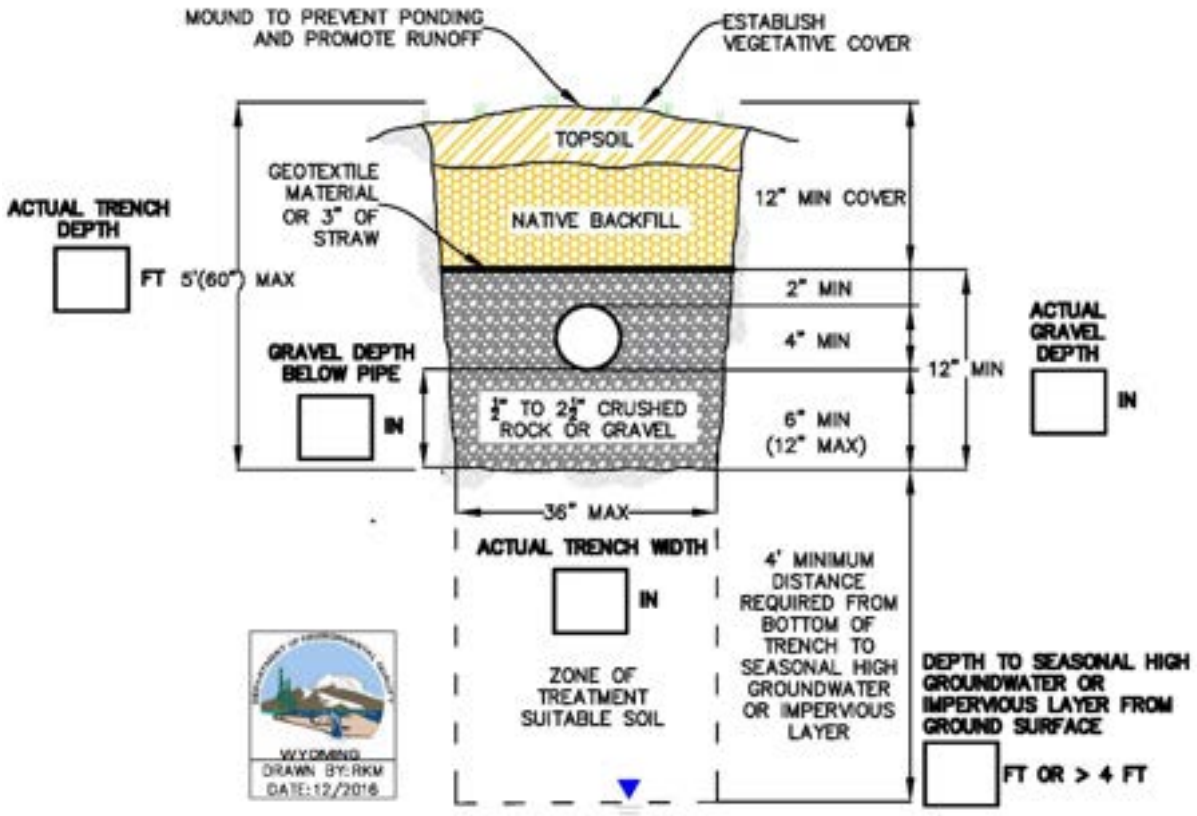
Chamber Class	Chamber Name	Nominal Dimensions			Effective Dimensions			Equivalent Area	
		Length (ft)	Width (in)	Height (in)	Length (ft)	Width[1] (in)	Height[2] (in)	Trench Layout (sf/unit)	Bed Layout (sf/unit)
High Capacity	**Quick4 High Capacity**	4.4	34	16	4.0	34	11.5	**23.9**	**16.2**
	Quick4 Plus High Capacity	4.4	34	14	4.0	34	8.0	**21.5**	**16.2**
	Arc 36 High Capacity	5.3	34	16	5.0	34	10.5	**29.0**	**20.3**
	BioDiffuser 16" High Capacity	6.3	34	16	6.2	34	11.2	**36.7**	**25.1**
Standard	**Quick4 Standard**	4.4	34	12	4.0	34	8.0	**21.5**	**16.2**
	Quick4 Plus Standard	4.4	34	12	4.0	34	8.0	**21.5**	**16.2**
	Arc 36	5.3	34	13	5.0	34	7.0	**26.1**	**20.3**
	BioDiffuser 11" Standard	6.3	34	11	6.2	34	5.8	**31.1**	**25.1**
Standard Low Profile	**Quick4 Plus Standard LP**	4.4	34	8	4.0	34	3.3	**18.4**	**16.2**
	Arc 36 LP	5.3	34	8	5.0	34	3.8	**23.4**	**20.3**
Narrow	**Quick4 Equalizer 36**	4.4	22	12	4.0	22	6.0	**14.5**	**10.5**
	Arc 24	5.6	22	12	5.0	22	6.3	**18.3**	**13.1**
	BioDiffuser Bio 3	7.3	22	12	7.2	22	6.4	**26.5**	**18.9**
Narrow LP	**Quick4 Plus Equalizer 36 LP**	4.4	22	8	4.0	22	3.3	**12.7**	**10.5**
Ultra-Narrow	**Quick4 Equalizer 24**	4.4	16	12	4.0	16	6.0	**11.6**	**7.6**
	Arc 18	5.6	16	12	5.0	16	6.3	**14.7**	**9.5**
	BioDiffuser Bio 2	7.3	16	12	7.2	16	6.4	**21.3**	**13.7**
Ultra-Narrow LP	**Quick4 Equalizer 24 LP**	4.4	16	8	4.0	16	2.0	**9.0**	**7.6**

