MISSOULA PUBLIC HEALTH
Environmental Health

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Missoula MT 59802-4123

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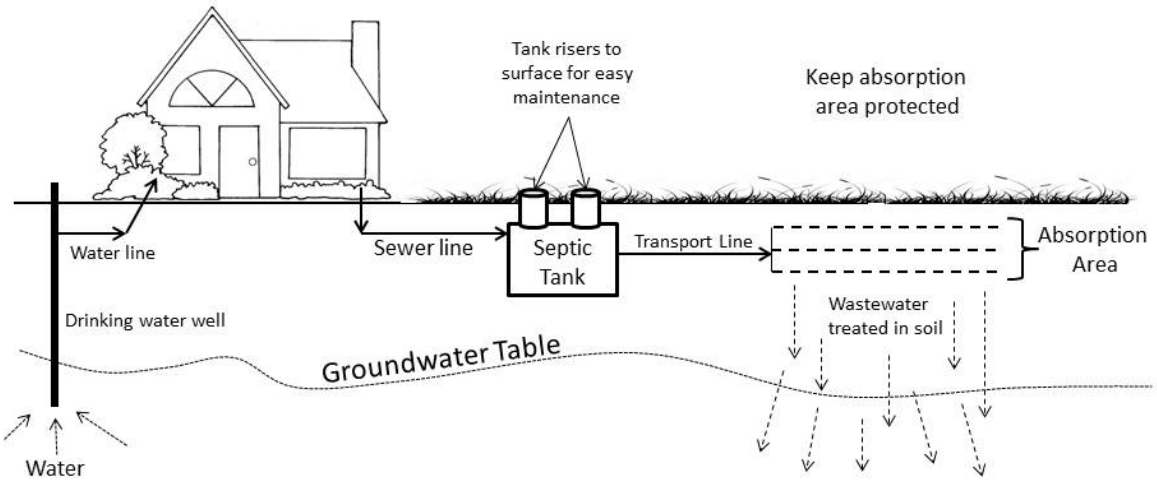
Certified Installers Resource Manual

for Wastewater Treatment and Disposal Systems



February 2020

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How to study for the Installer's Test

Missoula Public Health
City-County Health Department

HOW TO STUDY FOR THE CERTIFIED INSTALLER'S TEST

The point of certifying septic system installers is to make sure that people who construct, fix and abandon septic systems know the rules that apply in Missoula County. Each system you put in will have a permit, and the permit will let you know how big the system has to be, and where it has to be located. Many times, special conditions are included on the permit. But not every rule will be listed out. Installers have to know the basics, like how far apart drainfield laterals have to be, or the required slope of the line from the house to the tank.

The test is open book – after all, you can have a set of rules with you out on the job site. You'll be able to have a printed copy of the rules with you when you take it, but it will take hours if you haven't read through them and gotten the basic points down.

HOW THE RULES WORK TOGETHER

First, it is important to understand how the rules work together. Regulation 1, Wastewater Treatment and Disposal Systems, of the Missoula City-County Health Code is the primary set of regulations for Missoula County septic systems. You'll typical hear us refer to it as "Regulation 1." This is the main set of rules that you'll be tested on. State law requires all local Health Boards to adopt septic regulations that are at least as stringent as the state standards. The Missoula City-County Health Board first adopted Regulation 1 in 1966. Regulation 1 covers permitting, inspection, installer requirements, site evaluations, location of septic systems and more.

You'll see that Section 3 of Regulation 1 adopts two other documents "by reference":

- The Department of Environmental Quality's Circular 4, "Montana Standards for Subsurface Wastewater Treatment Systems" (DEQ 4) and
- The Missoula City-County Alternative System's Manual (Alternatives Manual).

Adoption by reference simply means that the Health Board made those additional documents part of Regulation 1. As you read through Missoula's rules, you'll see how these documents are referred to, and how to apply them in your work as a Certified Installer.

DEQ 4 is part of the minimum standards that counties have to adopt, so DEQ 4 applies across the state. Missoula has adopted more stringent standards in a number of areas, so Missoula County's rules will differ from other nearby counties. An example of a more

stringent regulation has to do with septic tank risers. DEQ 4, Section 5.1.2.3 (page 49) requires the access over each compartment of the septic tank be extended to within 12 inches of the finished ground surface. Missoula's rules [Regulation 1, Section 11(G), page 17] require access ports extend to the ground surface. The end result? In Missoula, access and inspection ports on septic tanks must extend to the finished ground surface.

Another example has to do with safety baskets (aka "kid catchers"). DEQ 4, Section 5.1.1 only *recommends* a safety basket in septic tank risers, while Regulation 1 *requires* it on access ports with an internal diameter of 22 inches or larger [Regulation 1, Section 11 (H)].

Regulation 1 divides septic systems into two main categories: conventional and alternative. (There is a third category, Experimental Systems, but those don't come up very often.) Conventional systems are the most commonly installed systems by far. A conventional system consists of a septic tank, maybe a dose tank, and a drainfield. It includes those systems that use gravity or pressure that have either rock and pipe or gravel-less trenches.

All other systems, such as absorption beds, seepage pits, elevated sand mounds and evapotranspiration beds are "alternative systems." There is a section in Regulation 1, Section 13, titled Alternative Systems, but it covers only basic requirements, and then refers you to Missoula's Alternative Systems Manual to establish when, where and how Alternative Systems can be used. In turn, the Alternative Systems Manual requires that Alternative Systems be designed in accordance with DEQ 4, except where the Missoula Alternative Systems Manual has more stringent rules. When installing an Alternative System, it will help to start with DEQ 4, and then refer to the Alternative Systems Manual to see what additional or more strict rules are in place in Missoula.

WHAT THE TEST COVERS

At the beginning of the Installers Resource binder is an overview called, "Wastewater Treatment and Disposal Systems." This covers some basic wastewater treatment concepts. Be familiar with this overview and how septic systems generally work, what is contained in wastewater and why it is a public health concern, what soils work best for treating septic system effluent and why a cesspool does a poor job treating wastewater.

Next, become familiar with the rules. There are questions on almost every section of Regulation 1, but there are certain sections you should concentrate on. It won't surprise you that we ask questions on Permits (section 6), Installer Certification (section 7) and Inspections (Section 8).

The septic permit will show you where the system is supposed to be located. But sometimes, when you are installing a septic system, you'll run into soils that are different than expected or you'll find that a neighbor's well is closer to the drainfield site than what was shown on the site plan. That's why the test also covers Site Evaluations (Section 9) and Location and Design of systems (Section 10). We want you to be able to identify when you should call the Health Department for a consultation – which we'd rather you do before you put in a system, instead of us discovering the problem during inspection. In the end, it will save money, hassle and a lot of bad feelings. No one, not us, you or the homeowner, wants a system to have to be moved after it's been put in the ground.

Sections 11 and 12, primary and secondary treatment, respectively, make up the bulk of the test. It will be important to know when you have to refer to DEQ 4 to correctly answer a question.

As mentioned above, there are questions on Alternative Systems (Sections 13 and 16 of Regulation 1, the Missoula Alternative Systems Manual and Chapters 6-8 of DEQ 4.) There are also a few questions holding tanks, chemical toilets and floor drains (Section 14 of Regulation 1).

It's not uncommon for property owners to call an Installer when their system is failing. For that reason, the test covers how a failed system is defined (Section 4), that repair or alteration of a cesspool is prohibited (Section 5), what maintenance and investigative activities do not require a permit (Section 6), that a failed system has to be replaced (Sections 5 and 16), and how to safely abandon a system that will no longer be used (Section 18).

Property owners may also consult with you on projects that they'd like to do. In order to help them, and direct them to us as appropriate, Certified Installers need to be familiar with Section 17 about existing and increased use to systems and the limitations or special requirements in some areas, known as Special Management Areas (Section 20).

Finally, there will also be a few questions on Section 19, Multi-User or Public Systems, so installers will generally know when a permit is required, where the septic system has to be installed, and how much of the system has to be constructed before it can be used.

TEST FORMAT

The test is open-book, and includes 100 questions. You have to get 75 questions correct to pass. Here's the breakdown:

Multiple Choice	~39 questions, ~39% of the test
Fill in the Blank	~36 questions, ~36% of the test
True False.	~25 questions, ~25% of the test

EXAMPLE QUESTIONS

Multiple Choice: Circle the correct answer.

A standard distribution box may be used:

A. When the drainfield is installed on a level site.
B. On slopes between 7 and 15%.
C. In a pressure distribution system.
D. Whenever a dosing distribution box is required.

Fill in the Blank: Write in the correct answer.

Gravity drainfield laterals cannot slope more than _____%.

True False: Circle T if the statement is true and F if the statement is false.

T F Elevated Sand Mounds are typically used to achieve separation between the absorption system and wells or surface water.

WHAT TO BRING

- You'll be taking test at a table in the lobby, which at times can get loud. Feel free to bring noise-canceling headphones if it helps you concentrate.
- Feel free to bring something to eat or drink. It typically takes several hours to get through all the questions.
- You are allowed to take breaks. Leave your test with the front desk staff if you leave the building. You are not allowed to take the test out of the office.
- Bring your copy of "Septic Installer Resources." All the questions are from the material in this binder.

AFTER THE TEST

In most cases, someone will be available to grade your test right after you finish. The sanitarian on duty will go over any questions that you got wrong to make sure you leave with a full and correct understanding of the rules. Once you pass the test, you'll get an

Installer's Certification number and laminated card, and you can install septic systems as the Certified Installer.

If you don't pass the first time, you can take it again, a day or more after your first attempt. If you have to take the test more than twice, you will be charged the test fee again.

PUBLIC LIST

We have a list of Certified Installers that we make available to the public, so property owners can find qualified people to put in their system. Only those Installers who want to be on the list are included. On the top of the test, where you put your name and contact information, there will be a place to choose whether you want to be on the public list or not. We typically include your name, the business you work for, and business contact information. Each year, when you recertify, we ask you again if you want to be on the public list.

Wastewater Treatment & Disposal Systems

Science of Wastewater Treatment

Missoula Public Health
City-County Health Department

WASTEWATER TREATMENT AND DISPOSAL SYSTEMS

An important part of installing septic systems is understanding why the Department requires particular design criteria. Of course, we want the system to work – which is why sanitarians inspect septic systems to ensure they have been installed properly. If the system is not installed correctly, it can fail. Failing systems are an inconvenience for homeowners, but getting rid of that characteristic sewage smell may be the least of their worries.

Sewage contains many organisms capable of causing disease, including bacteria, viruses and intestinal parasites. In fact, a single gram of human fecal material may contain as much as one billion organisms, many of which may be pathogenic. Anytime people come into contact with sewage, they can be exposed to these pathogens. Sometimes the contact is indirect; a fly may land on the sewage, then buzz inside and land on a sandwich, leaving hundreds of bacteria behind (a single housefly can carry over 6,500,000 organisms at one time!) or pets can tromp through the sewage and then track the pathogens inside. To prevent these kinds of exposure, it's best to keep the sewage underground.

However, disposing of wastewater (effluent) without exposing people and pets to pathogens is not the only purpose of septic systems. These systems are also designed to treat the effluent, changing its chemistry and biology, once again making it safe. If waste is not effectively treated in the drainfield, dangerous chemical compounds and disease-carrying agents may reach groundwater and threaten the community's drinking water supply.

The first types of septic systems were simply holes in the ground, commonly known as cesspools. Cesspools do not provide as much treatment as systems that have both a septic tank and an absorption area. Since the Health Department is committed to protecting groundwater, installation or repair of cesspools is not permitted in the County.

Why doesn't a cesspool provide as much treatment? To answer this question, it's important to first review how a typical septic system works. Today's systems consist of primary and secondary treatment. Primary treatment occurs in the septic tank, secondary treatment occurs in the drainfield.

As waste enters a septic tank, heavier solids separate from the liquids and settle on the bottom. Greases, fats and other materials float to the top, forming a scum layer held together partially by vegetative molds. Gases such as methane collect above this scum layer. This separation of solids from liquids is known as primary treatment and is the main purpose of the tank. As a result, clear liquid will enter the drainfield for secondary

treatment. If solids enter the absorption area, they can plug the pipes, gravel and soil pores and cause the system to fail.
Incidentally, as the solids sit in the tank, anaerobic organisms (those that do not use oxygen) begin to digest the organic material. They can reduce the volume of solids that enter the tank by about 90%. The rest accumulates on the bottom of the tank and must be pumped out periodically (generally at least every 3-5 years).

In the drainfield, wastewater is treated in a variety of ways. As it leaves the drainpipes, it passes through an organic mat (biomat) that forms on the surface of the absorption area. The biomat filters out some of the larger particles. More importantly, it slows the rate of filtration, giving aerobic (oxygen-loving) organisms a chance to break down contaminants in the wastewater. However, the system must be shallow enough for oxygen to be able to penetrate through the soil. If the system is installed too deep, or if it is a seepage pit, there may not be enough oxygen to support the aerobes, and an important aspect of treating the wastewater will be lost. In these systems, anaerobic organisms take over and can produce ferrous sulfides which can clog drainfields.

After it passes through the biomat, the wastewater seeps into the surrounding soil. Soil is made up of mineral and organic particles of different shapes and sizes. Pores or voids between the particles allow air and water to move through. When a soil is saturated, all the pores are filled with water. In this condition, soil loses most of its capacity to treat the effluent. For this reason, the regulations require at least four feet of soil between the bottom of the absorption area and a limiting layer (such as high seasonal groundwater). Research has shown that in most soils, four feet of soil will adequately treat the wastewater.

Soil primarily acts like a filter, trapping larger particles while the rest of the liquid moves through the pores. Soil also provides a surface for many chemical and biochemical processes to take place. Most soil particles and organic matter are negatively charged. Like magnets, they attract positively charged particles and repel negatively charged ones. The charged sites attract most of the principal contaminants of wastewater, including many bacteria and viruses, as well as ammonia and phosphorus. Unfortunately, some contaminants such as chloride and nitrates are negatively charged, and often move through soils without treatment.

For a septic system to work, the surrounding soil must be permeable enough to allow wastewater to flow down through the soil, yet fine enough to filter or treat the effluent before it reaches the groundwater. Extremely gravelly soils, common in many areas of Missoula County, often do not have enough fine soil particles in them to adequately treat the sewage before it reaches groundwater. Clay soils are the most effective for treating effluent because of their smaller pore size and much greater surface area available for treating or reacting with the sewage effluent. Too much clay, however, can result in impermeable conditions that cause sewage to pond on the ground and/or back up into a residence. Sandy loam is usually considered the ideal soil type for drainfields because it has enough fine soil particles to react with and treat the wastewater and yet it is coarse enough to retain its permeability.

Evaporation also plays a major role in wastewater treatment, especially in our dry climate. Evaporation can take place from a water surface, bare soil, or through plants. Evaporation from plants is called transpiration; together with soil surface evaporation, it is called evapotranspiration. Evapotranspiration is strongly influenced by meteorological factors such as air temperature, humidity, wind and solar radiation. For instance, evaporation rates decrease dramatically during the winter months. Plants, which can transpire at high rates, only do so during daylight hours during the growing season. Evapotranspiration is influenced by the design of the absorption system. The wastewater must be close enough to the surface of the ground to move upward through the soil to reach the soil surface. If the system is more than a few feet underground, evapotranspiration may not occur.

So why doesn't a cesspool provide as much treatment as a drainfield?

- A cesspool does not supply primary treatment; both solids and liquids are dumped into the absorption area. In many cases, this significantly reduces the life of the system as the surrounding soil becomes clogged with solids.

- Cesspools and seepage pits will typically be located closer to groundwater and may not provide the needed separation to allow for adequate treatment.

- The soil structure changes as it gets deeper. Underlying soils are often too coarse, without as much of the finer particles to slow down and treat the effluent. In addition, deep soils do not support the organisms needed to break down contaminants.

- Cesspools and seepage pits have a smaller area available for treating the effluent. More soil area is utilized in drainfields. As a result, drainfields are less likely to have saturated flow conditions and more likely to have adequate oxygen available for aerobic organisms. A biological mat forms to help "capture" pathogens and other contaminants until they are treated by any of a number of biological or chemical processes.

- The most important aspect missing from a cesspool (and from seepage pits for that matter) is an aerobic environment. Without oxygen, many organisms responsible for treating sewage cannot survive. Anaerobes will take their place, but they produce different end products. Some of these products, such as ferrous sulfides, will also clog the surrounding soils.

There you have it; a quick overview of how wastewater is treated in septic systems. We hope this summary will help explain why the Department has established certain design criteria, such as the preference for drainfields over cesspools and seepage pits. Sanitary disposal of wastewater is important, but it is only a small part of a septic system's purpose. Effective treatment of the effluent is essential to safeguard individual and community drinking water supplies. After all, no one wants to drink sewage.

02/13/2020

Key Information

- What Every Installer Needs to Know
- Self-Inspection Guidelines and Example
- Setting Floats for Pressurized Systems
- Drainfield Installations in Fine Soils
- Building Permit Resources

Missoula Public Health
City-County Health Department

WHAT EVERY INSTALLER NEEDS TO KNOW

- A Certified Installer must always be on site while a wastewater treatment and disposal system is being constructed.

- You must request an inspection at least 24 hours ahead of the time that you'd like the inspection to take place.

- We make every effort to inspect systems as close to the requested time as we can, but that isn't always possible. If we won't be able to make it out to the site within 1 business day of the requested inspection time, we'll ask you to self-inspect the system. You must get permission from the department before a system can be self-inspected.

- You cannot backfill any portion of the system without approval from the department.

- New connections to an existing system and septic tank replacements require a permit and an inspection.

- Setbacks to drainfields and other components are the absolute minimum horizontal distance allowed. As an example, we will not approve a drainfield that is 98 feet (instead of 100 feet) from a well.

- If site conditions don't match the expectations on the permit (for instance if there is an irrigation ditch not shown on the site plan, or there is a well closer than 100 feet to the approved drainfield location) please call us so we can figure out a solution before you put the drainfield in the ground. The direct line for the on-duty sanitarian is 258-4990.

MISSOULA COUNTY SELF-INSPECTION GUIDELINES

Our goal is to inspect every system. However, when the Department can't get out to the site within one working day of the requested inspection time (and the time was requested at least 24 hours in advance), you will be asked to do a self-inspection.

1. Before you self-inspect a system, you must have permission from the Department. Permission will only be granted if you have called us 24 hours before your requested inspection time and we are not able to make it out there within one day of that requested time.

2. You must submit your self-inspection drawing to the department within two working days of receiving permission to self-inspect. Failure to do so may result in disapproval of the system.

3. All drawings must be done on Department forms, approximately to scale and showing a "North" arrow. Do not hand draw on a separate sheet.

4. Sign the inspection on the line provided after the phrase "Self Inspected By:". In signing the inspection, you are certifying that you have given us a true and correct copy of what you put in the ground.

5. Once we receive the original inspection, a sanitarian will review the self-inspection to make sure that it shows that the system meets permit conditions and the regulations.

6. You will receive a copy of the finalized inspection in the mail, and a scanned version will be available online, usually within a week or two.

7. We recommend that you keep a copy of all inspections on file in your office – at least until you have confirmed that the inspection has been posted online.

SELF INSPECTION REPORT EXAMPLE

Permit No. 00-00

MISSOULA CITY-COUNTY HEALTH DEPARTMENT
301 W. Alder, Missoula, MT 59802 Phone: 258-4755, Fax 258-4781

INDIVIDUAL SEPTIC SYSTEM SELF-INSPECTION REPORT

You must call for an inspection and receive permission to self-inspect from the Department before using this form.

Name of Owner Joe Permit

Legal Address/Location 1313 Jackson Drive

Certified Installer Eddy Backhoe

System Type: New X Replacement ____ Standard ____ Gravelless X Pressure Dist. ____ Dosed ____

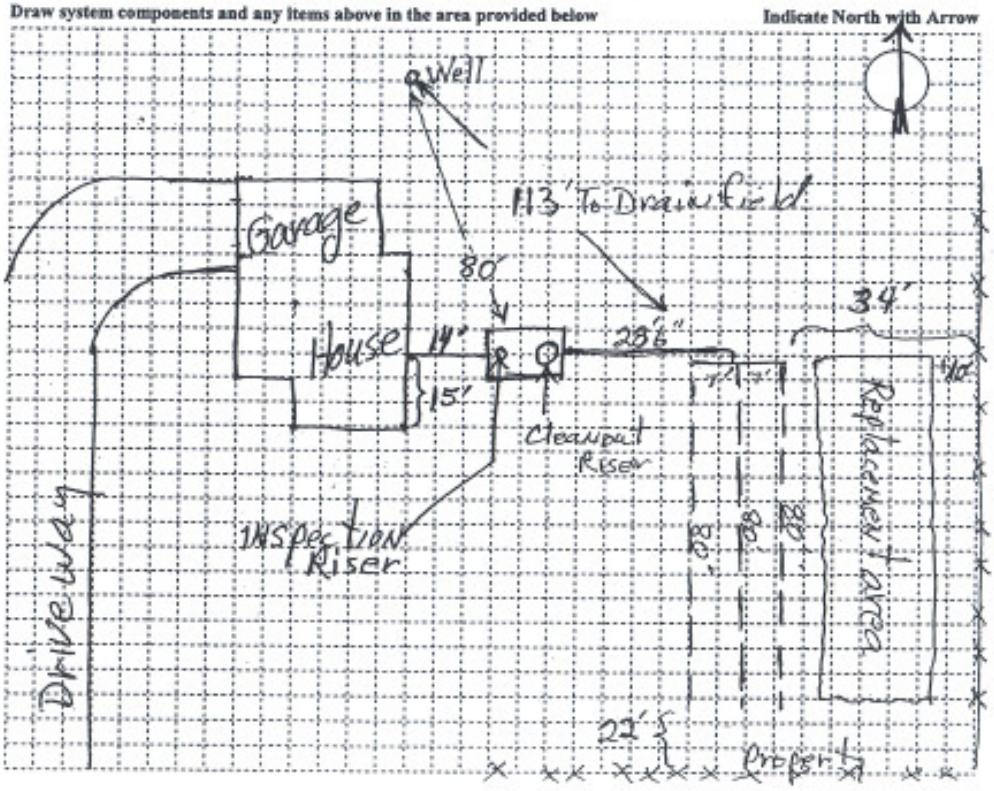
Capacity: Septic Tank 1000 gal. Pump Chamber ____ gal. **Depth to Top:** Septic Tank 2 ft. Pump Chamber ____ ft.

Drainfield: Total length 240 ft. # of laterals 3 Range of Trench Depth 18"-30 in. to bottom

Seepage Pit: Height ____ ft. Depth to Top ____ ft. ____ in. **No. of Bedrooms Permitted** 3

Distance of Installation from: Property Lines: 22' Wells: 113' Surface Water: >200'
Foundations: 14' Other: ____

Draw system components and any items above in the area provided below **Indicate North with Arrow**



I attest that this system was installed in accordance with the septic permit and the Missoula City-County Health Code and that the above drawing accurately reflects what was installed.

Self Inspected by: Eddy Backhoe (Certified Installer) 05/15/07 (Date)

Inspection Reviewed By: Sam Sanitarian, R.S. (Sanitarian) 05/16/07 (Date)

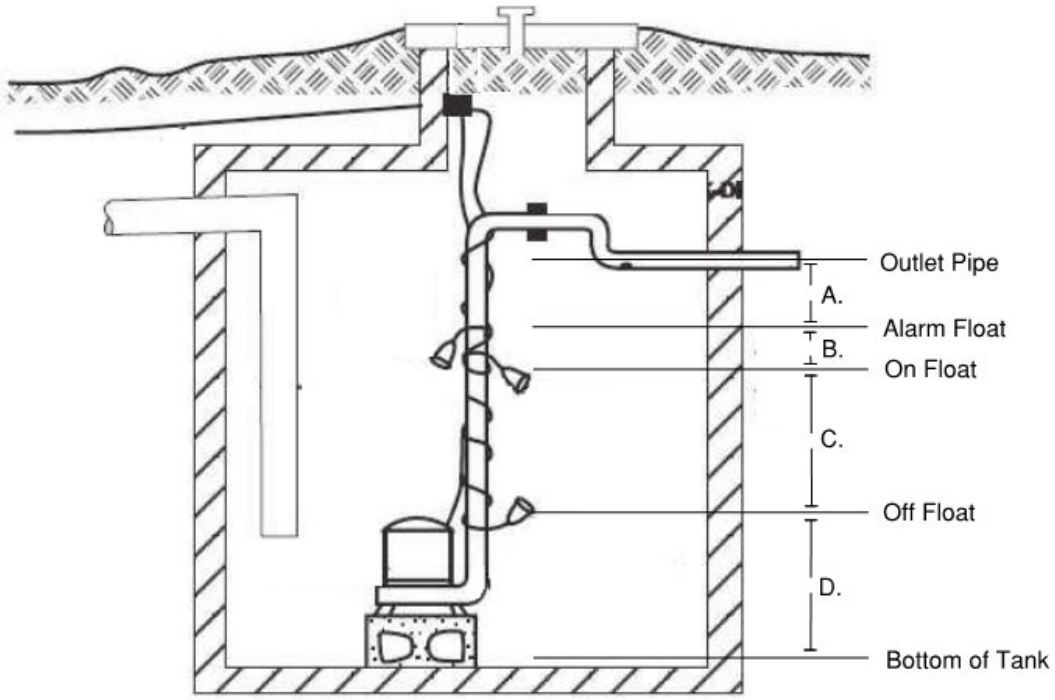
Drawing shows that system meets the requirements of the permit and the Health Code. Yes X No ____

Corrections Necessary: ____

Deficiencies Corrected: Yes ____ No ____ ____ (Sanitarian) ____/____/____ (Date)

SETTING FLOATS IN PRESSURIZED SYSTEMS

The diagram below outlines a typical dose tank and includes an explanation for each float setting. Float heights will vary for each individual system and can be found within the permit and/or the pressure designs. The floats settings are very important as they determine how well the drainfield will function, keep the pump from going dry and trigger an alarm for a pump failure.



A. Depth Needed for Reserve: This is the distance between the "alarm" float and the outlet pipe. This space provides owners with a minimum amount of time to take corrective actions once the alarm is triggered. Regulation 1 states the tank must maintain a reserve volume of 25% the design flow (gal/day).

B. Buffer for Alarm: Regulation 1 requires the "alarm" float to be set 3 inches above the "On" float.

C. Depth Needed for Total Dose: This is the distance between the "On" and "Off" floats and is the amount of effluent the drainfield receives per dose. When a drainfield receives the incorrect dose, the effluent will either surface and the drainfield will fail or the effluent will not be treated properly before entering the groundwater.

D. Elevation Left for Pump Cover: This is the distance between the "Off" float and the bottom of the tank. This space accounts for the height of effluent left in the tank after each dose. This height or elevation must be greater than the pump height to prevent pump failure.

* Some designs differ from this configuration due to different equipment or more floats. As always, please call us if you have any questions. The On-Duty Sanitarian can be reached at 258-4990.

DRAINFIELD INSTALLATION IN FINE SOILS

The Health Code states that drainfield construction must not be started when the soil moisture content is high. This is especially important in finer soil types such as silt and clay. If silts and clays are too wet, they can become compacted during installation, and the damage may be irreparable.

Compaction can occur in wet soil when a vehicle, machinery, excavator bucket, or even foot traffic apply force upon the soils. If the sides or bottoms of trenches are smeared and cannot be scarified, the soil will no longer absorb effluent with the same capacity. In severe cases of soil compaction, the drainfield may have to be abandoned and rebuilt in a new location.

Special installation requirements for fine soil types:

1. Do not install an absorption system when the soil at trench depth can be rolled into the shape of a rope.

2. Trenches must be scarified and may not show signs of smeared soil.

3. The drainfield may not be located in a swale and must be protected from surface runoff. If this appears to be an issue with the approved site, call the Health Department before installing the system.

4. Clay compacts easily; don't drive over the drainfield.

5. If infiltration chambers are used, clay and silt soils cannot be used to backfill between the chambers and trench sidewall. Use loam or sandy soils.

If you are unsure about on-site conditions as you begin an installation, call us at 406-258-4990.

BUILDING PERMIT AND CONSTRUCTION RESOURCES

OUTSIDE MISSOULA CITY LIMITS

Building permits are required throughout Missoula County.

www.MissoulaCounty.Build provides a step-by-step guide to building projects in Missoula County (outside the city limits) and could be a good resource for you and your clients. It is specifically targeted at first time home builders and renovators.

County building permits can be applied for online through:

- www.MissoulaCounty.Build; or
- https://webapps.missoulacounty.us/PublicPermitting/Login

Missoula County Public Works - Building Division

Missoula Office:
6089 Training Drive, Missoula, MT 59808
Phone: 406-258-3701
Email: pwbuildingpermits@missoulacounty.us
Office hours: 7:00 am- 4:00 pm, Monday - Friday

Seeley Lake Office:
3189 Hwy 83 N, Seeley Lake, MT 59868
Phone: 406-677-2226
Office Hours: 8:30 am - 10:30 am, Monday – Friday

Missoula County Community & Planning Services (CAPS)

127 East Main St, Suite 2, Missoula, MT 59802.
Phone: 406-258-4657
Email: caps@missoulacounty.us
In Desk Hours: 10:00 am- 2:00 pm, Monday – Friday

INSIDE MISSOULA CITY LIMITS

Missoula Development Services

435 Ryman, Missoula, MT 59802
Website: https://www.ci.missoula.mt.us/1258/Development-Services

Building Permits:
Phone: 406-552-6635
Walk-In Hours: 8 am – 2 pm, Monday - Friday

Engineering:
Phone: 406-552-6636
Email: engineering@ci.missoula.mt.us
Walk-In Hours: 10 am – 2 pm, Monday - Friday

Zoning:
Phone: 406-552-6625
Email: cityzoner@ci.missoula.mt.us
Walk-In hours: 10 am – 2 pm, Monday - Friday

On-Site Subsurface Wastewater Disposal

These rules, also known as Regulation 1, are adopted by the Missoula City-County Health Board and apply to wastewater treatment and disposal systems in Missoula County. These regulations adopt both the Missoula Alternatives Manual and the Montana DEQ Circular 4 (DEQ 4) by reference. Regulation 1 includes requirements unique to Missoula County, which apply in addition to those in DEQ 4.

Regulation 1
Wastewater Treatment and Disposal Systems

Amended 09/20/2018, Effective 09/20/2018

Contents

1. PURPOSE. The purpose of this regulation is to protect public health and environmental quality from risks associated with improper disposal of wastewater within Missoula County.

2. AUTHORITY. Authority for this regulation is provided for in 50-2-116 MCA which requires local boards of health to adopt necessary regulations that are not less stringent than state standards for the control and disposal of wastewater from private and public buildings and facilities.

3. ADOPTION BY REFERENCE.

(A) For the purposes of this regulation, the following documents are incorporated by reference.

(1) Department of Environmental Quality Circular 4, "Montana Standards for Subsurface Wastewater Treatment Systems," 2013 edition, except for Section 1.1.4 "Deviations".

(2) Missoula City-County Alternative Systems Manual, 2015 edition.

(B) If there is a discrepancy between the above referenced documents and this regulation, the most stringent regulation shall be applied.

4. DEFINITIONS.

(A) The following definitions apply to this regulation:

(1) Absorption area: that area determined by multiplying the length and width of the bottom area of the disposal trench.

(2) Absorption system: any part of a wastewater treatment and disposal system that discharges wastewater by design onto or into the ground.

(3) Absorption trench: excavations less than or equal to three (3) feet in width where the distribution system is laid for the purpose of distributing pretreated waste effluent into the ground.

(4) Adequate secondary treatment: secondary treatment that is similar to or better than the treatment provided by a drainfield meeting all requirements of Section 10(B) and (C). Absorption beds qualify when minimum separations are met and there is not enough room for a drainfield. Seepage pits qualify when minimum separations are met and there is not enough room for a drainfield or absorption bed. If a replacement system will not meet minimum separations, the Department can require elevated or alternative treatment systems. Adequate secondary treatment in the floodplain is an elevated sand mound or a system that incorporates advanced secondary treatment.

(5) Advanced secondary treatment: a system designed to lower BOD and TSS to 7 day averages of 40mg/L & 45mg/L or 30 day averages of 25mg/L & 30mg/L respectively, and when necessary, also lower fecal coliform levels in wastewater effluent.

(6) Alternative system: a wastewater treatment and disposal system approved by the Department to be used in lieu of a conventional system.

(7) Approved site evaluator: a person approved by the Department to conduct site evaluations.

(8) Bedrock: Material that cannot be readily excavated by hand tools, or material that does not allow water to pass through or that has insufficient quantities of fines to provide for the adequate treatment and disposal of wastewater.

(9) Bedroom: any room that is or may be used for sleeping. An unfinished basement is considered an additional bedroom. SEE APPENDIX “F”.

(10) Camping: the temporary placement of tents or cabins, or the parking of trailers or vehicles for the purpose of sleeping. A travel trailer or RV that has skirting installed or has been connected to either electrical or sewage services in a permanent manner is not considered camping.

(11) Certified installers: installers of wastewater treatment and disposal systems who have passed an annual examination to ensure sufficient knowledge of the sewer regulation.

(12) Cesspool: a seepage pit without a septic tank to pre-treat the wastewater.

(13) Community wastewater treatment and disposal system: a public wastewater treatment and disposal system which serves a non-transient population characterized by residential development.

(14) Construction Season: March 1st through November 30th.

(15) Containment Vault: a tank that is limited to containing accidental spills. A tank that receives wastewater from a fixture is not a containment vault.

(16) Contaminate: an increase in the concentration of chemicals, viruses, or bacteria in water to a degree which is likely to affect present or future beneficial uses of the water or which violates any applicable ground water or surface water standard.

(17) Conventional secondary treatment: treatment after a septic tank that consists of a drainfield, and includes systems that use infiltration chambers, gravity distribution, or pressure distribution.

(18) DEQ: The Montana Department of Environmental Quality.

(19) DEQ 4: The Montana Department of Environmental Quality regulatory document entitled "Montana Standards for Subsurface Wastewater Treatment Systems, 2013 Edition."

(20) Disposal Trench: an excavation in which the piping for an absorption system is laid for the purpose of distributing pre-treated waste effluent into the ground.

(21) Distribution Box: a receptacle that receives septic tank effluent and distributes it equally into two (2) or more header pipes leading to the absorption area.

(22) Dosing Tank: a water-tight receptacle placed after the septic tank or other treatment device approved by the Department, equipped with an automatic siphon or pump designed to discharge effluent.

(23) Drain rock: the rock or coarse aggregate used in an absorption system. Drain rock does not include gravels of shale, sandstone, or limestone.

(24) Drainageway: a course or channel along which stormwater moves in draining an area.

(25) Dwelling or residence: one or more structures or portion thereof, which is intended, designed, or used for human occupancy and provides independent living facilities including provisions for sleeping, cooking, and sanitation.

(26) Enlargement (of structure): an increase in the volume, or cubic feet, of a structure.

(27) Equal Distribution: uniform distribution of septic effluent throughout an absorption system. Gravity systems with no more than ten (10) foot difference in lateral length or pressure distribution systems meet the definition of equal distribution for the purposes of this regulation.

(28) Escarpment: any slope greater than 50 percent which extends vertically six (6) feet or more as measured from toe to top.

(29) Experimental System: a wastewater treatment and disposal system, which is neither conventional nor alternative, which needs to be evaluated using rigorous scientific methods.

(30) Failed Wastewater Treatment and Disposal System: a system in which the absorption system fails to accept waste at the rate of application, that no longer provides the treatment and/or disposal for which it was intended, that has a septic tank that suffers structural failure, or that violates Section 5(A) of this regulation.

(31) Floodplain: that portion of land adjacent to a water-way which is inundated when the water-way overflows on an average frequency of once per one hundred (100) years, including all land area designated by the Federal Emergency Management Agency as being in the 100-year floodplain on the Flood Insurance Rate Maps.

(32) Flood-prone Areas: areas where information indicates that the land is subject to flooding in a one hundred (100)-year flood event but not included on Flood Insurance Rate Maps.

(33) Floor Drain: a drain in the floor to accept non-toilet wastewater that collects on the floor.

(34) Gray Water: wastewater such as that which is discharged from kitchens, laundry, etc. Toilet waste is not considered gray water.

(35) Groundwater Table: the surface of the zone of water saturation of a geologic formation. The surface of a perched water table is included in this definition.

(36) High Seasonal Groundwater: the depth from the natural ground surface to the surface of the zone of saturation, as measured in an unlined hole or perforated monitoring well during the time of year when the water table is the highest. The term includes the surface of a perched water table.

(37) High-Strength Waste: wastewater that has BOD5 greater than 300 mg/L, TSS greater than 150 mg/L, or fats, oils, and grease greater than 25 mg/L.

(38) Holding tank: a watertight receptacle that receives wastewater for retention and does not, as part of its normal operation, dispose of or treat the wastewater.

(39) Impervious layer: layer of material that has a percolation rate slower than 240 minutes per inch.

(40) Increased Use: the enlargement or change in use of a structure that would potentially increase the effluent flow to the wastewater treatment and disposal system from the structure in excess of approved limits. Increased use includes but is not limited to the enlargement of a residence by adding one or more spaces which can be used as bedrooms. It also includes increasing a room or building's total square footage in a way that could lead to increased use in the future. The Department has the sole discretion to determine if an enlargement or change in use is an increased use.

(41) Individual Wastewater Treatment and Disposal System: a wastewater treatment and disposal system that serves one (1) living unit or commercial unit. The term does not include a public wastewater treatment and disposal system.

(42) Leaching Chambers: plastic (often polyolefin) chambers with an open bottom, structurally designed to carry the earth loading. The Department considers leaching chambers to be conventional systems.

(43) Limiting layer: bedrock, an impervious layer, or seasonally high groundwater.

(44) Living unit: the area in a dwelling or residence that is, or is designed to be, occupied by a household. For example, a duplex is considered two living units.

(45) Lot: synonymous with "tract" or "parcel."

(46) Mixing Zone: an area established in a permit or by a non-degradation analysis where water quality standards may be exceeded, subject to conditions imposed by the Montana Department of Environmental Quality and consistent with rules adopted by the Montana Board of Environmental Review.

(47) Mobile Home: a transportable structure constructed without a permanent foundation.

(48) Multi-User Wastewater Treatment and Disposal System: A wastewater treatment and disposal system that serves, or is intended to serve, more than two living or commercial units, but which is not a public wastewater treatment and disposal system. In estimating the population that will be served by a proposed residential system, the Department shall multiply the number of living units times 2.5 people per living unit.

(49) MWTPSA: Missoula Wastewater Treatment Plant Service Area.

(50) Natural Soil: soil that has developed through natural processes, and where no fill material has been added.

(51) Non-Community Public Wastewater Treatment and Disposal Systems: public wastewater treatment and disposal systems which serve a transient population such as a restaurant or bar.

(52) Non-contact cooling water: Water used for heat exchange to reduce temperature that has not come into direct contact with any waste product, raw material, intermediate or finished product.

(53) Other components: include the unsealed portions of intermittent and recirculating sand filters, package plants and evapotranspiration systems.

(54) Parcel: a portion of land that can be identified by legal description independent of any other portion of land.

(55) Percolation Test: a standardized test used to determine soil permeability. This test is described in Appendix A of DEQ 4.

(56) Permit: a written authorization issued by the Department, permitting the construction, alteration, extension, or operation of a wastewater treatment and disposal system under this regulation.

(57) Primary Treatment: treatment provided in a septic tank containing one or more chambers.

(58) Public Wastewater Treatment and Disposal System: a wastewater treatment and disposal system that serves 15 or more families or 25 or more persons daily for any 60 days or more in a calendar year. In estimating the population that will be served by a proposed residential system, the Department shall multiply the number of living units times 2.5 people per living unit, so that 10 or more proposed residential connections will be considered a public system.

(59) Public Nuisance: any condition which affects an indefinite number of persons, or all the residents of a particular locality, or all persons coming within the extent of its range or operation by being injurious to health, annoying, or indecent or offensive to the senses, although the extent of the effect on individuals may vary.

(60) Public Sewer: a government owned and operated wastewater treatment work that:
(a) serves a community;
(b) is supported by full time staff and ordinances requiring connection permits and inspections by the utility; and
(c) consists of a community-wide collection system, a treatment plant, and a method of disposal that is subject to a DEQ discharge permit.

(61) Replacement System: a wastewater treatment and disposal system that is installed to replace an existing system.

(62) Running Water: A water supply that is capable of providing a continuous source of flow. Fresh water storage tanks and cisterns may qualify despite inherent limitations on water quantity.

(63) Scarify: to break up and loosen the surface of the soil.

(64) Sealed component: a component of wastewater treatment and disposal system that is sealed including a sewer line, sewer main, septic tank, grease trap, dosing tank, pumping chamber, holding tank, or sealed pit privy.

(65) Sealed pit privy: an enclosed receptacle designed to receive non-water carried toilet wastes into a watertight vault for temporary storage.

(66) Secondary Treatment: a biological wastewater treatment process occurring after solid/liquid separation in a septic tank or equivalent.

(67) Seepage Pits: deep excavations used for the subsurface disposal of pre-treated effluent. Covered porous walled chambers are placed in the excavation and surrounded by rock.

(68) Septic tank: a storage settling tank in which settled sludge is in immediate contact with the wastewater flowing through the tank while the organic solids are decomposed by anaerobic action.

(69) Shared Wastewater Treatment and Disposal System: a wastewater treatment and disposal system that serves, or is intended to serve, two living units, two commercial units, or a combination of one living unit and one commercial unit. This term does not include a public wastewater treatment and disposal system.

(70) Significant alteration: when a structure has suffered fifty (50) percent or greater destruction and is being replaced or restored. The destruction can be intentional or unintentional, resulting from things like fire, flood, or remodeling. Replacement of a mobile home with a permanent structure is considered significant alteration. Replacement of a single wide mobile home with another single wide mobile home or replacement of a double wide mobile home with another double wide mobile home with the same number of bedrooms is not significant alteration.

(71) Single family dwelling or residence: a dwelling or residence designed to be occupied by not more than one (1) family or other group of people living in common.

(72) Site Evaluation: an on-premises evaluation to determine if a site is suitable for the installation of a subsurface wastewater treatment and disposal system.

(73) Slope: the rate that a ground surface declines expressed as percent of grade.

(74) Soil Profile: a description of the soil strata using the USDA soil classification system.

(75) Soil Texture: the amount of sand, silt or clay, measured separately in a soil mixture. (For individual definitions, see Appendix A)

(76) Squirt Height: the height water reaches in a field test to evaluate uniform distribution in a pressure distribution system.

(77) Steep slope: An incline with a grade of 35% or greater, and an incline with a grade between 25% and 35% for which the requirements of Section 10(B)(1)(b) of this regulation have not been satisfied.

(78) STEP: Septic Tank Effluent Pump

(79) STEP Septic Tank: a septic tank designed to accept pumping equipment to pump effluent into a public sewer system which meets the design criteria established by the City of Missoula Public Works division.

(80) Structure: that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner, including but not limited to: dwelling units, mobile homes, sleeping quarters, business establishments, grandstands, amphitheaters, and warehouses.

(81) Subdivision: a division of land or land so divided that creates one or more parcels containing less than 20 acres, exclusive of public roadways, in order that the title to or possession of the parcels may be sold, rented, leased, or otherwise conveyed and includes any re-subdivision or re-write of a previous subdivision approval and any condominium or area, regardless of size, that provides permanent multiple spaces for recreational camping vehicles or mobile homes.

(82) Surface water: any water on the earth's surface including, but not limited to streams, lakes, ponds, reservoirs, irrigation drainage systems or other water on the earth's surface. Water bodies that are part of an approved sewage treatment system and intermittent water bodies that are part of a storm drainage system are not considered surface water.

(83) System: a Wastewater Treatment and Disposal System.

(84) Uniform Plumbing Code: a model code developed by the International Association of Plumbing and Mechanical Officials to govern the installation and inspection of plumbing systems.

(85) Unsealed Pit Privy: a facility designed to receive non-water carried toilet wastes into a pit excavated into natural soil.

(86) Useable acreage: the total area of a lot minus flood plain or flood prone area.

(87) Waste segregation: a system for the dry disposal of toilet waste by a method such as composting, chemical, dehydrating, or incinerator treatment, with a separate disposal method for gray water.

(88) Wastewater: liquid waste which may include chemicals, household, commercial or industrial wastes, human excreta, animal and vegetable matter in suspension or solution, discharged from a dwelling, building, establishment, vehicle, or container. Gray water and non-liquid carried toilet waste are considered wastewater. Non-contact cooling water is not wastewater.

(89) Wastewater Treatment and Disposal System: a system that receives wastewater for purposes of treatment, storage, or disposal including, but not limited to, pit privies, holding tanks, subsurface absorption systems, waterless toilets, and alternative and experimental systems. A containment vault is not a wastewater treatment and disposal system.

(90) Zone of Saturation: that area beneath the ground in which all open spaces are filled with groundwater.

5. GENERAL.

(A) Prohibited activities and exceptions.

(1) No person may install, modify, repair, replace, use or increase the use of an on-site wastewater treatment and disposal system that may:
- (a) contaminate any actual or potential drinking water supply;
- (b) cause a public health hazard as a result of access to insects, rodents, or other possible carriers of disease to humans;
- (c) cause a public health hazard by being accessible to persons or animals;
- (d) violate any law or regulation governing water pollution or wastewater treatment and disposal in effect at the time of installation;
- (e) pollute or contaminate state waters, in violation of 75-5-605, MCA;
- (f) degrade state waters unless authorized pursuant to 75-5-303, MCA;
- (g) cause a nuisance due to odor, unsightly appearance or other aesthetic consideration; or
- (h) enter directly into subsurface groundwater. A wastewater system that discharges at an elevation at or below peak seasonal groundwater is presumed to discharge directly to groundwater.

(2) Construction, repair, alteration, or increased use to a system without primary and secondary treatment is prohibited unless permitted in accordance with these regulations.

(3) A person may not discharge wastewater onto the ground unless it does not cause a public nuisance and meets one of the exceptions provided below:
- (a) wastewater discharged into an approved surface application wastewater treatment and disposal system;
- (b) wastewater discharged onto a DEQ approved disposal site by licensed pumpers;
- (c) wastewater discharged from a floor drain meeting the requirements of Section 14(B);
- (d) wastewater discharged from a swimming pool, or spa;
- (e) gray water discharged from a dry structure without running water or without plumbing extended into or out of the structure; or
- (f) de minimis gray water discharged from camping. This does not include wastewater from an RV or any other plumbed fixture.

(4) Unless an Underground Injection Control (UIC) permit is obtained from the U.S. Environmental Protection Agency pursuant to 40 CFR 144, a person may not install or use any sump, dry well, or wastewater treatment and disposal system for disposal of wastewater from the washing, servicing, maintenance, or storage of any vehicle, equipment or components that are associated with an internal combustion engine.
(5) No person may use an on-site wastewater treatment and disposal system that is located in the floodplain unless the system was installed according to the regulations effective at the time of installation. No person may increase use to a septic system in the floodplain.
(6) No person may use a septic system that does not have a valid permit issued by the Department if one was required at the time of construction.
(7) No person may dispose of high-strength waste into a wastewater absorption system.

(B) System required.
(1) A structure that is, or is designed to be, occupied by people must have approved toilet facilities within the structure or have uninterrupted access to approved toilet facilities within 200 feet of the structure.
(2) A structure with running water or with plumbing extending into or out of the structure may not be occupied unless it is connected to public sewer or an approved wastewater treatment and disposal system.

(C) Connection to public system.
(1) All new and replacement sewage disposal facilities must comply with the Uniform Plumbing Code requiring connection to publicly owned sewage treatment plants.
(2) No person owning real property with a structure that generates wastewater may install, modify, or replace a wastewater treatment and disposal system except for a gray water irrigation system when public sewer is available. Public sewer is available when a main:
(a) abuts or serves the property, and is within 200 feet of the structure;
(b) is within 200 feet of any part of the subsurface disposal system; or,
(c) is within 200 feet of the property line and meets all of the following:
(i) the owner or managing entity of the public collection and treatment system approves the connection;
(ii) the necessary easements are available;
(iii) the cost to connect is less than three times the cost of installing an on-site wastewater treatment and disposal system; and
(iv) it is physically practical to connect.
(3) If a structure on a parcel is connected to public sewer, all new structures generating wastewater on that parcel must be connected to public sewer if the owner or managing entity of the public sewer approves the connection.
(4) Existing wastewater treatment and disposal systems may remain in service until:
(a) ordered disconnected by the Health Board or other jurisdiction;
(b) the system fails as defined in Section 4 of this regulation;
(c) connection to public sewer is required; or,
(d) connection to public sewer is required per City of Missoula Ordinance Title 13.
(5) This Section (C) does not apply when the entity owning the public system refuses to allow connection or if the system has been permitted pursuant to Section 15 (Experimental Systems) of this regulation.

(D) Circumvention.
(1) A person may not knowingly make false statements, representations, or certifications in, or omit information from, or knowingly alter, conceal, or fail to file or maintain any notice, application, record, report, permit, plan or other document required to be filed or maintained in order to evade these regulations.
(2) A person may not divide a property or properties in order to evade these regulations. Examples include but are not limited to phased or piecemeal development.

6. PERMITS.

(A) Permit Required.

(1) No person may install, modify, repair, replace, or increase use of a wastewater treatment and disposal system within Missoula County without first obtaining a permit from the Department, except for activities and systems described in (A)(2) and (A)(3).

(2) The following activities do not require a permit from the Department:

(a) Maintenance activities including, but not limited to, effluent filter cleaning, replacement of effluent pump(s) with an equivalent pump, removal of blockages not requiring substantial excavation of the drainfield, and pumping the septic tank.

(b) Investigative activities to determine location of systems, dimensions of systems, or to determine the cause of failure. A certified installer, property owner, or an authorized agent must contact the Department prior to any excavating of the absorption area.

(c) Surface application of wastewater from swimming pools or spas.

(d) Disposal of de minimis wastewater generated from camping. This does not include wastewater from RVs or any other plumbed fixture.

(e) Discharge of gray water from a dry structure without running water or without plumbing extended into or out of the structure.

(3) The following systems do not require a permit from the Department:

(a) Sumps receiving wastewater from only water softeners, swimming pools, or spas.

(b) Floor drains meeting the requirement of Section 14(B) of this rule.

(B) General Requirements for Permits.

(1) Parcels must be recorded with the County Clerk and Recorder before a permit may be issued by the Department.

(2) Permits must be issued in the name of the parcel's owner, but may be picked up and executed by an authorized agent.

(3) The Department shall issue a permit following the submittal of all required fees, a complete and accurate permit application, and other necessary information demonstrating compliance with all applicable regulations. If more information is needed in order to process an application, the department shall notify the applicant.

(4) The Department may place any other conditions on a permit, which will facilitate compliance with the provisions of this regulation or subdivision approval.

(5) The Department may require enforceable, binding agreements which reflect representations of use made at the time of permitting. The Department may require agreements under this section to be filed at the Clerk and Recorder's office.

(6) A permit may not be issued for a system when use of the system would constitute a violation of any ordinance, rule, law or conditional approval including but not limited to a Certificate of Subdivision Approval.

(7) Notice of denial. Written notice that a permit has been denied must be given to the applicant. The notice must list deficiencies and reasons for the denial.

(8) Unapproved changes. Unapproved changes in plans, specifications, or stated use after a permit has been issued or any falsification or significant error in information submitted by an applicant invalidates the permit.

(C) Applications.

(1) A complete application for a permit must be submitted on forms provided by the Department, be accompanied by the application fee, and include the following information:

(a) Name and address of applicant and owner;

(b) A complete legal description and physical address of the property where the wastewater treatment and disposal system is or will be located;

(c) A scaled site plan, showing all property boundaries, no larger than eleven (11) inches by seventeen (17) inches illustrating that the proposed site meets the minimum requirements in Sections 5(A) and 10 of this regulation;

(d) Floor plans of any structure to be served on paper no larger than eleven (11) inches by seventeen (17);

(e) A plan and relevant design specifications of the proposed wastewater treatment and disposal system; and,

(f) Other relevant information as required by the Department to substantiate that the proposed installation, modification, repair, replacement, or increased use complies with this regulation and applicable DEQ rules.

(2) Applications for new or increased use must also include:
(a) an acceptable site evaluation as described in Section 9 or DEQ Certificate of Subdivision Approval; and,
(b) evidence that non-degradation requirements of ARM 17.30, Subchapters 5 & 7 have been satisfactorily addressed.

(D) Expiration of permits and applications.
(1) A permit expires if the system is not installed, inspected, and approved by the Department within two (2) years of issuance.
(2) If a permit is not issued, an application expires one year after its submittal.

(E) Permits are subject to the regulations in effect at the time of permit issuance.

(F) Construction without permit. The Department shall charge a fee three (3) times the permit and application fees when the installation, repair, modification, replacement, or increased use of a system starts prior to a valid permit being issued.

(G) Permits for Temporary Repairs or Increased Use.
(1) The Department may issue a temporary repair permit for a failed seepage pit, cesspool, or drainfield in areas that have received construction grants or loans, and where a government entity is actively organizing the public funding, RSID or SID necessary to install public sewer interceptor or collector systems. Temporary repairs may be accomplished by the addition of absorptive area to a currently existing system. This practice is commonly called re-rocking.
(2) The Department may issue a temporary permit for increased use or for the enlargement of a structure without requiring an upgrade to an existing seepage pit, cesspool, or drainfield in areas which have received construction grants or loans and where a government entity is actively organizing the public funding, RSID, or SID necessary to install public sewer systems. Such temporary increased use may be permitted by the Department only for systems which are currently accepting waste at the rate of application from the source.
(3) The Department shall charge a minimal administrative fee as established by the Board for a temporary repair or increased use permit. The Department is not required to inspect such repairs. Inspections must be performed by licensed installers and submitted to the Department.
(a) Prior to the issuance of a temporary repair permit, the owner of the property must execute any contracts, petitions, or agreements required by the utility, the Department, or other entity for the creation of SIDs or RSIDs and must meet other conditions which the municipality, the Department, or utility may require. The homeowner shall sign a document indicating that he or she will connect to public sewer within 180 days after the installation of the sewer mains designed to service the property.
(4) A temporary repair or increased use permit satisfies the requirements of Section 16, which establishes requirements for replacement systems.
(5) Applicants for temporary permits may instead apply for a normal replacement permit, using the established fees and requirements of the Department.
(6) The granting of a temporary permit for repair or increased use does not guarantee a life expectancy or operation of the system and if the system fails prior to availability of public sewer, further repairs or upgrades to the system may be required by the Department.

7. INSTALLER CERTIFICATION.

(A) General.
(1) Installation, modification, replacement, or repair of a wastewater treatment and disposal system that requires a permit in accordance with Section 6 must be supervised by a person who has passed an examination administered by the Department to ensure they have sufficient knowledge and training to complete the work in compliance with this regulation.
(2) A certified installer must install a system according to all conditions on the permit and all applicable regulations.
(3) A certified installer must be on site at all times during installation.
(4) A certified installer must have evidence of certification at the installation site available for inspection by the Department and a copy of the appropriate permit.

(5) The Department may not approve a system if a certified installer is not present during the installation. The Department may approve the system if a certified installer completes the system or the uncertified installer takes and passes the required certification exam(s) and the system meets all requirements.

(B) Certification and Renewal.
(1) An installer is certified for the calendar year in which the exam was taken and passed. Certification expires annually on December 31st.
(2) Applications for certification and certification renewal must be in writing on forms provided by the Department and must include the name, address and phone number of the applicant and the name of the business that the applicant is representing.
(3) Applications must be accompanied by an application fee determined by the Board to defray the costs for training and exams.
(4) Certified installers must pass an annual exam for re-certification. These exams must be submitted to the Department with the application for re-certification.

(C) Revocation of Certification.
(1) The Department may revoke certification from an individual or from an employer and its employees for any of the following reasons:
(a) A single occurrence of installing or attempting to install a system without a valid permit.
(b) A single occurrence of deliberately falsifying an inspection.
(c) A single occurrence of failing to correct deficiencies noted on the inspection form.
(d) Repeated mistakes within a two (2) year period in installing a system in accordance with this regulation or failure to submit self-inspection forms in a timely manner. The Department must have issued a Notice of Violation within a two (2) year period prior to revoking an installer's certification for repeated installation mistakes.
(2) Revocation of certification may extend for up to one (1) year.
(3) When revoking a certification, the Department shall provide the installer with a written explanation of the reasons for the revocation in the form of a Notice of Violation.

8. INSPECTION & FINAL APPROVAL.

(A) All systems must receive final approval from the Department for a permit to remain valid.

(B) Wastewater treatment and disposal systems require an inspection prior to covering the system unless specific permission has been granted by the Department to backfill a portion of the system for a justified reason.

(C) When there is no certified installer on site during an inspection the Department may charge a reinspection fee to return and reinspect the system when a certified installer is on site. The Department may waive the requirement to have a certified installer on site during an inspection by arrangements made prior to the inspection.

(D) When final approval is withheld, a written notice of deficiencies and required corrective action must be given to the certified installer or property owner. The certified installer or property owner must notify the Department upon correction of all deficiencies. The Department shall confirm the deficiencies have been corrected prior to granting final approval. If reinspection is required the Department shall charge a re-inspection fee established by the Board.

(E) When final approval is granted by the Department, but a deficiency requiring correction exists, the Certified Installer must correct the deficiency. The Department may require that the Certified Installer provide evidence that the deficiency has been corrected.

(F) The applicant or installer must notify the Department not less than one business day prior to a system being ready for a final inspection.

(G) Certified installers, after receiving permission from the Department, may inspect their own installations and certify the system is installed in compliance with these regulations on forms provided by the Department when Department personnel are unable to inspect the system within one (1) business day of the requested inspection time. The installer

must submit a completed inspection of the system, including a drawing and location of the disposal system, to the Department within two (2) business days after receiving permission to self-inspect.

(H) When a signed copy of the 'as built' plans for an engineered system is required by DEQ 4, Appendix D, the owner or authorized agent must submit the plans as described in DEQ 4 to the Department within 90 business days following the final inspection.

(I) Acceptance of a permit by the applicant confers upon the Department the authority to access the installation site at reasonable times to inspect or to collect samples. The Department may also inspect existing systems that have been subject to complaint(s), create health hazard(s), or have become public nuisances.

(J) Deviations from the approved plans, which do not violate the regulation, may be approved by the Department. Approved deviations must be noted on the inspection form.

9. SITE EVALUATIONS.

(A) A site evaluation must be conducted by an approved site evaluator who has passed an examination administered by the Department to demonstrate knowledge of soils and site characteristics and how they relate to the design and function of wastewater treatment and disposal systems. The following persons may be approved site evaluators.
(1) Professional Engineers specializing in civil, environmental, sanitary, or agricultural engineering;
(2) Persons possessing a B.S. degree in geology, hydrogeology, or soils science;
(3) Registered Sanitarians with sufficient soils course work or specialized soils training; or,
(4) Other persons with equivalent expertise or experience, as determined by the Department.

(B) A person taking the test to become an approved site evaluator must pay a fee as determined by the Board.

(C) A site evaluation must be conducted in the location of each proposed system. The following factors must be evaluated: size and shape of the lot, soil conditions, slope of natural and finished grade, depth to groundwater, proximity to existing and proposed water supplies, proximity to existing systems, proximity to surface water, floodplain and flood prone areas, escarpments, and area available for the system and its designated replacement area.

(D) Soil conditions. Where the Department determines adequate soils information is not available, soil conditions must be obtained by digging two (2) pits, one to a depth of at least ten (10) feet and a second to a depth of at least five (5) feet, located at each end of the proposed absorption system site.

(E) The U.S. Department of Agriculture's "Soils Classification System" must be used to describe and determine soil texture. (see DEQ 4 Appendix B). The following factors must be included in any soils evaluation:
(1) Thickness of layers or horizons of soil profile.
(2) Texture and structure of horizons.
(3) General color, and color variation (mottling).
(4) Depth to water (if observed) or a statement that groundwater depth exceeds six feet throughout the entire year based on evidence from pits, borings, or other physical substantiation.
(5) Depth to bedrock or impervious layer (if observed).
(6) Other prominent features that would have a bearing on a site's compatibility for use as a wastewater absorption site. Additional soils information may be required.
(7) The site of the soil testing must be clearly identified by placing a perforated pipe to a depth of nine (9) feet in the soil profile hole.

(F) The Department may require as many soil profile holes be dug in the area of the proposed absorption system as the Department determines is necessary to describe and evaluate the soils of the site.

(G) A person performing a site evaluation on a parcel shall submit to the Department all data and locations on all test holes and percolation tests performed on the parcel.

(H) When a site evaluation is required, the evaluation may be performed by an approved site evaluator or the applicant may request that the Department perform the site evaluation.
(1) If a site evaluation is not conducted by the Department, the Department may require access to the property where the proposed site is located to confirm information submitted by the applicant. The Department may reject a site evaluation if access is denied.
(2) The Department may refuse to accept site evaluations from persons who have a documented history of supplying inaccurate site evaluations or incomplete information as required.

(I) Percolation Tests and Exceptions.
(1) A percolation test is required in accordance with Table 1.
(2) If a potential impervious layer is present less than six (6) feet below ground level, percolation tests must be conducted in this layer unless other testing (e.g. hydrometer, permeameter, or other approved hydraulic conductivity test) is provided that substantiate the layer is not impervious.
(3) Three percolation tests must be conducted, when required, in accordance with DEQ 4, Appendix A on absorption system sites. Test holes must be evenly spaced throughout the area of the proposed absorption site.
(4) Percolation tests must be conducted by an Approved Site Evaluator.

TABLE 1

Soil Type	Percolation Testing Required?
Any extremely gravelly, cobbly, or bouldery soil	YES, Unless sand-lining and pressure distribution is provided
Coarse sand Sand Loamy sand	YES, Unless sand-lining and pressure distribution is provided
Medium sand Fine sandy loam Fine sand Very fine sand Sandy loam Loam Non-compacted silt loam	NO
Compacted silt loam Sandy clay loam Clay loam Silty clay loam Sandy clay Silty clay Silt Clay	YES

10. LOCATION AND DESIGN OF WASTEWATER TREATMENT AND DISPOSAL SYSTEMS.

(A) General.

(1) All systems must be located and designed in accordance with DEQ 4 unless a more specific or stringent requirement is included in this Code.

(2) Applicants proposing a new wastewater treatment and disposal system, or increased use of a system must designate a full sized separate replacement area that meets all the criteria for the initial drainfield or absorption system without any sizing reductions.

(3) The Department may require that both the primary and replacement drainfield areas be identified by staking prior to construction.

(4) All individual wastewater systems and designated replacement areas being reviewed as part of a Sanitation in Subdivision application must be located on the same lot as the dwelling or business served. This provision does not apply to:

(a) wastewater systems or replacement areas proposed on lots created on or before December 31, 2009; or,

(b) wastewater systems or replacement areas proposed on lots created as part of any Sanitation in Subdivision application submitted to the Department by December 31, 2009; or,

(c) wastewater systems or replacement areas proposed on lots created as part of any subdivisions with preliminary plat approvals from the County Commissioners or City Council by December 31, 2009; or,

(d) wastewater systems and replacement areas located off of the lot prior to application for subdivision.

(5) A structure, movable or immovable, may not be located over, or moved onto, any part of the system. Vehicles may not be driven over the system after installation, except those portions properly designed to accept traffic loads. The drainfield or other absorption system must be located and protected in a manner that prevents vehicles from passing over or parking on top of the system. This area must be kept free of all obstructions, including pavement, which will prevent air from penetrating the soil.

(6) Fill may not be used to overcome minimum vertical or horizontal separation distances in Sections 10(B) and (C), except for sealed components.

(B) Prohibited locations.

(1) Steep slopes.

(a) No system or any portion of a system may be located on a slope that exceeds 35%.

(b) Systems may not be located on slopes between 15% and 35% unless a registered professional engineer or a person qualified to evaluate and identify soil in accordance with the Natural Resource Conservation Service standards submits adequate evidence that conditions are such that there will be no visible outflow of effluent down slope from the installation of the system.

(c) Systems must meet minimum setback distances from steep slopes in accordance with Table 2.

(2) Floodplain or flood-prone areas.

(a) Absorption systems may not be located within 100 feet of a floodplain or flood-prone area.

(b) When property within the designated FEMA floodplain can be shown to be above base floodplain elevation, an official action from FEMA is required to remove the area from the floodplain before a permit may be issued by the Department. If the property is within shaded Zone X floodplain, written approval from the Floodplain Administrator is sufficient.

(c) A parcel containing Zone A approximate floodplain must have the base flood elevation determined by a licensed professional engineer through hydrologic and hydraulic analysis, or another method approved by the Floodplain Administrator before the Department may:

(i) approve a subdivision or,

(ii) issue a septic permit on a DEQ-reviewed parcel that was created after August 15, 1983.

(3) Waterways. A subsurface treatment and disposal system may not be located within a drainage way or within a natural or manmade intermittent watercourse.

(4) Groundwater. Groundwater depth at any time of less than six (6) feet from the natural ground surface precludes the use of conventional subsurface wastewater treatment and disposal systems. There must be a minimum separation of at least four (4) feet of natural soil between the bottom of the drainfield and the maximum high groundwater elevation.

(a) The Department may require one (1) year of groundwater monitoring conducted by the Department to delineate the highest groundwater level.

(b) If the groundwater is within ten (10) feet of the ground surface, or if there is any reason to believe

that the groundwater will be within ten 10 feet of the natural ground surface during any time of the year, groundwater monitoring is required.

(c) The applicant must provide groundwater test holes and piping to a depth of at least nine (9) feet within the boundary of the proposed drainfield to determine the high groundwater during its peak occurrence. If shallow groundwater or an impervious layer is encountered during excavation of the test holes at a depth less than nine (9) feet, the piping may be placed at that depth.

(d) The Department may refuse to accept seasonal high groundwater data when total precipitation for the previous year (defined as May 1 of the previous year through April 30 of the current year), or April 1 snowpack water equivalent, measured at the nearest officially recognized monitoring station, is more than 20 percent below the historical average.

(e) The Department may consider soil morphology data and data from nearby groundwater monitoring sites with similar soil, geology and proximity to streams or irrigation ditches, if available, to determine maximum groundwater elevation. Morphology data may only be substituted if groundwater monitoring was conducted and precipitation or snowpack for the monitoring period is more than 20 percent below the historical average per Section 10(B)(3)(d). The Department may charge a fee to be determined by the Board for review of morphology data.

(5) Bedrock and impervious layers. Four (4) feet of natural soil must be present between the bottom of the absorption system and bedrock or an impervious layer throughout the proposed drainfield site and replacement area.

(C) Minimum horizontal setbacks.

Minimum horizontal setbacks are shown in Table 2, with clarifying statements shown in 1-8 below.

TABLE 2

Minimum Horizontal Setback Distances in Feet

FROM:	TO:		
	Sealed components	Other components	Absorption systems
Public or multi-user wells/springs	100	100	100
Other wells	50	50	100
Property Boundaries	10	10	10
Foundation Walls	10	10	10
Suction lines	50	50	100
Cisterns	25	25	50
Irrigation Ditches (8)	50	50	100
Roadcuts, escarpments (2)	10	10	25
Floodplain or flood prone area (3)(4)(5)	-	100	100
Steep slopes (1)(2)	10	10	25
Subsurface drains	10	10	10
Water Lines(6)	10	10	10
Drainfields/sand mounds	10	10	-
Surface water, springs	50	50	100

(1) Sewer lines and sewer mains may be located in roadways and on steep slopes if the lines and mains are safeguarded against damage.

(2) The minimum horizontal setback from a slope or escarpment applies to the slope down gradient of the absorption system.

(3) Sealed transport lines may be located within the flood prone/floodplain area.

(4) If the floodplain has not been designated and its level relative to a wastewater system is in question, the applicant must submit evidence adequate to establish the location of the floodplain.

(5) Sealed components of a wastewater system located in a 100-year floodplain or area of high groundwater must be designed and constructed to prevent surface and ground water inundation. Pump lines must be pressure tested prior to use and must have a pressure rating of at least two (2) times the operating pressure or pump shutoff pressure, whichever is greater. Pipes must be tested at 1.5 times the operating pressure or pump shutoff pressure,

whichever is greater, or must be tested as specified by the manufacturer.

(6) Separation of Water and Sewer

(a) Horizontal separation of at least ten (10) feet is required between sewer and water mains, unless the sewer main must cross the water line. The distance shall be measured from the closest edge of each pipe.

(b) Sewer mains which must cross water mains shall be laid to provide a minimum distance of 18 inches between the outside of the pipes. Service lines shall be constructed in accordance with the Uniform Plumbing Code.

(7) The Department may require greater horizontal separation distances than those specified in Table 2 if it determines that site conditions or water quality non-degradation requirements indicate a need for the greater distance.

(8) Exceptions for Irrigation Ditches.

(a) The setback distance from an irrigation ditch to an absorption system may be reduced to a minimum of 50 feet provided the ditch is sealed prior to construction of the system to prevent seepage of water out of the ditch and seepage of wastewater into the ditch. The setback distances may be reduced to a minimum of 10 feet based on a case by case evaluation of engineered plans for piping submitted to the department.

(b) If the top of the absorption system is to be placed at an elevation equal to or lower than the flow line of the ditch to prevent wastewater effluent from entering the ditch and groundwater monitoring during the peak season demonstrates that seepage of water from the ditch will not result in a depth to groundwater of less than six (6) feet in the area of the absorption system, the setback distance may be reduced to a minimum of 50 feet.

(D) Maximum land application rates.

(1) Wastewater application into the soil may not exceed 700 gallons/useable acre/day for any system or group of systems.

(a) Total area for the purpose of calculating the maximum land application rate may include lots, interior parks, and public right of ways within the subdivision, minus floodplain or flood-prone area.

(b) All parcels included within a proposed project may be considered to determine compliance with this section.

(c) For the purpose of calculating application rate limits each individual single family dwelling unit is considered to have a discharge of 350 gallons per day. The application rate for multi-family units will be calculated using the flows shown in Table 4.

(d) Flow rates for industrial and non-residential establishments must be as determined by design in accordance with DEQ 4, Chapter 3.

(2) Exceptions:

(a) Existing lots not being reviewed for subdivision to be used for single family dwelling(s) or multi- family dwellings with 4 or fewer dwelling units do not have to meet the requirements of 10(D)(1), but must demonstrate adequate room for both a drainfield and full replacement area and meet all other requirements of these regulations.

(b) If a Level II wastewater treatment system is used and nitrate is projected to be 5 mg/l or less at the end of the mixing zone, wastewater application may increase to 1,400 gallons/useable acres/day.

(c) If a DEQ groundwater discharge permit restricts and requires monitoring of the nitrate level in the effluent, wastewater application may increase based on the following formula:

(50 mg/l ÷ x mg/l) x 700 gallons/useable acre/day, where x is the discharge permit nitrate limit in mg/l

11. PRIMARY TREATMENT REQUIREMENTS.

(A) All new and replacement wastewater treatment and disposal systems must provide a primary treatment device prior to disposal in an absorption system.

(B) The primary treatment device must consist of a septic tank that conforms to the design and construction requirements in DEQ 4.

(C) Septic tanks must be leak tested in accordance with DEQ 4 and as required by this section.

(1) A tank that is, or may be, in groundwater must be leak tested in place, except an individual or shared tank with a design flow of less than 700 gallons per day may submit a certificate from the tank manufacturer stating that the tank was leak tested before transport to the site.

(2) The Department may require a tank to be leak tested following installation if there is evidence that the tank or seals have been damaged and may no longer be water tight.

(D) Septic tanks must be located where they are readily accessible for inspection and maintenance. Nothing may be constructed or installed over a septic or dosing tank that would prevent the tank access openings from being readily accessible.

(E) Septic tanks must be sized in accordance with DEQ-4, Chapter 5.

(F) The pipe between the structure and the septic tank may not have a single bend of more than 45°.

(G) Access and inspection ports must be provided as required in DEQ 4, and must extend to the ground surface.

(H) All access ports 22 inches or larger in diameter must be equipped with a safety pan or basket device.

(I) Covers on all access and inspection ports must remain in place and be secured per manufacturer's specifications unless the tank or filter is being serviced.

(J) The septic tank must be set on undisturbed ground or properly bedded with sand to prevent settling of the tank. The tank must be installed level.

(K) Septic tank outlets must include an effluent filter with an opening no larger than 1/8 inch or another approved device such as a screened pump vault.

12. CONVENTIONAL SECONDARY TREATMENT.

(A) Drainfield wastewater flow rates.

(1) Design wastewater flow for residential use shall be as follows:

(a) A living unit on an individual wastewater treatment and disposal system must be sized using the design flow in Table 3;

(b) If 2 or more living units use a common absorption system the wastewater treatment and disposal system must be sized using the design flow in Table 4;

(c) When 10 or more living units use a common absorption system, the design flow may be reduced to 250 gpd per living unit. The Department may determine that a larger per-living-unit average design flow is necessary for a given project.

(d) Design flow is based on individual living units, not collective number of bedrooms.

(e)The Department will use the guidelines established in Appendix F to determine if a room is to be considered a bedroom for determining minimum design flow rates.

TABLE 3
Minimum Design Flow Rates for Residential Individual Systems

1 bedroom	300 gpd
2 bedrooms	300 gpd
3 bedrooms	300 gpd
4 bedrooms	350 gpd
5 bedrooms	400 gpd
Each additional bedroom	add 50 gpd

TABLE 4
Minimum Design Flow Rates for Residential Shared and Multi-user Systems

First Living Unit			Subsequent Living Units	
1 bedroom	300 gpd		1 bedroom	150 gpd
2 bedrooms	300 gpd		2 bedrooms	225 gpd
3 bedrooms	300 gpd	+	3 bedrooms	300 gpd
4 bedrooms	350 gpd		4 bedrooms	350 gpd
5 bedrooms	400 gpd		5 bedrooms	400 gpd
Each additional bedroom- add 50 gpd			Each additional bedroom- add 50 gpd	

(2) Wastewater flow rates for non-residential, industrial, recreational, and commercial establishments are determined by:
(a) DEQ 4, Chapter 3; or
(b) Applicable tables and charts found in the EPA Design Manual for Onsite Wastewater Treatment and Disposal Systems; or
(c) Metered flow data which has been approved by the Department gathered from comparable facilities.

(B) Drainfield application rates.
(1) Application rates for residential and non-residential drainfields are determined using Table 5.
(2) The most conservative of soils profile report or percolation rate will be used to select applicable square footage.
(3) The following formula must be used to determine the size in lineal feet of the drainfield. Example calculations can be found in Appendix A.

$$\text{Lineal feet} = \frac{\text{gallons of effluent per day}}{\text{application rate X width of trench in feet}}$$

TABLE 5

Texture	Est. Perc rate (min/in)	App. Rate (gpd/ft^2)
Gravelly to extremely gravelly sands, extremely gravelly loamy sands, coarse sands and coarser soils	< 3	0.8
Loamy sand, coarse & gravelly sands & gravelly loamy sands from above that perc 3 – 6 mpi	3 - < 6	0.8
Medium sand, sandy loam	6 - <10	0.6
Fine sandy loam, fine sand, loam	10 - <16	0.5
Very fine sand, Sandy clay loam, silt loam	16 - <31	0.4
Clay loam, silty clay loam	31 - <51	0.3
Sandy clay	51 - <121	0.2
Clays, silts, silty clays	121 - ≤240	0.15
Any soils that perc >240 minutes per inch (this is considered an impervious layer, and a system that relies on absorption is not permitted)	>240	Not Permitted

(C) Pressure Distribution.
(1) Pressure distribution and sand lining in accordance with DEQ 4 is required if the percolation rate is less than three (3) minutes per inch.
(2) Pressure distribution is required for the following:
(a) If the soil is coarse or loamy sand and there is less than six (6) feet between the bottom of the absorption trench and a limiting layer.
(b) If more than 1000 square feet of absorption area is needed prior to the application of any reductions in sizing.
(c) If any portion of the absorption system lies on a slope greater than 25 percent.
(d) If an effluent pump is part of the system design.
(e) Shallow Drainfields, Elevated Sand Mounds, Absorption Beds, and Deep Absorption Trench systems.
(f) Replacement systems that cannot meet all separations in Section 10(B) & (C) of this regulation.
(g) Replacement drainfields installed in fill.
(h) Trenches greater than 24 inches wide when leaching chambers are used.
(3) Pressure distribution may also be required in other alternative or experimental systems.

(D) Drainfield construction details.

(1) Drainfield construction details must conform to the standards found in Table 6 and below:

(a) Drain rock around drainfield pipes must be clean, with no more than 2 percent passing the No. 8 sieve.

(b) Drain rock must be covered with a minimum of two (2) layers of untreated building paper, synthetic drainage fabric or other approved material before backfill. Straw may not be used in place of building paper or drainage fabric.

(c) For gravity fed systems, the pipe connecting the septic tank and the drainfield must be properly bedded and consist of schedule 40 PVC pipe at least three inches in diameter and lie on a slope of not less than 1/8 inch/ft.

(d) Pipe used in gravity flow drainfields shall be perforated PVC pipe at least four (4) inches in diameter.

(e) Header pipes shall consist of solid class 200 or Schedule 40 PVC pipe.

(f) The ends of drainfield laterals must be marked with a metal location marker.

(g) Perforations in drainfield pipe shall be placed at five (5) and seven (7) o'clock.

(h) Perforated pipe connecting the ends of the drainfield laterals will not be included when calculating absorption area sizing.

(i) When trenches have been excavated, the sides and bottom must be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system must be kept off the absorption area to prevent soil compaction. Construction must not be initiated when the soil moisture content is high.

(j) Equal distribution of septic tank effluent throughout the secondary treatment system is required.

(k) Minor leveling is allowed in accordance with DEQ 4.

(2) Distribution Boxes. When gravity-fed drainfield laterals are installed at different elevations, a dosing distribution box is required, and:

(a) The total length of perforated pipe of each connection to a distribution box may not vary by more than 10 feet;

(b) The bottom of all outlets of the distribution box must be level, and the bottom of the inlet must be at least one (1) inch above the outlets;

(c) The distribution box must be adequately bedded to prevent settling;

(d) The location of the distribution box must be marked by a metal location marker to facilitate locating the distribution box for maintenance and inspection;

(e) At least five (5) feet of solid pipe must extend from a distribution box; and

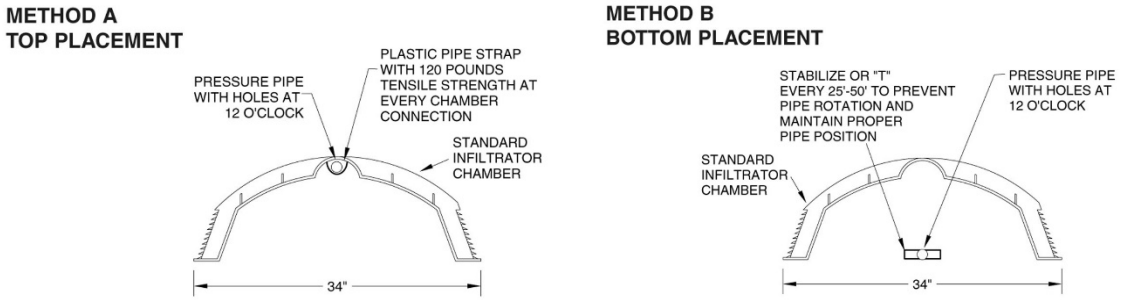
(f) The certified installer must test the distribution box at the time of inspection by filling it with water to ensure equal distribution.

TABLE 6

	Units	Gravity Maximum	Gravity Minimum	Pressure Maximum	Pressure Minimum
Trench length	feet	100	0	-	0
Trench width	inches	24	18	36	12
Trench depth	inches	36	24	36	24
Slope of drainfield lines	percent	0	0	0	0
Slope of trench bottom	percent	0	0	0	0
Slope of header pipe	percent	0	0	0	0
Depth of drain rock: Under pipe Over pipe	inches	 - -	 6 2	 - -	 6 2
Size of drain rock	inches	2.5	.75	2.5	.75
Space between centers	feet	-	7	-	7

(3) Leaching Chambers. Figure 1 shows a typical cross section of a leaching chamber installed with pressure distribution.

FIGURE 1
CUTAWAY OF A TYPICAL LEACHING CHAMBER SYSTEM



(a) Leaching chambers may be used, and must be installed in accordance with DEQ 4.
(b) The required absorption system size may be reduced by 25 percent if using leaching chambers. Systems using leaching chambers must maintain a replacement area large enough to accommodate a system without chambers.
(c) Leaching chambers must have at least 12 inches of cover and be compacted by foot compression along the sides of the chamber to provide support for the chambers.
(d) In clay soils, the space between the louvers of chamber systems and the trench sidewall must be filled with loam or sandy soil.
(e) For installations with pressure distribution, the following requirements apply:
(i) For installations with pipe hung in the top of the chamber (see Figure 1) the pipes must be secured with plastic strap with a minimum 120 pounds of tensile strength.
(ii) For installations with pipe placed directly on the trench bottom (see Figure 1) stabilizing T's must be installed every 25 to 50 feet to prevent pipe rotation and maintain orifice position. Stabilizing T's are only required when the lateral is more than 50 feet long.
(iii) Orifices must be placed at the 12 o'clock position, except orifices at each end of the lateral, and one orifice every 25 feet along the lateral must be faced down and have an orifice shield placed under them to allow for drainage of the pipe.
(iv) Access for pipe maintenance and flushing and a metal pipe cap or other metal location marker must be provided at the end of each lateral.