[1]The equivalent areas calculation used the outside width of the chamber.
[2]The effective height is the height of the slotted sidewall of the chamber or depth below the flow line of the inlet pipe, whichever is less.

Perforated Pipe Trench Layout Worksheet

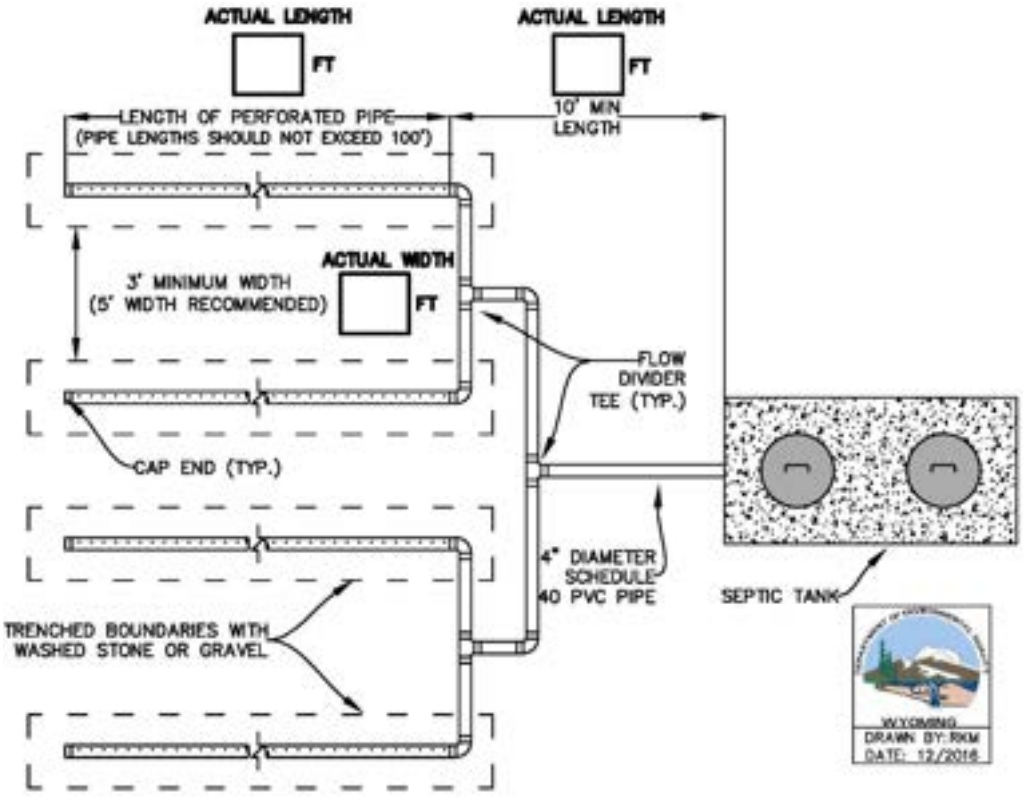
<table>
<tr><td rowspan="4">Design</td><td>Required Leachfield Area (Page 11, Box 3)</td><td colspan="3">Box 1</td></tr>
<tr><td>Depth of Trench Below Pipe (ft)</td><td colspan="3">Box 2</td></tr>
<tr><td>Width of Trench (ft)</td><td colspan="3">Box 3</td></tr>
<tr><td>Absorptive Area Per Linear Foot of Trench (ft²/ft)</td><td colspan="3">Box 4
_____ + _____ + _____ = _____
Trench Depth (Box 2) Trench Depth (Box 2) Trench Width (Box 3) Absorptive Area</td></tr>
<tr><td>Total Trench Length (ft)</td><td colspan="3">Box 5
_____ ÷ _____ = _____
Required Leachfield Area (Box 1) Absorptive Area (Box 4) Total Trench Length</td></tr>
<tr><td rowspan="8">Trench Layout</td><td rowspan="8">Number of Trenches to Use</td><td>Total Trench Length (ft) (from Box 5)</td><td>Minimum Number of Trenches to Use</td><td rowspan="8">Box 6
Number of Trenches to Use = _____
Length of Trenches = _____
*A distribution box, or D-box, is required when an odd number of trenches is used.</td></tr>
<tr><td><101</td><td>1</td></tr>
<tr><td>101-200</td><td>2</td></tr>
<tr><td>201-300</td><td>3*</td></tr>
<tr><td>301-400</td><td>4</td></tr>
<tr><td>401-500</td><td>5*</td></tr>
<tr><td>501-600</td><td>6</td></tr>
</table>