(E) Pressure Distribution Secondary Treatment.
(1) When pressure distribution is used, a three (3) foot trench width with four (4) foot separation between trench edges is allowed.
(2) A pump or siphon may be used to provide pressure distribution. A typical layout for a pressure distribution system is depicted in Figure 2.
(3) The distribution system must be designed by an engineer or someone experienced in the design of pressure distribution systems to ensure equal distribution and minimum squirt height throughout the drainfield.
(4) Dosing tanks must have access ports sufficiently large to maintain the tank and pumps, and must be vented. Pumps, valves and other apparatus, which require maintenance, must be accessible from the surface without entering the tank or be located in a dry tank adjacent to the wet chamber. Pumps and controls must be corrosion resistant and meet National Electrical Code requirements.
(5) The dose volume must be equal to the drained volume of the discharge pipe and manifold plus a volume between five (5) and ten (10) times the distribution pipe volume. If a programmable timer is used, the minimum dose size may be equal to two (2) times the distribution pipe volume.

(6) Dosing pumps and siphons used for pressure distribution systems must be selected to provide a minimum of five (5) feet of head for orifices 5/32 inch or smaller, and 2.3 feet of head for orifices 3/16" or larger.
(7) All lateral and manifold piping shall be Schedule 40 or stronger PVC pipe. The pipe must have a single row of perforations 1/8 inch diameter or larger in a straight line perpendicular to the ground surface. Maximum perforation spacing is five (5) feet. An equivalent design that assures uniform distribution and minimum squirt height may be provided with the approval of the reviewing authority.
(8) A hydraulic analysis demonstrating uniform distribution and minimum required squirt height must be provided. The analysis must show no greater than ten 10 percent variation in distribution of dose across the entire drainfield.
(9) Distribution pipes of pressure–distributed drainfields must have capped inspection risers that terminate no more than six (6) inches below ground surface. Inspection risers must be installed with a long-sweep elbow or single 45° bend. A-metal location marker must be provided for each-inspection riser.
(10) Pressure distribution systems and controls must be field tested to demonstrate uniform flow distribution prior to approval of the system. The system must be tested by pressurizing it with water before covering the distribution pipe with gravel. Holes must be facing up for this test. The elevation of the spray from each hole must be a minimum of five (5) feet for orifices 5/32 inch or smaller, and 2.3 feet for orifices 3/16" or larger and maintain a maximum flow variance of 10 percent.
(11) Dosing tanks, except those designed in accordance with the City of Missoula's Standard Installation Manual for Residential On-Site STEP System Sanitary Sewer Connection, must comply with the following requirements unless the Department approves alterations that have been justified by a Professional Engineer.
  (a) The dosing tank must have adequate volume to provide storage for the necessary effluent dose, the transport line (if the line drains back) and the required reserve capacity.
  (b) The reserve volume must be equal to at least 25 percent of the daily flow.
  (c) Dosing tanks must be made of reinforced concrete meeting the same structural standards as those required for septic tanks in DEQ Circular 4 or an approved equivalent.
  (d) Risers for pump access must be a minimum of 18 inch inside diameter and must be constructed of concrete, ribbed fiberglass or other approved non-corrosive durable material. The pump access must extend to finished grade and have a secure cover made of concrete or fiberglass.
  (e) Pump vaults must be installed to allow for venting back through the septic tank. A vent with an activated carbon filter is recommended and is required if an odor nuisance is created.
(12) Pumps must comply with the following requirements:
  (a) Pumps used for pressure distribution systems must meet the specifications determined by the pressure distribution design criteria.
  (b) Pumping head must be within the manufacturer's recommended operating range for that pump. Pumping head is determined using the elevation distance between the lowest pumping level in the dosing tank and the highest level in the drainfield system and adding the total of the friction losses for the transport pipe and any fittings.
  (c) Pumps must be designed and approved for intended use.
  (d) The effluent must be screened through a 1/8 inch filter before it enters the pump chamber.
  (e) Pumps must be installed to be easily removed without entering the access port. Pumps must be provided with an easy, readily available means of electrical and plumbing disconnect, and a non-corrosive lifting device as a means of removal for servicing.
  (f) Pump systems must be designed to keep the pump motor submerged unless an explosion proof pump is installed that is acceptable for use in a hazardous environment in accordance with the National Electric Code ANSI/NFPA 70.
  (g) Every new or replacement system requiring a pump must have a properly functioning audible and visible high water alarm installed in the pump chamber with a manual silencing switch located in or near the building served by the system. An electrical safety switch must be installed near this alarm. The alarm must be installed on a separate circuit from the pump. The electrical and alarm systems must be installed in accordance with the National Electric Code and other applicable rules.
(13) Transport pipes must comply with the following requirements:
  (a) All pressure transport pipe and fittings must meet or exceed ASTM Specification D-2241. Polyvinyl chloride (PVC) transport pipes must be at least Schedule 40 or Class 200 PVC. Polyethylene(PE) transport pipe of one (1) inch or less must have a minimum pressure rating of 200 pounds per square inch (psi). For diameters greater than one (1) inch, the minimum pressure shall be 160 psi.

(b) Continuously pressurized transport lines (systems with check valves) must be buried a minimum of 60 inches deep unless the line is insulated with two (2) inches of high density styrofoam insulation capable of providing a thermal resistance of 10.8 at 40°F mean temperature. Insulated lines may not be shallower than 24 inches. This requirement includes any portion of a pressurized line that is shallower than 60 inches. Transport lines designed to flow back after each dose must be buried at least two (2) feet deep.
(c) An isolation valve must be placed on a continuously pressurized transport pipe in or near the dosing tank to allow for repairs without flowback of sewage.
(d) Transport pipes must be installed to prevent siphoning of the drainfield back into the tank or the tank effluent into the drainfield. This may be accomplished using weep holes or anti-siphon valves.

(F) Siphons must comply with the following requirements:
(1) The specifications for the siphon including elevation difference between the tank and drainfield, and slope profile of the site must be submitted to the Department for review and approval for use in the specific application proposed.
(2) Siphons must use a minimum four (4) inch diameter external vent line which vents back to the dosing chamber.
(3) Siphons must be constructed of corrosion-resistant materials and installed according to manufacturer's recommendation.
(4) Effluent screens or filters with an outlet no larger than 1/8 inch must be installed to protect the siphon snifter tube from plugging.
(5) The owner of a system that uses a siphon is responsible for ensuring the ongoing proper operation of the siphon.
(6) All systems using siphons must be field tested prior to approval of the system. Pressure distribution systems using siphons must use orifices at least 5/32 inches in diameter and be tested by pressurizing the system with water before covering the distribution pipe. The squirt height must be a minimum of five (5) feet and maintain a flow variance of 10 percent or less.
(7) Systems using a siphon should have a dose counter installed to check for continued function of the siphon.

FIGURE 2
PRESSURE DISTRIBUTION NETWORK

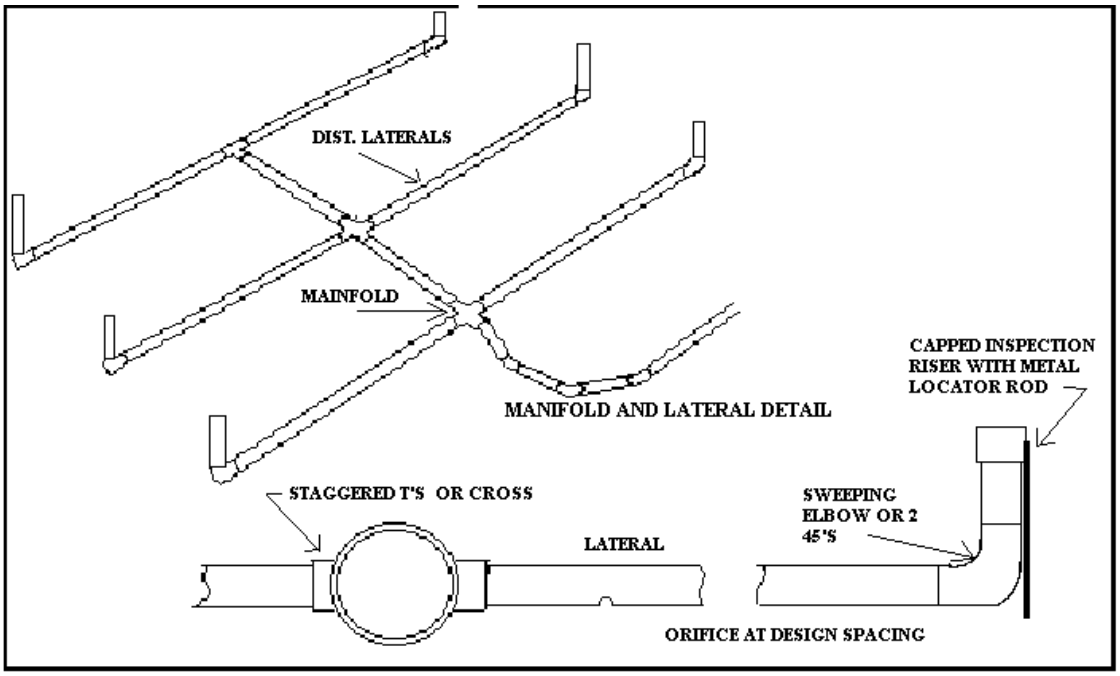
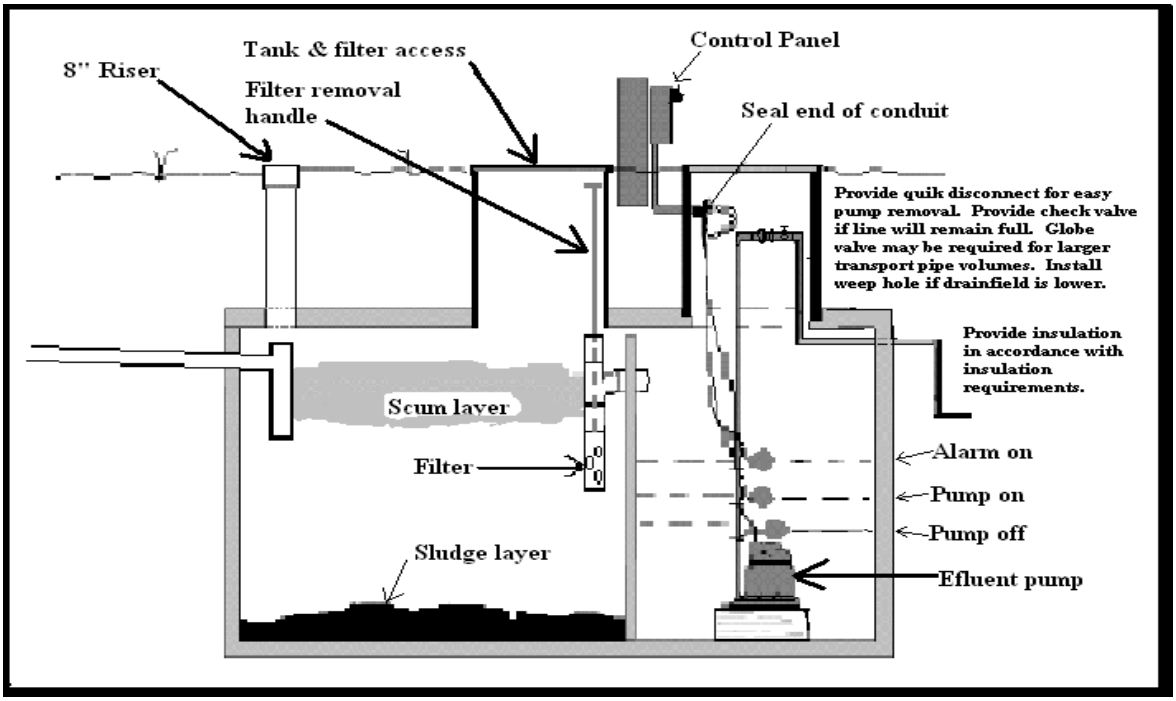


FIGURE 3
COMBINATION SEPTIC TANK / PUMP VAULT



13. ALTERNATIVE TREATMENT SYSTEMS.

(A) Alternative wastewater systems may be approved by the Department to be used in lieu of conventional systems. Alternative treatment systems must meet the requirements prescribed in the Missoula City-County Alternative Systems Manual.

(B) The applicant shall provide substantial scientific field testing information concerning a particular system design for systems not in the Alternative Systems Manual before the system may be approved as an alternative. The information must indicate that the system will perform for the purpose for which it is designed over a period of years with proper maintenance.

(C) Unless the Alternative Systems Manual provides otherwise, all rules pertaining to conventional drainfields and septic tanks apply to alternative systems.

(D) Alternative systems may require additional inspections during and after installation and an additional inspection fee may be charged for each inspection. The Department must provide a written report of each inspection to the system owner listing deficiencies of the system and corrections needed for the system.

(E) Use of an alternative system may preclude future divisions of the property pursuant to DEQ requirements. The applicant and future owners assume responsibility for any restrictions, liabilities or encumbrances that are caused by the installation and use of an alternative system.

(F) All alternative system designs, with the exception of pit privies, must provide for replacement areas equivalent to those required for conventional systems in the event of system failure.

(G) The Department may place any restrictions or requirements on the design, installation and operation of an alternative system that it deems necessary. Such restrictions or requirements include but are not limited to: temporary or ongoing monitoring, discharge limitations on pollutants, and provisions to ensure proper maintenance and operation of alternative systems. In such cases the Department shall be allowed access to the property to verify that such restrictions or requirements are implemented. Failure to properly follow permit restrictions or conditions, or failure to properly maintain an alternative system is a violation of this rule and grounds for permit revocation.

(H) Design criteria for the alternative systems approved for use by the Department are available at the Environmental Health Division Office and on the Department's website.

14. HOLDING TANKS, FLOOR DRAINS, CHEMICAL TOILETS, AND CAMPING.

(A) Holding tanks are not allowed.

(B) Floor Drains.

(1) Floor drains may be used in areas used for parking or storing vehicles, equipment, or components that are associated with an internal combustion engine under the following conditions:

(a) The structure may not house a business that washes, works on, repairs or rebuilds vehicles, equipment or components that are associated with an internal combustion engine;

(b) Floor drains may only be used to convey snow melt and rainwater from a structure;

(c) No deleterious substances may be disposed of in the floor drain;

(d) The floor drain may not accept wastewater from a plumbed fixture; and,

(e) The drain line extending from the floor drain:

(i) may not cause wastewater to travel onto neighboring property;

(ii) must dispose of the wastewater on the same parcel as the structure is located;

(iii) must dispose of the wastewater at least 10 feet from property lines and at least 100 feet from wells and surface water;

(iv) must dispose of the wastewater above ground onto pervious soil;

(v) may not discharge into a sump or injection well; and,

(vi) must dispose of the wastewater in a location that can be easily located and routinely observed by the structure's occupants.

(C) Chemical Toilets. Chemical toilets may be used for temporary events, construction sites and at other locations where a permanent system is not required. Chemical toilets may not be used to serve as a permanent sewer system for structures, except chemical toilets may be used as the approved toilet facilities for picnic shelters in parks owned or operated by the city or county.

(D) Camping. The Department may require the submittal of a waste disposal plan meeting the requirements of these regulations when a tent, RV, camper, or other temporary structure is placed for the purpose of camping in one area for 30 or more days outside of a licensed campground or RV park.

15. EXPERIMENTAL SYSTEMS.

(A) A wastewater treatment and disposal system not specifically allowed under this regulation may receive a permit as an experimental system. Experimental permits are intended for the primary purpose of conducting an experiment, and may not substitute for a variance from this regulation.

(B) Experimental systems may only be permitted under the following conditions:

(1) The applicant must provide adequate information to the Department that ensures the system will effectively treat wastewater in a manner that will prevent groundwater contamination and will meet all of the requirements in Section 5(A) at all times. Failure to meet the requirements of Section 5(A) or any permit conditions at any time shall invalidate the permit and be grounds to order cessation of use of the system and buildings that the system serves.

(2) The application must include a complete description of the scientific goals of the project and criteria used to evaluate the performance of the system. The evaluation process and requirements must be detailed in a contract or other written agreement between the evaluating entity and system owner, if different.

(3) The experiment must be conducted by a scientific, educational, governmental, or engineering organization.
(4) The applicant must provide any funding necessary for adequate design, installation, monitoring, and maintenance.
(5) The system must be designed by a Professional Engineer, sanitarian or other professional acceptable to the Department.

(C) A permit to construct an experimental system is not transferable from person to person.

(D) The Department may refuse to issue a permit for an experimental system for any reason.

(E) The Department may limit the number of experimental permits issued in a year.

(F) The Department may place any requirements or restriction it deems necessary on a permit for an experimental system.

(G) All provisions of Health Department regulations apply to experimental systems except those specifically exempted by the permit.

(H) Applicants must provide for inspections to be made by persons approved by the Department. A performance and evaluation report must be submitted annually to the Department for the duration of the experiment.

(I) There must be the potential to connect to public sewer, or an adequate replacement area for a conventional wastewater treatment and disposal system without sizing reductions must be designated and preserved if the experimental system is connected to an occupied structure.

(J) Systems required to connect to a publicly owned sewage treatment plant under Section 5(C) of this regulation, but not connected as a provision of an experimental permit may be required to connect once the experiment ends or the permit is no longer valid.

(K) Any person who sells a property containing an experimental system must disclose all permit, monitoring and maintenance requirements to the buyer. In the case of a transfer of ownership of the property, the designated experimenter must remain the same.

(L) An experimental system may be re-classified by the Department as an alternative system after submission of a final performance report demonstrating sufficient evidence has been collected to show that the system meets the performance and evaluation criteria of the permit and functions satisfactorily over time.

(M) By March 1st of the calendar year the permit holder of an experimental permit must pay an annual review fee as established by the Board.

16. REPLACEMENT SYSTEMS.

(A) A person may not operate a wastewater treatment and disposal system that has failed, as defined in Section 4 of this regulation. Failed systems must be replaced and meet the following requirements:
(1) Replacement systems must be designed and constructed to allow the best treatment practical and must meet all separation distances whenever possible.
(a) A drainfield is required when there is adequate room;
(b) If room is unavailable for a drainfield, an absorption bed is required;
(c) If room is unavailable for either a drainfield or absorption bed, a seepage pit may be allowed where groundwater is a minimum of 25 feet below the bottom of the proposed seepage pit.
(2) If a replacement system will not meet minimum separations in Sections 10(B) & (C), a pressure distribution system is required.
(3) Replacement systems will be sized based on the previously approved number of bedrooms or flow limitations unless the increased use requirements of Section 17 are met.

(B) Seepage pits may be permitted under the following conditions for replacement systems regardless of the area available in areas that are expected to receive public sewer service within five (5) years, as determined by the Department. Seepage Pits permitted under this section must also comply with the Alternative Systems Manual, Section 21.
(1) Seepage pit replacement permits will expire 180 days after public sewer becomes available to the property as described in Section 5(C);
(2) The property owner must execute a deed restriction waiving the right to protest an SID or RSID for the installation of public sewer; and,
(3) Upon expiration of a permit issued under this section, all structures served by the permitted wastewater treatment and disposal system must be connected to public sewer.

(C) A wastewater treatment and disposal system originally approved for use with 1,000 gallons septic tank capacity and legally installed before May 20, 2004 may replace the absorption area without increasing septic tank capacity if serving four (4) or less bedrooms. If the tank has not been pumped of its contents within the 12 months preceding permit issuance, it must be pumped prior to final inspection.

(D) Soil profiles and percolation tests may be required to determine proper sizing of replacement systems.

(E) Replacement of systems in floodplain.
(1) A system in a floodplain or flood-prone area that was legally installed must be replaced with an elevated sand mound or a system that incorporates advanced secondary treatment. The bottom of the trench or drainfield must be above floodplain elevation, or the system must include advanced secondary treatment before wastewater is discharged into the soil.
(2) Replacement sealed pump chambers must be designed to prevent floating in a flood.
(3) A system that was not legally installed must be replaced with a system that is in full compliance with this Code.

(F) Drainfields in Fill.
(1) Drainfields may only be installed in fill for the replacement of failing systems or as part of an alternative system approved by the Department.
(2) Drainfields in fill must be designed, constructed, and located in accordance with DEQ 4.
(3) Minor leveling is allowed for replacement systems in accordance with DEQ 4.
(4) Fill may not be considered natural soil.
(5) Fill may not be used to overcome minimum separation requirements in Section 10(B) and (C) of this regulation.

17. EXISTING USE, INCREASED USE, AND CHANGES TO STRUCTURES OR PARCEL BOUNDARIES.

(A) Existing use and connection to existing systems.
(1) The continued use or maintenance of a properly functioning existing wastewater treatment system legally installed according to regulations and standards in effect at the time of construction is allowed unless the system causes a violation of Section 5(A) of this regulation or is ordered disconnected by the Health Board or other jurisdiction. Such a system may not be enlarged, repaired, subject to increased use, or altered in any manner unless the alteration(s) bring the system into compliance with current regulations.
(2) No person may connect to a wastewater treatment and disposal system when the system or connection point (in the case of a multiple connection system) has been unused or disconnected from any residence or structure for more than one (1) year without a written septic determination issued by the Department verifying that the system meets the requirements of Section 5(A) of this regulation; has primary and secondary treatment; and meets the separation requirements in Section 10(B) & (C) of this regulation.

(B) Increased use, new use, and altering parcel lines.
(1) No person may increase use to an existing system or operate an existing system that has increased use unless the system meets all current requirements of this regulation or a temporary increased use permit is granted pursuant to Section 6(G).

(2) A properly functioning system originally permitted for three (3) bedrooms with a 1,000 gallon septic tank legally installed before May 20, 2004 may increase use to four (4) bedrooms without increasing septic tank capacity. The tank must be pumped of its contents prior to final approval, unless evidence is provided that it has been pumped of its contents within the twelve months preceding permit issuance. The drainfield may have to be modified to accept the increased use.
(3) To increase use to an existing system in the MWTPSA, a person must file a waiver of protest as described in Section 20(A)(1) of this rule.
(4) Adding new or increased use or structures to a parcel, or changing parcel boundaries, may not encroach upon or eliminate replacement areas for existing use.
(5) No person may install, cause to install or operate additional wastewater systems on a parcel of land or subdivide a parcel of land with a cesspool or other system that does not meet the requirements of Section 5(A) of this regulation. Substandard systems must be upgraded to meet Section 5(A), provide primary and secondary treatment, meet all separation requirements in Section 10(B) & (C), and reserve a full replacement area that meets current requirements of this regulation.

(C) Significant Alteration and Enlargement of Structure.
(1) The following conditions apply to enlargement and significant alteration of structures:
(a) No person may begin construction until the Department issues either a septic permit or a written determination that no septic permit is needed for the proposed project;
(b) No person may build over any portion of a system except the pipe from the structure to the septic tank;
(c) An adequate replacement area must be preserved that is at least equivalent to what was available before the proposed enlargement or significant alteration;
(d) The system must provide primary and adequate secondary treatment;
(e) The system must meet Section 5(A)(1) of this regulation; and,
(f) If public sewer is available as described in Section 5(C), the applicant shall connect to public sewer.

(D) Septic Determinations.
(1) A complete application for a determination must be submitted on forms provided by the Department and must include the following:
(a) Applicant name and mailing address
(b) Property owner name and mailing address
(c) Address and legal description of property
(d) A brief description of proposed project
(e) A site plan, on paper no larger than 11” x 17”, accurately showing all existing and proposed buildings, wells, septic systems, replacement areas, surface water and floodplains or flood prone areas on or within 100 feet of the property
(f) Detailed floor plans, on paper no larger than 11” x 17”, showing the existing floor plan and the floor plan of the proposed project
(g) Other relevant information as required by the Department to clearly define the scope of the project and to ascertain compliance with this Code
(i) Septic determination application fee
(2) Unapproved changes in plans or specifications after a determination is issued or any falsification or significant error in information submitted by an applicant invalidates the determination.
(3) The Department may place conditions in a determination regarding future use of the enlarged structure to facilitate compliance with the provisions of this regulation.

18. SAFETY AND ABANDONMENT OF WASTEWATER SYSTEMS.

(A) When a wastewater treatment and disposal system is replaced, or will no longer be used, the system shall be considered abandoned and any further use of the system for any purpose is prohibited.

(B) When a septic tank, seepage pit, or cesspool is abandoned it must be:
(1) located;
(2) pumped entirely of its contents by a licensed septage hauler; and,

(3) properly abandoned in one of the following ways:
(a) filled with sand, gravel, or other suitable material;
(b) broken into pieces with the resultant hole being filled with suitable material; or
(c) removed, with the resultant hole being filled with suitable material.

19. MULTI-USER OR PUBLIC SYSTEMS.

(A) Plans for public and multi-user wastewater treatment and disposal systems must be approved by DEQ and permitted by the Department.

(B) Applicants for a multi-user or public wastewater treatment and disposal system shall submit a maintenance and operation plan to the Department in accordance with DEQ 4, designating who is responsible for maintenance and operation of the system. Maintenance and operation must be carried out according to the approved plans.

(C) All portions of the multi-user or public system, except for on-lot service lines and individual tanks, must be installed before the system may be used. In the case of a phased subdivision, the treatment system installed must be adequate to serve a particular phase before the system is put into use.

(D) An individual connection to a multi-user or public system requires a permit before installation. The connection must have final approval by the Department prior to use. An individual connection to a community system must also be inspected by the certified operator or the design engineer for the system.

(E) A multi-user or public wastewater treatment and disposal system must be installed on a separate utility lot, in a common area, in an easement, or on the same lot as all the structures served so that it can easily and legally be accessed by the system's users for maintenance and repair of the system.

20. SPECIAL MANAGEMENT AREAS.

(A) Missoula Wastewater Treatment Plant Service Area (MWTPSA). The purpose of the MWTPSA requirements are to place landowners on notice that permission to use wastewater disposal in this area is temporary and is intended to be replaced with discharge to a public sewage treatment plant. The following restrictions apply to all land within the Missoula Wastewater Treatment Plant Service Area depicted on the map in Appendix D:

(1) The Department may not issue a permit for an increased use, a new wastewater treatment and disposal system, or a replacement seepage pit in the MWTPSA unless the owner(s) execute a deed restriction waiving the right to protest the creation of a Special Improvement District (SID) or a Rural Special Improvement District (RSID) for the installation of public sewer, using the language set forth below.

> *"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) which is in an area where public sewer is planned to be installed. I/we hereby waive any right to protest an RSIDs or SIDs affecting said property for the purpose of financing the design and construction of a public sewer benefiting said property. Further, my/our signatures on this waver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSID or SID petitions for the purpose of financing the design and construction of a public sewer benefiting the above-described property. This deed restriction is granted by the current and future owners of the property to the County or City of Missoula in exchange for permission to discharge sewage into the ground until such time that public sewer is installed.*
>
> *This deed restriction shall also constitute an agreement whereby the owner(s) must connect to public sewer within 180 days after public sewer mains are installed and available to the property.*
>
> *This waiver runs with the land and shall be binding on the transferees, successors, and assigns of the owners of the land described herein.*
> *All documents of conveyance must refer to and incorporate this waiver."*

The filing of a deed restriction is not required if previously filed for the same parcel, or where similar language has been shown on an approved and filed subdivision plat or certificate of survey.

(2) Owners of property encumbered by a deed restriction must connect to sewer as established in the deed restriction.

(3) A new division of land, including any subdivision as defined in Section 4 within the MWTPSA must exhibit language consistent with Section 20(A)(1) of this regulation on the face of the recorded plat or on a Certificate of Survey. Language approved by the City and County Attorney is available at the Department.

(4) Any person installing a new or replacement septic tank in an area of the MWTPSA designated for STEP (shown in Appendix D) must install a STEP septic tank with manway.

(5) A Multi-user or community wastewater treatment and disposal system serving five or more connections in the MWTPSA must be designed and located to allow a single, common future connection point to public sewer, and must conform to the design criteria established by the City of Missoula Public Works Department. The design, installation and inspection of all mains, service lines to public sewer, STEP tanks, and related appurtenances must be approved by the City of Missoula Public Works Department in accordance with its design criteria for sewers. As-built plans for all multi-user, community, or dry laid systems must be submitted to the City of Missoula Public Works Department and the Department by the applicant within 90 days of installation.

(6) A new subdivision-within the MWTPSA must provide easements as necessary to facilitate the connection of all parcels requiring facilities to public sewer service when sewer mains become available.

(7) If a property in the MWTPSA is part of a proposed subdivision containing five (5) or more lots of less than two (2) acres per lot in all phases, the developer must provide a multi-user or community wastewater treatment and disposal system converging at one common point that may be easily connected to public sewer when sewer mains are available to service the property.

(8) A properly designed, installed and inspected dry laid pressure or gravity main connecting the lots with appropriate easements may be used in place of a multi-user or community system as required above in areas where the subdivision contains no more than fourteen 14 lots in all phases approved after September 21st, 1994 when the City Engineer makes the following written findings provided to the Department:

(a) That the design of the dry-laid system meets City Public Works criteria for design of sewers; and,

(b) that a dry laid main is preferable in a given instance to a community or multi-family septic system for eventual connection to public sewer because:

(i) the dry laid system will be less expensive for future homeowners to connect to public sewer; or

(ii) because site characteristics make it infeasible to connect a community or multi family system to public sewer in the future.

(9) When the subdivision includes perpetually dedicated common areas and wildlands or an area reserved from development by deed restriction until public sewer becomes available, the Department will divide the area of such dedicated land by the number of lots and add the result to each lot area to determine applicability of Section 20(A)(7).

(B) Rattlesnake Valley Special Management Area. The following restrictions apply to wastewater treatment and disposal systems in the portion of the Rattlesnake Creek Drainage above the Mountain Water intake dam classified as A-closed by DEQ (see Appendix E).

(1) A wastewater treatment and disposal system serving one (1) single family dwelling or other use with flows less than or equal to a single family dwelling per lot or parcel will be allowed provided all other requirements are met.

(2) Except for a boundary line relocation, the Department may not issue a permit or approve a Certificate of Subdivision Approval for subsurface disposal of wastewater for a new division or subdivision of land inside the special management area.

(3) The Department may place any conditions on a wastewater treatment and disposal system permit it deems necessary to ensure compliance with the A-closed classification standards, including but not limited to requiring an alternative treatment system effective at removing pathogens.

(C) Roman Creek/Touchette Lane Special-Management Area. The following restrictions shall apply to all land included within the E 1/2 of Section 29, W 1/2 of Section 27, Section 28, T15N, R21W, bordered on the north by the Frenchtown Irrigation Canal and bordered on the south by U.S. Interstate 90.

(1) All parcels with existing plat approvals may install systems if the site meets the four (4) foot separation required from the bottom of the disposal trench to high seasonal groundwater. High groundwater testing may be required to satisfy this requirement.
(2) All parcels without existing plat approvals may only install one single family system if all other requirements of this regulation are met.
(3) The Department shall perform a preliminary inspection of the site with the excavator at the start of construction to ensure that:
  (a) maximum depth is maintained; and
  (b) the absorption system is located properly.
(4) Wells must be grouted to a minimum twenty (20) feet. Bacterial samples are recommended and disinfection may be necessary to ensure a potable water supply. A copy of the well log shall be submitted to the Department showing adequate compliance with the plat approval and Montana DNRC Well Drilling Requirements.
(5) The Department may not approve further subdivisions which create lots that generate wastewater or require wastewater facilities in the area until the cause of water contamination is discovered and the problem corrected.

(D) Seeley Lake Special Management Area. The following restrictions apply to land located in the NW quarter of T16 R15 Section 2, the East half of T16 R15 S03, and the South half of T17 R15 S35 (see Appendix G).
(1) New or increased use may not be approved unless the Department determines that it will not cause or contribute to a violation of the nitrate standard established in 76-5-605, MCA.
(2) The Department will evaluate septic permit applications on a case by case basis, using the best information available including, but not limited to, nitrate sample results and existing studies on groundwater flow direction. The Department may require an applicant to supply additional information to substantiate that groundwater will be protected.
(3) Provided there has been no unapproved increased use, replacement systems will be allowed in this area.

(E) Non-designated Areas of Concern.
The Department may impose restrictions or conditions on new, increased use or replacement wastewater treatment and disposal permits in areas where the activities may cause or contribute to the violation of water quality standards established in Title 75, Chapter 5, MCA.

Appendix A: Sample Calculations of Absorption System Sizing

The following general examples illustrate how conventional absorption system sizing is typically calculated. Note: There are sizing/design requirements not specifically addressed in these examples. These examples are provided for illustrative purposes only.

Example 1: An applicant proposes a drainfield downhill of a new 4-bedroom home in "gravelly silt loam" soils. The system may use gravity distribution (if topography allows). Sizing of the absorption system is calculated as follows:

$$\frac{\text{350 gallons per day design flow}}{\text{.4 application rate X 2 foot trench width}} = \text{438 LINEAL FEET WITHOUT CHAMBERS OR 328 LINEAL FEET WITH CHAMBERS (25\% sizing reduction)}$$

Example #2: An applicant proposes a drainfield downhill of a new 3-bedroom home in "very-gravelly sandy clay" soils. Percolation testing shows a perc rate averaging 30 minutes per inch at the proposed drainfield site. In this example, the absorption area would be sized based on the soil type of "sandy clay" because this is the more conservative value. The system must use pressure distribution because the absorption area will be greater than 1,000 square feet. Sizing of this absorption system is calculated as follows:

$$\frac{\text{300 gallons per day design flow}}{\text{.2 application rate X 3 foot trench width}} = \text{500 LINEAL FEET WITHOUT CHAMBERS OR 375 LINEAL FEET WITH CHAMBERS (25\% sizing reduction)}$$

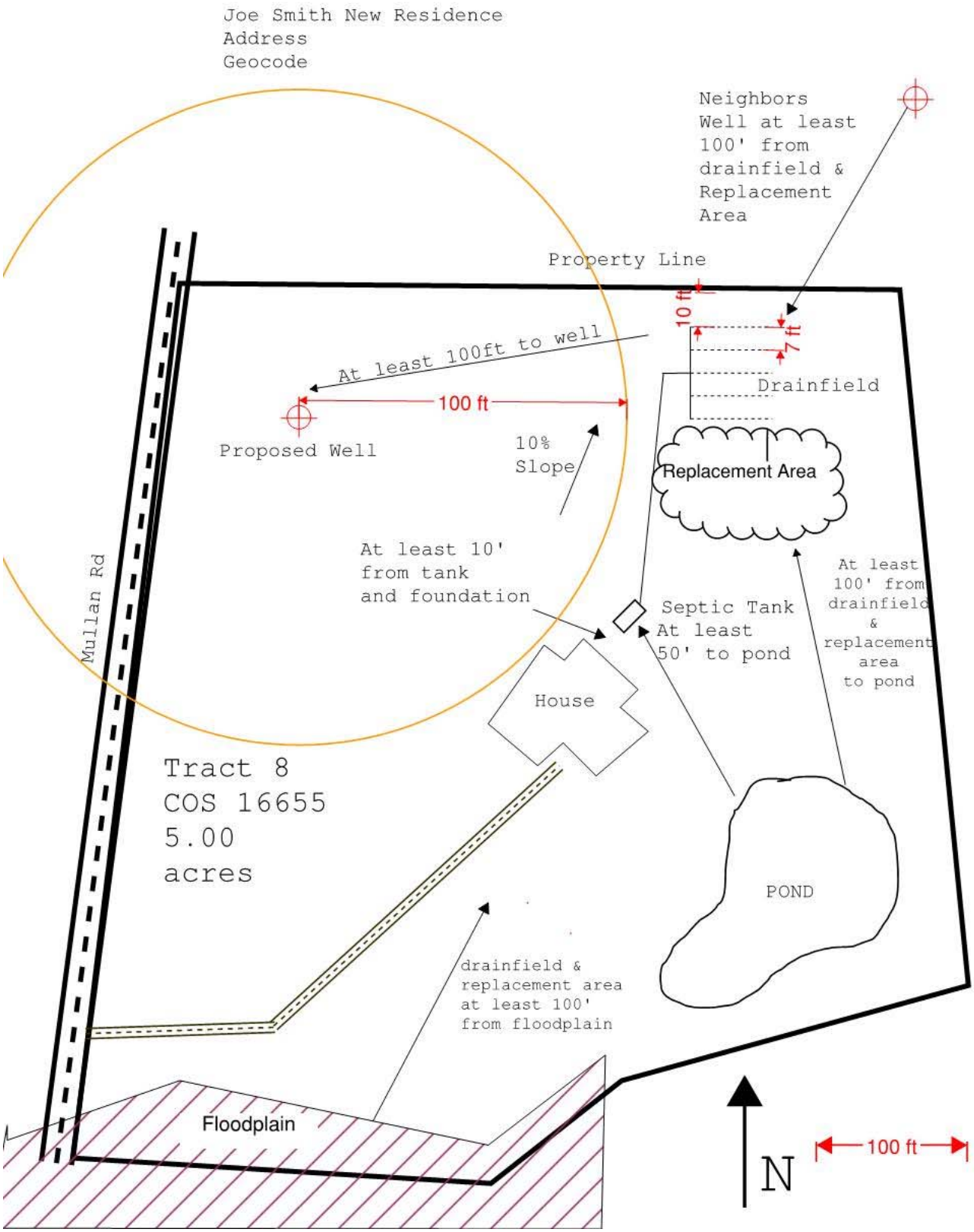
Example #3: An applicant proposes a drainfield downhill of a new 5-bedroom home in "extremely-gravelly sandy loam" soils. Unless percolation testing shows that the soil perc rates are slower than 3 minutes per inch, the trenches must be lined with medium sand and use pressure distribution because the soil is extremely gravelly. Sizing of this absorption system is calculated as follows:

$$\frac{\text{400 gallons per day design flow}}{\text{.6 application rate X 3 foot trench width}} = \text{222 LINEAL FEET WITHOUT CHAMBERS OR 167 LINEAL FEET WITH CHAMBERS (25\% sizing reduction)}$$

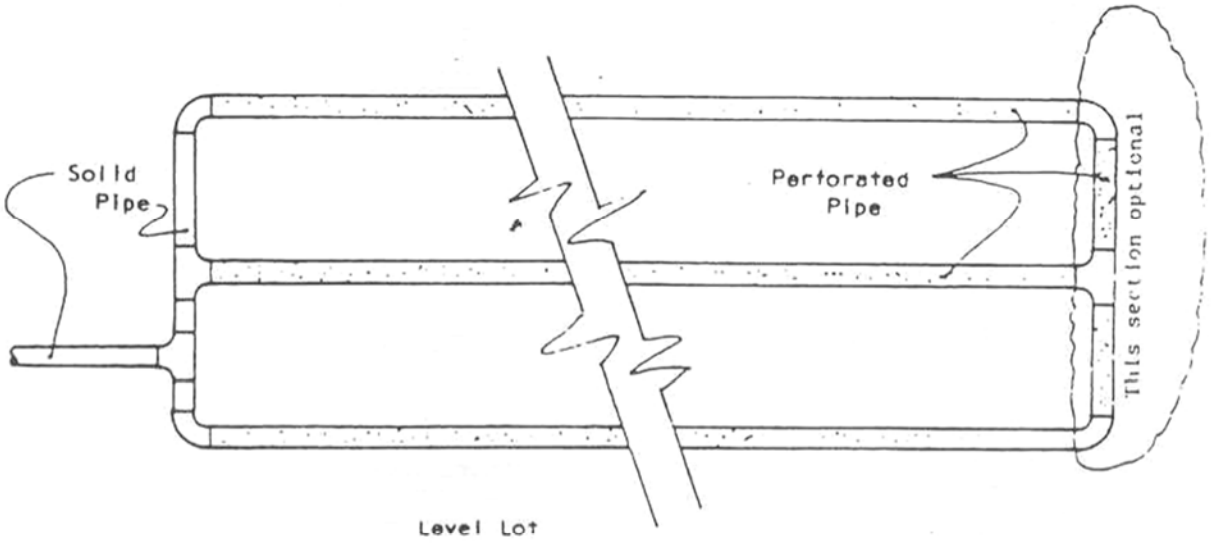
Example #4: An applicant proposes a drainfield downhill of a new 3-bedroom home in "gravelly sandy clay loam" soils. Percolation testing shows a perc rate averaging 50 minutes per inch at the proposed drainfield site. In this example, the absorption area would be sized based on the percolation rates because this is the more conservative value. The system may use gravity distribution (if topography allows) because the absorption area is not more than 1,000 square feet. Sizing of this absorption system is calculated as follows:

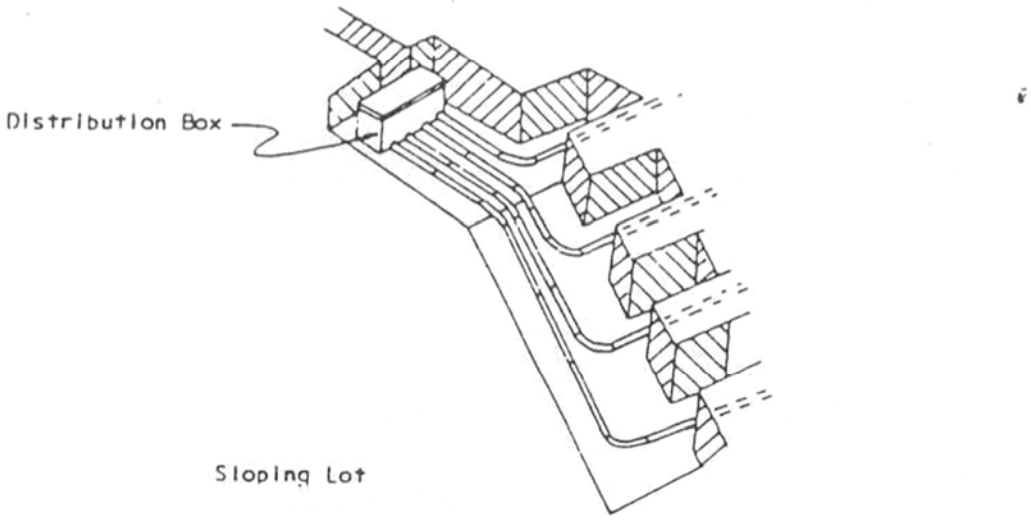
$$\frac{\text{300 gallons per day design flow}}{\text{.3 application rate X 2 foot trench width}} = \text{500 LINEAL FEET WITHOUT CHAMBERS OR 375 LINEAL FEET WITH CHAMBERS (25\% sizing reduction)}$$

Appendix B Absorption System Construction Detail
Minimum Separation Distances Illustration

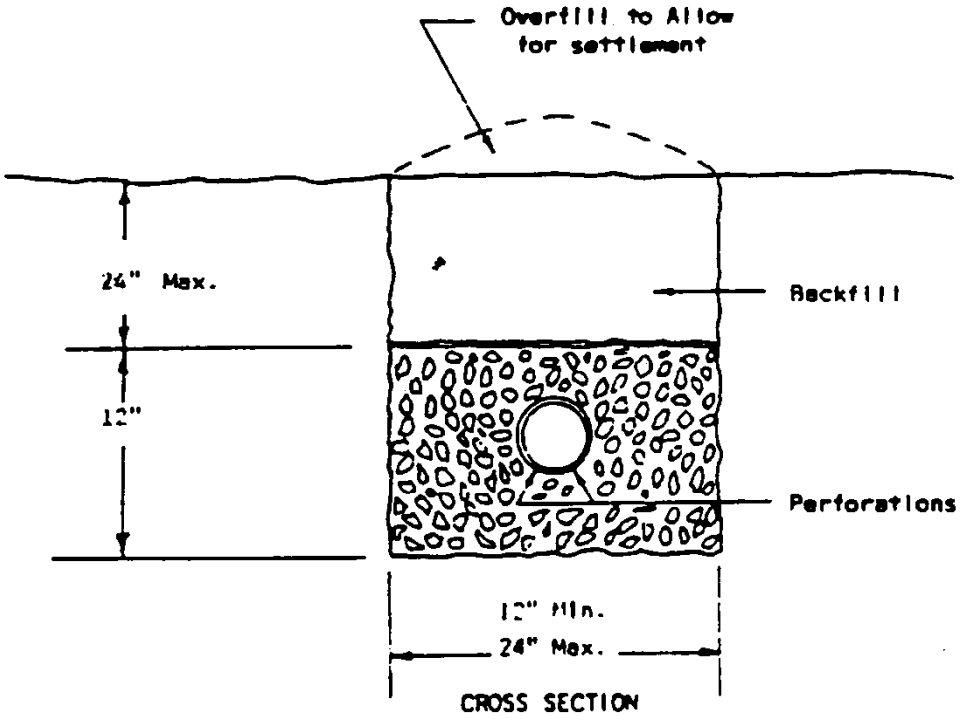


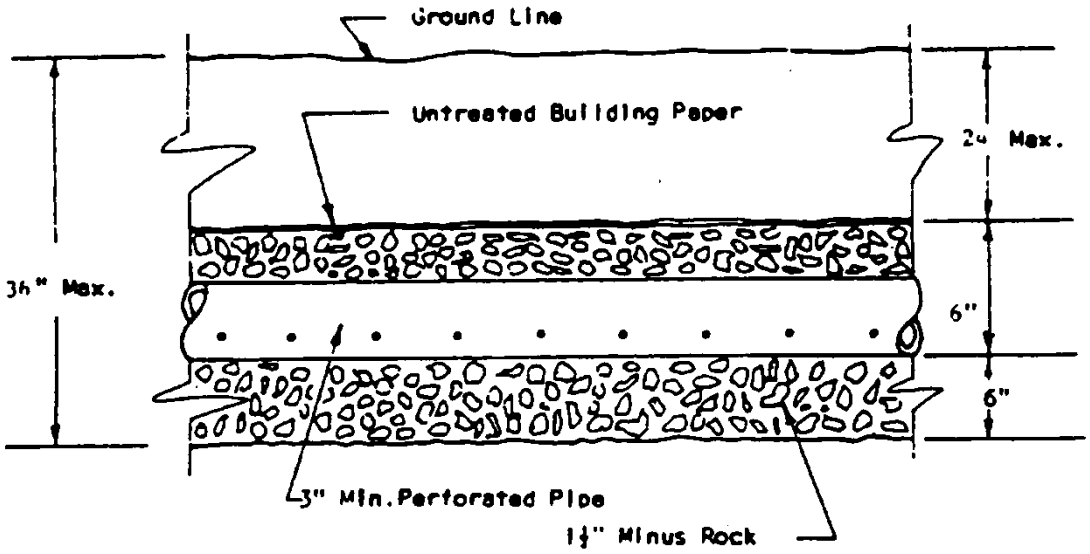
Appendix B Absorption system Construction Detail (continued)
Disposal Field Layout





Appendix B Absorption system Construction Detail (continued)
Absorption trench Detail

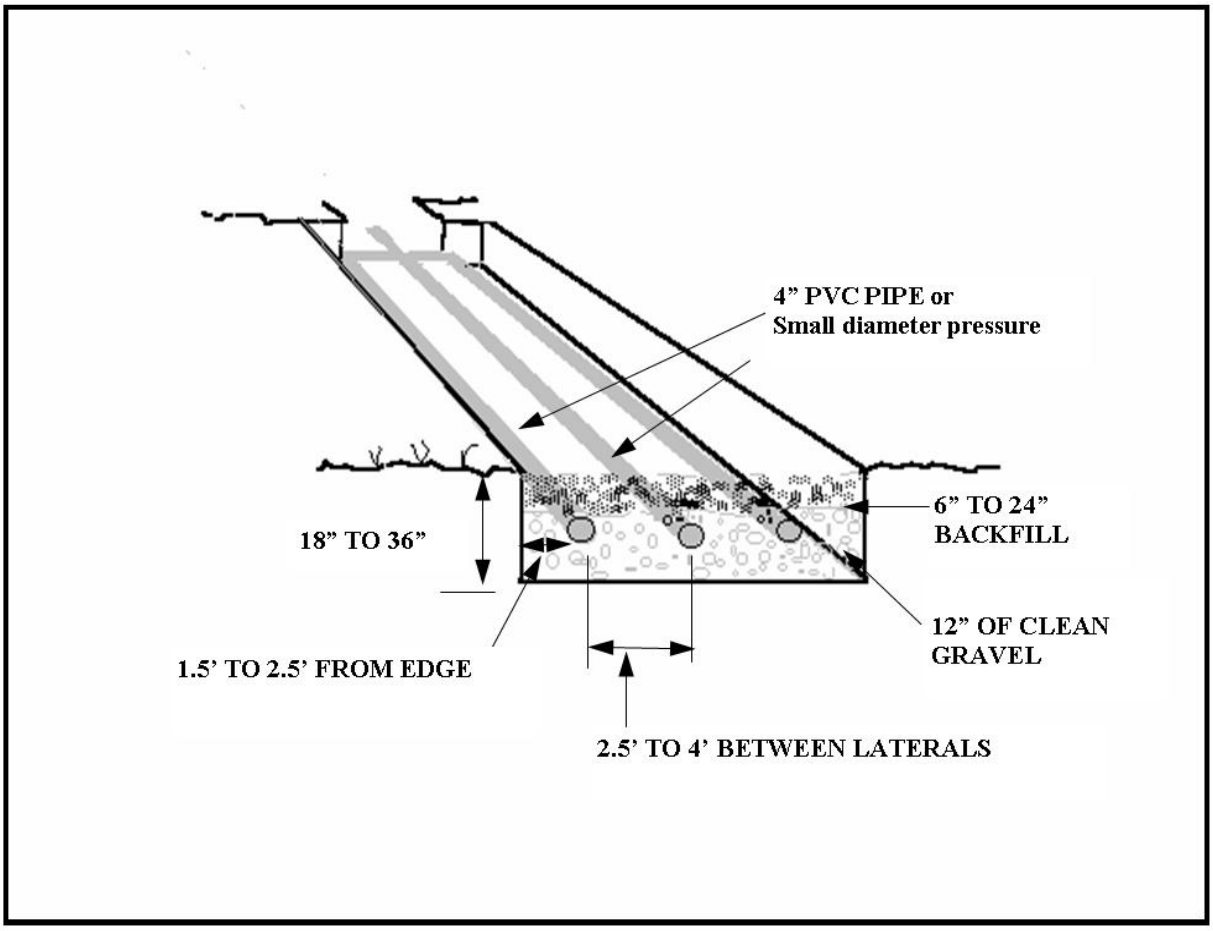




LONGITUDINAL SECTION

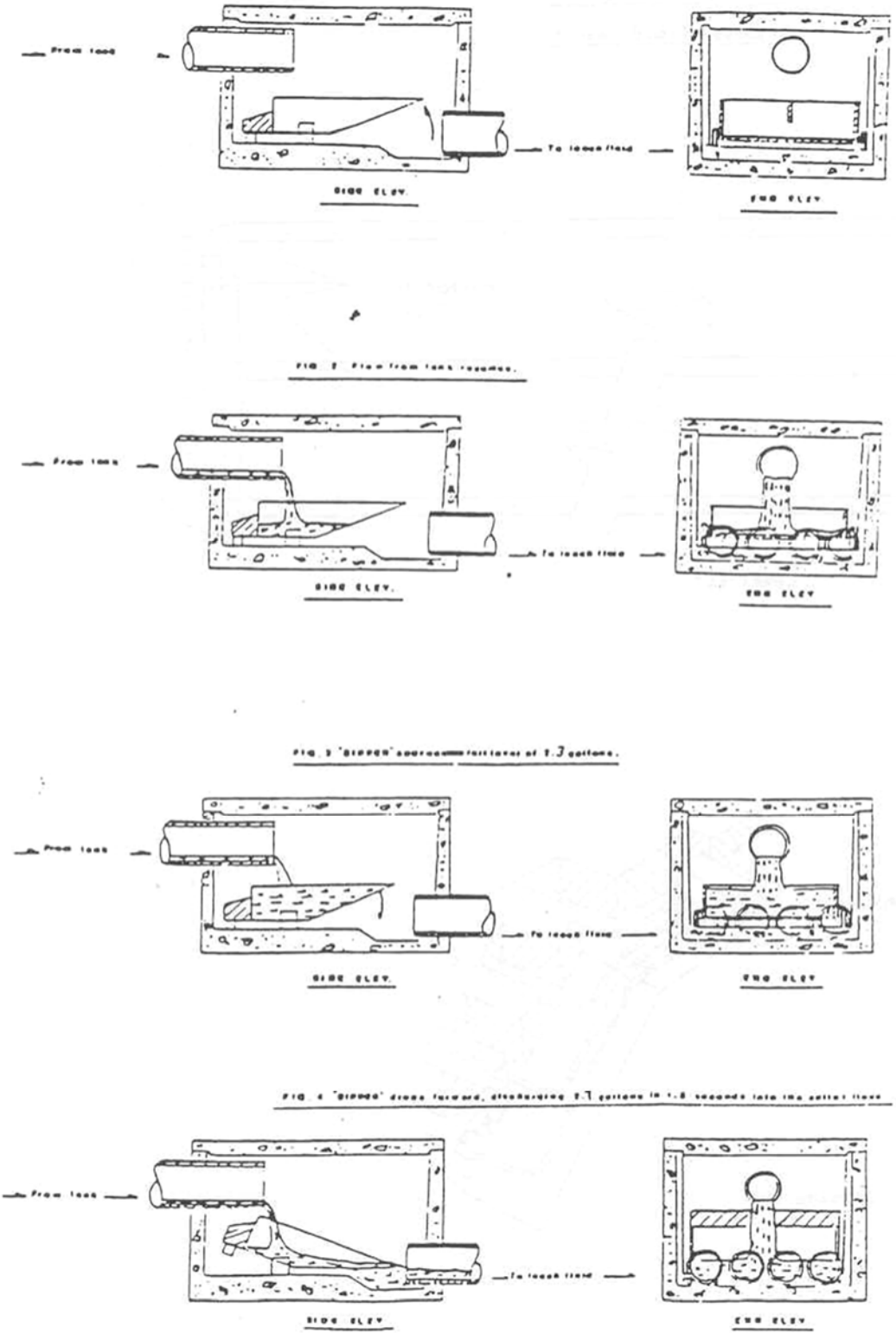
Appendix B Absorption system Construction Detail (continued)

ABSORPTION BED

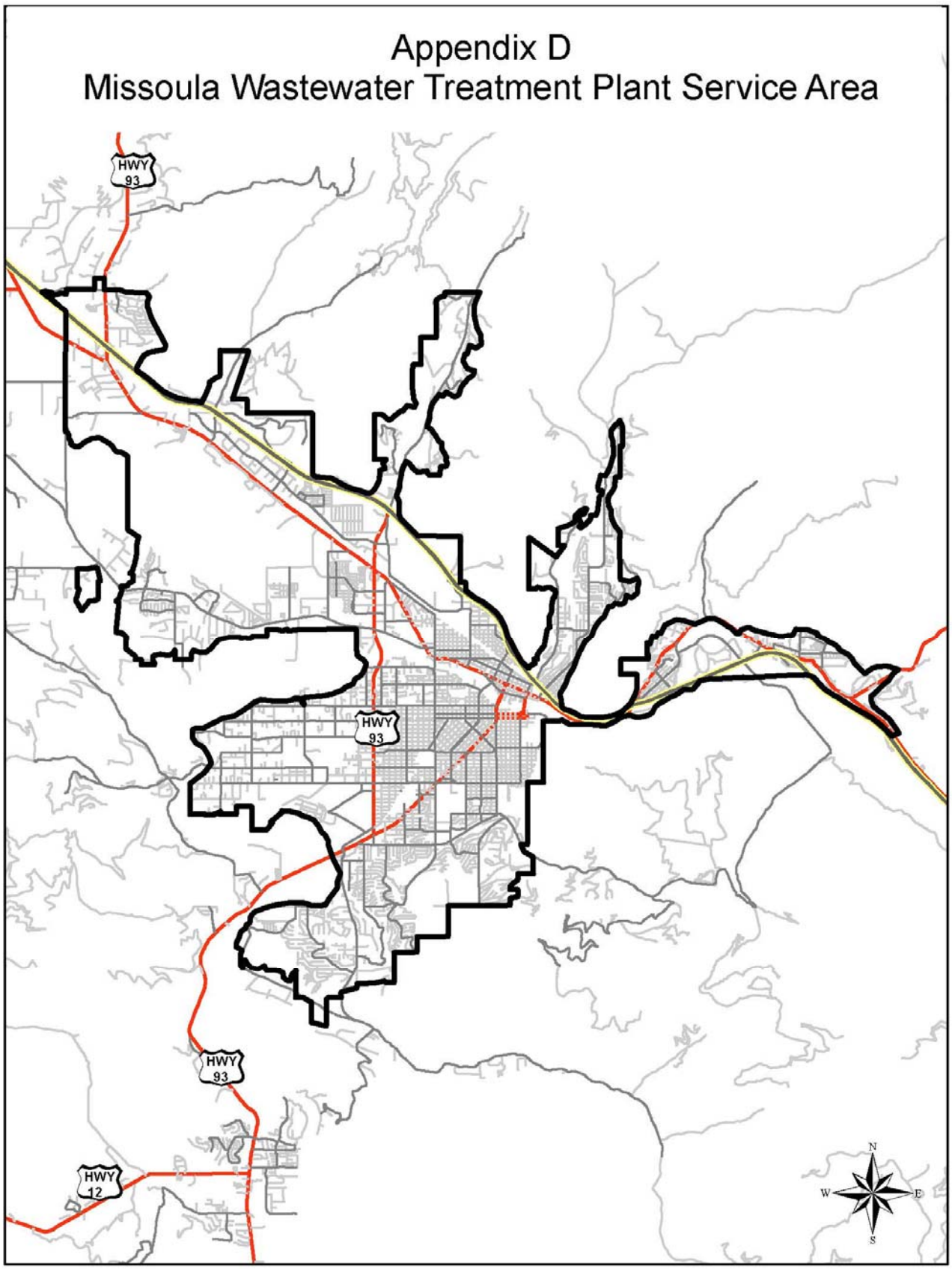


Appendix C: Dosing Distribution Box Operation Detail

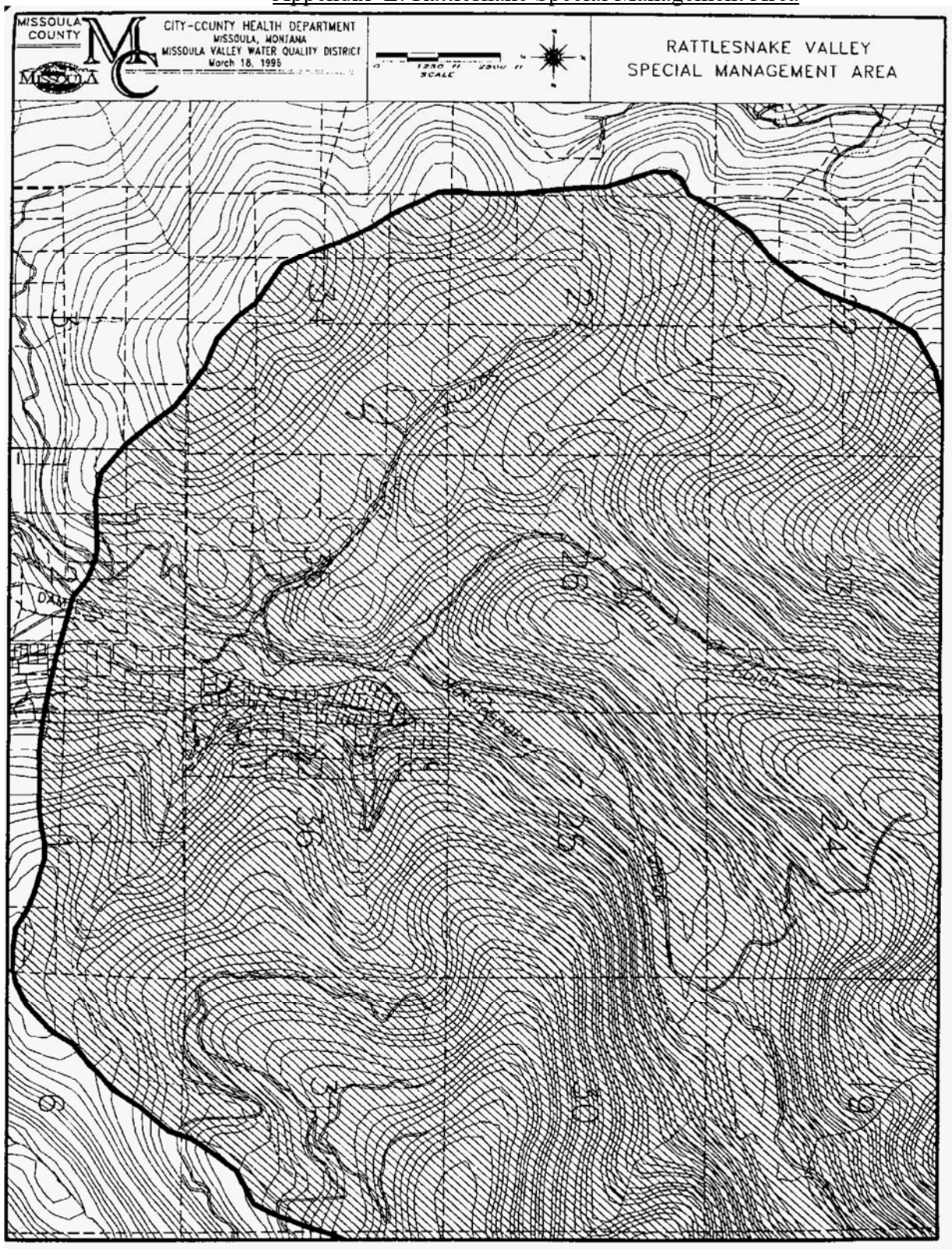
Dosing Distribution Box



Appendix D
Missoula Wastewater Treatment Plant Service Area



Appendix E: Rattlesnake Special Management Area



Appendix F
Identifying Bedrooms to Determine Wastewater Design Flows

The following guidelines will be used by the Department to determine how many rooms in a house are to be counted as bedrooms for sizing a wastewater treatment and disposal system.

Current room use
A room that has been or is currently being used as a sleeping room, even if not constructed to the current building code standards, will be counted as a bedroom. The Department can make exceptions to this requirement if the use is temporary (e.g., weekend house guests sleeping on a pull out couch in the living room or den.)

Unfinished basements
If the basement will be unfinished at the time of permitting, it will be counted as one additional bedroom. If the basement is later finished, a permit for increased use will be required if the basement is proposed to have more bedrooms than allowed by the current septic permit.

Possible room use
A room that is not used for sleeping currently, but may be used for sleeping in the future, will be considered a bedroom under the following circumstances:

- It's labeled as a bedroom on the floor plans; or
- It has a minimum floor area of 70 square feet with a window or door to the outside (regardless of whether the egress is legal by building department standards) and it has the expected degree of privacy typical of a bedroom; or
- It's an open loft area that has at least 70 square feet of floor space, and no other rooms access off of it.
- It's a room with downward-tapering ceilings with at least 70 square feet, not counting any areas where the ceiling is less than 5' tall.

A room that is not used for sleeping or labeled a bedroom will not be counted a bedroom under the following circumstances:

- It is obviously a kitchen, bathroom, living room, dining room, laundry room, storage room (with no windows or with ceilings less than 5' tall), utility room or family room
- It has an arched doorway that lacks a door, half walls, or other architectural features that limit privacy or use as a bedroom (such as sloped floors in a home theater).
- It has no egress or source of light to the outside.
- It's used as a passage to other rooms, stairs, or bathrooms unless this is the only sleeping area in the dwelling
- It's not finished living space, such as a storage shed, potting shed, greenhouse or shop.

Buildings not connected to water or septic
A separate building without plumbing or running water may be considered as one or more additional bedrooms to a structure with plumbing or running water. Examples include a bunk house or artist studio.

Appendix F(continued)

Quick Reference Table

The table below is intended to be used as a reference by the Department, when determining whether a room (that's not currently being used for sleeping) should be counted as a bedroom for the purpose of septic system sizing. The department will make a decision based on all available information and a single item (whether an obstacle or support) might not disqualify a room from being counted as a bedroom.

Obstacles to Bedroom Designation	Support for Bedroom Designation
The room is obviously a kitchen, bathroom, living room, dining room, laundry room, storage room (without windows) or family room.	Legal Egress
Large Entryway, no door, half walls, or other features that limit privacy.	Has a Closet
Low Ceilings	Area greater than 70 sf
No source of ventilation or lighting from outside	Currently used as a bedroom
Rooms that are used as a passage to other uses	Defined as bedroom by Assessor or building plans
Open Lofts that lead to other rooms	Rooms Adjacent to Bathroom
Media rooms with sloped floors	On second level and not bathroom
Room with mechanical facilities or laundry plumbing connections	Rooms in accessory buildings without plumbing
Room in separate building that is not finished living space, such as a storage shed or greenhouse	

NOTES:

Expected Privacy: This term is difficult to define. The maximum level of privacy a room could offer is if it has four walls and a closable door. However, the absence of one of those components does not necessarily limit the expected privacy to a degree in which the room could not be reasonably used as a bedroom. For instance, an expanded entryway such as a wide archway with no door *can* remove a room's ability to offer privacy, but that archway must be located in such a way that the room becomes open to the adjacent portion of the home. Conversely, the same door-less entryway could exist, but could be positioned so that you enter the room and then turn 90 degrees to continue further into the room. Picture a public restroom that has been designed so that there are no doors in the entry. While entering, one makes a series of turns that create a degree of expected privacy. This is why the department looks closely at the details of interior layouts when determining the level of expected privacy, and each case is a little bit different.

Lofts: Lofts do not have four walls, but are elevated above the rest of the living space. More often than not, a bed can be tucked away so that it is not visible to those in the living room or kitchen. In addition, the vast majority of lofts we have come across are used as sleeping space. This is especially true in recreational cabins where, although seasonal, use is generally high for short periods and sleeping space is generally limited. All that said, a loft will not be counted as a bedroom if there is a clear reason that it would be unlikely to be used for sleeping. Examples include a loft that serves as an entryway into another room or rooms, or one that has less than 70 square feet.

Limitation/Disclaimer: This definition of "bedroom" is only applicable when estimating wastewater flow from a dwelling. It cannot be used to determine the adequacy or safety of a room for sleeping purposes. For adequacy and safety requirements, please contact the applicable Building Department.

Appendix G: Seeley Lake Special Management Area

Alternative Systems Manual

-This manual is a supplement to Regulation 1. It contains local requirements for alternative wastewater treatment and disposal systems. It is used in conjunction with the standards in DEQ 4 and Regulation 1

Missoula Public Health
City-County Health Department

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ALTERNATIVE SYSTEMS MANUAL

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Alternative systems must be designed in accordance with the Department of Environmental Quality (DEQ) Circular 4 except when noted otherwise in this manual.

Missoula Public Health
City-County Health Department

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ALTERNATIVE SYSTEMS MANUAL

ALTERNATIVE SYSTEMS MANUAL

1. GENERAL

1.1 General Conditions

1.1.1 This document establishes the allowed uses, the design and installation criteria and operational requirements of alternative septic systems that have been approved by the Missoula City-County Health Board.

1.1.2 Unless a provision under an alternative system provides otherwise, all definitions and rules pertaining to conventional drainfields and septic tanks apply to alternative systems.

1.1.3 Use of an alternative system may preclude future divisions of the property pursuant to State requirements. The applicant and future owners assume responsibility for any restrictions, liabilities or encumbrances that are caused by the use of an alternative system.

1.1.4 All alternative system designs must provide for replacement areas equivalent to those required for conventional systems.

1.2 Applicable Rules and Design Manuals

1.2.1 Applicable rules and design manuals are available at the Health Department at 301 West Alder in Missoula and on the Environmental Health Website www.co.missoula.mt.us. At the time of adoption, the documents were also available at the websites listed below. Copy fees apply to documents picked up at the Health Department.

1.2.2 Alternative systems must be designed in accordance with the Department of Environmental Quality (DEQ) Circular 4, "Montana Standards for Subsurface Wastewater Treatment Systems," 2013 Edition (DEQ 4) except when noted otherwise in this manual.

1.2.3The Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, Edition 2000 (Wisconsin Manual), sets forth siting, design and construction requirements for elevated sand mounds.

1.2.4The DEQ "List of Subsurface Wastewater Treatment Systems (SWTS) that are Approved as a Nitrogen Reducing System" (Approved Systems for Nitrogen Reduction) governs which systems can be used for nitrogen reduction.

1.2.5 DEQ Circular 2, "Design Standards for Wastewater Facilities", 2012 Edition (DEQ 2) applies to Wastewater Reclamation and Reuse systems and Wastewater Lagoons and Ponds.

1.2.6 The United States Environmental Protection Agency's (EPA) "Design Manual for Land Treatment of Municipal Wastewater", Chapter 4 (EPA 625/1-81-013) or succeeding documents, applies to Wastewater Reclamation and Reuse systems.

(Informational Only) Links to Above Referenced Manuals and Regulations	
Missoula City-County Health Code	www.missoulacounty.us
DEQ Circular 4	http://www.deq.mt.gov/wqinfo/Circulars.mcpx
Wisconsin Manual	http://www.soils.wisc.edu.sswmp.SSWMP_15.24.pdf
Approved Systems for Nitrogen Reduction	deq.mt.gov/wqinfo/Sub/.../level2_web_list_4_2012.pdf
DEQ Circular 2	http://www.deq.mt.gov/wqinfo/Circulars.mcpx
US EPA Design Manual for Land Treatment of Municipal Wastewater	http://www.epa.gov/nrmrl/pubs/625180113/625181013FrontMatter.pdf

*This table is not regulatory and will be updated as needed by the Department.

2. SHALLOW-CAPPED DRAINFIELDS

2.1 Definition

Shallow-capped drainfields are conventional drainfields installed less than 24" deep.

2.2 Use

2.2.1 Shallow-capped drainfields may be used where depth to seasonal high groundwater, bedrock or any limiting layer is 5 feet or more from the natural ground surface.

2.3 Design & Construction

2.3.1 Shallow-capped drainfields must be designed and constructed in accordance with DEQ 4, Section 6.2 in addition to the requirements of this section.

2.3.2 Pressure distribution is required.

2.3.3 Trenches must be at least 12" deep.

2.3.4 The system must meet the cap requirements of DEQ 4, Section 6.2.3.1.

2.3.5 A minimum of ten (10) feet must separate the edge of the fill and the nearest trench sidewall.

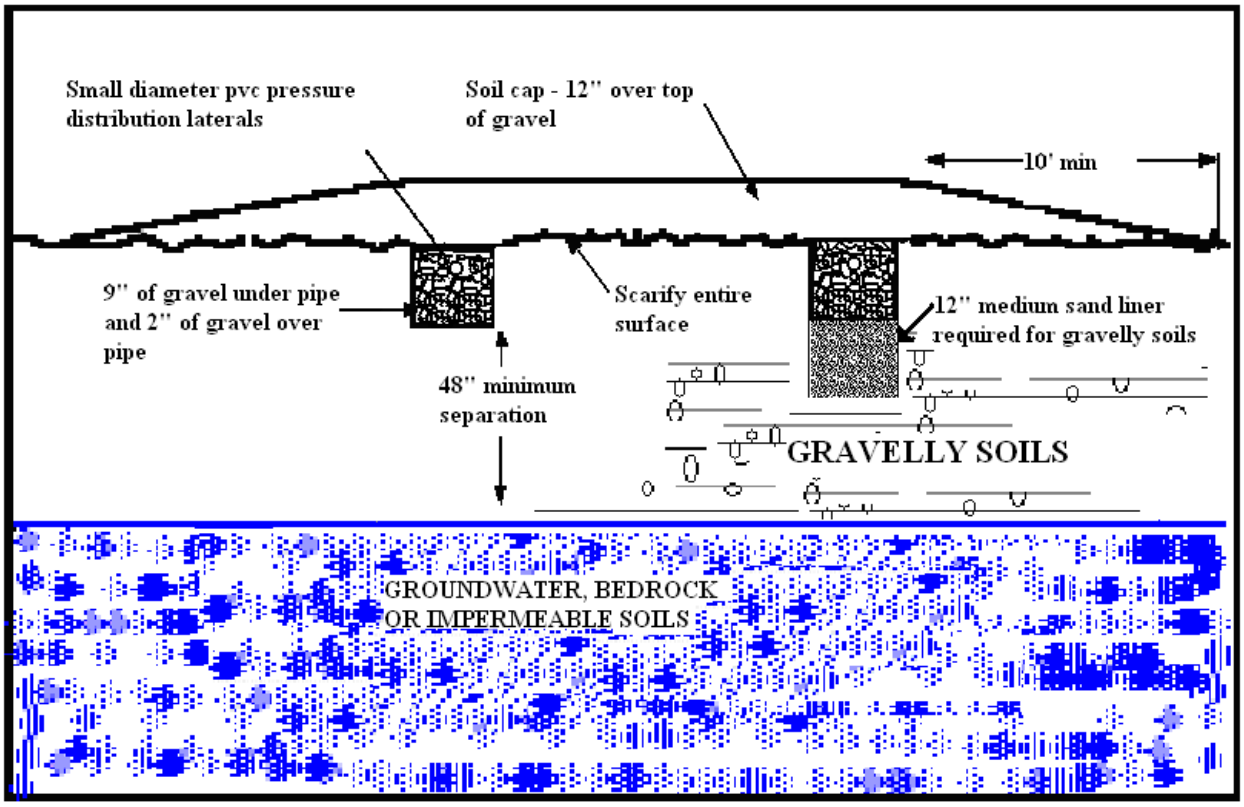
2.3.6 The cap must be fenced from livestock and protected from any potentially damaging conditions.

2.3.7 Shallow-capped drainfield systems must be installed during dry weather conditions when the moisture content of the soil is low enough to prevent the loss of soil structure.

2.3.8 The absorption system site and the site from which the fill material is taken must be scarified to destroy vegetation.

2.3.9 The cap must be seeded.

FIGURE 2.1
CROSS SECTION OF SHALLOW DRAINFIELD



2.4 Inspections

2.4.1 All shallow drainfields must receive a pre-cover inspection of the installed pressure distribution system, scarification areas, and cap material.

3. DEEP ABSORPTION TRENCHES

3.1 Definition

Deep absorption trenches are drainfields with trenches more than thirty-six (36) inches deep, which break through a less permeable soil to a more permeable soil layer below.

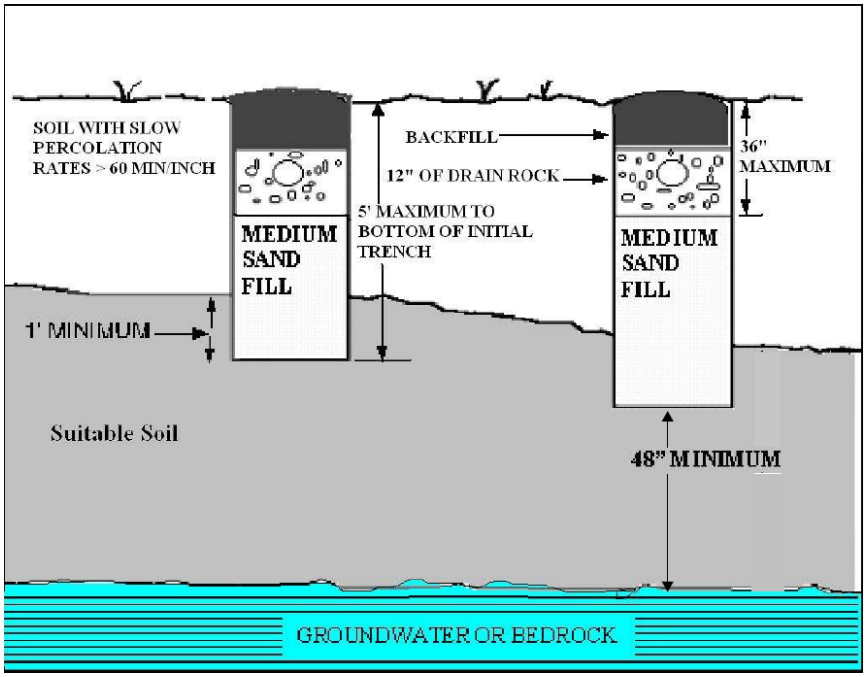
3.2 Use

3.2.1 Deep absorption trenches may only be used to break through a less permeable soil layer and allow effluent to infiltrate a deeper and more permeable soil.

3.3 Design & Construction

3.3.1 Deep absorption trenches must be designed and constructed using the criteria in DEQ 4, Section 6.4, in addition to the requirements of this section.

FIGURE 3.1
DEEP ABSORPTION TRENCH CROSS SECTION



4. ELEVATED SAND MOUNDS

4.1 Definition

Elevated sand mounds are absorption systems installed above natural ground in a mound of medium sand. A typical mound system is depicted in Figure 4.1.

4.2 Use

4.2.1 Elevated sand mounds may be used to achieve separation distance between the treatment system and a limiting layer. Four feet of natural soil must be maintained between the modified site and the limiting layer.

4.3 Design & Construction

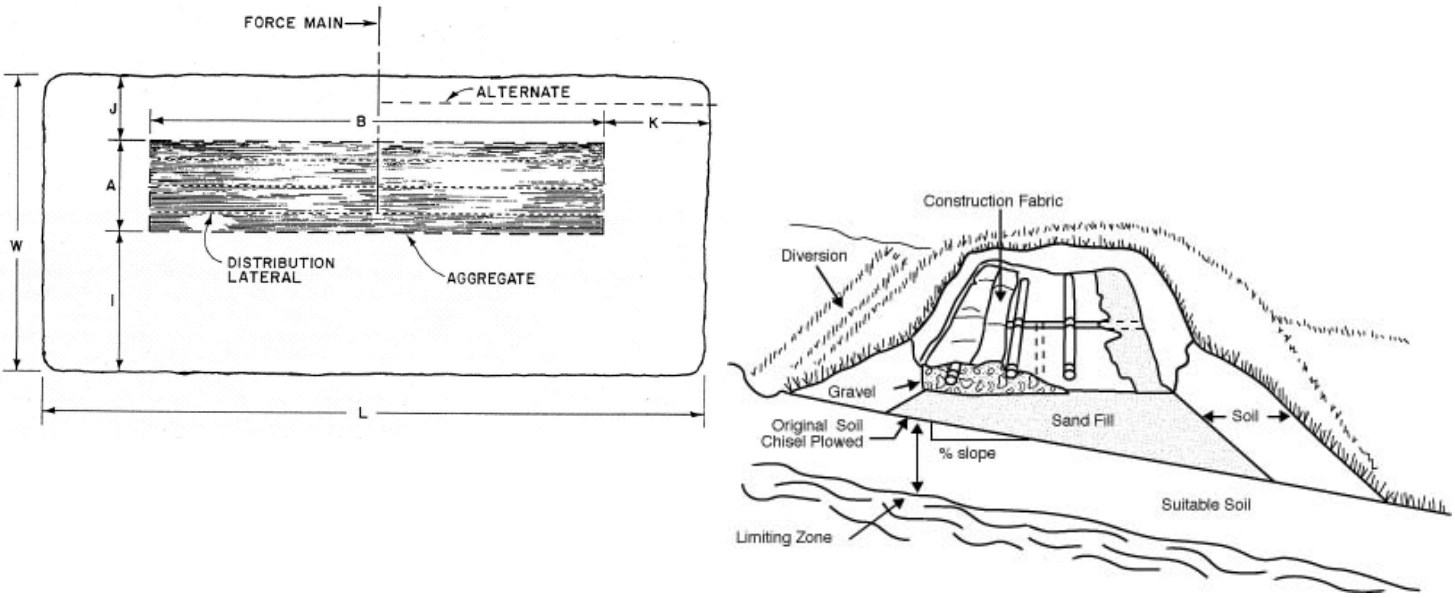
4.3.1 Elevated Sand Mounds must be sited, designed and constructed in accordance with DEQ 4, Section 6.7. and the Wisconsin Mound Soil Absorption System: Siting, Design and Construction Manual, January, Edition 2000, in addition to the requirements of this section.

4.3.2 Linear and basal loading rates from the Wisconsin Manual must be used.

4.4 Certification and As-builts

4.4.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

FIGURE 4.1
ELEVATED SAND MOUND
(as depicted in Wisconsin Manual)

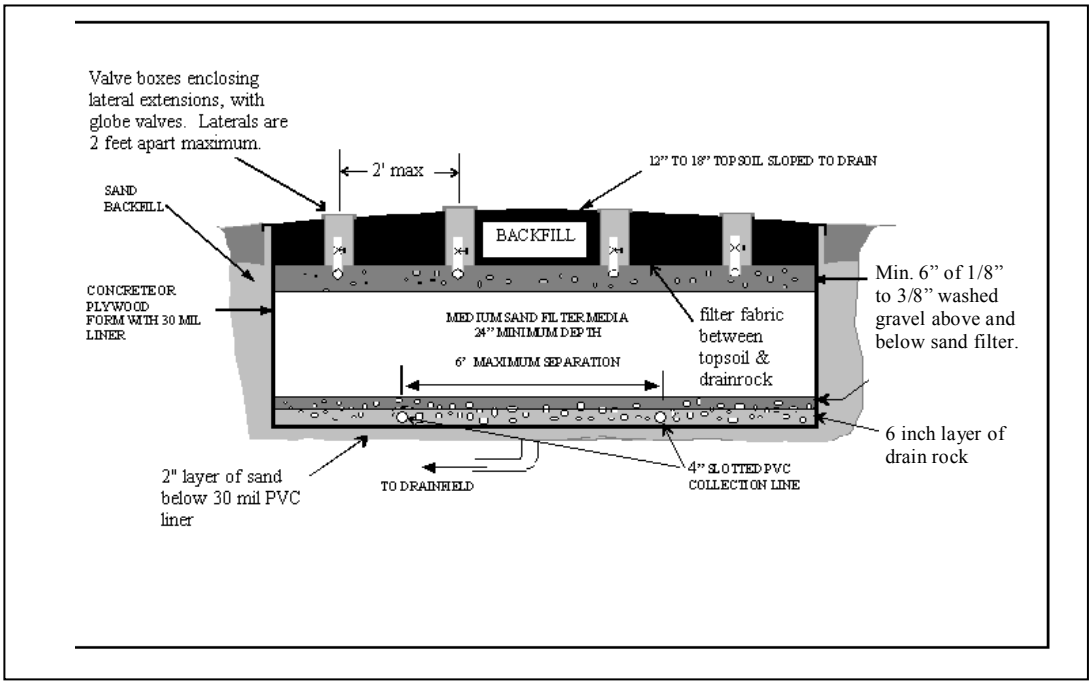


5. INTERMITTENT SAND FILTERS

5.1 Definition

Intermittent sand filters (ISF) are sand-filled chambers or boxes used to filter or treat primary effluent from a septic tank or other type of primary treatment device. The filters are dosed intermittently and the effluent is disposed of in a drainfield or other approved wastewater treatment system allowed by the Health Code. Figure 5.1 depicts the cross section of a typical ISF.

FIGURE 5.1
INTERMITTENT SAND FILTER



5.2 Use

5.2.1 Intermittent Sand Filters may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in an approved system.

5.3 Design & Construction

5.3.1 ISF's must be designed and constructed in accordance with DEQ 4, Section 7.2., in addition to the requirements of this section.

5.3.2 A perimeter support frame, made of plywood or concrete, must be used to hold the liner in place during construction. Sand must be placed between frame supports structure supports and the excavated soil while the filter media is being installed to keep the framework and liner vertical during construction. The frame may not have any nails or sharp objects located on the inside where they may puncture the liner.

5.4 Maintenance

5.4.1 ISF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

5.4.2 ISF's must be operated and maintained to ensure they work as designed. At a minimum:

5.4.3 Septic tanks must be inspected every year and pumped at least every fourth year.

5.4.4 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with ISF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

5.4.5 The owner of an individual lot with an ISF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

5.4.6 Deed restriction required.

5.4.6.1 Owners of individual lots who apply for a permit for an ISF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the intermittent sand filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the sand filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the sand filter system used for the above-described property.

5.4.6.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

5.5 Certification and As-builts

5.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

6. RECIRCULATING SAND FILTERS

6.1 Definition

Recirculating Sand Filters (RSF) are "pea gravel" (or similar material) filled chambers or boxes used to filter or treat primary effluent from a septic tank or other type of primary treatment device. The filter has a tank that circulates the filtered effluent back through the filter using a minimum equivalent of 4 passes through the filter. The effluent is disposed of in a drainfield or other approved wastewater treatment system. Figure 6.1 depicts the cross-section of a typical RSF.

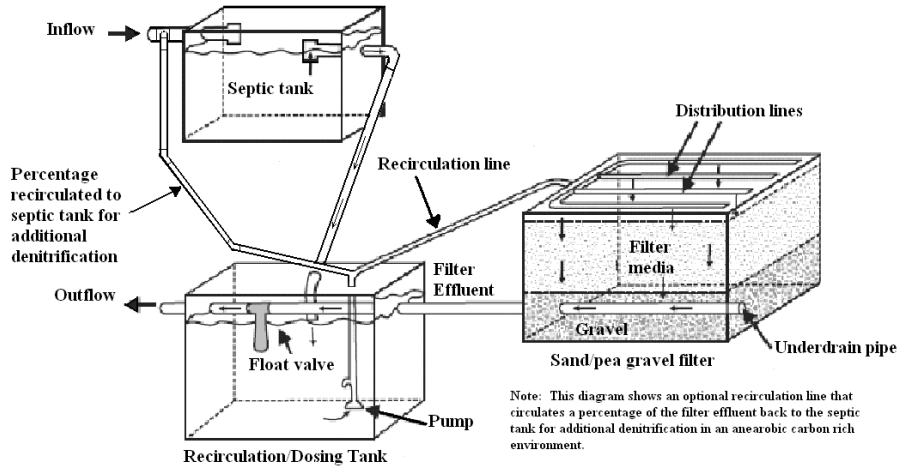
6.2 Use

6.2.1 RSF's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in an approved system.

6.3 Design & Construction

6.3.1 RSF's must be designed & constructed in accordance with DEQ 4, Section 7.3., in addition to the requirements of this section.

FIGURE 6.1
RECIRCULATING SAND FILTER



6.3.2 A plywood or concrete perimeter support frame is required to hold the liner in place during construction. Sand must be placed between structure supports and the excavated soil while the filter media is being installed to keep the framework and liner vertical during construction. The frame may not have any nails or sharp objects located on the inside where they may puncture the liner.

6.4 Maintenance

6.4.1 RSF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

6.4.2 RSF's must be operated and maintained to ensure they work as designed. At a minimum:

6.4.3 Septic tanks must be inspected every year and pumped at least every fourth year.

6.4.4 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with RSF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

6.4.5 The owner of an individual lot with a RSF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

6.4.6 Deed restriction required.

6.4.6.1 Owners of individual lots who apply for a permit for a RSF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the recirculating sand filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the recirculating sand filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the sand filter system used for the above-described property.

6.4.6.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

6.5 Certification and As-builts

6.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

7. RECIRCULATING MEDIA TRICKLING FILTERS

7.1 Definition

Recirculating Media Trickling Filters (RMTF's) use aerobic, attached-growth treatment processes to biologically oxidize organic material and convert ammonia to nitrate (nitrification). A trickling filter consists of a bed of highly permeable medium to which a bio-film adheres in an unsaturated environment. Wastewater is applied to the top of the bed and it trickles through the media. Microorganisms in the bio-film degrade organic material and may also nitrify the wastewater. An under-drain system collects the treated wastewater and any sloughed solids and transports it to a settling tank, from which it is recirculated through the trickling filter. The effluent is disposed of in a drainfield or other approved wastewater treatment system. Figure 7.1 depicts the cross section of a typical RMTF.

7.2 Use

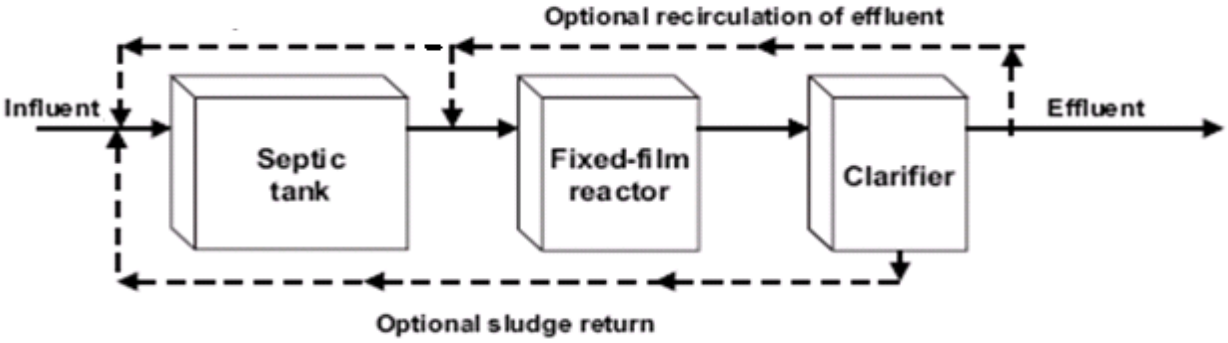
7.2.1 RMTF's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in any approved system.

7.3 Design & Construction

7.3.1 RMTF's must be designed and constructed in accordance with DEQ 4, Section 7.1., in addition to the requirements of this section.

7.3.2 Package designs may be used if engineered specifications are included with the permit application and are approved by the Department.

FIGURE 7.1
RECIRCULATING TRICKLING FILTER



7.4 Maintenance

7.4.1 RMTF's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

7.4.2 RMTF's must be operated and maintained to ensure they work as designed. At a minimum:

7.4.2.1 Septic tanks must be inspected every year and pumped at least every fourth year.

7.4.3 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with RMTF's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

7.4.4 The owner of an individual lot with a RMTF system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

7.4.5 Deed Restriction Required

7.4.5.1 Owners of individual lots who apply for a permit for a RMTF's must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the recirculating trickling filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the recirculating media trickling filter as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the recirculating trickling filter system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the recirculating trickling filter system used for the above-described property. I/We understand that in lieu of an RSID or SID to finance the maintenance and repair or replacement of the recirculating trickling filter, the real property owner is responsible for any financial requirements of operation, maintenance, or replacement.

7.4.5.1 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;

b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,

c.) the property is owned by a public entity.

7.5 Certification and As-builts

7.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

8. UNSEALED PIT PRIVIES

8.1 Definition

Unsealed pit privies are buildings containing a stool, urinal or seat over an excavation in natural soil For the disposal of non-water carried toilet wastes.

8.2 Use

8.2.1 Unsealed pit privies may only serve structures that are not served by running water or plumbing extending into or out of the structure, except when waste segregation is utilized.

8.2.2 Unsealed pit privies are prohibited on small lots in areas characterized as residential or commercial development.

8.2.3 Unsealed pit privies must meet all setback distances of standard absorption trenches.

8.2.4 Unsealed pit privies may be approved only for use in remote locations that are not accessible to septic tank pumpers.

8.3.5 The use of unsealed pit privies may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

8.3 Design

8.3.1 Unsealed pit privies must be designed to maintain at least 4 feet of natural soil between the bottom of the pit and groundwater or other limiting layer.

8.3.2 A site evaluation may be required to determine the depth to groundwater or other limiting layer prior to the construction of an unsealed pit privy.

8.4 Construction

8.4.1 Unsealed pit privies must meet all the construction requirements of DEQ 4, Section 8.3.dealing with unsealed pit privies.

8.4.2 An unsealed pit privy may be constructed by someone other than a Certified Installer.

8.5 Abandonment

8.5.1 Unsealed pit privies must be abandoned according to the requirements of DEQ Circular 4, Section 8.3. dealing with unsealed pit privies.

9. SEALED (VAULT) PIT PRIVIES

9.1 Definition

A sealed pit privy is an underground vault for the temporary storage of non-water-carried wastewater. The vault must be pumped periodically and the wastewater disposed of at a treatment site.

9.2 Use

9.2.1 Sealed pit privies may be used only at public recreational facilities operated by governmental institutions, recreation facilities located on government property operated under lease, licensed campgrounds, or to replace a legally installed, privately owned, unsealed pit privy in an area of high groundwater or fractured bedrock.

9.2.2 The use of sealed pit privies shall cease when the property on which they are located is no longer a public recreation facility operated by a governmental institution, a recreation facility located on government property operated under lease, a licensed campground, or conditions allowing the use of the original sealed pit privy are no longer applicable.

9.2.3 Sealed pit privies may be required as privately owned replacement systems instead of permitting an unsealed pit privy if the Department determines that waste from the pit privy could potentially pollute groundwater or cause a nuisance.

9.2.4 Sealed pit privies may only serve structures that are not served by running water or plumbing extending into or out of the structure, except when waste segregation is utilized.

9.2.5 The use of sealed pit privies may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

9.3 Design & Construction

9.3.1 Sealed pit privies must be designed and constructed in accordance with the requirements of DEQ 4, Section 8.2, in addition to the requirements of this section.

9.3.2 Permit applications for sealed pit privies must include plans for the proposed sealed pit.

9.3.3 A sealed pit privy may be constructed by someone other than a Certified Installer.

9.3.4 Sealed pit privies must be located at least ten (10) feet outside the floodplain or any openings must be at least two feet above the floodplain elevation.

9.3.5 Except for floodplain or flood-prone area separation, permanently sealed pit privies must follow the location requirements for septic tanks in section 10(C). This provision does not release the applicant from obtaining required floodplain permits.

9.4 Maintenance and Operation

9.4.1 Sealed pit privies must be maintained and operated in accordance with DEQ 4, Section 8.2, in addition to the requirements of this section.

9.4.2 Sealed pit privies must be emptied as needed by a licensed septic tank pumping service.

10. WATERLESS TOILETS

10.1 Definition

Waterless Toilets typically consist of a toilet seat and cover over a compartment designed to either receive composting materials sufficient to reduce waste by aerobic decomposition or incinerate deposited waste using a gas fired or electric heating system.

10.2 Use

10.2.1Waterless toilets may be used in addition to or in lieu of another approved wastewater treatment and disposal system. If the structure served by the waterless toilet has running water or plumbing extending into or out of the structure, another approved wastewater treatment and disposal system must be installed.

10.2.2 Installation of a waterless toilet does not relieve the applicant of meeting any applicable increased use or enlargement of structure requirements. No reduction in system sizing may be granted for use of a waterless toilet in a structure served by a conventional or other alternative system.

10.2.3 If waste segregation is used, a primary and full sized replacement area for the installation of a wastewater treatment and disposal system properly sized for both black and gray water must be reserved to accommodate future change of use. The reserved area must meet the requirements of the Missoula City-County Health Code Regulation 1, Chapters 10 & 16. The gray water system may be installed within the primary reserved area.

10.2.4 The use of waterless toilets may be further restricted by the Missoula Municipal Code and Ordinances inside of city limits.

10.3 Design & Installation

10.3.1 Waterless toilets must be designed and installed in accordance with DEQ 4, Section 8.5, and per manufacturer's recommendations, in addition to the requirements of this section.

10.3.2 If necessary, odor controls may be required on venting systems.

10.3.3Waterless toilets may be installed by someone other than a Certified Installer.

10.4 Operation and Maintenance

10.4.1 Waterless toilets must be used in accordance with the manufacturer's recommendations.

10.4.2 Wastes generated by a waterless toilet must be: disposed of in a licensed landfill; used as a soil amendment on the owner's property for non-food crops; or disposed of by another method approved by the Department.

11. MEDIUM SAND-FILLED DRAINFIELD SITE

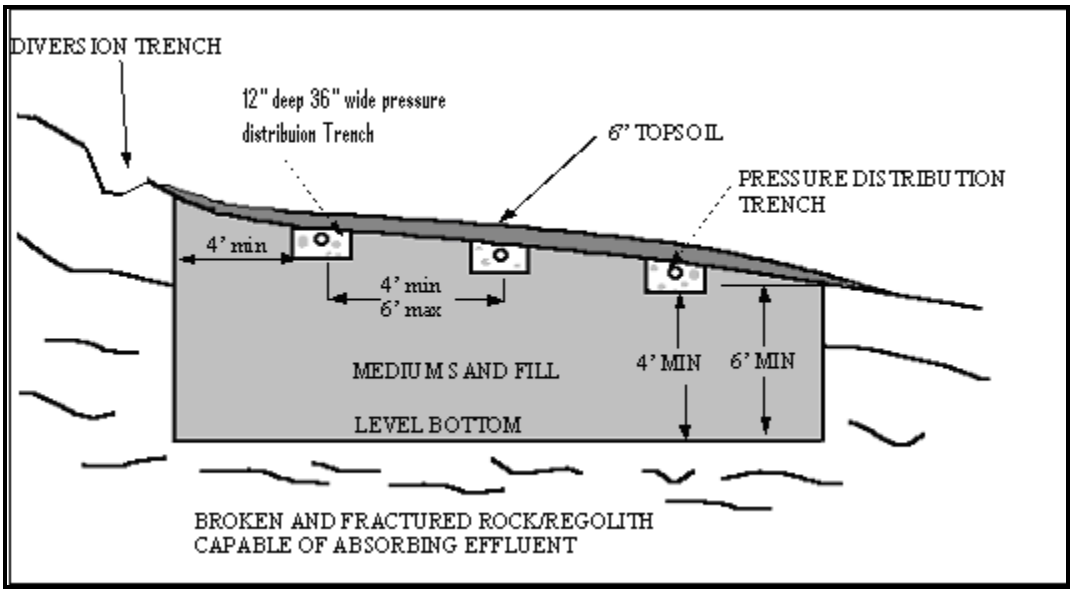
11.1 Definition

Sand-filled drainfield sites are excavations that are filled with medium sand to the extent necessary to provide the minimum separations to limiting layers required for a conventional system.

11.2 Use

11.2.1 Medium sand-filled drainfields may only be used to obtain separation from broken or fractured rock/regolith on existing lots or parcels. Medium sand-filled drainfields are not allowed in solid or unfractured bedrock. Only one system serving a single-family dwelling or structure with a maximum sewage flow of 350 gallons per day is allowed per lot or parcel.

FIGURE 10.1
MEDIUM SAND-FILLED DRAINFIELD SITE



11.3 Design

11.3.1 Three percolation tests evenly spaced throughout the basal (or bottom) area are required for system sizing and ensuring the site is capable of absorbing effluent. The Department may deny a permit for a sand-filled drainfield site if it determines that there is inadequate fracturing of the underlying material or if there is evidence of aquifer contamination in the area.

11.3.2 The effluent application rate for the basal (or bottom) area is determined using the criteria in Table 2 of the Wisconsin Sand Mound Manual.

11.3.3 Trenches must be a minimum of 4 feet and a maximum of 6 feet apart, measured from pipe to pipe. Trenches must be a minimum of 4 feet and a maximum of 6 feet from the side wall, measured from the edge of the trench.

11.3.4 The minimum amount of trench used for distributing the effluent is determined using an application rate of 0.8 gallons/square-foot/day. The Department may require a larger distribution system based on the required bottom area and the maximum separations allowed in 10.3.3.

11.3.5 The bottom of the excavation must be substantially level.

11.3.6 A minimum of 4' of medium sand must surround the sides and ends of the drainfield trench; and a minimum of 4' of medium sand must be placed below the distribution trench bottom.

11.3.7 The medium sand fill (USDA Soils Classification) must be approved by the Department. The Department may require a sieve analysis to ensure the sand meets specifications for medium sand.

11.3.8 Pressure distribution is required.

11.3.9 Water must be diverted away from the site using berms or trenches to prevent infiltration of run-off into the drainfield.

11.3.10 Horizontal setback distances required by Table 2 of the Health Code, Regulation 1 are measured from the edge of the sand fill.

11.4 Inspections

11.4.1 The Department must inspect the site twice: once after the site has been excavated to ensure the excavation is substantially level and there is adequate fracturing of underlying material, and again after the trenches have been installed.

12. EVAPOTRANSPIRATION ABSORPTION SYSTEMS

12.1 Definition

Evapotranspiration absorption (ETA) systems are absorption beds or trenches designed to provide for the absorption and evaporation of effluent. The systems are designed to store effluent through months when evaporation is low until dryer, warmer months when evaporation is high. The systems also use absorption of effluent to minimize the amount of storage required.

12.2 Use

12.2.1 ETA systems may be used in soils with percolation rates that are slower than 120 minutes per inch and where a design is submitted showing that total water lost through evaporation and absorption equals or exceeds the total water gained through precipitation and effluent discharge.

12.3 Design

12.3.1 ETA systems must be designed in accordance with DEQ 4, Section 6.8. in addition to the requirements of this section.

12.3.2 ETA systems installed on land with a slope greater than 6 percent must use maximum 36-inch-wide beds with 4 foot separation between trench sidewalls.

12.4 Construction

12.4.1 Construction must be completed in accordance with requirements found in DEQ 4, Section 6.8.

12.5 Maintenance

12.5.1 All systems must follow the Operation and Maintenance Plan requirements in DEQ 4, Appendix D.

12.6 Certification and As-builts

12.6.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

13. EVAPOTRANSPIRATION SYSTEMS

13.1 Definition

Evapotranspiration (ET) systems are sealed beds designed to provide for the evaporation of effluent. The systems are designed to store effluent through months when evaporation is low until dryer, warmer months when evaporation is high.

13.2 Use

13.2.1 Evapotranspiration systems may be used in soils with percolation rates that are slower than 120 minutes per inch and where a design is submitted showing that total water lost through evaporation equals or exceeds the total water gained through precipitation and wastewater input.

13.3 Design

13.3.1 ET systems must be designed in accordance with DEQ 4, Section 6.8. in addition to the requirements of this section.

13.4 Construction

13.4.1 Construction must be completed in accordance with requirements found in DEQ 4, Section 6.8.

13.5 Maintenance

13.5.1 All systems must follow the Operation and Maintenance Plan requirements in DEQ 4, Appendix D.

13.6 Certification and As-builts

13.6.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

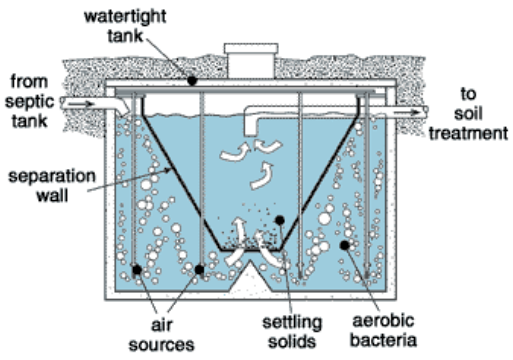
14. AEROBIC WASTEWATER TREATMENT UNITS

14.1 Definition

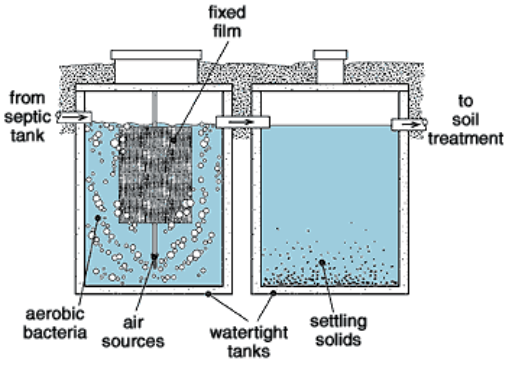
Aerobic Treatment Units (ATUs) refer to a broad category of engineered wastewater treatment devices designed to oxidize both organic material and ammonium-nitrogen (to nitrate nitrogen), decrease suspended solids concentrations and reduce pathogen concentrations. They include units referred to as suspended growth ATUs, fixed film reactor ATUs and sequencing batch reactor ATUs as depicted in Figure 13.1.

Figure 13.1
Suspended Growth, Fixed Film and Sequencing Batch ATUs

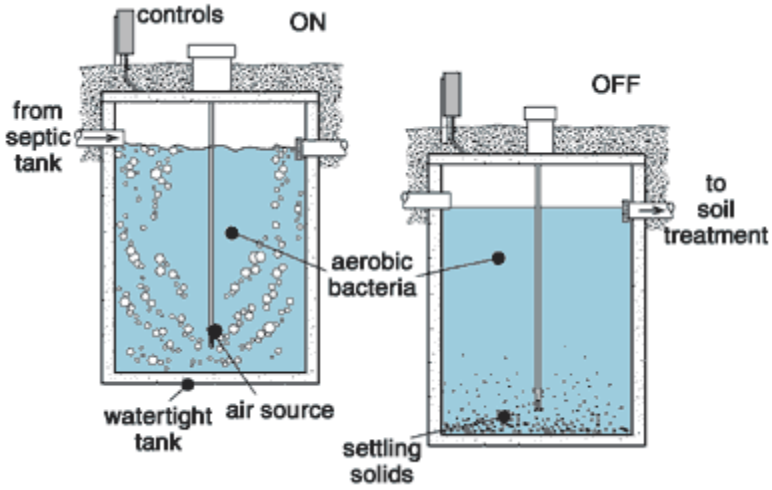
Suspended Growth Reactor



Fixed Film Reactor



Sequencing Batch Reactor



14.2 Use

14.2.1 ATU's may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) before disposal in any approved system.

14.3 Design

14.3.1 ATU's must be designed and installed in accordance with DEQ 4, Section 7.4.

14.4 Maintenance

14.4.1 ATU's must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

14.4.2 Proposed subdivisions with three or more lots that are or will be served with shared, multi-family and community systems with ATU's must provide a Maintenance Special Improvement District, a Sewer and Water District or other mechanism providing equivalent institutional and financial stability, as approved by the Department.

14.4.3 The owner of an individual lot with an ATU system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

14.4.4 Deed restriction required.

14.4.4.1 Owners of individual lots who apply for a permit for an ATU must execute a deed restriction requiring on-going operation and maintenance of the system and waiving the option to protest the creation of a Maintenance Special Improvement District, a Sewer and Water District, or other approved mechanism instituted to ensure maintenance of the sand filter system, using the language set forth below.

"I/We, the undersigned, hereby certify that I/we are the owners of the real property located at (legal description) and hereby agree to operate and maintain the aerobic treatment unit (ATU) as stated in the operation and maintenance plan on file with the Missoula City-County Health Department and I/we waive the option to protest an RSID or SID affecting the property for the purpose of financing the maintenance, repair or replacement of the ATU system serving the property. Further, my/our signatures on this waiver may be used in lieu of my/our signature(s) on an RSID or SID petition for the creation of one or more RSIDs or SIDs for the purpose of financing the maintenance and repair or replacement of the ATU system used for the above-described property.

14.4.4.2 The filing of a deed restriction is not required if:

a.) previously filed from the same parcel;
b.) similar language has been shown on an approved and filed subdivision plat or certificate of survey; or,
c.) the property is owned by a public entity.

14.5 Certification and As-builts

14.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

15. WASTEWATER LAGOONS AND PONDS

15.1 Definition.

Wastewater ponds and lagoons discussed in this section are designed to receive effluent from either residential or commercial sources and are capable of achieving secondary treatment standards through facultative bacterial action and/or evaporation. Lagoons or ponds used for equalization, percolation, and sludge storage are not included in this section.

15.2 Use

15.2.1 Pond and lagoon systems may only be used for systems with design flows of at least 3500 gallons per day. Commercial and industrial systems with design flows of less than 3500 gallons per day not containing black water wastes may be approved by the Department on a case by case basis.

15.3 Design

15.3.1Wastewater lagoons and ponds must meet the requirements of DEQ Circular 2, Chapter 94 dealing with wastewater treatment ponds.

15.4 Inspection

15.4.1 A minimum of 2 inspections are required for wastewater lagoon and pond systems. One inspection must take place before the liner is installed, and the second inspection must take place after leak testing and the system has been pre-filled prior to use.

16. WASTEWATER RECLAMATION AND REUSE REQUIREMENTS

16.1 Use.

16.1.1 Land application of municipal sewage is an alternative to traditional methods of municipal waste treatment and septic systems. Persons wanting to land apply treated sewage or use it for some other beneficial use must comply with these requirements. This section does not apply to subsurface gray water irrigation of non-food crops.

16.2 Applicability and Purpose

16.2.1 The purpose of Missoula City-County wastewater reclamation and reuse requirements are to protect public health, safety and welfare of those persons who may come in contact with treated wastewater and those using surface and groundwater in Missoula County. The requirements shall be broadly construed to affect their purpose. Wastewater reclamation and reuse systems are alternative treatment systems, as defined in the Missoula City-County Health Code.

16.2.2 These requirements do not relieve a person from the requirements of any other federal, state, or local regulation

16.2.3 In addition to requirements in this chapter, reclamation plants and use areas must meet the requirements of Section 10(A) and Section 13 of the Missoula City-County Health Code, with the exception of Section 10(A)(3).

16.3 Permitting

16.3.1 A permit to operate a reclamation plant or use area must be obtained from the Department before construction of new facilities begins. Existing reclamation plants or use areas must get an operations permit from the Department no later than January 1, 2002. The permit to operate must be renewed annually.

16.3.2 The permit application for a reclamation plant must include an engineering report demonstrating compliance with the requirements of DEQ Circular 2 and any applicable portions of A.R.M. 17.30.

16.3.3 Applications for operating an existing reclamation plant or use area must include detailed information on the current operation of the facility, and describe the requirements of this chapter that are not being met.

16.3.4 A permit may only be issued after review of the permit application and payment of a permit fee. Plan review and permit fees shall be established by the Department. Permits for reclamation or reuse of sewage at facilities may be granted only to municipalities, City or County Special Improvement Districts, or persons which provide for the construction, maintenance, and operation of the facility.

16.3.5 Application of reclaimed water to a use area or operation of a reclamation plant without an operations permit from the Department is prohibited.

16.4 Reclamation Plant Design Requirements

16.4.1 Wastewater reclamation and reuse facilities must meet the requirements of DEQ Circular 2.

16.4.2 The design must include a provision for measuring the volume of wastewater that is land applied. Records of discharge volumes and frequency must be maintained at the facility.

16.4.3 Flow Meter
All reclamation plants must have a flow meter to determine the volume of wastewater treated and reused.

17. GRAY WATER IRRIGATION SYSTEMS

17.1 Definition.

Gray water is wastewater that is collected separately from a sewage flow and does not contain industrial chemicals, hazardous wastes, flows from floor drains, backwash from water softeners, or wastewater from toilets. Gray water irrigation systems may only be used for irrigation of: non-food crops, fruit and nut trees, or landscaping.

17.2 Use

17.2.1Gray water irrigation systems may be used in conjunction with waterless toilets, pit privies, or a separate wastewater treatment and disposal system for black water wastes. Applicants wishing to use an irrigation system in conjunction with advanced treatment systems must demonstrate that the advanced treatment system will meet required treatment performance when gray water is being diverted for irrigation use.

17.2.2 Gray water from kitchen sources may be used for irrigation only where a waste segregation system is used. A primary and full sized replacement area for the installation of a wastewater treatment and disposal system properly sized for both black and gray water must be reserved to accommodate future change of use. The reserved area must meet the requirements of the Missoula City-County Health Code Regulation 1, Chapters 10 & 16. The gray water system may be installed within the primary reserved area.

17.2.3 If municipal sewer is available, the gray water must be diverted to the municipal system from October 1st to April 30th.

17.2.4 Owners must execute a deed restriction stating the structure has a gray water irrigation system which requires maintenance and adherence to an operation and maintenance manual. For properties served by municipal sewer, the deed restriction must also state that the system may only be used from May 1st to September 30th.

17.3 Design & Construction

17.3.1 Gray water systems must meet all requirements of DEQ 4, Section 6.10., ARM 17.36.919, and the requirements of this section.

17.3.2 Gray water irrigation systems do not have to meet the separation requirements found in Regulation 1, Sections 10 (B) and (C).

17.3.3 A minimum vertical separation of 4 feet of natural soil between the point of gray water application and a limiting layer is required.

17.3.4 Gray water systems may not be installed:

17.3.4.1Within 100 feet of: flood plain or flood prone areas, springs, surface water, or wells;

17.3.4.2 Within 2 feet of property lines; or

17.3.4.3 On steep slopes.

17.3.5 Calculation of minimum required absorption area to be used in conjunction with DEQ 4, Section 6.10.

17.3.5.1 Systems must have at least the minimum square footage of absorption area based on soil type.

17.3.5.2 Systems must be designed and installed to ensure most of the effluent is absorbed by plants during the growing season.

17.3.5.3 Systems installed on parcels subject to the maximum land application limits in the Missoula City-County Health Code Regulation 1, Chapter 10(D) may not discharge greater than 700 gallons per usable acre per day of gray water unless the daily design flow of the system is less than or equal to the lowest projected seasonal agronomic uptake rates for the area being irrigated.

17.3.6 All gray water systems must have a filter installed with openings no larger than 40 mesh or another approved device. All gray water must pass through the filter before being discharged to the absorption system.

17.3.7 Orifices must be spaced between 1 and 5 feet, except manufactured designs may use an orifice spacing less than 1 foot.

17.3.8 Pressurized systems must maintain a maximum flow variance of 10%.

17.3.9 Gray water irrigation systems may not be deeper than 12 inches when municipal sewer is available, or 36 inches when municipal sewer is not available.

17.3.10 Systems using gray water from kitchen sources must be buried a minimum of 12 inches.

17.3.11 Other designs may be approved by the Department on a case by case basis.

17.3.12 Gray water systems using manufactured designs or equipment must follow manufacturers' recommendations for construction, operation, and maintenance of the system.

17.4 Maintenance

17.4.1 The owner or operator of a gray water irrigation system must maintain the system as directed in an operation and maintenance manual that will remain with the system. The operation and maintenance manual must include, but is not limited to, the following:

a.) A detailed description of the gray water system;
b.) A detailed description of any scheduled activities required to operate and maintain the system;
c.) Operating dates, and;
d.) If monitoring is required, the specific monitoring procedures.

17.5 Certification and As-builts

17.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

18. PASSIVE AEROBIC WASTEWATER TREATMENT SYSTEMS

18.1 Definition

Passive Aerobic Treatment Systems (PATS) refer to wastewater treatment systems designed to oxidize organic material and ammonium-nitrogen (to nitrate nitrogen), decrease suspended solids concentrations, and reduce pathogen concentrations through convection and hydraulically driven aeration in the absorption trenches.

18.2 Use

18.2.1 PATS may be used for improving effluent quality (including reducing nitrogen when approved by DEQ) prior to discharge of the effluent into any portion of the infiltrative surface. PATS may not be used in areas where the absorption system may be subject to flooding or inundation by groundwater.

18.3 Design

18.3.1 PATS must be designed and installed in accordance with DEQ 4, and any system specific deviations issued by DEQ. Approved deviations and sizing criteria can be found in Appendix A.

18.3.2 The Department may approve gravity distribution in place of normal requirements for pressure distribution if it determines pressure distribution will reduce the effectiveness of the system.

18.3.3 Gravity distribution system designs incorporating continuously linked laterals at different elevations do not require a dosing-distribution box.

18.3.4 The Department may approve other deviations from Missoula County Health Code, Regulation 1, Section 12 (Conventional Secondary Treatment) evaluated as necessary to accommodate system specific design/function.

18.3.5 Systems must be designed, installed, and operated according to all manufacturers' specifications unless otherwise prohibited by state or local rule.

18.3.6 For replacement systems, the absorption system must maintain a minimum of 1 foot vertical separation from seasonal high groundwater, and the 100 year floodplain elevation when the absorption system is located within the 100 year floodplain.

18.3.7 Effluent filters on the outlet of the septic tank are required unless it is not recommended by the manufacturer.

18.3.8 Effluent filters are always required when an effluent pump is used in the system.

18.4 Maintenance

18.4.1 PATS must be operated and maintained to ensure they work as designed. At a minimum:

18.4.1.1 Septic tanks must be inspected every year and pumped at least every fourth year.

18.4.1.2 Filters must be inspected and cleaned at least once per year. More frequent cleaning may be necessary based on system usage.

18.4.2 The owner of an individual lot with a passive aerobic treatment system is responsible for its maintenance and operation. A maintenance and operation plan must be signed by the owner and attached to the septic permit at the time of issuance.

18.4.3 The Department may require additional mechanisms to ensure proper maintenance including, but not limited to operating permits, or other specific funding provisions.

19. Subsurface Drip Systems

19.1 Definition

Subsurface drip systems are an efficient method for dispersal of wastewater and/or gray water into the soil in small volume doses throughout the day.

19.2 Use

19.2.1 Subsurface drip systems may be used as the disposal field for systems with Advanced Treatment.

19.3 Design & Construction

19.3.1Subsurface drip systems must be designed and constructed in accordance with DEQ 4, Section 6.9, in addition to the requirements of this section.

19.4 Operation and Maintenance

19.4.1 Subsurface drip systems must meet the operation and maintenance criteria in DEQ 4, Appendix D, in addition to the criteria in this section.

19.5 Certification and As-builts

19.5.1 Certification and as-built plans are required in accordance with DEQ 4, Appendix D.

20. Absorption Beds

20.1 Definition

Absorption beds are excavations filled with washed rock or sand that do not have trench walls separating laterals.

20.2 Use

20.2.1 Absorption beds may be used as replacement wastewater systems on existing lots where there is not adequate room for a drainfield.

20.2.2 Absorption beds may be used when Certificate of Subdivision Approvals require seepage pits.

20.2.3 Absorption beds may not be used on proposed lots unless the system existed before the proposed subdivision, has been in continuous use, and was permitted by the Department.

20.3 Design & Construction

20.3.1 Absorption beds must be designed and constructed in accordance with DEQ 4.

20.3.2 When the bed has been excavated, the sides and bottom of the bed must be raked to scarify any smeared soil surfaces and loose material must be removed. The bed bottom may not be compacted by equipment during construction.

21. Seepage Pits

21.1 Definition

Seepage pits are excavations in which a subsurface concrete ring(s) is placed in drain rock to receive effluent from the septic tank.

21.2 Use

21.2.1 Seepage pits may only be permitted as replacement systems.

21.2.2 Seepage pits can only be used when there is not adequate room for a drainfield or absorption bed.

21.2.3 Seepage pits may only be permitted where groundwater is a minimum of 25 feet below the bottom of the proposed seepage pit.

21.3 Design & Construction

21.3.1 Seepage pits must be constructed in accordance with DEQ 4.

21.3.2 Conventional location requirements in section 10(C) must be used, if possible, for seepage pits.

APPENDIX A
DEQ Deviations for Presby Advanced Enviro-Septic® (AES) Treatment Systems and Sizing Requirements

The Department has recently approved blanket deviations from the Design Standards that may be used by Environmental Consultants and Reviewers when a Presby AES Treatment System is proposed.

Applicability: These deviations can be used for non-public wastewater systems (those that serve less than 25 people for 60 days) with residential strength waste and a design capacity of less than 2,500 gallons per day.

Design Standards: The approved changes to the Design Standards are:

Presby laterals may be placed a minimum of two feet on center with zero distance between trench walls. The centerline-to-centerline distance between the two outermost pipe laterals shall not exceed 14'.

For the purposes of sizing, Presby lateral trenches must not be considered more than 48 inches wide.

Presby lateral trenches may use gravity distribution for widths up to 48 inches.

When installing a Presby system, the absorption system size in square footage per DEQ-4 may be reduced in size by 50 percent for soil percolation rates less than 51 mpi and 25 percent for soil percolation rates between 51 mpi and 120 mpi.

Table A
Application Rates by Soil Texture and Perc Rate

Texture	Estimated Perc Rate In Minutes per Inch (MPI)	Typical Application Rate (gpd/ft²)	AES Application Loading Rate (ALR) (gpd/ft²)
Gravelly Sand or very coarse sands	< 3	0.8	1.60
Loamy sand, coarse sand	3-5	0.8	1.60
Medium sand, sandy loam	6-9	0.6	1.20
Fine sandy loam, loam, silt loam	10-15	0.5	1.00
Very fine sand, sandy clay loam	16-30	0.4	0.80*
Clay loam, silty clay loam	31-50	0.3	0.60*
Sandy clay, clay or silty clay	51-79	0.2	0.266*
Clays, silts, silty clays (Soil is reported throughout the soil profile)(Use EVTA BED)	80-120	0.15	0.20*
Clays or silts, pan evaporation rates do not allow for EVTA use	120+	Not Permitted	Not Applicable

* Percolation (perc) tests may be required to help distinguish between types of clays and compacted silts and their permeability as a result of mineralogy, structure, compactness and other factors. If the local reviewing authority has experience with the soil type encountered, the percolation test may be waived and the application rate provided in the table may be used. If percolation rates are faster than the estimate shown the application rate provided in the appropriate column must be used as the maximum. (In other words, use the most conservative of the two, either soil texture or percolation rates).

Table B
Slope Limitations and AES Pipe Requirements

Perc Rate (MPI)	Minimum Units* AES pipe per bedroom	% System Slope (Maximum)	% Site Slope (Maximum)	Bed Configurations Allowed
1 to 15	5	25	30	All Standard Bed Configurations
16 to 30	6			
31 to 40	7	20	25	
41 to 50		15	20	
51 to 60		10	15	
61 to 120		0	5	Basic Serial or Multiple Beds

* AES pipe is supplied in 10 ft. units

Circular DEQ 4

-This circular contains the minimum standards for the State of Montana. It applies to wastewater treatment and disposal systems state-wide.

CIRCULAR DEQ 4

MONTANA STANDARDS

FOR SUBSURFACE WASTEWATER

TREATMENT SYSTEMS

2013 Edition

FOREWORD

These standards, based on demonstrated technology, set forth requirements for the design and preparation of plans and specifications for subsurface wastewater treatment systems.

Users of these standards need to be aware that subsurface wastewater treatment systems are considered by the Environmental Protection Agency to be Class V injection wells and may require associated permits.

These standards are a revision of Department of Environmental Quality (DEQ) Circulars WQB-4, WQB-5, and WQB-6, 1992 Editions, and Circular DEQ-4, 2000, 2002, 2004, and 2009 Editions.