Please fill in the boxes on the diagram below.



Perforated Pipe Trench Layout Diagram

Example Layout Diagram

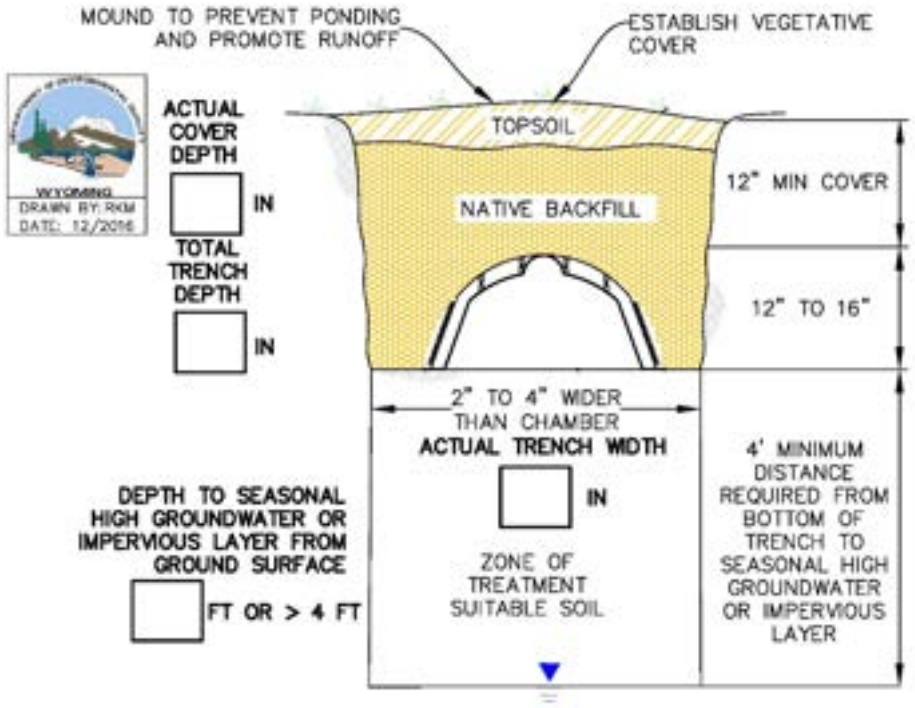


Draw your perforate pipe trench layout below or attach a separate sheet.