CIRCULAR DEQ-4

CHAPTER

1. INTRODUCTION

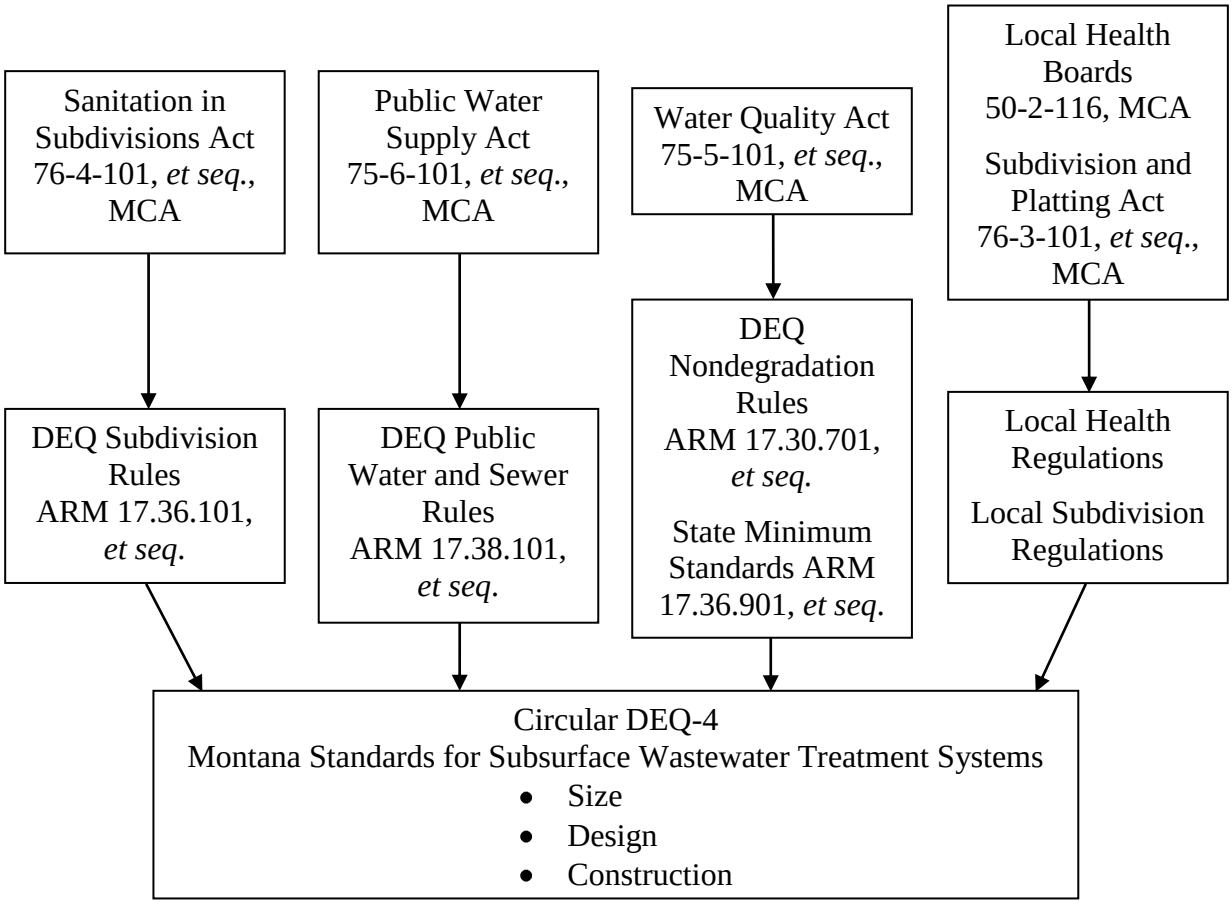
1.1. APPLICABILITY

1.1.1. General

These minimum standards apply to all subsurface wastewater treatment systems in Montana. In some cases, a reviewing authority (other than the Department of Environmental Quality) may have requirements that are more stringent than those set out in this Circular.

The term "reviewing authority," as used in these standards, refers to the Montana Department of Environmental Quality as referenced in the Sanitation in Subdivisions Act, Public Water Supply Act or Water Quality Act. The term "reviewing authority" can also be a division of local government delegated to review public wastewater systems pursuant to Administrative Rules of Montana (ARM) 17.38.102, a unit of local government that has adopted these standards pursuant to 76-3-504, Montana Code Annotated (MCA), or a local board of health that has adopted these standards pursuant to 50-2-116, MCA. Chart 1 shows this relationship graphically.

CHART 1



1.1.2. Types of Systems

This Circular describes different types of wastewater treatment and disposal systems for use in subsurface effluent discharge. These systems typically consist of a collection system, septic tank, distribution box, or manifold and a series of subsurface laterals for effluent allocation. All wastewater applied to the subsurface treatment system must meet residential strength parameters. The method and pattern of effluent discharge in a subsurface absorption system are important design elements; distribution of effluent may be either through gravity flow application or pressure dosing.

The gravity flow method of effluent distribution discharges wastewater from the septic tank or other pretreatment tank directly to the subsurface treatment system as incoming wastewater displaces it from the tank(s). It is characterized by the term "trickle flow" because the effluent is slowly discharged over much of the day. Typically, tank discharges are too low to flow throughout the entire subsurface network; thus, distribution is unequal and localized. Overloading of the infiltration surface may occur. Without extended periods of little or no flow to allow the subsoil to dry, hydraulic failure is possible.

Pressure dose distribution accumulates wastewater effluent in a dose tank from which it is periodically discharged under pressure to the subsurface treatment system by a pump. The pretreated wastewater is allowed to accumulate in the dose tank and is discharged "in doses" when a predetermined water level, water volume, or elapsed time is reached. The dose volumes and discharge rates are usually such that much of the subsurface network is filled, resulting in more uniform distribution over the absorption system area. Periods between doses provide opportunities for the subsoil to drain and re-aerate before the next dose. As a result, dosed-flow systems reduce the rate of soil clogging, more effectively maintain unsaturated conditions in the subsoil, and provide a means to manage wastewater effluent applications to the absorption system. Dosing outperforms gravity-flow systems because distribution is more uniform, controlled, and can be used in any application. Pressure dosed distribution should be the method of choice whenever possible.

The wastewater treatment and disposal systems described by this document include standard absorption trenches, shallow-capped absorption trenches, at-grade absorption trenches, deep absorption trenches, sand-lined absorption trenches, gravelless trenches and other absorption systems, elevated sand mounds, intermittent sand filters, recirculating sand filters, recirculating trickling filters, evapotranspiration absorption systems, evapotranspiration systems, aerobic wastewater treatment units, chemical nutrient reduction systems, waste segregation systems, subsurface drip systems, gray water systems, and experimental systems. Below is a partial list of system applications intended to assist in problem solving for a particular set of site conditions.

1.1.3. System Uses

1.1.3.1. Deep absorption trenches are used to break through an impervious soil layer and allow effluent to infiltrate a deeper and more permeable soil. The bottom of the trench must not be more than 5 feet below natural ground surface.

1.1.3.2. Shallow-capped absorption trenches and elevated sand mounds are used to achieve the minimum separation distance between the treatment system and a limiting layer.

1.1.3.3. Sand-lined absorption trenches are used for rapid permeability situations.

1.1.3.4. Gravelless trenches and other absorption systems are used in lieu of standard absorption trenches within the limitations provided in this Circular.

1.1.3.5. Evapotranspiration absorption systems are used where slow percolation rates or soil conditions would preclude the use of a standard absorption trench.

1.1.3.6. Evapotranspiration systems are used where slow percolation rates or soil conditions would preclude the use of a soil absorption system.

1.1.3.7. Subsurface drip systems are used for irrigation and in cases where the standard absorption system shape must be altered due to topography or natural barriers.

1.1.3.8. Gray water irrigation systems are used for irrigation.

1.1.3.9. Intermittent sand filters are used to provide advanced treatment of septic tank effluent prior to application of effluent to the infiltrative surface and are typically used on small wastewater systems.

1.1.3.10. Recirculating sand filters are used to provide advanced treatment of septic tank effluent prior to application of effluent to the infiltrative surface and are typically used on large wastewater systems.

1.1.3.11. Recirculating media trickling filters, aerobic wastewater treatment units, and chemical nutrient reduction systems are used to provide advanced treatment of septic tank effluent prior to final disposal. They also may be used to provide treatment of high strength wastewater.

1.1.3.12. Absorption beds, holding tanks, sealed pit privies, unsealed pit privies, and seepage pits may only be used as specified in the reviewing authority's regulations. These systems are not allowed as new systems in subdivisions unless authorized by the regulations. Typically, these systems are used for limited areas, replacement systems, or where other systems cannot be installed.

1.1.3.13. Waste segregation systems are used in areas of limited water availability or as a way to implement water saving measures.

1.1.4. Deviations

1.1.4.1. The reviewing authority may grant deviations from the requirements of this Circular. The terms **shall, must,** and **may not** are used where practice is

sufficiently standardized to permit specific delineation of requirements or where safeguarding of the public health justifies such definite action. These mandatory items serve as a checklist for the reviewing authority. Other terms, such as **should, may, recommended,** and **preferred** indicate desirable procedures or methods. These non-mandatory items serve as guidelines for designers and do not require specific approval for deviations.

1.1.4.2. A person desiring a deviation shall make a request, in writing, to the reviewing authority having jurisdiction and shall include the appropriate review fee. The request must identify the specific section of the Circular to be considered. Adequate justification for the deviation must be provided. "Engineering judgment" or "professional opinion" without supporting data is considered inadequate justification. The justification must address the following issues:

A. The system that would be allowed by the deviation would be unlikely to cause pollution of state waters in violation of 75-5-605, MCA;
B. The granting of the deviation would protect the quality and potability of water for public water supplies and domestic uses and would protect the quality of water for other beneficial uses, including those uses specified in 76-4-101, MCA; and
C. The granting of the deviation would not adversely affect public health, safety, and welfare.

The reviewing authority having jurisdiction will review the request and make final determination on whether a deviation may be granted.

1.1.4.3. The reviewing authority shall maintain a file of all deviations.

1.1.5. Illustrations and Examples

The images, pictures, examples, and calculations found in this Circular are presented for illustration purposes only and may not include all design requirements. Please refer to the specific rules in this Circular pertaining to each element for details.

1.2 DEFINITIONS

1.2.1. **Absorption area** means that area determined by multiplying the length and width of the bottom area of the disposal trench or bed.

1.2.2. **Absorption bed** means an absorption system that consists of excavations greater than 3 feet in width where the distribution system is laid for the purpose of distributing pretreated waste effluent into the ground.

1.2.3. **Absorption system** means any secondary treatment system, including absorption trenches, elevated sand mounds, evapotranspiration absorption (ETA), gray water irrigation, and subsurface drip systems, used for subsurface disposal of pretreated waste effluent.

1.2.4. **Absorption trench** means an absorption system that consists of excavations 18 to 36 inches in width where the distribution system is laid for the purpose of distributing pretreated waste effluent into the ground.

1.2.5. **Accessory building** means a subordinate building or structure on the same lot as the main building, which is under the same ownership as the main building, and which is devoted exclusively to an accessory use such as a garage, workshop, art studio, guest house, or church rectory.

1.2.6. **Advanced treatment** means a treatment process that provides effluent quality in excess of primary treatment.

1.2.7. **Aerobic wastewater treatment unit** means a wastewater treatment plant that incorporates a means of introducing air and oxygen into the wastewater so as to provide aerobic biochemical stabilization during detention period. Aerobic wastewater treatment facilities may include anaerobic processes as part of the treatment system.

1.2.8. **Bedrock** means material that cannot be readily excavated by hand tools, material that does not allow water to pass through, or material that does not provide for the adequate treatment and disposal of wastewater.

1.2.9. **Bedroom** means any room that is or may be used for sleeping. An unfinished basement is considered an additional bedroom.

1.2.10. **Blackwater** means any wastewater that includes waste from toilets**.**

1.2.11. **BOD_5 (5-day biochemical oxygen demand)** means the quantity of oxygen used in the biochemical oxidation of organic matter in 5 days at 20 degrees centigrade under specified conditions and reported as milligrams per liter (mg/L).

1.2.12. **Building drain** means the pipe extending from the interior plumbing to a point 2 feet outside the foundation wall.

1.2.13. **Building sewer** means the pipe connecting the house or building drain to the public sewer or private sewer.

1.2.14. **Cleanout** means access to a sewer line, extending from the sewer line to the ground surface or inside the foundation, used for access to clean a sewer line.

1.2.15. **Commercial unit** means the area under one roof occupied by a business. For example, a building housing two businesses under one roof is considered two commercial units.

1.2.16. **Composting toilet** means a system consisting of a compartment or a vault that contains or will receive composting materials sufficient to reduce human waste by aerobic decomposition.

1.2.17. **Connection** means a line that provides water or sewer service to a single building or main building with accessory buildings. The term is synonymous with "service connection."

1.2.18. **Design flow** means the flow used for sizing hydraulic facilities, such as pumps, piping, storage, and absorption systems.

1.2.19. **Distribution box** means a watertight receptacle that receives septic tank effluent and distributes it equally into two or more pipes leading to the absorption area.

1.2.20. **Distribution pipe** means a perforated pipe used in the dispersion of septic tank or other treatment facility effluent into a subsurface wastewater treatment system.

1.2.21. **Dosed system** means any system that utilizes a pump, siphon, or actuated valves to deliver treated effluent to a subsurface absorption area.

1.2.22. **Dosing frequency** means the number of times per day that effluent is applied to an absorption system or sand filter.

1.2.23. **Dosing tank** means a watertight receptacle receiving effluent from the septic tank or another treatment device, equipped with a siphon or a pump designed to discharge effluent.

1.2.24. **Dosing volume** means the volume of effluent, in gallons applied to an absorption system or sand filter each time a pump is activated or each time a siphon functions.

1.2.25. **Drain rock** means the rock or coarse aggregate used in an absorption system, sand filter, or seepage pit. Drain rock must be washed, be a maximum of 2.5 inches in diameter and larger than the orifice size unless shielding is provided to protect the orifice, and contain no more than 2 percent passing the No. 8 sieve. The material must be of sufficient competency to resist slaking or dissolution. Gravels of shale, sandstone, or limestone may degrade and may not be used.

1.2.26. **Drop box** means a watertight structure that receives septic tank effluent and distributes it into one or more distribution pipes and into an overflow leading to another drop box

and/or absorption system located at a lower elevation.

1.2.27. **Effective size** means the sieve size in millimeters (mm) allowing only 10 percent of the material to pass as determined by wet-test sieve analysis method ASTM C 117-95.

1.2.28. **Effluent** means partially treated wastewater from a primary, advanced, or other treatment facility.

1.2.29. **Effluent filter** means an effluent treatment device installed on the outlet of a septic tank designed to prevent the passage of suspended matter larger than 1/8 inch in size.

1.2.30. **Effluent pump** means a pump used to convey wastewater that has been partially treated from a septic tank or other treatment facility. This wastewater has had settleable or floatable solids removed.

1.2.31. **Ejector pump** means a pump that transports raw sewage.

1.2.32. **Emitter** means orifices that discharge effluent at controlled rates, usually specified in gallons-per-hour (gph). Emitters are typically found in subsurface drip irrigation systems.

1.2.33. **Fats, oils, grease (FOG)** means a component of wastewater typically originating from food stuffs (animal fats or vegetable oils) or consisting of compounds of alcohol or glycerol with fatty acids (soaps and lotions).

1.2.34. **Fill** means artificially placed soil.

1.2.35. **Gravity dose** means a known volume (dose) of effluent that is delivered to an absorption system in a specific time interval. The effluent is delivered either by a siphon or by a pump to a drop box, distribution box, or manifold. The drop box, distribution box, or manifold then distributes effluent into a non-pressurized absorption system.

1.2.36. **Gray water** means wastewater that is collected separately from a sewage flow and that does not contain industrial chemicals, hazardous wastes, or wastewater from toilets.

1.2.37. **Grease trap** means a device designed to separate fats, grease, and oils from the effluent.

1.2.38. **Grinder pump** means a pump that shreds solids and conveys wastewater through a sewer to primary or advanced treatment.

1.2.39. **High-strength waste** means effluent from a septic tank or other treatment device that has BOD_5 greater than 300 mg/L, TSS greater than 150 mg/L, or fats, oils, and grease greater than 25 mg/L.

1.2.40. **Holding tank** means a watertight receptacle that receives wastewater for retention and does not, as part of its normal operation, dispose of or treat the wastewater.

1.2.41. **Horizon** means a layer in a soil profile that can be distinguished from each of the layers

directly above and beneath it by having distinctly different physical, chemical, and/or biological characteristics.

1.2.42. **Impervious layer** means any layer of material that has a percolation rate slower than 240 minutes per inch (mpi).

1.2.43. **Incinerating toilet** means a self-contained unit consisting of a holding tank and an adequate heating system to incinerate waste products deposited in the holding tank. The incineration by-products are primarily water and a fine ash.

1.2.44. **Individual wastewater system** means a wastewater system that serves one living unit or commercial unit. The term does not include a public sewage system as defined in 75-6-102, MCA.

1.2.45. **Industrial wastewater** means any waste from industry or from the development of any natural resource, together with any sewage that may be present.

1.2.46. **Infiltrative surface** means the soil interface that receives the effluent wastewater below the drain rock or sand.

1.2.47. **Influent** means the wastewater flow stream prior to any treatment.

1.2.48. **Irrigation** means those systems that provide subsurface application of wastewater to any planted material by means of a piping system.

1.2.49. **Key** means to hollow out in the form of a groove.

1.2.50. **Limiting layer** means bedrock, an impervious layer, or seasonally high ground water.

1.2.51. **Living unit** means the area under one roof that can be used for one residential unit and which has facilities for sleeping, cooking, and sanitation. A duplex is considered two living units.

1.2.52. **Main** means any line providing water or sewer to multiple service connections, any line serving a water hydrant that is designed for firefighting purposes, or any line that is designed to water or sewer main specifications.

1.2.53. **Manhole** means an access to a sewer line for cleaning or repair.

1.2.54. **Manifold** means a solid (non-perforated) wastewater line that distributes effluent to individual distribution pipes.

1.2.55. **Mottling** or **redoximorphic features** means soil properties associated with wetness that result from the reduction and oxidation of iron and manganese compounds in the soil after saturation and desaturation with water.

1.2.56. **Multiple-user wastewater system** means a non-public wastewater system that serves, or

is intended to serve, more than two living or commercial units, but which is not a public sewage system as defined in 75-6-102, MCA. The total number of people served may not exceed 24. In estimating the population that will be served by a proposed residential system, the reviewing authority shall multiply the number of living units times 2.5 people per living unit.

1.2.57. **Natural soil** means soil that has developed in place through natural processes and to which no fill material has been added.

1.2.58. **Orifice** means an opening or hole through which wastewater can exit the distribution pipe**.**

1.2.59. **Percolation test** means a standardized test used to assess the infiltration rate of soils performed in accordance with Appendix A.

1.2.60. **Plasticity** means the ability of a soil sample to be rolled into a wire shape with a diameter of 3 mm without crumbling.

1.2.61. **Pressure distribution** means an effluent distribution system where all pipes are pressurized and the effluent is pumped, or delivered by siphon, to the next portion of the treatment system in a specific time interval or volume.

1.2.62. **Pretreatment** means the wastewater treatment that takes place prior to discharging to any component of a wastewater treatment and disposal system including, but not limited to, pH adjustment, oil and grease removal, BOD_5, and TSS reduction, screening, and detoxification.

1.2.63. **Primary treatment** means a treatment system, such as a septic tank, that provides retention time to settle the solids in raw wastewater and that retains scum within the system.

1.2.64. **Private sewer** means a sewer receiving the discharge from one building sewer and conveying it to the public sewer system or a wastewater treatment system.

1.2.65. **Professional engineer** means an engineer licensed or otherwise authorized to practice engineering in Montana pursuant to Title 37, Chapter 67, MCA.

1.2.66. **Proprietary system** means a wastewater treatment method holding a patent or trademark.

1.2.67. **Public wastewater system** means a system for collection, transportation, treatment, or disposal of wastewater that serves 15 or more families or 25 or more persons daily for any 60 days or more in a calendar year. In estimating the population that will be served by a proposed residential system, the reviewing authority shall multiply the number of living units times 2.5 people per living unit, so that 10 or more proposed residential connections will be considered a public system.

1.2.68. **Qualified site evaluator** means a soils scientist, professional engineer, registered sanitarian, hydro geologist, or geologist who has experience and knowledge of soil

morphology. Other individuals will be considered qualified after providing, to the reviewing authority, evidence of experience describing soils or experience conducting necessary test procedures.

1.2.69. **Raw wastewater** means wastewater that has not had settleable solids removed through primary treatment or other approved methods.

1.2.70. **Recreational camping vehicle (RV)** means a vehicular unit designed primarily as temporary living quarters for recreation, camping, travel, or seasonal use, and that either has its own power or is mounted on, or towed by, another vehicle. The basic types of RVs are camping trailer, fifth-wheel trailer, motor home, park trailer, travel trailer, and truck camper.

1.2.71. **Redoximorphic or mottling features** means soil properties associated with wetness that result from the reduction and oxidation of iron and manganese compounds in the soil after saturation and desaturation with water.

1.2.72. **Residential strength wastewater** means effluent from a septic tank or other treatment device with a BOD_5 less than or equal to 300 mg/L, TSS less than or equal to 150 mg/L, and fats, oils, and grease less than or equal to 25 mg/L.

1.2.73. **Reviewing authority** means the Department of Environmental Quality, a local department or board of health certified to conduct reviews under 76-4-104, MCA, a division of local government delegated to review public wastewater systems pursuant to ARM 17.38.102, a local unit of government that has adopted these standards pursuant to 76-3-504, MCA, or a local board of health that has adopted these standards pursuant to 50-2-116, MCA.

1.2.74. **Scarify** means to make shallow cuts in order to break the surface.

1.2.75. **Seasonally high ground water** means the depth from the natural ground surface to the upper surface of the zone of saturation, as measured in an unlined hole or perforated observation well during the time of the year when the water table is the highest. The term also means the upper surface of a perched water table.

1.2.76. **Septic tank** means a wastewater settling tank in which settled sludge is in immediate contact with the wastewater flowing through the tank while the organic solids are decomposed by anaerobic action.

1.2.77. **Service connection** means a line that provides water or sewer service to a single building or main building with accessory buildings. The term is synonymous with "connection."

1.2.78. **Sewage** is synonymous with "wastewater" for purposes of this Circular.

1.2.79. **Sewer invert** means the inside bottom, or flow line, of a sewer pipe.

1.2.80. **Shared wastewater system** means a wastewater system that serves, or is intended to serve, two living units, two commercial units, or a combination of one living unit and one

commercial unit. The term does not include a public sewage system as defined in 75-6-102, MCA.

1.2.81. **Siphon** means a pipe fashioned in an inverted U shape and filled until atmospheric pressure is sufficient to force a liquid from a reservoir in one end of the pipe over a barrier and out the other end.

1.2.82. **Slope** means the rate that a ground surface declines in feet per 100 feet. It is expressed as percent of grade.

1.2.83. **Soil consistence** means attributes of soil material as expressed in degree of cohesion and adhesion or in resistance to deformation or rupture. For the purposes of this Circular consistence includes resistance of soil material to rupture, resistance to penetration, plasticity, toughness, and stickiness of puddled soil material, and the manner in which the soil material behaves when subject to compression. Although several tests are described, only those should be applied which may be useful.

1.2.84 **Soil profile** means a description of the soil strata to a depth of eight feet using the United States Department of Agriculture (USDA) soil classification system method in Appendix B.

1.2. 85. **Soil texture** means the amount of sand, silt, or clay measured separately in a soil mixture.

1.2. 86. **Surge tank** means a watertight structure or container that is used to buffer flows.

1.2. 87. **Synthetic drainage fabric** means a nonwoven drainage fabric with a minimum weight per square yard of 4 ounces, a water flow rate of 100 to 200 gallons per minute per square foot, and an apparent opening size equivalent to a No. 50 to No. 110 sieve.

1.2. 88. **Total Suspended Solids (TSS)** means solids in wastewater that can be removed by standard filtering procedures in a laboratory and is reported as milligrams per liter (mg/L).

1.2. 89. **Transport pipe** means the pipe leading from the septic tank or dose tank to the distribution box or manifold.

1.2. 90. **Uniformity coefficient (UC)** means the sieve size in millimeters (mm) that allows 60 percent of the material to pass (D60), divided by the sieve size in mm allowing 10 percent of the material to pass (D10), as determined by ASTM C 117-95 (UC=D60/D10).

1.2.91. **Uniform distribution** is a means to distribute effluent into a pressure dosed absorption system or sand filter such that the difference in flow, measured in gallons per day per square foot, throughout the treatment system is less than 10 percent.

1.2.92. **Waste segregation** means a method by which human toilet waste is disposed of through composting, chemical, dehydrating, or incinerator treatment, with a separate disposal method for gray water.

1.2.93. **Wastewater** means water-carried waste including, but not limited to, household, commercial, or industrial wastes, chemicals, human excreta, or animal and vegetable matter in suspension or solution.

1.2.94. **Wastewater treatment system or wastewater disposal system** means a system that receives wastewater for purposes of treatment, storage, or disposal. The term includes all disposal methods described in this Circular.

1.2.95. **Wet well** means a chamber in a pumping station, including a submersible pump station, where wastewater collects.

2. SITE CONDITIONS

2.1. SITE EVALUATION

2.1.1. General

Information concerning soil and site conditions is needed for the design of subsurface wastewater treatment systems. Elements that must be included in the evaluation are:

A. soil profile descriptions as described in Section 2.1.4;
B. soil permeability determined from soil texture or percolation tests described in Section 2.1.5, if required;
C. depth to ground water, bedrock, or other limiting layer;
D. land slope and topographic position;
E. flooding potential;
F. amount of suitable area available; and
G. setback distances required in ARM Title 17, Chapter 36, subchapters 3 or 9, as applicable.

2.1.2. System Evaluation

A qualified site evaluator shall conduct a site evaluation in the location of each proposed system.

2.1.3 Existing Soil Information

Soil surveys are usually found at the local USDA Natural Resources Conservation Service (NRCS) office or through the USDA WebSoil Survey website. Soil surveys offer good preliminary information about an area and can be used to identify potential problems, however, they cannot substitute for a field investigation.

2.1.4 Soil Profile Description

Soils must be described in accordance with Appendix B.

Soil profiles within 25 feet of the boundaries of the proposed absorption system and its replacement area are required. Soil pits should be located outside the boundaries of the proposed absorption system so that they do not act as a conduit for effluent between soil horizons. The number and depth of soil pit descriptions for a subsurface wastewater treatment system must comply with the requirements of ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

For proposed primary and replacement absorption systems that are not located in the same immediate area, a soil profile may be required for each proposed absorption system area. The minimum depth of soil profile descriptions must be 8 feet unless a limiting layer is encountered at a shallower depth. If a limiting layer is encountered at less than 8 feet in the soil profile or if the site is in an area where bedrock outcroppings exist, the reviewing

authority may require one soil profile at each end of both the absorption system and the replacement area to ensure adequate depth of soil. The soil profile may need to be completed to a greater depth to demonstrate compliance with other applicable rules.

2.1.4.1. Soil Properties

The following soil properties must be evaluated and reported by a qualified site evaluator in accordance with this Circular to the full depth of the hole:

A. thickness of each layer or horizon needs to be described;
B. texture, structure, and consistence of soil horizons;
C. color (preferably described by using the notation of the Munsell color scheme) and color variation (redoximorphic features);
D. depth of water, if observed;
E. estimated depth to seasonally high ground water and basis for the estimate;
F. depth to and type of bedrock or other limiting layer, if observed;
G. stoniness reported on a volume basis (i.e., the percentage of the soil volume occupied by particles greater than 2 mm in diameter);
H. plasticity; and
I. other prominent features such as roots, etc.

2.1.5. Percolation Tests or Infiltrometer Tests

The reviewing authority may require multiple percolation tests when the soils are variable or other conditions create the need to verify system sizing.

Percolation tests, if required, must be conducted at the approximate depth of proposed construction. For elevated sand mounds and at-grade systems, the depth of the percolation test hole must be 12 inches. Additional percolation tests may be required to determine the existence of a limiting layer. The percolation tests must be performed in accordance with the procedures contained in Appendix A.

When more than one percolation test is conducted within the boundaries of a proposed absorption system, the percolation rate will be determined based on the arithmetic mean of similar percolation test values.

2.1.6. Suitable Area Evaluation

The size of the site and the amount of suitable area must be evaluated in conjunction with the size of the proposed subsurface wastewater system and locations of other features requiring a minimum separation distance.

2.1.7. Application Rates

Table 2.1-1 and the soil descriptions outlined in Appendix B must be used to determine application rates for subsurface wastewater treatment systems.

TABLE 2.1-1
Soil Texture Descriptions are found in Appendix B

Texture	Percolation Rate (minutes per inch)	Application rate (gpd/ft^2) (a) (b)
Gravel, gravelly sand, or very coarse sand (c)	<3	0.8
Loamy sand, coarse sand (d)	3-<6	0.8
Medium sand, sandy loam	6- <10	0.6
Fine sandy loam, loam	10- <16	0.5
Very fine sand, sandy clay loam, silt loam	16-<31	0.4
Clay loam, silty clay loam	31-<51	0.3
Sandy clay	51-<121	0.2
Clays, silts, silty clays (e)	121- <240	0.15
Clays, silts, silty clays (f)	>240	Additional Soil Information Required

(a) If more than 500 lineal feet, or 1,000 square feet of distribution line, calculated before applying any reductions, are needed, then pressure distribution must be provided.
(b) Comparison of the soil profile report, percolation rate, and USDA-NRCS soils report should be reviewed. If the information shows a variable application rate, additional site specific information may be required by the reviewing authority.
(c) Systems installed in gravel or coarser textured soils with percolation rates faster than 3 mpi must be pressure dosed and sand lined.
(d) Pressure distribution must be provided for these soils if there is less than 6 feet from the bottom of the trench to a limiting layer.
(e) Percolation tests must be conducted in accordance with Appendix A.
(f) Soils with initial percolation rates greater than 240 mpi must be reevaluated using the double-ring infiltrometer procedure outlined in ASTM D 5093-02. Systems may be proposed for these soils only if the double-ring infiltrometer procedure shows a percolation rate of 240 mpi or less. All calculations and results must be reported to the reviewing authority. Only ETA or ET systems designed in accordance with Subchapter 6.8 may be used.

2.1.8. Site Factors

The land slope, potential for flooding, and amount of suitable area must be evaluated.

2.1.8.1. Type and Percent of Land Slope

The type (concave, convex, or plane), percent, and direction of land slope must be reported along with the method of determination. The reviewing authority may require a 2-foot contour map of the area for sites having slopes exceeding 15 percent within 25 feet of the absorption system or replacement area.

2.1.8.2. Flooding and Surface Water

The potential for flooding or accumulation of surface water from storm events must be evaluated. Floodplain maps, when available, must be included as part of the evaluation.

2.1.8.3. Ground Water and Surface Water Quality Impact

Compliance with the nondegradation requirements of the Montana Water Quality Act (75-5-101, et seq., MCA) must be demonstrated.

2.1.8.4. Ground Water Observation

When required, ground water observation must be conducted in accordance with Appendix C.

2.1.9. Site Evaluation Reporting

Any person performing a site evaluation on a parcel shall submit to the reviewing authority all data and locations of all test holes and percolation tests performed on the parcel.

2.2. SITE MODIFICATIONS

2.2.1. General

Site modifications, as described in Sections 2.2.2, 2.2.3, and 2.2.4 of this Subchapter, may be used only for replacement of failing systems. Site preparation for cut and fill modifications must be completed prior to final approval. Minor leveling, as described in Section 2.2.5 of this Subchapter, will be allowed for both new systems and replacement systems. All new and replacement subsurface wastewater treatment systems must meet the requirements of this Circular.

2.2.2. Artificially Drained Site

Artificially drained site modifications may be used only for the replacement of failing systems and may not be used for new systems.

Prior to construction of any site drainage system such as a field drain, under drain, or vertical drain, an evaluation of the site must be performed including soil profile descriptions, slope, depth to bedrock or other impervious layer, estimation of depth to seasonally high ground water, topography, distance to wells, seeps, streams, ponds, or other open water, and any other pertinent considerations.

2.2.2.1. Design of Drain System

The drainage method chosen (curtain drain, vertical drain, or under drain) and the reason for this choice must be detailed. Drawings showing dimensions of the drain system and materials to be utilized must be provided.

The drainage system must be constructed according to the specific design approved by the reviewing authority.

2.2.2.2. Depth to Ground Water

The type of wastewater treatment system to be approved must depend upon the depth to seasonally high ground water. A minimum of 4 feet of natural soil from the bottom of the infiltrative surface to the seasonally high ground water must be achieved by the site drainage system. An adequate horizontal separation distance must be maintained between the drain and the absorption system to reduce the potential for effluent to enter the drain.

2.2.2.3. Depth to Ground Water Observation

The reviewing authority may require observation of the depth to seasonally high ground water after installation of the drainage system.

2.2.2.4. Operation and Maintenance, Certification, and As-builts
A detailed set of plans, specifications, and an operation and maintenance plan are

required, prior to approval by the reviewing authority. The operation and maintenance plan must meet the requirements in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

2.2.3. Cut Systems

Cut systems may be used only for the replacement of failing systems and may not be used for new subsurface wastewater treatment systems. Site modification for replacement subsurface wastewater treatment systems must be completed prior to approval by the reviewing authority.

2.2.3.1. Limiting Layer

A minimum of 4 feet of natural soil from the bottom of the infiltrative surface to a limiting layer must be maintained.

2.2.3.2. Design

A. Cut areas for the replacement absorption system must be physically completed prior to approval. Two soil test holes must be excavated and detailed soil profile descriptions of the final receiving soils must be provided prior to excavation. Percolation tests may be required after the cut has been completed. All soil information must be submitted to the reviewing authority.
B. A complete lot layout must be submitted showing the cut areas, the uphill and downhill slope, and slope across the cut area. Slope across the absorption system site must be a uniform slope.
C. Cut systems will only be considered on slopes that do not exceed 25 percent and where downhill slope below the cut area is not greater than 25 percent.

2.2.3.3. Certification and As-builts

The designer shall submit a letter of verification indicating that the site meets minimum requirements of this Circular after the cut has been completed. Certification and as-builts are required in accordance with Appendix D.

2.2.4. Fill System

Fill systems may be used only for replacement of existing failed systems and may not be used for new subsurface wastewater treatment systems. The reviewing authority must initially approve the fill location with the site modification completed prior to final system approval. Fill areas for replacement absorption systems must be physically completed prior to approval by the reviewing authority.

2.2.4.1. Location

A. The entire area necessary for the replacement absorption system must be filled prior to final approval of the system.
B. Fill systems may not be installed on soils with a percolation rate slower than 60 mpi. Side slopes on the fill may not exceed 25 percent (4:1).

2.2.4.2. Fill Restrictions

A minimum of 4 feet of natural soil from the bottom of the infiltrative surface of the subsurface absorption system to a limiting layer must be maintained. Fill cannot be used to overcome minimum vertical or horizontal separation distances.

2.2.4.3. Fill Material

Soils used for fill may not be finer than sandy loam with a maximum of 20 percent passing the No. 100 sieve.

2.2.4.4. Design

A. System configuration dimensions and orientation must be submitted in a design report. The design report and drawings must be approved by the reviewing authority prior to the placement of fill material.
B. Three percolation tests evenly spaced across the completed fill must be performed at the depth of the proposed infiltrative surface as a basis for design application rate.
C. The absorption system must be sized on the basis of the percolation rate for either the soil beneath the fill material or the percolation rate of the fill material, whichever is slower.

2.2.4.5. Construction

A. All vegetative cover must be removed from the area to be filled.
B. Fill material must not be put in place when the fill or the original soil surface is frozen.
C. Fill material must be placed in lifts and compacted as specified in the design report so that stable soil structure conditions are achieved.
D. Absorption systems must be set back at least 25 feet from the lower edge of the filled area on slopes of 6 percent or greater. For slopes less than 6 percent, absorption systems must be set back at least 10 feet on all sides prior to starting the side slope.
E. The fill area must be seeded with a suitable grass to aid in stabilization.

2.2.4.6. Certification and As-builts

Certification and as-builts are required in accordance with Appendix D.

2.2.5. Minor Leveling

Minor leveling is limited to sites with a natural ground slope of 15 percent or less. A parcel may undergo minor leveling by cutting and/or filling of the natural ground surface up to and no more than a 12-inch depth.

Soil that has undergone minor leveling will not be considered natural soil and all vertical depth requirements must be met.

A minimum of 4 feet of natural soil from the bottom of the infiltrative surface to a limiting layer must be maintained.

The reviewing authority may require a detailed site plan of the area proposed for minor leveling showing the contours and other pertinent land features, both before and after minor leveling.

3. WASTEWATER

3.1. WASTEWATER FLOW

3.1.1. General

The purpose of this chapter is to provide a method for estimating wastewater flows. Subsurface wastewater treatment system flow rates, in gallons per day (gpd), are based on type of use, size of the home, including number of bedrooms, or number of people. The agreements and easements for shared, multi-user, or public subsurface wastewater treatment systems, as required in ARM 17.36.326 must be met.

3.1.2. Residential wastewater design flow rates must be estimated as follows:

A. When the number of individual living units on a single or common absorption system is 9 or less, the following table must be used. Sizing is based on individual living units, not collective number of bedrooms. Living units will be considered to have three bedrooms unless otherwise approved.

1 bedroom	150 gpd
2 bedrooms	225 gpd
3 bedrooms	300 gpd
4 bedrooms	350 gpd
5 bedrooms	400 gpd
Each additional bedroom	add 50 gpd

B. When the number of living units on a single or common absorption system is 10 or more, the design flow rate per living unit may be reduced to 100 gpd per person. An average of 2.5 persons per living unit must be used to calculate total design flow unless the reviewing authority determines that a larger per-living-unit average is appropriate for a given project.

Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

3.1.3. Nonresidential Wastewater Flow

Typical daily flows for a variety of commercial, institutional, and recreational establishments are presented in this section.

The reviewing authority may require that nonresidential establishments demonstrate that the wastewater meets residential strength standards or complies with the requirements of

Subchapter 3.2.

For design purposes, the typical flows must be used as minimum design flows. Greater design flows may be required where larger flows are likely to occur, such as resort areas. Design flow must be computed using the total number of units in the proposed facility times the typical daily flow in the tables, with no reduction allowed for occupancy rates. Where the system includes several different types of uses from the tables, each use must be computed separately and the design flow must be based on the sum of all of the uses. A means of flow measurement, such as flow meters or pump run-time meters, may be required.

As an alternative to the flows listed in the tables, design flows may be based on actual water use data from similar facilities. If daily flows are used, the design flow must be 1.1 times the highest daily flow. If monthly averages are used, the peak design flow must be a minimum of 1.5 times the average flow of the highest month. The water use data must be representative of the facility proposed and for a time period adequate to evaluate annual use of the system. System components may be added or enlarged to address peak flows to allow absorption systems to be sized based on average flow.

For expansions of existing systems, the reviewing authority may approve the use of actual water use data to determine appropriate flows.

TABLE 3.1-1
TYPICAL WASTEWATER FLOWS FROM
COMMERCIAL, INDUSTRIAL, AND OTHER NONRESIDENTIAL SOURCES

Source	Unit	Wastewater Flow, gpd/unit	
		Range	Typical
Airport	Passenger	2-4	3
Automobile Service Station	Vehicle Served	7-13	10
	Employee	9-15	12
Bar	Customer	5	3
	Employee	10-16	13
Church	Seat		3
(Not including a kitchen, food service facility, daycare, or camp)			
Church	Seat		5
(Including kitchen, but not including a food service facility, day care, or camp)			
Daycare	Child	10-30	25
	Employee	10-20	15
Department Store	Toilet Room	400-600	500
	Employee	8-12	10
Hospital, medical	Bed	125-240	165
	Employee	5-15	10
Hospital, mental	Bed	75-140	100
	Employee	5-15	10
Hotel/Motel	Guest	40-56	48
	Employee	7-13	10
Industrial Building	Employee	10-16	13
(Sanitary waste only)			
Laundry	Machine	450-650	580
(Self-serve)	Wash	45-55	50
Office	Employee	7-16	13
Prison	Inmate	75-150	115
	Employee	5-15	10
Rest home	Resident	50-120	85
Restaurant	Meal	2-4	3
School, day:			
With cafeteria, gym, showers	Student	15-30	25
With cafeteria only	Student	10-20	15
Without cafeteria, gym, showers	Student	5-17	11
School, boarding	Student	50-100	75
Shopping Center	Parking Space	1-2	2
	Employee	7-13	10
Store	Customer	1-4	3
	Employee	8-12	10

TABLE 3.1-2
TYPICAL WASTEWATER FLOWS FROM RECREATIONAL FACILITIES

Source	Unit	Wastewater Flow, gpd/unit	
		Range	Typical
Apartment, resort	Person	50-70	60
Bed and Breakfast	Person	20-40	40
Cabin, resort	Person	8-50	40
Cafeteria	Customer	1-3	2
	Employee	8-12	10
Campground (developed)	Person	20-40	30
Cocktail lounge	Seat	12-25	20
Coffee shop	Customer	4-8	6
	Employee	8-12	10
Country club	Member (present)	60-130	100
	Employee	10-15	13
Day camp (no meals)	Person	10-15	13
Dining hall	Meal served	4-10	7
Dormitory, bunkhouse	Person	20-50	40
Hotel/Motel, resort	Person	40-60	50
Store, resort	Customer	1-4	3
	Employee	8-12	10
Swimming pool	Customer	5-12	10
	Employee	8-12	10
Theater	Seat	2-4	3
Visitor center	Visitor	4-8	5
Recreational Vehicles without individual hookups for water or sewer	Space		50
Recreational Vehicles with individual hookups for water and/or sewer	Space		100

3.2. HIGH STRENGTH WASTEWATER

3.2.1. General

Nonresidential establishments may have the potential to produce wastewater considered high-strength. Elevated levels of BOD_5, TSS, and FOG will reduce the effectiveness of onsite wastewater treatment systems by increasing the biological demand on downstream components in the system, by containing inorganic compounds that are not easily broken down, and by accelerating mechanical clogging of the infiltrative surface. These establishments often produce effluent with variations of flow including intermittent, seasonal, or sporadic peak events.