Chambered Trench Layout Worksheet

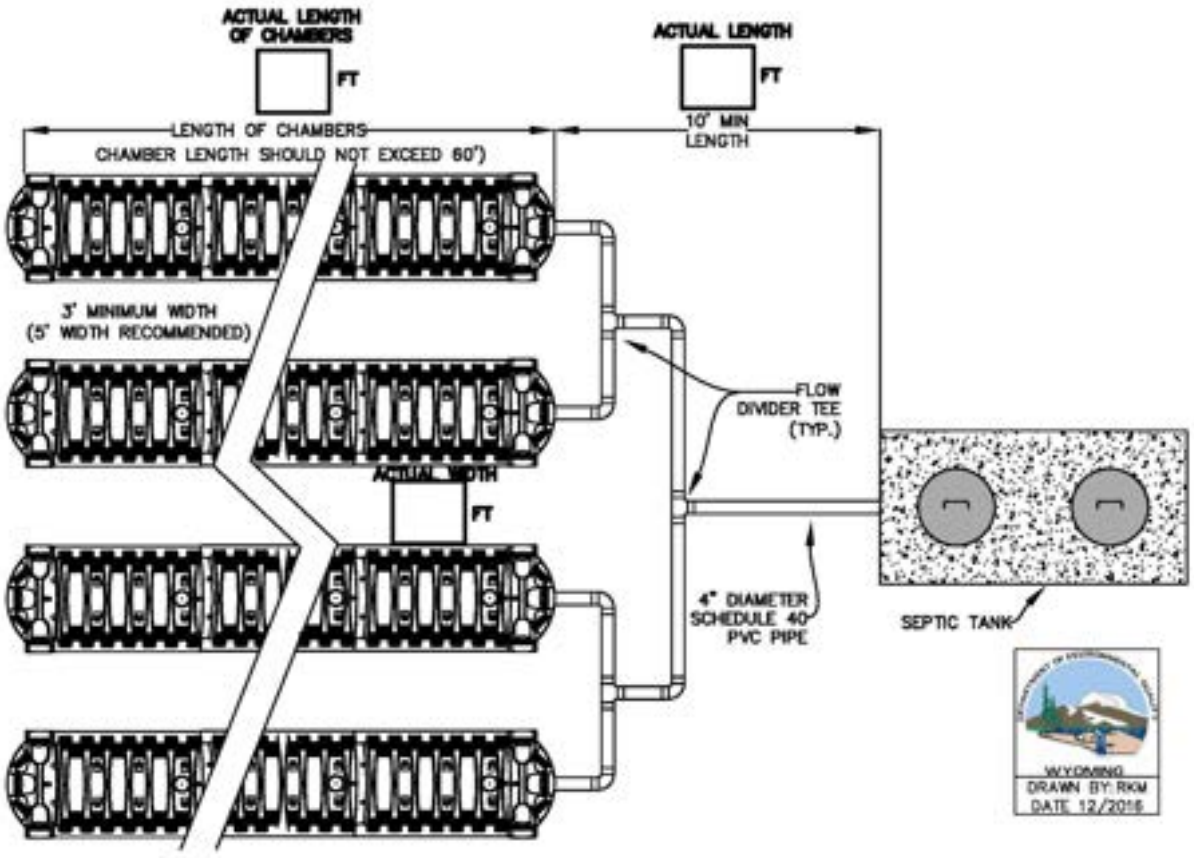
Chamber (See Table 1, Page 13)	Manufacturer			
	Model			
	Nominal Length (ft)			
	Nominal Width (in)			
	Nominal Height (in)			
	Effective Length (ft)			Box 1
Design	Required Leachfield Area (Page 11, Box 3)			Box 2
	Equivalent Area Per Unit (See Table 1, Page 13)			Box 3
	Number of Chambers	_____ ÷ _____ = _____ Required Leachfield Area (Box 2) / Equivalent Area Per Unit (Box 3) / Number of Chambers (Round Up)		Box 4
Trench Layout	Total Trench Length (ft)	_____ * _____ = _____ Number of Chambers (Box 4) / Effective Length (Box 1) / Total Trench Length		Box 5
	Number of Trenches to Use	**Total Trench Length (ft) (from Box 5)**	**Minimum Number Of Trenches to Use**	Box 6 **Number of Trenches to Use = _____** **Length of Trenches = _____**
		<60	1	
		61-120	2	
		121-180	3*	
		181-240	4	*A distribution box, or D-box, is required when an odd number of trenches is used.
		241-300	5*	
		301-360	6	

Please fill in the boxes on the diagram below.



Chambered Trench Layout Diagram

Example Layout Diagram

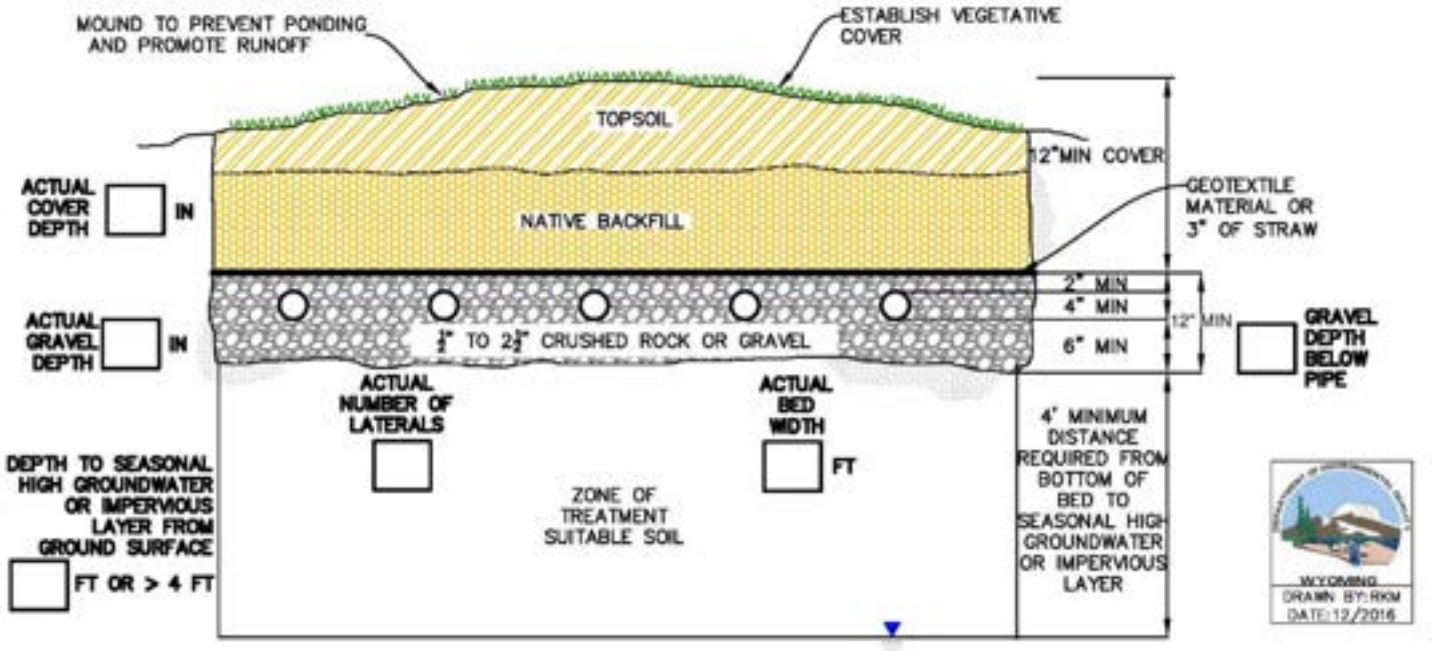


Draw your chambered trench layout below or attach a separate sheet.