The reviewing authority may require that nonresidential establishments demonstrate that the wastewater meets residential strength standards or complies with the requirements of this subchapter.

Nonresidential establishments are listed in Section 3.1.3, Table 3.1-1, 3.1-2 and may also include, but are not limited to:

Athletic facilities
Bakeries
Beauty shops/nail salon
Breweries
Car washes
Food processing facilities
Funeral homes and crematoriums
Facilities with separate gray water plumbing
Hobby woodworking shops or art studios
Manufacturing facilities
Nursing homes
Rest areas
Restaurants
RV dump stations
Schools
Tanneries
Veterinarian clinics

Nonresidential structures or establishments that produce or contain any industrial or chemical components may be required to obtain a Montana ground water pollution control system permit regardless of system size.

3.2.2. Wastewater strength

Systems, accepting wastewater not treated to the following levels, must comply with this section prior to final disposal in a subsurface absorption system. Other conditions of system approval may be required by the reviewing authority.

A. BOD_5 less than or equal to 300 mg/L;
B. TSS less than or equal to 150 mg/L; and
C. FOG less than or equal to 25 mg/L

3.2.2.1. BOD_5 or TSS

All wastewater must meet residential waste standards for BOD_5 and TSS. The reviewing authority may impose additional requirements on systems with low BOD_5 levels where compliance with the Water Quality Act and nondegradation of

state waters is a concern.

3.2.2.2. Fats, Oils, and Grease (FOG)

Restaurants, nonresidential kitchens, or other facilities that have FOGs greater than 25 mg/L must include a grease tank or other treatment system approved by the reviewing authority in their design. This treatment must occur prior to wastewater entering the septic tank.

A. Grease Tanks

1. Grease tanks must be sized based upon the daily design flow estimates in this chapter, with the minimum acceptable tank size being 1,000 gallons. Grease tanks must provide a minimum of 24 hours of holding time to allow FOGs to cool and separate out of emulsion. Establishments that experience surge loading must provide larger grease tanks designed for longer holding periods.
2. Grease tanks must be constructed in accordance with Section 5.1.7.
3. Grease tanks must have sanitary Ts on the inlet and sanitary Ts or baffles on the outlet. The baffles must extend down from the top of the tank with the openings near the bottom. The chamber between the baffles must be sized to contain the expected FOG volume between pumping periods.
4. Wastewater from all food preparation and clean-up areas must be plumbed separately into the grease tank. Cross connections with blackwater sewers is not allowed.
5. Effluent from the grease tank must be plumbed into the septic tank.

B. Other treatment systems designed to treat FOGs will be reviewed on a case-by-case basis.

3.2.3. A design report must be submitted along with plans and specifications including:

3.2.3.1. A statement describing the type of business or industry and the end products and byproducts that will be disposed of in the wastewater system; and

3.2.3.2. Description, plans, and specifications that detail the treatment of the high strength wastewater.

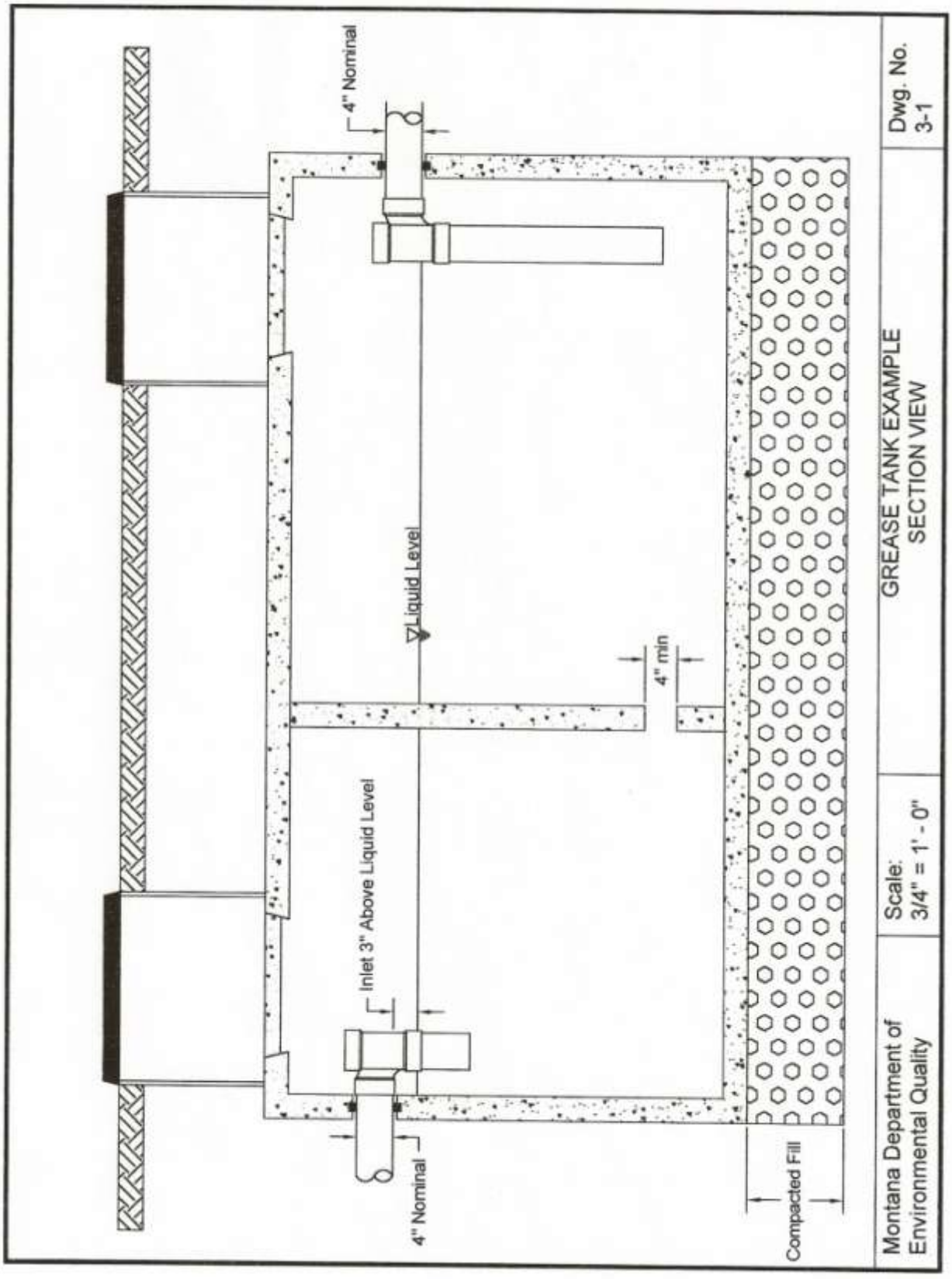
3.2.4. Operation and Maintenance, Certification, and As-builts

All high strength wastewater treatment systems must submit an operation and maintenance plan in accordance with Appendix D and this chapter. Certification and as-built plans are required in accordance with Appendix D.

3.2.4.1. The operation and maintenance plan must include procedures for each component of the wastewater treatment system. Material Safety Data Sheets (MSDS) for

chemicals used, as well as a perpetual contract for operation and maintenance of the system must be included.

3.2.4.2. Sampling records, when required, must be kept on site and made available to the reviewing authority upon request.


4" Nominal
Liquid Level
4" min
Inlet 3" Above Liquid Level
4" Nominal
Compacted Fill
Montana Department of Environmental Quality
Scale: 3/4" = 1' - 0"
GREASE TANK EXAMPLE
SECTION VIEW
Dwg. No. 3-1

3.3. WATER TREATMENT WASTE RESIDUALS

3.3.1. General

Wastewater from ion exchange water treatment systems, water softening treatment systems, demineralization water treatment systems, or other water treatment systems that produce a discharge may be disposed using an onsite wastewater treatment absorption system. A Montana Ground Water Pollution Control System permit and nondegradation analysis may be required.

3.3.2. Water Softener Discharges

The wastewater (backwash) from water softeners may be discharged to a wastewater treatment system only if the installed water softener:

A. regenerates using a demand-initiated regeneration control device; and
B. is connected only to interior plumbing for potable water usage and not to exterior irrigation water lines.

3.3.3. Discharges to Experimental and Proprietary Systems

Wastewater from ion exchange water treatment systems, water softening treatment systems, demineralization water treatment systems, or other water treatment systems that produce a discharge may not be discharged into an experimental, or proprietary on-site wastewater treatment system, unless the quality and quantity of discharge meets the recommended usage, operation, and maintenance specifications of the designer or manufacturer of the system. If such specifications are not available, then approval for the discharge must be obtained from the reviewing authority.

3.3.4. Discharges to Approved Systems

Wastewater from ion exchange water treatment systems, water softening treatment systems, demineralization water treatment systems, or other water treatment systems that produce a discharge may be discharged to a separate drainfield, other approved absorption system, or into the ground, if not prohibited by other rules or regulations.

3.3.5. Operation and Maintenance Plan

An operation and maintenance plan for all components of the water treatment and subsurface wastewater treatment systems must be submitted in accordance with Appendix D.

3.3.6. Other Requirements

The reviewing authority may require that water treatment residuals be disposed in a separate subsurface wastewater treatment system unconnected to the system for the disposal of sanitary wastewater.

4. COLLECTION, PUMPING, AND EFFLUENT DISTRIBUTION SYSTEMS

4.1 COLLECTION SYSTEMS

4.1.1. General

4.1.1.1. Sewer collection systems, as described in this subchapter, are the system of pipes and other appurtenances that receive and convey wastewater or effluent either by gravity or through force mains to a treatment system. This subchapter discusses sewer service connections, gravity mains, force mains, alternative collection systems, and necessary setbacks.

4.1.1.2. Sewer collection systems, including sewer service lines and sewer mains, must maintain the setback distances required in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

4.1.1.3. Sewer collection systems that include inverted siphons or those to be constructed near stream crossings, at water main crossings, or with aerial crossings must be designed in accordance with Department Circular DEQ-2.

4.1.1.4. Sewer collection systems must be designed for wastewater only. Rain water from roofs, streets, and other areas; cooling water, surface water drainage, ground water from foundation drains, etc., are not permitted in wastewater sewers.

4.1.1.5. In general, flow used for designing sewers must consider the ultimate population to be served, maximum hourly wastewater flow, and possible infiltration. Sewer extensions should be designed for projected flows even when the diameter of the receiving sewer is less than the diameter of the proposed extension. A schedule for future downstream sewer relief may be required by the reviewing authority.

4.1.1.6. Sewer collection systems must be designed to prevent freezing. The minimum depth of bury must not be less than 4 feet to the top of the pipe without justification by the designer. Insulation must be provided for sewers that cannot be placed at a depth sufficient to prevent freezing. Insulation used for this purpose must be specifically designed to withstand compaction and for use in subsurface locations. It must retain the insulating value for the design life of the sewer.

4.1.1.7. Schedule 40 PVC sewer pipe must be used leading into and out of the septic tank, and in the area of backfill around the tank for a minimum length of at least 10 feet. Other sewer collection pipes must be made of PVC or High Density Polyethylene (HDPE).

A. PVC sewer pipes must meet the requirements of ASTM D 3034-08, Schedule 40, or Schedule 80 and meet ASTM D 1785-12. Sewer collection pipes must be joined by an integral bell-and-spigot joint with rubber

elastomeric gasket or solvent cement joints. When using ASTM D 3034-08, rock-free bedding is required.

B. HDPE sewer pipe must meet the requirements of ASTM D 3350-12, must meet the minimum cell classification of 435400C as defined and described in ASTM D 3350-12, and must be joined by an integral bell-and-spigot joint with rubber elastomeric gasket or butt fusion weld.

4.1.1.8. Transition connections to other materials must be made by adapter fittings or one-piece molded rubber couplings with appropriate bushings for the respective materials. All fittings must be at least of equivalent durability and strength of the pipe itself.

4.1.1.9. Sewer collection pipes must be installed at a uniform slope.

4.1.1.10. Buoyancy of sewer collection systems including pipes, and manholes must be considered and flotation of the component must be prevented with appropriate construction where high ground water conditions are anticipated.

4.1.1.11. Installation specifications must contain appropriate requirements based on the criteria, standards, and requirements established by the industry in its technical publications. Requirements must be set forth in the specifications for the methods of bedding and backfilling the pipe. See ASTM D 2321-11 with respect to PVC pipe installation, when appropriate.

4.1.2. Sewer Service Connections

4.1.2.1. Sewer service connections from the structure to the septic tank must be at least 4 inches in diameter and must be placed at a minimum slope of 1/4 inch per foot toward the point of discharge unless pressurized.

Sewer service connections that are greater than 4 inches in diameter must be designed in accordance with the requirements of Department Circular DEQ-2.

4.1.2.2. Sewer service connections should be sufficiently deep to receive wastewater from basements.

4.1.2.3. Cleanouts are recommended within 3 feet of the building, at angles greater than 45 degrees, and for continuous pipe runs greater than 150 feet in length.

4.1.2.4. Sewer service connections to the sewer main must be watertight and may not protrude into the sewer. If a saddle-type connection is used, it must be a device intended to join with the types of pipe that are to be connected. All materials used to make service connections must be compatible with each other and with the pipe materials to be joined. All materials must be corrosion-proof.

4.1.3. Gravity Sewer Mains

4.1.3.1. Gravity sewer mains conveying raw wastewater must be designed in accordance with the requirements of Department Circular DEQ-2, except where modified by this section. They must be at least 8 inches (203 mm) in diameter, except gravity sewer mains used within private property, trailer courts, condominiums, apartments, etc., are allowed mains no smaller than 6 inches in diameter, provided that the 6-inch diameter main can be shown to be hydraulically feasible, that no future expansion is anticipated, and that maintenance will not be increased due to the smaller diameter.

Gravity sewer mains conveying effluent must be at least 4 inches in diameter and must be designed in accordance with the requirements of Department Circular DEQ-2.

4.1.3.2. Manholes must be installed at the end of each sewer line, at all grade, size, or alignment changes, at all intersections, and at distances not greater than 400 feet (122 m) for sewers 15 inches (381 mm) or less in diameter and 500 feet (152 m) for sewers 18 inches (457 mm) to 30 inches (762 mm) in diameter. Greater spacing may be permitted in larger sewers at the discretion of the reviewing authority.

Distances up to 600 feet (183 m) may be approved where cleaning equipment for the stated spacing is provided. Documentation must be provided that such cleaning equipment is readily available and has the cleaning capability stated.

Manholes must be constructed in accordance with the requirements of Department Circular DEQ-2.

Cleanouts may be used only for special conditions and may not be substituted for manholes or installed at the end of laterals greater than 150 feet (46 m) in length.

Cleanouts may not be used in place of manholes on mains of public wastewater systems conveying raw wastewater, but may be used in place of manholes on lines conveying septic tank effluent. For systems conveying septic tank effluent, manholes or cleanouts must be located at major junctions of 3 or more pipes and should be limited to strategic locations for cleaning purposes.

4.1.4. Force Mains (Pressurized Sewers)

Force mains must be designed in accordance with the requirements of Department Circular DEQ-2.

4.1.5. Alternative Collection Systems, Certification, and As-builts

Alternative wastewater collection systems must be designed in accordance with the requirements of Department Circular DEQ-2. This would include grinder pump systems, septic tank effluent pump systems, and small diameter gravity systems. Certification and as-built plans are required in accordance with Appendix D.

4.2. PUMPING SYSTEMS

4.2.1 General

This subchapter describes pumping systems and appurtenances for both raw wastewater and effluent.

Buoyancy must be considered and flotation of pumping systems prevented with appropriate construction where high ground water conditions are anticipated.

Pumping systems must maintain the setback distances required in ARM Title 17, Chapter 37, subchapters 3 or 9, as applicable.

4.2.2. Raw Wastewater Pumping Stations, Certification, and As-builts

4.2.2.1. Wastewater pumping stations receiving raw wastewater that has not had settleable solids removed and that have design flow rates of 5,000 gpd or greater must be designed in accordance with the requirements of Department Circular DEQ-2. Certification and as-built plans are required in accordance with Appendix D.

4.2.2.2. Wastewater pumping stations receiving raw wastewater that has not had settleable solids removed and that have design flow rates less than 5,000 gpd must be designed in accordance with the requirements of Department Circular DEQ-2, with the following exceptions:

A. Pumps must be capable of passing spheres of at least 2 inches in diameter, or grinder pumps capable of handling raw wastewater must be provided.
B. Submersible pumps and motors must be designed specifically for totally submerged operation and must be submerged at all times.
C. Multiple pumps are not required.
D. Pump suction and discharge piping may be less than 4 inches in diameter.
E. A 4-inch pump is not required.
F. The discharge line must be sized to provide a minimum velocity of 2 feet per second.

Certification and as-built plans are required in accordance with Appendix D.

4.2.3. Effluent Pumping Stations

Effluent pumping stations process partially treated wastewater from a primary, advanced, or other treatment facility. The intent of effluent pumping stations is the distribution of effluent to a receiving component.

Pressure dosing or pumping stations used to dose subsurface treatment or absorption systems include both gravity dosing to a distribution box or a drop box and delivery of effluent to a manifold for pressure distribution to a subsurface treatment or absorption

system.

4.2.3.1. Wastewater pumping stations must be provided with effluent pumps, controls, and wiring that are corrosion-resistant and listed by Underwriters Laboratories, Canadian Standards Association, or other approved testing and/or accrediting agency as meeting the requirements for National Electric Code (NEC) Class I, Division 2 locations. An audible or visible alarm must be provided to indicate high water levels.

In lieu of meeting the requirements for NEC Class 1, Division 2 locations, pumping stations receiving effluent from 5 or less living units, those stations vented in accordance with the requirements of Chapter 40 of Department Circular DEQ-2, or advanced treatment effluent pumping units that are preceded by a septic tank, may use submersible pumps and motors designed specifically for totally submerged operation with controls and wiring that are corrosion-resistant.

4.2.3.2. Effluent pumping stations for alternative collection systems must be designed in accordance with the requirements of Department Circular DEQ-2.

4.2.3.3. Dosing and Pressure Distribution - Pumping Stations Used with Subsurface Absorption Systems

A. The intent of dosing is the uniform distribution of effluent to a receiving component. Dosing includes both gravity dosing to a distribution box or a drop box and delivery of effluent to a manifold for pressure distribution to a subsurface wastewater treatment system.

B. Pressure distribution to a subsurface wastewater treatment system should be utilized whenever practical, but must be utilized when the design wastewater flow requires an effective length of more than 500 lineal feet or 1,000 square feet of distribution lines, calculated before applying any reductions. The effective length of the absorption area is the actual length of the trench or bed, calculated prior to any applied reductions. The effective length cannot exceed the length of the pipe by more than one-half the orifice spacing.

C. Dosing may be accomplished with either pumps or siphons, which must be sized for the distribution system. Justification for the pump or siphon model selected must be included for review.

D. The dose volume of a pressure distribution system must be equal to the drained volume of the transport pipe and manifold, plus a volume that should be 5 to 10 times the net volume of the distribution pipe. Where the system is designed to operate on a timer, more frequent, smaller doses may be used. The minimum dose volume must be equal to the drained volume of the transport pipe and manifold, plus a volume equal to at least 2 times the distribution pipe volume. Where timers are used, additional controls are necessary to prevent pump operation at low-water level. For gravity-dosed systems, the volume of each dose must be at least equal to 75 percent of the internal volume of the distribution lines being dosed.

E. The pressure distribution pipe must be at least Class 200 or Schedule 40 PVC or high density polyethylene (HDPE) with a minimum pressure rating of 160 psi. All fittings must be pressure rated to the pipe. The pipe must have a single row of orifices 1/8-inch diameter or larger in a straight line. Design must include orifices to allow for drainage of the pipe and to allow air to be expelled from the pipe. Maximum orifice spacing must be 5 feet. The size of the dosing pumps and siphons must be selected to provide a minimum pressure of 1 psi (2.3 feet of head) at the end of each distribution line. For orifices smaller than 3/16-inch, the minimum pressure must be 2.16 psi (5 feet of head) at the end of each distribution pipe.

F. A hydraulic analysis demonstrating uniform distribution must be provided for all pressure distribution systems. The analysis must show no greater than 10 percent variation in distribution of dose across the entire distribution system. Pressure-dosed systems installed on a sloping site must include means for controlling pressure differences caused by varying distribution pipe elevations across the entire distribution area.

G. Cleanouts must be provided at the end of every lateral. The cleanouts must be within 6 inches of finished grade and should be made with either a long-sweep elbow or 2 45-degree bends. A pressure distribution system designer may specify the use of capped ends that are replaced after flushing if, in the designer's opinion, this is a more feasible option than long sweep cleanouts. A metal location marker or plastic valve cover must be provided for each cleanout.

H. Dosing tanks

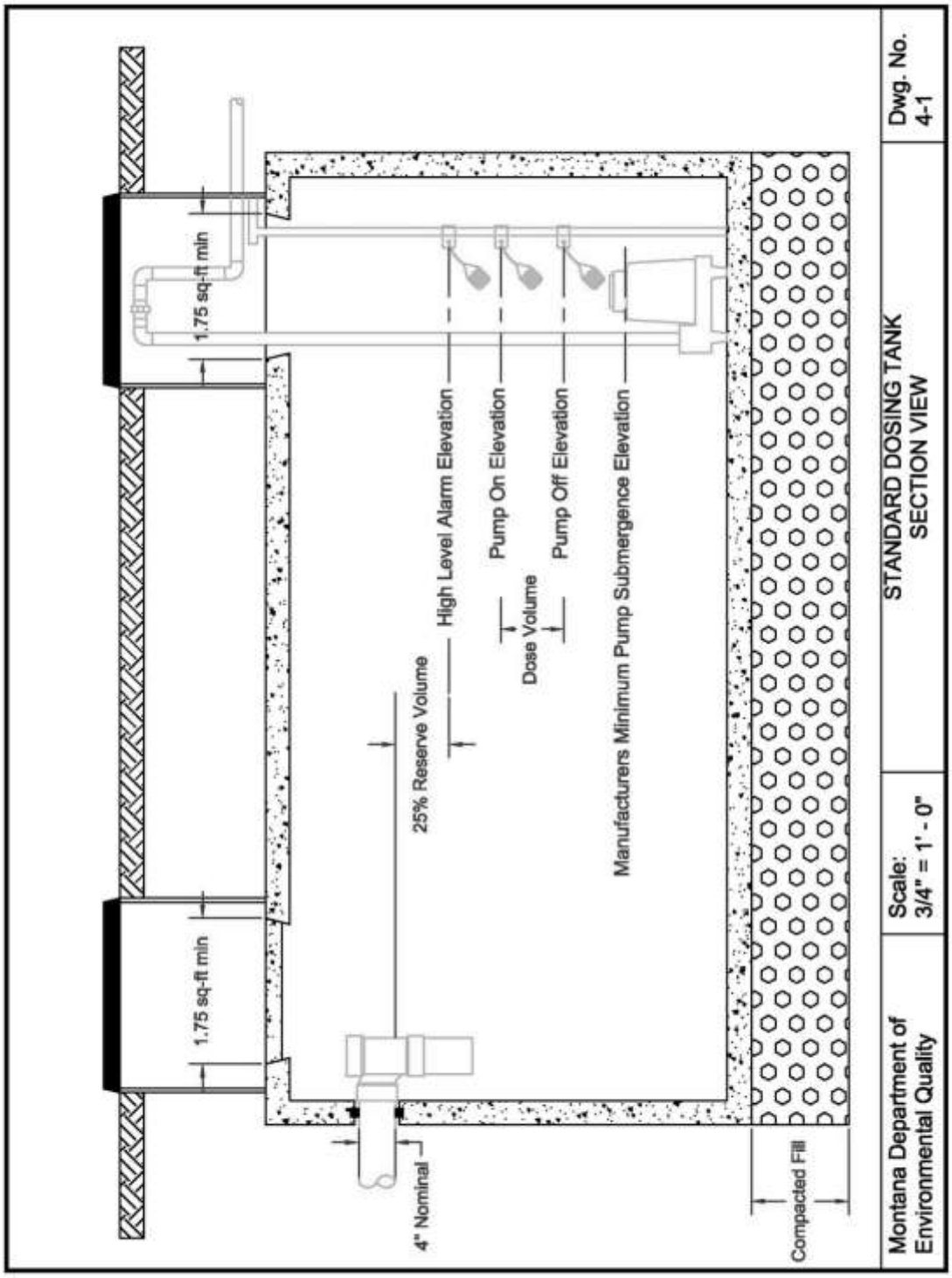
1. Dose tank volumes are not to be included in primary, advanced, or other required tank volumes.
2. The reserve storage volume of the dosing tank must be at least equivalent to 25 percent of the subsurface distribution system design flow. If a duplex pump station is used, where each pump doses the entire distribution system, then the reserve storage volume of the dosing tank may be reduced. The reserve storage volume is computed from the high-level alarm. If the specified pump requires submergence, the tank must also include adequate liquid capacity for pump submergence and the dose volume.
3. The dosing tank must be separated from the septic tank by an air gap to eliminate the possibility of siphoning from the septic tank. Dosing tanks must be provided with access ports sufficiently large enough to maintain the tank and pumps. Pumps, valves, and other apparatus requiring maintenance must be accessible from the surface without entering the tank or be located in a dry tank adjacent to the wet chamber. Adequate provision must be made to effectively protect maintenance personnel from hazards.
4. Dosing tanks must meet the construction requirements for septic tanks listed in Section 5.1.7.

   High-water alarms must be provided for all dosing chambers that

utilize pumps.

Dosed systems using a siphon should have a dose counter installed to check for continued function of the siphon.

I. Pressure distribution systems must be field-tested to verify that the pressure across the entire absorption field does not vary by greater than 10 percent.


1.75 sq-ft min
1.75 sq-ft min
High Level Alarm Elevation
Pump On Elevation
Pump Off Elevation
Dose Volume
25% Reserve Volume
Manufacturers Minimum Pump Submergence Elevation
4" Nominal
Compacted Fill
Montana Department of Environmental Quality
Scale: 3/4" = 1' - 0"
STANDARD DOSING TANK
SECTION VIEW
Dwg. No. 4-1

4.3. EFFLUENT DISTRIBUTION SYSTEMS

4.3.1. General

This subchapter applies to the transportation and distribution of treated effluent.

NOTE: Effluent transport pipes, distribution boxes, drop boxes, manifolds, and distribution pipes must maintain the setback distances required in ARM Title 17, Chapter 36, subchapters 3 or 9, as applicable.

4.3.2. Pipes

4.3.2.1. Transport pipes

Transport pipes move effluent from the primary or advanced treatment system to the distribution box, drop box, or manifold.

4.3.2.2. Transport, manifold, and distribution pipe materials

A. Gravity-fed distribution lines must be fabricated from 4-inch diameter ASTM D3034-08 sewer pipe with perforations per ASTM D2729-11.
B. Coiled, perforated-plastic pipe may not be used for distribution pipe within absorption systems. Straight lengths of pipe must be used.
C. Pipe used for pressure-dosed distribution lines must be at least Class 200 PVC or Schedule 40 and meet ASTM D1785-12 or ASTM D2241-09 or high density polyethylene (HDPE) with a minimum pressure rating of 160 psi. All fittings must be pressure rated to the pipe. Pressure rated fittings compatible with the materials must be used for pressure-dosed piping.
D. Other distribution pipe materials may be used with prior approval from the reviewing authority.

4.3.3. Distribution Box, Drop Box, and Manifold

Distribution boxes, drop boxes, and manifolds collect effluent from either primary or advanced treatment systems for distribution in subsurface absorption systems.

Distribution boxes, drop boxes, and manifolds must be of watertight construction. Manifolds used in gravity systems must be set level and arranged so that effluent is distributed to an equal length of distribution pipe on both sides of the junction of the transport pipe to the manifold. Distribution boxes or drop boxes may be used in gravity systems in lieu of manifolds.

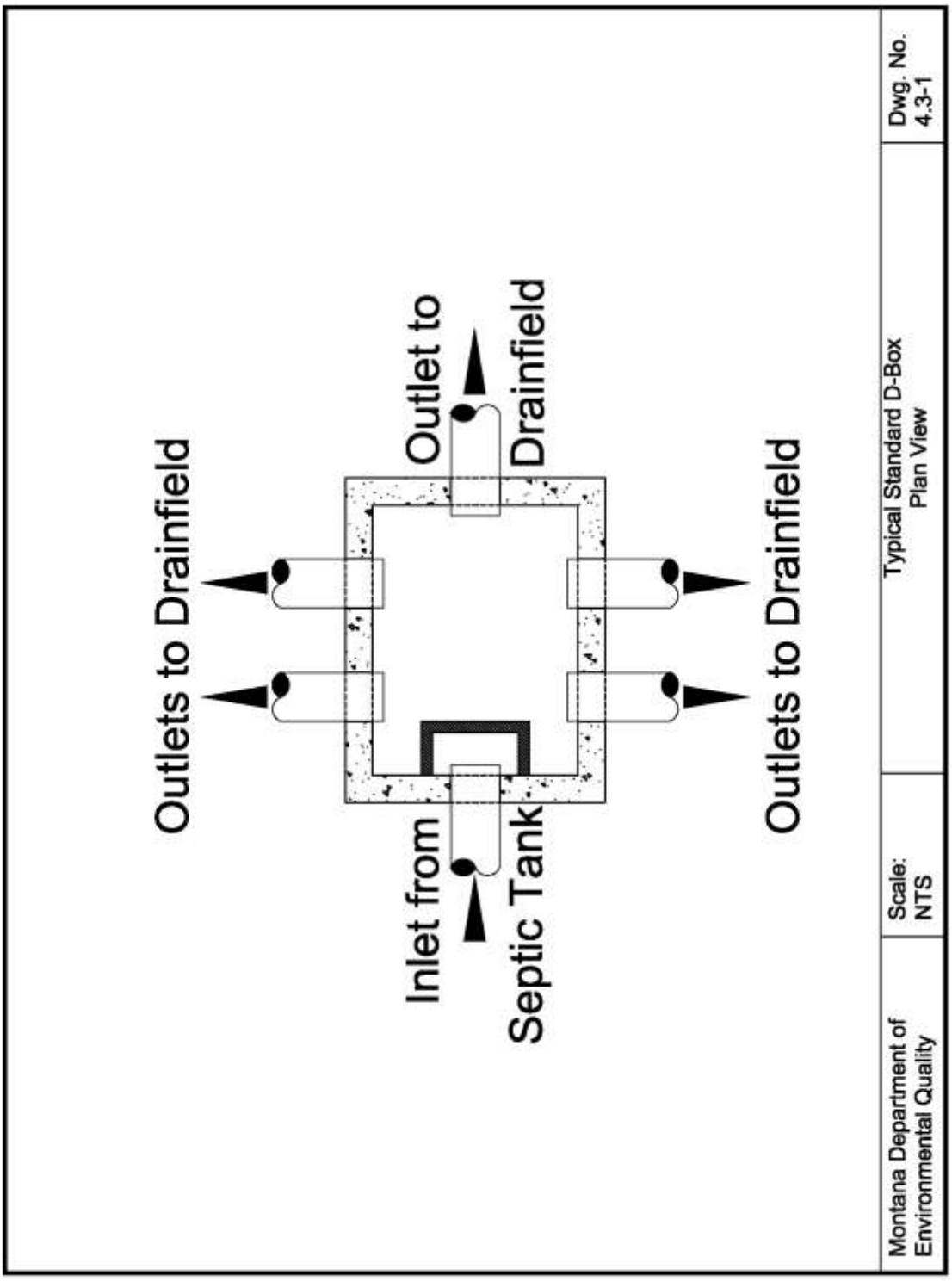
4.3.3.1. Distribution boxes must:

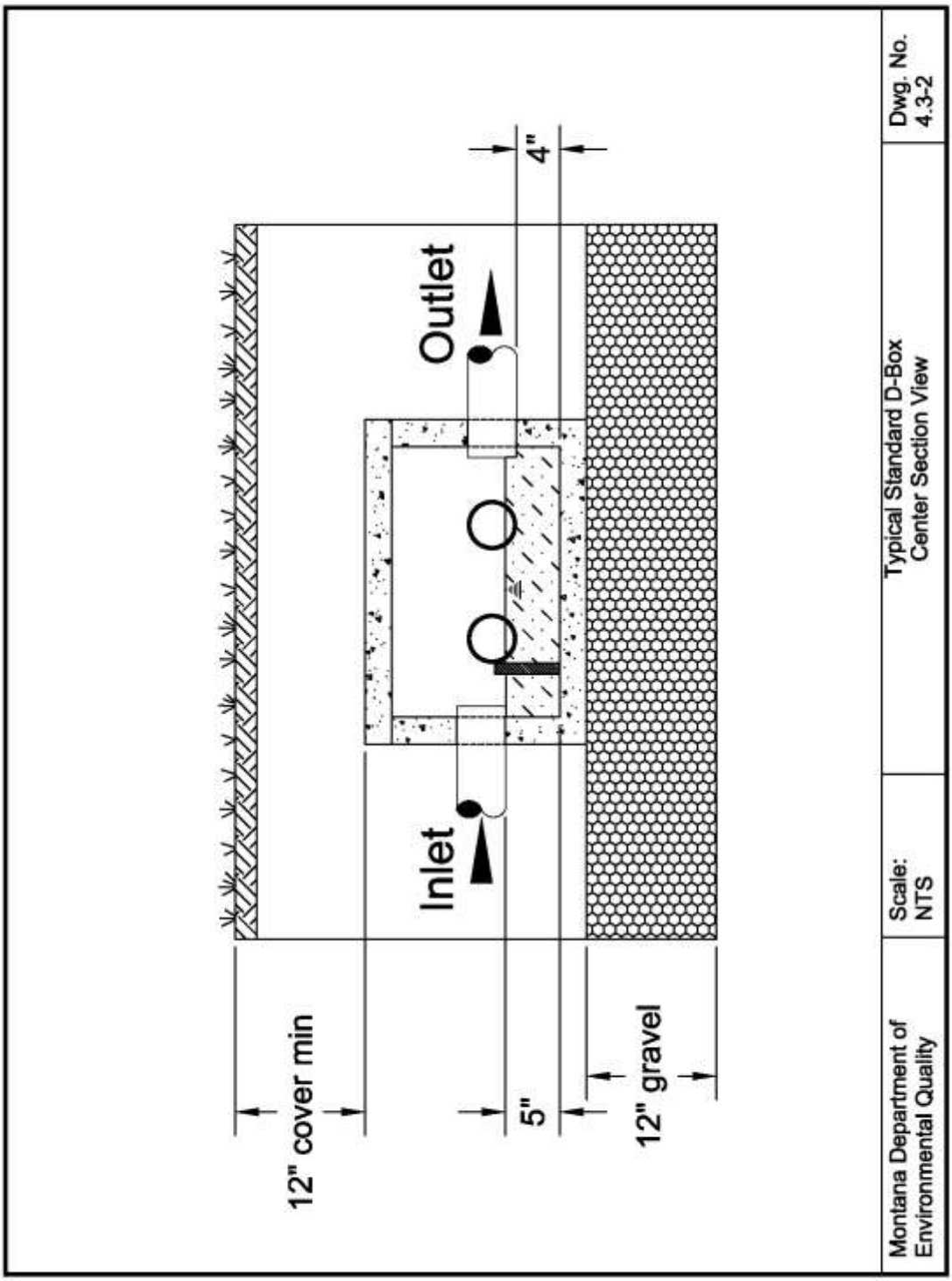
A. Be set level and bedded to prevent settling;
B. Use some flow control or baffling device to ensure equal distribution of effluent;

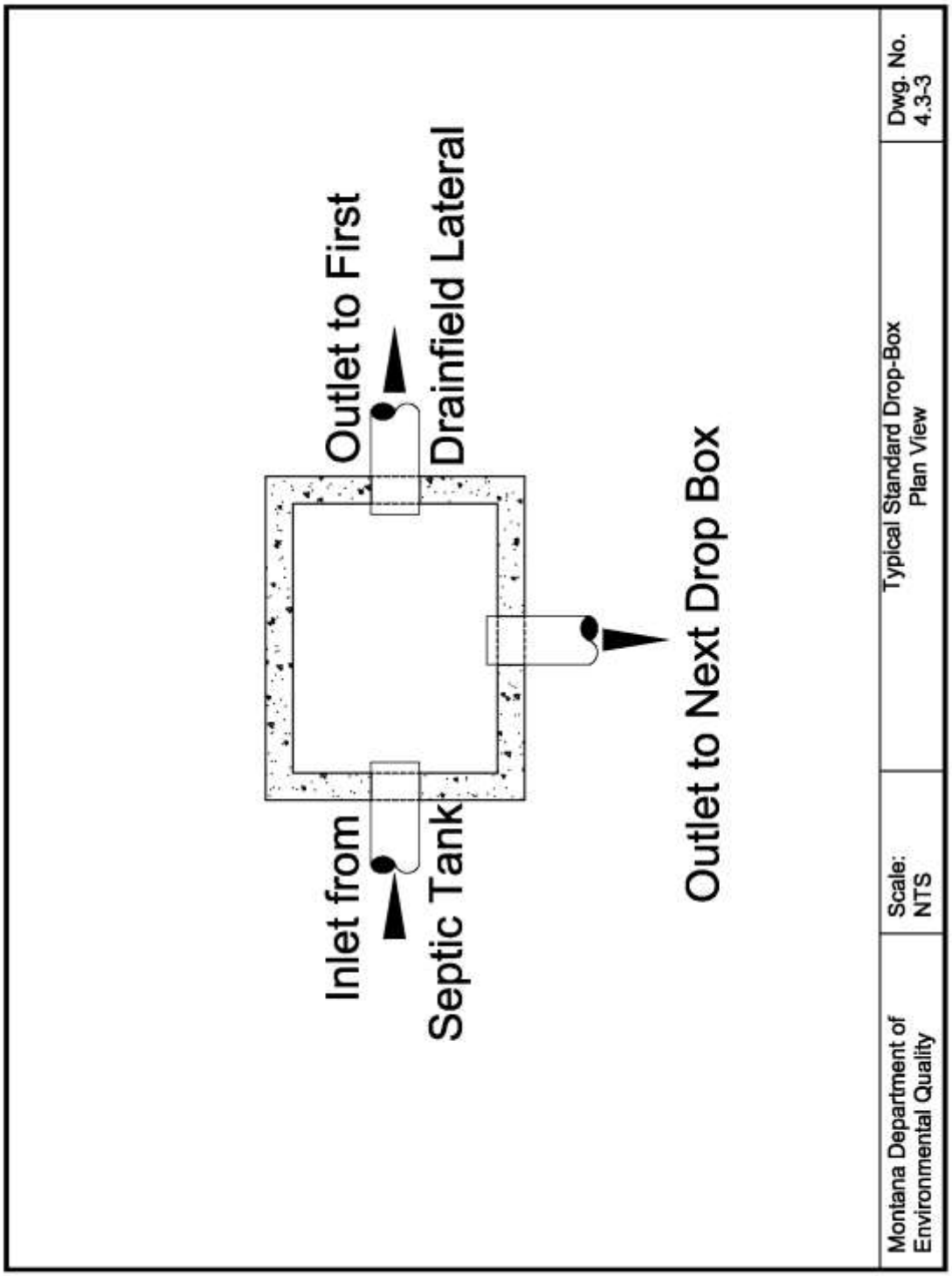
C. Be water tested for equal distribution;
D. Have each outlet serving an equal length of absorption trench;
E. If constructed using concrete, the concrete must meet the same requirements as concrete for septic tanks in Subsection 5.1.7.1. Minimum wall, floor, and lid thickness for concrete distribution boxes must be 2 inches; and
F. Have an access for inspection provided either through a riser or be marked with iron or a suitable, durable marker.