Perforated Pipe Bed Layout Worksheet

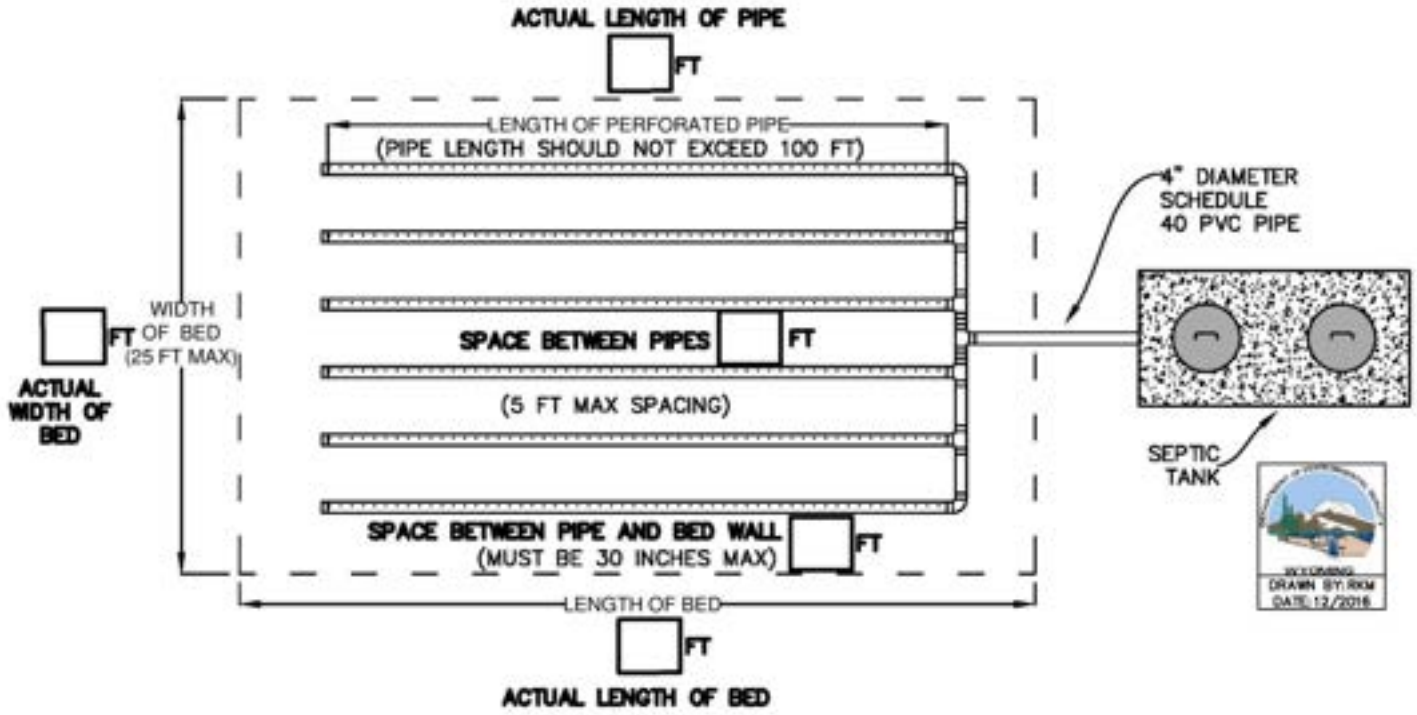
Design	Required Leachfield Area (Page 11, Box 3)	Box 1
	Total Excavated Depth (ft)	
	Depth below pipe (ft)	
Bed Layout	Bed Width (ft)	Box 2
	Bed Length (ft)	Box 3
	Bed Total Square feet	Box 4 _____ * _____ = _____ Bed Width (Box 2) Bed Length (Box 3) Total Bed Area
	Is Box 4 greater than or equal to Box 1	☐ Yes ☐ No
☐	If No, adjust Bed Width (Box 2) and Bed Length (Box 3) until Box 4 is greater than Box 1	
☐	If Yes, Complete bottom of Page 18	

Please fill in the boxes on the diagram below.



Perforated Pipe Bed Layout Diagram

Example Layout Diagram

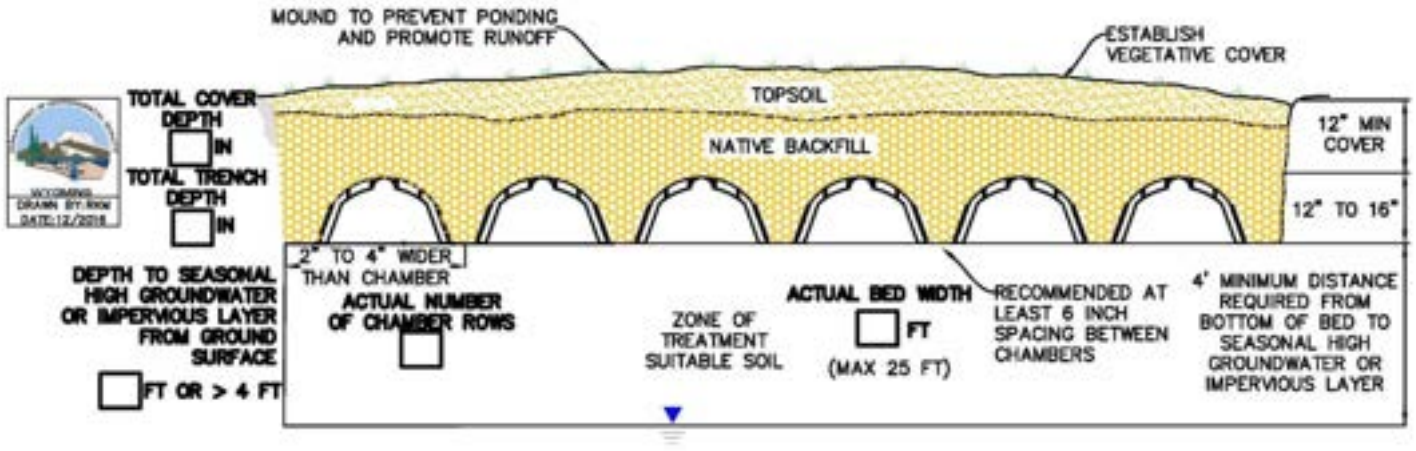


Draw your layout below or attach a separate sheet.

Chambered Bed Layout Worksheet

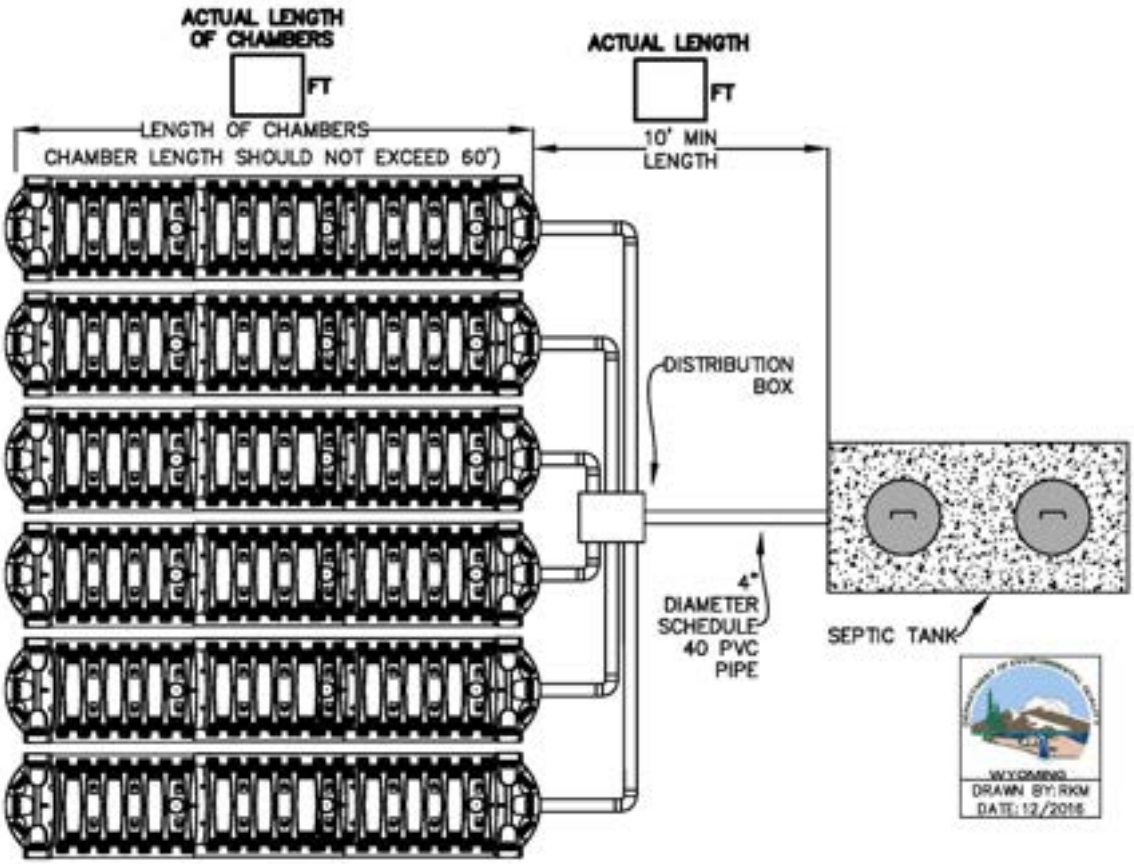
<table>
<tr><td rowspan="6">Chamber
(See Table 1, Page 13)</td><td>Manufacturer</td><td colspan="3"></td></tr>
<tr><td>Model</td><td colspan="3"></td></tr>
<tr><td>Nominal Length (ft)</td><td colspan="3"></td></tr>
<tr><td>Nominal Width (in)</td><td colspan="3"></td></tr>
<tr><td>Nominal Height (in)</td><td colspan="3"></td></tr>
<tr><td>Effective Length (ft)</td><td colspan="3">Box 1</td></tr>
<tr><td rowspan="3">Design</td><td>Required Leachfield Area (Page 11, Box 3)</td><td colspan="3">Box 2</td></tr>
<tr><td>Equivalent Area Per Unit (See Table 1, Page 13)</td><td colspan="3">Box 3</td></tr>
<tr><td>Number of Chambers</td><td colspan="3">Box 4
_____ ÷ _____ = _____
Required Leachfield Area (Box 2) | Equivalent Area Per Unit (Box 3) | Number of Chambers (Round Up)</td></tr>
<tr><td rowspan="2">Bed Layout</td><td>Total Chamber Length (ft)</td><td colspan="3">Box 5
_____ * _____ = _____
Number of Chambers (Box 4) | Effective Length (Box 1) | Total Chamber Length</td></tr>
<tr><td>Number of Chamber Rows to Use</td><td>Total Chamber Length (ft) (from Box 5)
<60
61-120
121-180
181-240
241-300
301-360</td><td>Minimum Number of Chamber Rows to Use
1
2
3*
4
5*
6</td><td>Box 6
Number of Chamber Rows to Use = _____
Length of Rows = _____
*A distribution box, or D-box, is required when an odd number of trenches is used.</td></tr>
</table>

Please fill in the boxes on the diagram below.



Chambered Bed Layout Diagram

Example Layout Diagram



Draw your chambered bed layout below or attach a separate sheet.

Attachment 1. Table 2 Excerpted from Water Quality Rules and Regulations, Chapter 25.

Non-Residential Wastewater Design Flow Rates (Table 2 Excerpted from Water Quality Rules and Regulations, Ch. 25)[1]

Facility	Unit	Flow (gallons/unit/day)
Airports	person	4
Apartment	bedroom	120
Automobile Service Station	vehicle served	10
Bars	seat	20
Bathhouses and swimming pools	person	10
Campgrounds (w/ toilets only)	person	25
Campgrounds (w/shower facility)	person	45
Church	person	4
Country Club	member	25
Day School, Office Building, Retail Store, Warehouse (no showers)	person	15
Hospital	bed	250
Industrial Building (sanitary waste only)	employee	20
Laundry (self-service)	machine	450
Mobile Home	bedroom	see Table 1
Motel, Hotel, Resort	bedroom	140
Recreational Vehicle	each	100
Rest Home, Care Facility, Boarding School	bed	100
Restaurant	meal	10
Restaurant (kitchen waste only)	meal	6
Theater	seat	3

[1]Values shown in the above table are the typical flow rates from *Wastewater Engineering Treatment and Reuse*, Metcalf and Eddy, 2003.