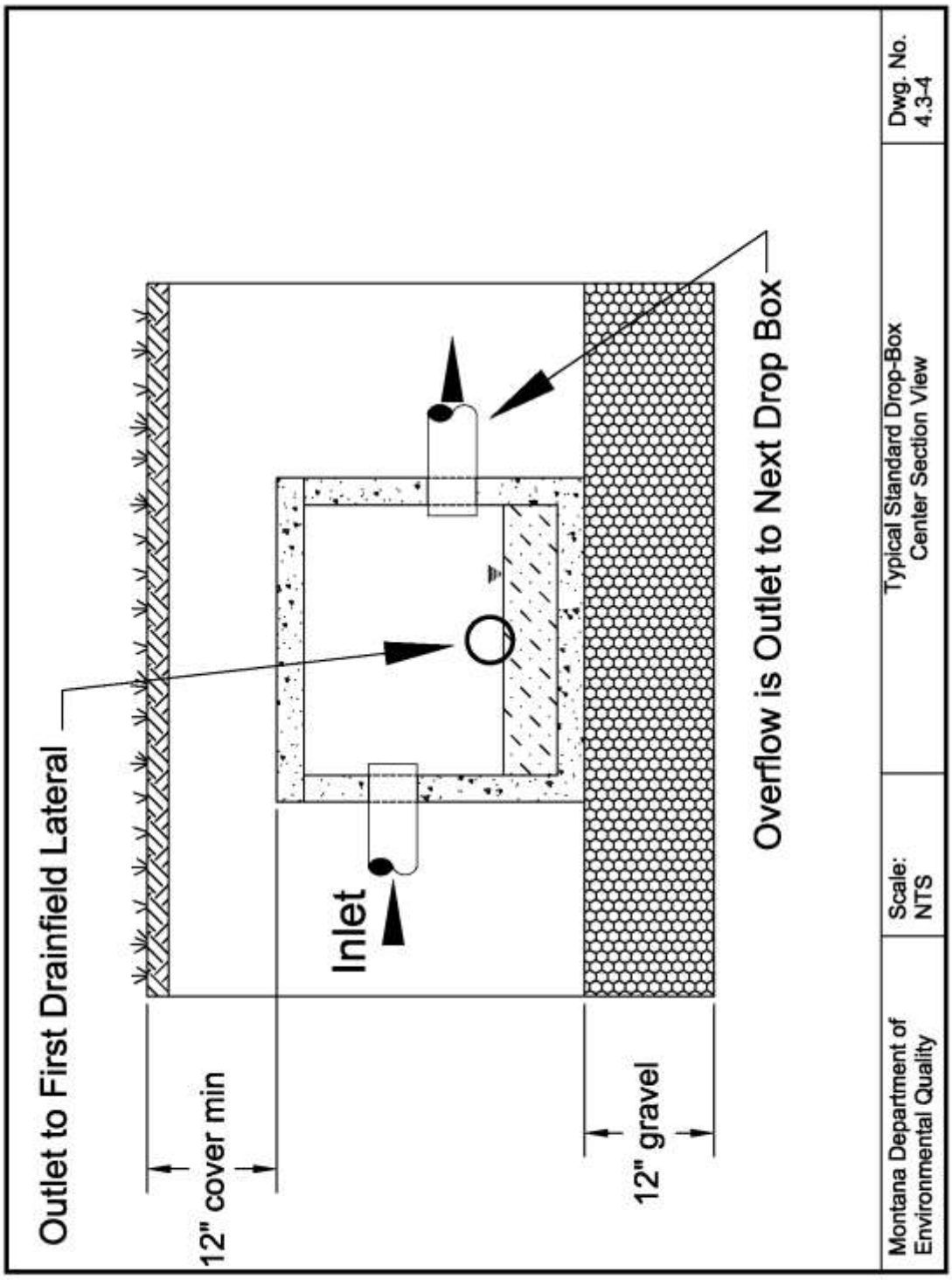
4.3.3.2. Drop boxes must:

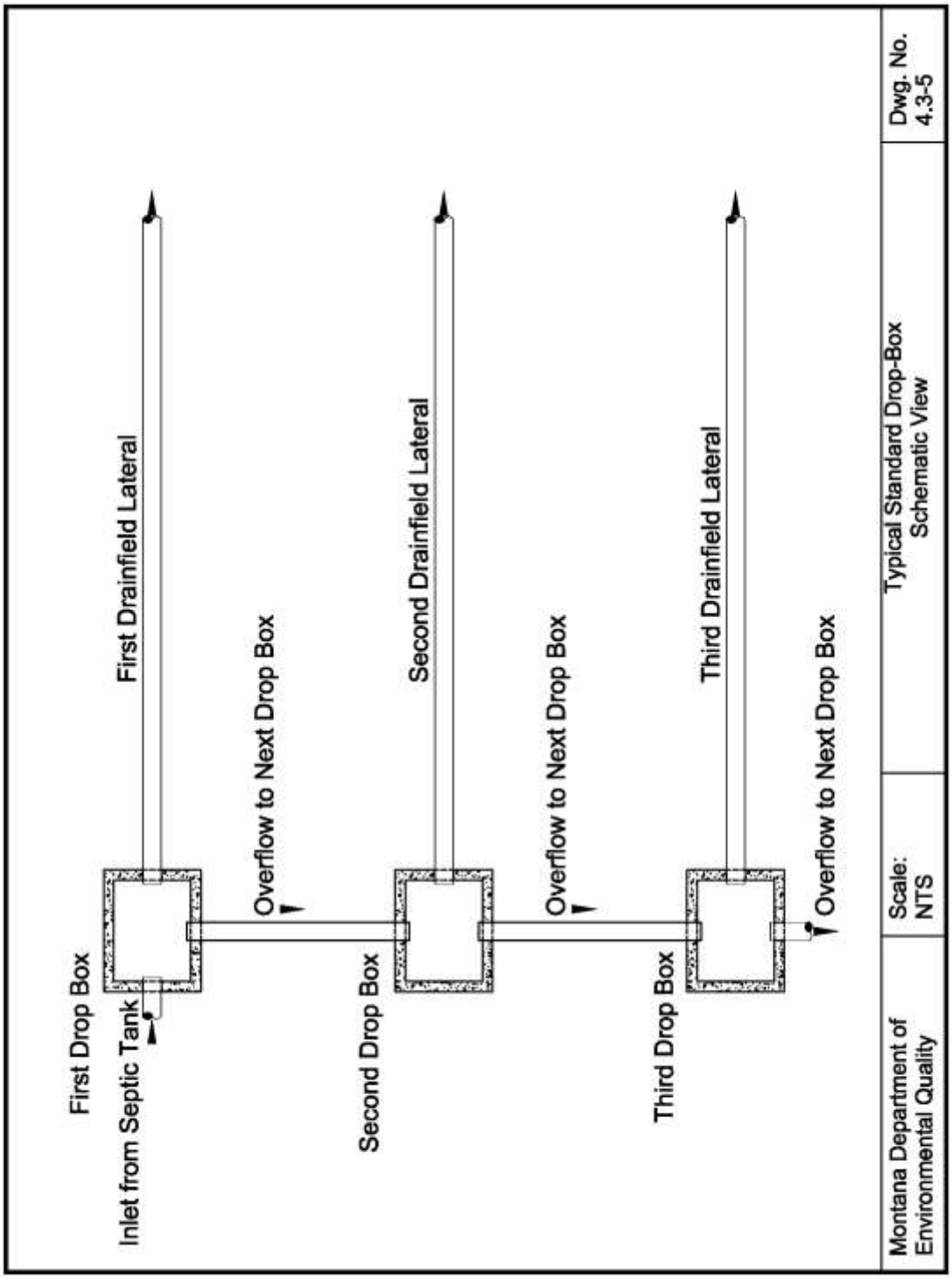
A. Be set level and bedded to prevent settling;
B. If constructed using concrete, the concrete must meet the same requirements as concrete for septic tanks in Subsection 5.1.7.1. Minimum wall, floor, and lid thickness for concrete drop boxes must be 2 inches; and
C. Have an access for inspection provided either through a riser or be marked with iron or a suitable, durable marker.


Outlets to Drainfield
Outlet to Drainfield
Outlets to Drainfield
Inlet from Septic Tank
Montana Department of Environmental Quality
Scale: NTS
Typical Standard D-Box Plan View
Dwg. No. 4.3-1


Outlet
Inlet
4"
12" cover min
5"
12" gravel
Montana Department of Environmental Quality
Scale: NTS
Typical Standard D-Box Center Section View
Dwg. No. 4.3-2


Outlet to First
Drainfield Lateral
Inlet from
Septic Tank
Outlet to Next Drop Box
Montana Department of
Environmental Quality
Scale:
NTS
Typical Standard Drop-Box
Plan View
Dwg. No.
4.3-3


Outlet to First Drainfield Lateral
12" cover min
Inlet
12" gravel
Overflow is Outlet to Next Drop Box
Montana Department of Environmental Quality
Scale: NTS
Typical Standard Drop-Box Center Section View
Dwg. No. 4.3-4


First Drainfield Lateral
Second Drainfield Lateral
Third Drainfield Lateral
Overflow to Next Drop Box
Overflow to Next Drop Box
Overflow to Next Drop Box
First Drop Box
Inlet from Septic Tank
Second Drop Box
Third Drop Box
Montana Department of Environmental Quality
Scale: NTS
Typical Standard Drop-Box Schematic View
Dwg. No. 4.3-5

5. PRIMARY TREATMENT

5.1. SEPTIC TANKS

5.1.1 General

All wastewater must discharge into a septic tank unless otherwise specifically provided in this Circular.

Roof, footing, garage, surface water drainage, and cooling water must be excluded from the septic tank.

The septic tank must be located where it is readily accessible for inspection and maintenance. The bottom of the septic tank should not be deeper than 12 feet from finished grade for ease of pumping and maintenance.

All septic tanks and access ports must have lids. The lids must be of durable construction and be secured with hex screws, lag bolts, locks, or other methods to prevent unauthorized access. Safety basket screens (child catchers) should be installed in all septic tanks.

5.1.2 Design

5.1.2.1. Liquid connection between compartments must consist of a single opening completely across the compartment wall or two or more openings equally spaced across the wall. The total area of openings must be at least three times the area of the inlet pipe.

5.1.2.2. A septic tank must provide an air space above the liquid level, which must be equal to, or greater than, 15 percent of its liquid capacity. Dose tanks do not need to meet the 15 percent air space requirement. Each compartment of the septic tank must be vented back to the inlet pipe.

5.1.2.3. Inspection ports measuring at least 8 inches in diameter must be provided above each inlet and outlet and marked with rebar. An access of at least 1.75 square feet in size must be provided for each compartment. Each access must be extended to within 12 inches of the finished ground surface. Access to the effluent filter must be large enough to maintain the filter and must be extended to the finished ground surface.

5.1.2.4. The nominal length of the septic tank must be at least twice the width (or diameter) of the tank. Dose tanks are excluded from these length, width, and depth requirements.

5.1.2.5. Septic tanks that have less than, or equal to, a 5,000-gallon liquid capacity must not use depths greater than 78 inches in computing tank capacity.

5.1.2.6. Septic tanks that have a greater than 5,000-gallon liquid capacity must calculate

the maximum liquid depth by dividing the liquid length by a factor of 2.5.

5.1.3. Inlets

5.1.3.1. The inlet into the tank must be at least 4 inches in diameter and enter the tank 3 inches above the liquid level. The inlet connection must be watertight.

5.1.3.2. The inlet of the septic tank and each compartment must be submerged by means of a vented tee or baffle. Tees and baffles must extend below the liquid level to a depth where at least 10 percent of the tank's liquid volume is above the bottom of the tee or baffle.

5.1.3.3. Vented tees or baffles must extend above the liquid level a minimum of 7 inches.

5.1.3.4. Baffle tees must extend horizontally into the tank to the nearest edge of the riser access to facilitate baffle maintenance.

5.1.4. Outlets

5.1.4.1. Outlets must include an effluent filter complying with Section 5.1.5. A combination septic/dosing tank outlet is considered to be in the wall dividing the septic compartment(s) and the dosing compartment. Septic tanks aligned in series require an effluent filter only on the final outlet.

5.1.4.2. The outlet of the tank must be at least 4 inches in diameter. The outlet connection must be watertight.

5.1.4.3. Each compartment of the septic tank must be vented to the atmosphere.

5.1.5. Effluent Filters

5.1.5.1. Effluent filters must be used in all systems, unless the reviewing authority approves another filtering device such as a screened pump vault.

5.1.5.2. All septic tank effluent must pass through the effluent filter. No by-pass capability may be designed into the effluent filter. A high-water alarm should be installed to signal that the filter has clogged and needs maintenance.

5.1.5.3. Effluent filter inlets must be located below the liquid level at a depth where 30 to 40 percent of the tank's liquid volume is above the intake of the filter.

5.1.5.4. The effluent filter must be secured so that inadvertent movement does not take place during operation or maintenance. Filters must be readily accessible to the ground surface and the handle must extend to within 2 inches of the access riser lid to facilitate maintenance.

5.1.5.5. The effluent filter manufacturer must provide documentation that the filter meets

the design standard for effluent filters in ANSI/NSF Standard 46.

5.1.5.6. The effluent filter manufacturer must provide installation and maintenance instructions with each filter. The installer must follow the manufacturer's instructions when installing the filter and must use the manufacturer's recommendations for sizing and application. The installer must provide the owner of the system with a copy of the maintenance instructions.

5.1.6. Sizing of Septic Tanks

5.1.6.1. Minimum Size Requirements

Multiple single compartment tanks may be connected in series to meet minimum capacity requirements. Dose tank or other tank volumes included in the design may not be included in the required septic tank minimum capacity. The reviewing authority may have additional maintenance requirements for tanks connected in series or those systems utilizing grinder pumps.

5.1.6.2. For Residential Flows

A. Residential septic tank capacity must be sized in accordance with the number of bedrooms as described below:

1. For 1 to 3 bedrooms, the minimum capacity is 1,000 gallons per living unit;
2. For 4 to 5 bedrooms, the minimum capacity is 1,500 gallons per living unit;
3. For 6 to 7 bedrooms, the minimum capacity is 2,000 gallons per living unit;
4. For 8 or more bedrooms, the minimum capacity is 2,000 gallons per living unit plus 250 gallons for each bedroom greater than 7 bedrooms (i.e., 8 bedrooms requires a 2,250 gallon tank, 9 bedrooms requires a 2,500 gallon tank).

B. When the number of living units on a single or common septic tank is between 2 and 9, the minimum capacity will be based on the number of living units and corresponding bedrooms as described in Subsection 5.1.6.2.A.

C. When the number of living units on a single or common septic tank is 10 or greater, the septic tank must have a capacity of at least 2.5 times the design flow.

5.1.6.3. For Nonresidential Flows

The minimum acceptable septic tank size is 1,000 gallons for any nonresidential system and must have a minimum tank capacity of 2.5 times the design flow.

5.1.7. Construction

5.1.7.1. Concrete Tanks (cast-in-place tanks and pre-cast tanks)

A. General Requirements

All concrete tanks must comply with Sections 1, 2, 3, 5, and 6 of ASTM C 1227-12 with the following additional requirements:

1. All concrete tanks must be manufactured with ASTM C 150-12 Type I, Type I-II or Type V cement and must be made with sulfate-resistant cement (tricalcium aluminates content of less than 8 percent).
2. All concrete tanks must be watertight. Tanks used for commercial facilities, multiple-user systems, public systems or those with a design flow of 700 gallons per day, or greater, must be tested in place for water tightness using a vacuum test or water pressure test. The reviewing authority or designer may require tanks intended for other uses to be tested. Tanks must be tested using one of the following methods:

    a. Vacuum testing: Seal the empty tank and apply a vacuum to 4 inches (100 mm) mercury. The tank is approved if 90 percent of vacuum is held for 2 minutes; or
    b. Water pressure testing: Seal the tank, fill with water, and let stand for at least 24 hours. Refill the tank. The tank is approvable if it holds water.

3. Repairs of all concrete tanks, when required, must be performed by the manufacturer in a manner ensuring that the repaired structure will conform to the requirements of this Circular.
4. All concrete tank sealants must be flexible, appropriate for use in septic tanks, and must conform to ASTM C 990-09.

B. Pre-cast Concrete Tank Requirements

A set of complete plans stamped by a professional engineer to certify compliance with this Circular must be on file with the tank manufacturer and made available to the reviewing authority upon request. These plans must show maximum depth of bury, all dimensions, capacities, reinforcing, structural calculations, and other such pertinent data for each tank model.

The pre-cast concrete tank manufacturer shall develop manufacturer's recommended installation instructions for each tank model. The manufacturer shall provide a copy of the stamped drawings along with the installation instructions to each tank purchaser.

All pre-cast concrete tanks must be clearly marked within 2 feet of the outlet with the name of the tank manufacturer, tank model, number of gallons, date of manufacture, and maximum depth of bury.

C. Cast-in-Place Concrete Tank Requirements, Certification, and As-builts

A complete set of plans stamped by a professional engineer to certify compliance with this Circular and ACI 318-11 must be provided to the reviewing authority. These plans must show maximum depth of bury, all dimensions, capacities, reinforcing, structural calculations, and other such pertinent data. The approved stamped plans must be given to the tank purchaser. As-built plans and a letter of certification, from a professional engineer, must be submitted to the reviewing authority within 90 days of construction of all cast-in-place concrete tanks.

5.1.7.2. Thermoplastic and Fiberglass Tanks

Thermoplastic and fiberglass septic tanks must be water tight and made of materials resistant to the corrosive environment found in septic tanks.

A set of complete plans stamped by a professional engineer to certify compliance with this Circular and IAPMO/ANSI Z1000-07 must be on file with the tank manufacturer and made available to the reviewing authority upon request. These plans must show maximum depth of bury, all dimensions, capacities, reinforcing, structural calculations, and other such pertinent data for each tank model.

The thermoplastic and fiberglass tank manufacturer shall develop manufacturer's recommended installation instructions for each tank model. The manufacturer shall provide a copy of the stamped drawings along with the installation instructions to each tank purchaser.

All thermoplastic and fiberglass tanks must be clearly marked near the outlet or on the top surface of the tank with the name of the tank manufacturer, tank model, number of gallons, date of manufacture, and maximum depth of bury.

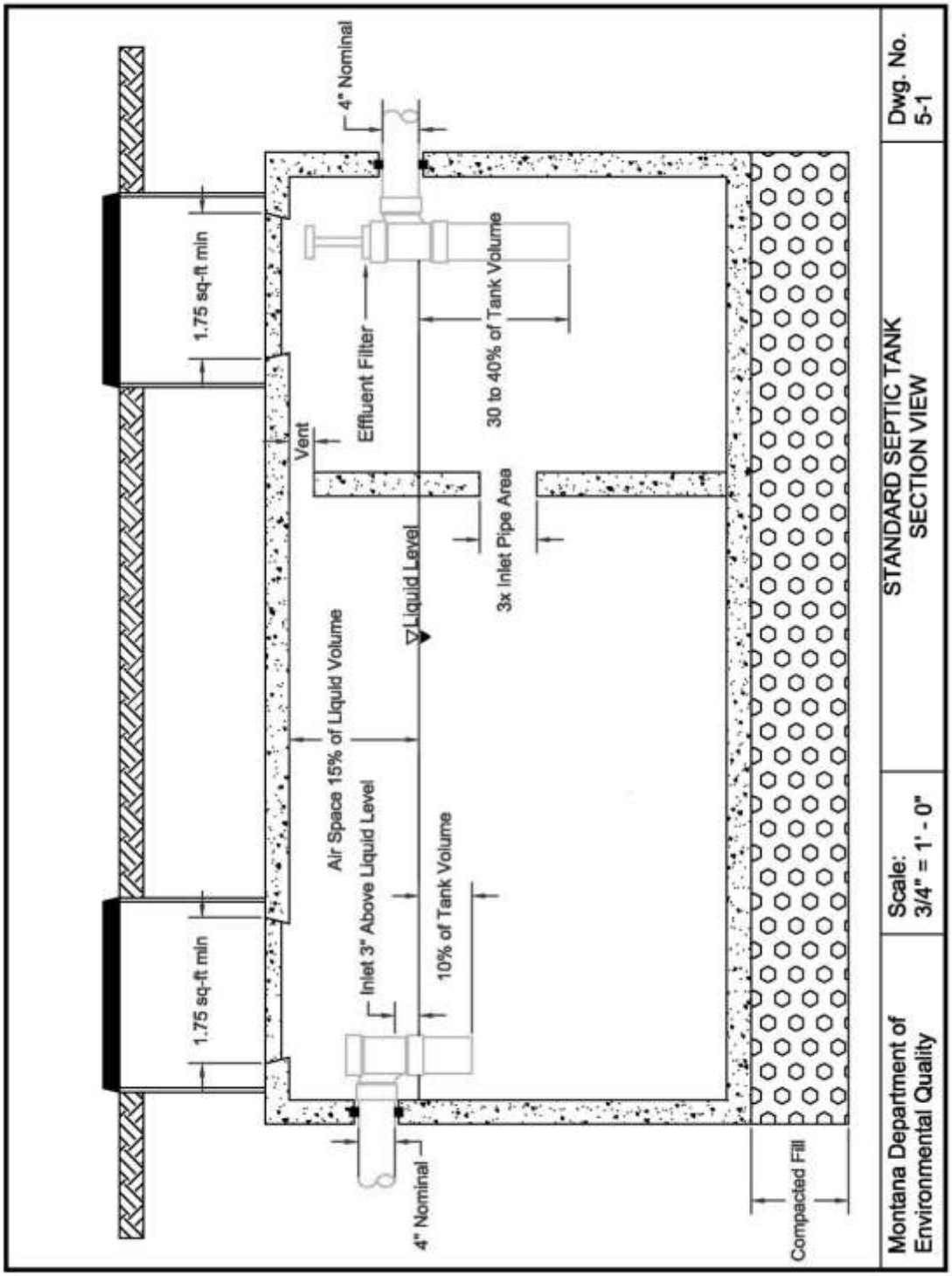
Tanks used for commercial facilities, multiple-user systems, public systems, or those with a design flow of 700 gpd or greater must be tested in place for water tightness. The reviewing authority may require tanks intended for other uses to be tested. For pressure testing a fiberglass or thermoplastic tank, all inlets, outlets, and access ports must be sealed and adequately secured. The tank must be charged with 5 pound-force per square inch gauge (psig) for a tank less than 12 feet in diameter or 3 psig for a tank 12 feet or larger in diameter. The tank pressure must be allowed to stabilize and the air supply must be disconnected. If there is any noticeable pressure drop in 1 hour, the tank must be rejected or repaired. After repair, the test must be repeated. Air must be carefully released through an appropriate valve mechanism.

5.1.8. Installation

All septic tanks must be installed per the manufacturer's recommendations.

5.1.9. Maintenance

Owners of septic systems should follow the septic tank maintenance recommendations published by Montana State University Extension Service, which are available through Montana County Extension Service offices located in each county. Two of these publications are *Septic Tank and Drainfield Operation* and *Maintenance and Septic System Inspection and Troubleshooting*. Those who own systems with siphons, pumps, or controls should carefully adhere to manufacturer's recommendations for operation and maintenance and seek guidance from the county extension service or local health department.


4" Nominal
1.75 sq-ft min
1.75 sq-ft min
Effluent Filter
30 to 40% of Tank Volume
Vent
Liquid Level
3x Inlet Pipe Area
Air Space 15% of Liquid Volume
Inlet 3" Above Liquid Level
10% of Tank Volume
4" Nominal
Compacted Fill
Montana Department of Environmental Quality
Scale: 3/4" = 1' - 0"
STANDARD SEPTIC TANK
SECTION VIEW
Dwg. No. 5-1

6. SOIL ABSORPTION SYSTEMS

6.1. STANDARD ABSORPTION TRENCHES

6.1.1. General

The satisfactory operation of the wastewater treatment system is largely dependent upon wastewater quality, proper site selection, and the design and construction of absorption trenches.

All new and replacement absorption systems must be designed to accept and treat residential strength waste. High strength wastewater or water treatment waste residuals must comply with Subchapters 3.2 and 3.3 of this Circular.

6.1.2. Location

Absorption trenches must meet the location criteria in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

All absorption trenches must meet the site requirements of Chapter 2.

6.1.3. Trench Design

6.1.3.1. The minimum area in any absorption trench system must be based upon the flow, as determined in Chapter 3 and sized by the soil type and percolation rate if percolation testing is required by the reviewing authority, whichever results in a larger absorption system, in accordance with Chapter 2, Section 6.1.4, and Appendix B. The reviewing authority may require a percolation test when the soils are variable or other conditions create the need to verify trench sizing.

6.1.3.2. An area that can be used as a replacement area for the original absorption trench system must be designated. Interim use of the area must be compatible with future absorption system use. The replacement area should be located separately from the primary area and must not be interlaced within the primary area.

6.1.3.3. Gravity-fed and gravity-dosed absorption trenches must be separated by at least 5 feet between trench walls. Pressure dosed absorption trenches must be separated by at least 4 feet between trench walls. Absorption trenches, utilizing proprietary design configurations, with effluent meeting NSF 40 criteria for 30 mg/L BOD_5 and 30 mg/L TSS, may have trench separation distances that meet manufacturer recommendations.

6.1.3.4. Gravity-fed and gravity-dosed absorption trenches must be at least 18 inches wide, but, for purposes of sizing, any width greater than 24 inches wide will not be considered. Systems utilizing pressure distribution may have absorption trenches 36 inches wide.

6.1.3.5. The bottom of the absorption trenches must be at least 24 inches and no more than 36 inches below the natural ground surface. There must be a minimum of 12 inches of soil or fill material above the drain rock.

6.1.3.6. Gravity-fed absorption trenches may not exceed 100 feet in length from where effluent is first applied to the soil. Gravity-fed absorption trenches may be connected through a manifold to accommodate serial configurations. If more than 500 lineal feet, or 1000 square feet, of absorption area, calculated before applying any reductions, is needed, then pressure distribution must be provided.

6.1.4. Sizing of the Absorption System

6.1.4.1. Application rates and absorption system length used for sizing onsite wastewater absorption systems can be determined using soil descriptions in accordance with Chapter 2, Appendix B, and the formula in Subsection 6.1.4.2. Comparison of the soil profile descriptions, at or near the depth of the infiltrative surface, percolation rate, if conducted, and USDA soils report must be submitted for review. If the submitted information shows a variable application rate, additional site-specific information may be required by the reviewing authority.

6.1.4.2. Absorption system sizing must be determined using the following formula:

The total square feet of the absorption system area is determined using the design wastewater flow rates from Chapter 3 (gpd) divided by the application rate in Section 2.1.7, Table 2.1-1 (gpd/ ft^2).

Total trench length is calculated by dividing the total square feet of the absorption system area by the trench width.

6.1.4.3. Systems that provide documentation or demonstrate, through a third independent party, that the unit is able to meet the testing criteria and performance requirements for NSF Standard No. 40 for Class 1 certification, or meet the testing requirements outlined in ARM 17.30.718 for 30 mg/L BOD_5 and 30 mg/L TSS, only, may utilize a reduced absorption area in accordance with the following criteria:

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi, as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

A full-sized separate subsurface absorption replacement area, sized without reduction, must be designated for each site.

Further reductions in subsurface absorption system sizing, beyond those listed in this subsection, are not permissible.

6.1.5. Construction

6.1.5.1. Gravity-fed and gravity-dosed absorption field distribution pipes and trench bottoms must be level. Pressure-dosed distribution pipes in an absorption system or sand filter must be level, unless a hydraulic analysis indicates uniform distribution of effluent will occur with a sloped line.

6.1.5.2. When the trenches have been excavated, the sides and bottom must be raked to scarify any smeared soil surfaces. Construction equipment, unless needed to construct the system, should be kept off the area to be utilized for the absorption trench system to prevent undesirable compaction of the soils. Construction must not be initiated when the soil moisture content is high.

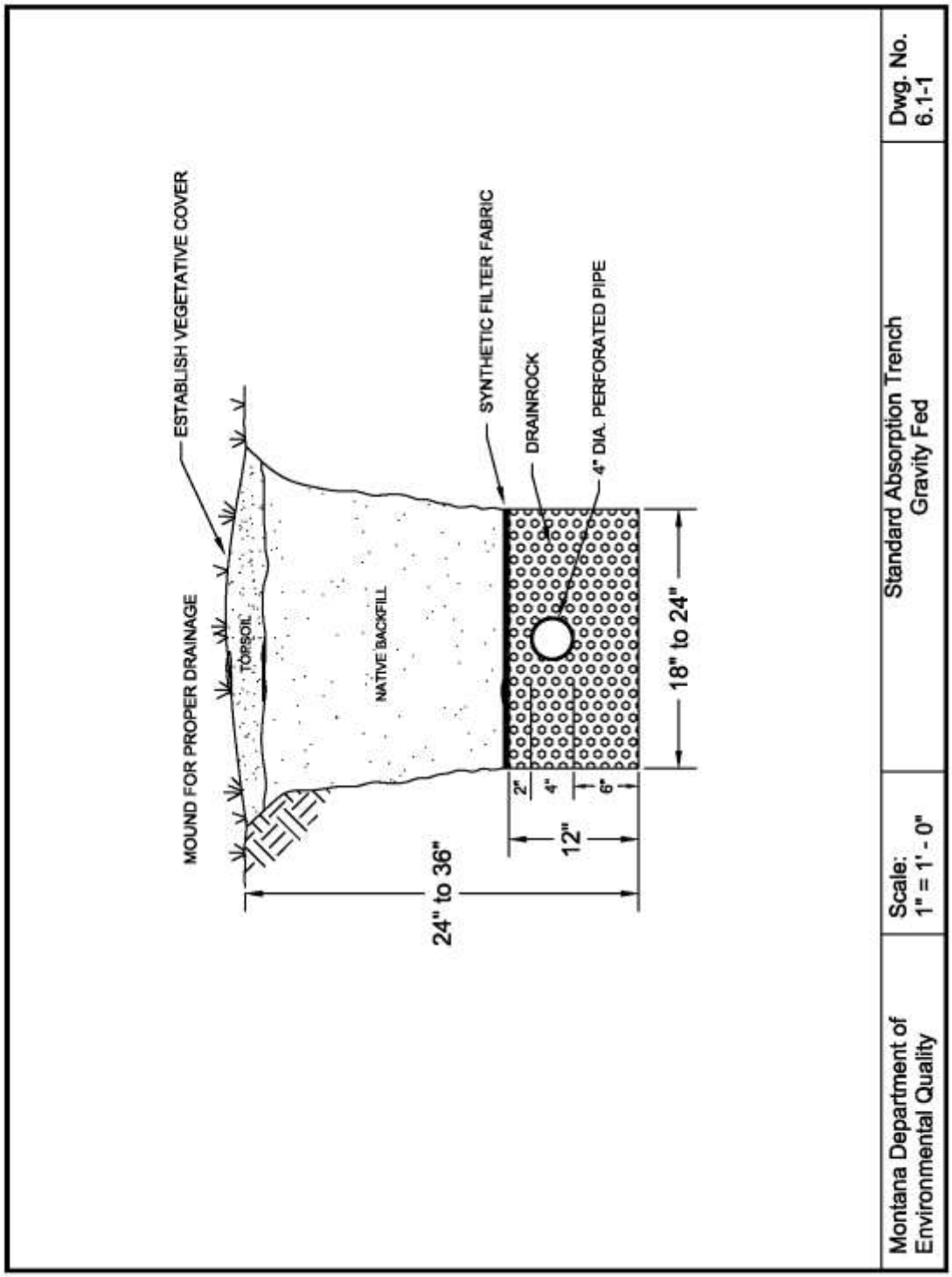
Note: If a sample of soil within the working depth can be easily rolled into the shape of a wire or ribbon, the soil moisture content is too high for construction purposes.

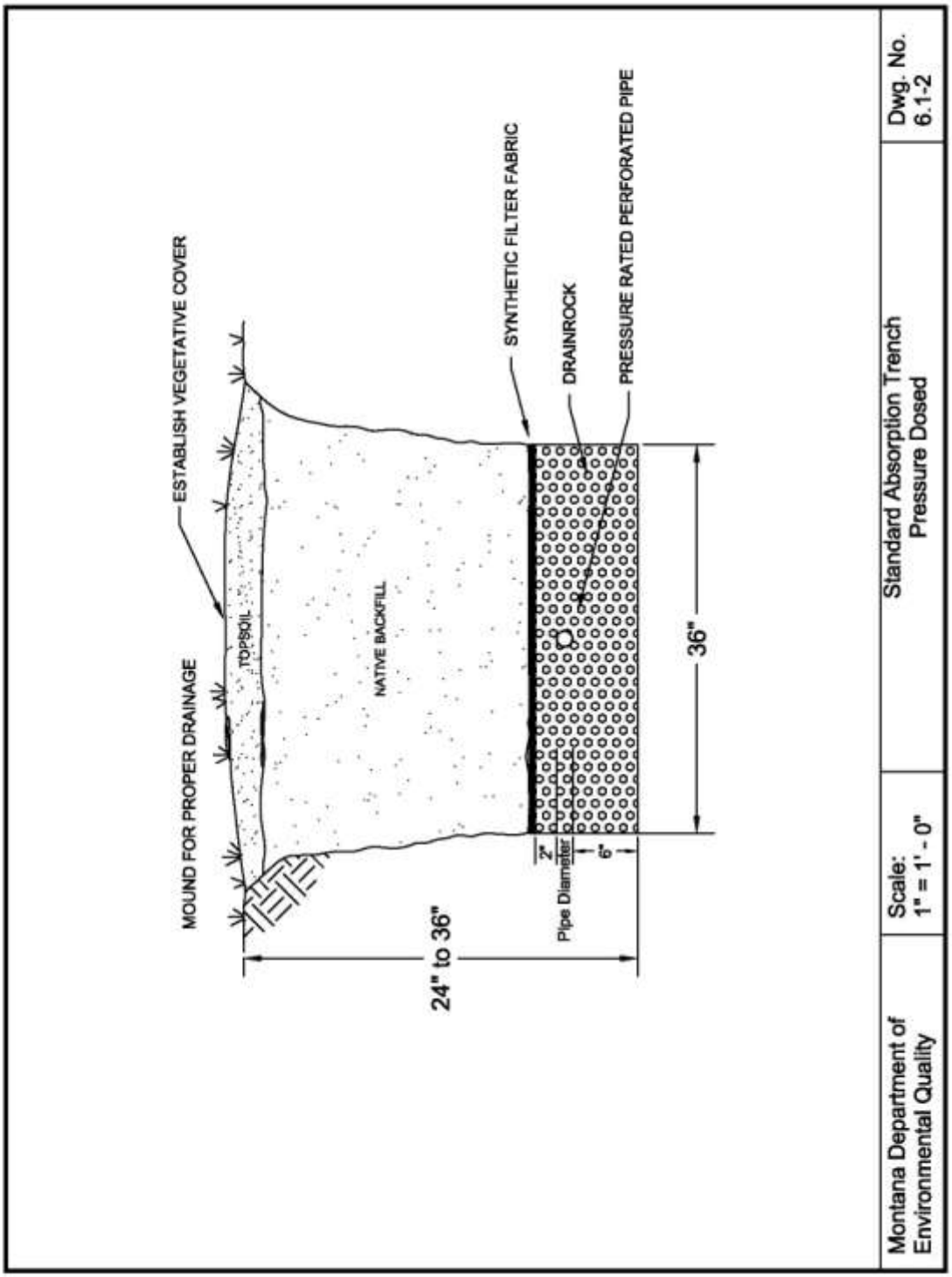
6.1.5.3. At least 6 inches of drain rock meeting the requirements of Section 1.2.25 must be placed in the bottom of the trench.

6.1.5.4. The distribution pipe must be covered with at least 2 inches of drain rock meeting the requirements of Section 1.2.25. An appropriate geotextile fabric, untreated building paper, or straw must be placed over the drain rock and covered with a minimum of 1 foot of soil or fill.

6.1.5.5. The ends of the distribution pipes must be capped or plugged.

6.1.5.6. Gravelless trenches and other absorption systems may be used in place of distribution pipe and drain rock in accordance with Subchapter 6.6.


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
4" DIA. PERFORATED PIPE
2"
4"
6"
12"
18" to 24"
24" to 36"
Montana Department of Environmental Quality
Scale: 1" = 1' - 0"
Standard Absorption Trench Gravity Fed
Dwg. No. 6.1-1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MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
36"
2"
Pipe Diameter
6"
24" to 36"
Montana Department of Environmental Quality
Scale: 1" = 1' - 0"
Standard Absorption Trench
Pressure Dosed
Dwg. No. 6.1-2

6.2. SHALLOW-CAPPED ABSORPTION TRENCHES

6.2.1. General

A shallow-capped absorption trench is used to maintain a 4-foot natural soil separation between the bottom of the infiltrative surface and a limiting layer and/or to increase vertical separation distances in porous soils. Shallow-capped absorption trenches must meet the same requirements as a standard absorption trench, Subchapter 6.1, and, if applicable, gravelless and other absorption system methods, Subchapter 6.5, except where specifically modified in this subchapter.

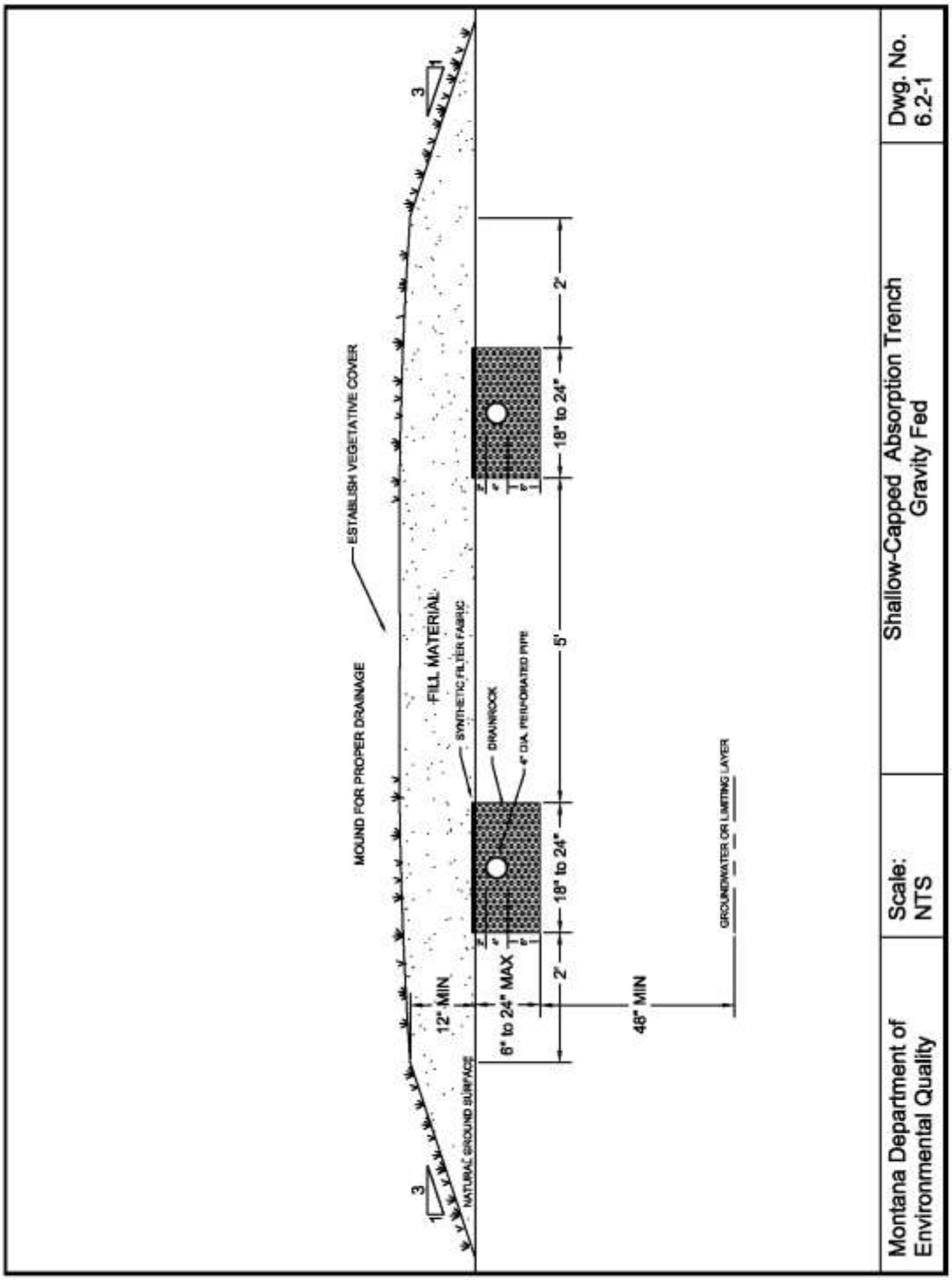
6.2.2. Design

Shallow-capped absorption trenches must be 6 to 24 inches below the natural ground.

6.2.3. Construction

6.2.3.1. Shallow-capped absorption trench systems require a cap of topsoil material a minimum of 12 inches deep. This cap must be loamy sand or sandy loam and must extend 2 feet beyond the edges of the required absorption area before the sides are shaped to a 3 horizontal to 1 vertical or lesser slope. The cap must be sloped to provide positive drainage away from the center of the absorption system. The entire mound must be seeded, sodded, or otherwise provided with shallow-rooted vegetative cover to ensure stability of the installation.

6.2.3.2. If gravelless or other absorption systems are used, depth of bury must be in accordance with manufacturer's recommendations but the top of the chamber or other manufactured distribution device must be no higher than the level of the natural ground.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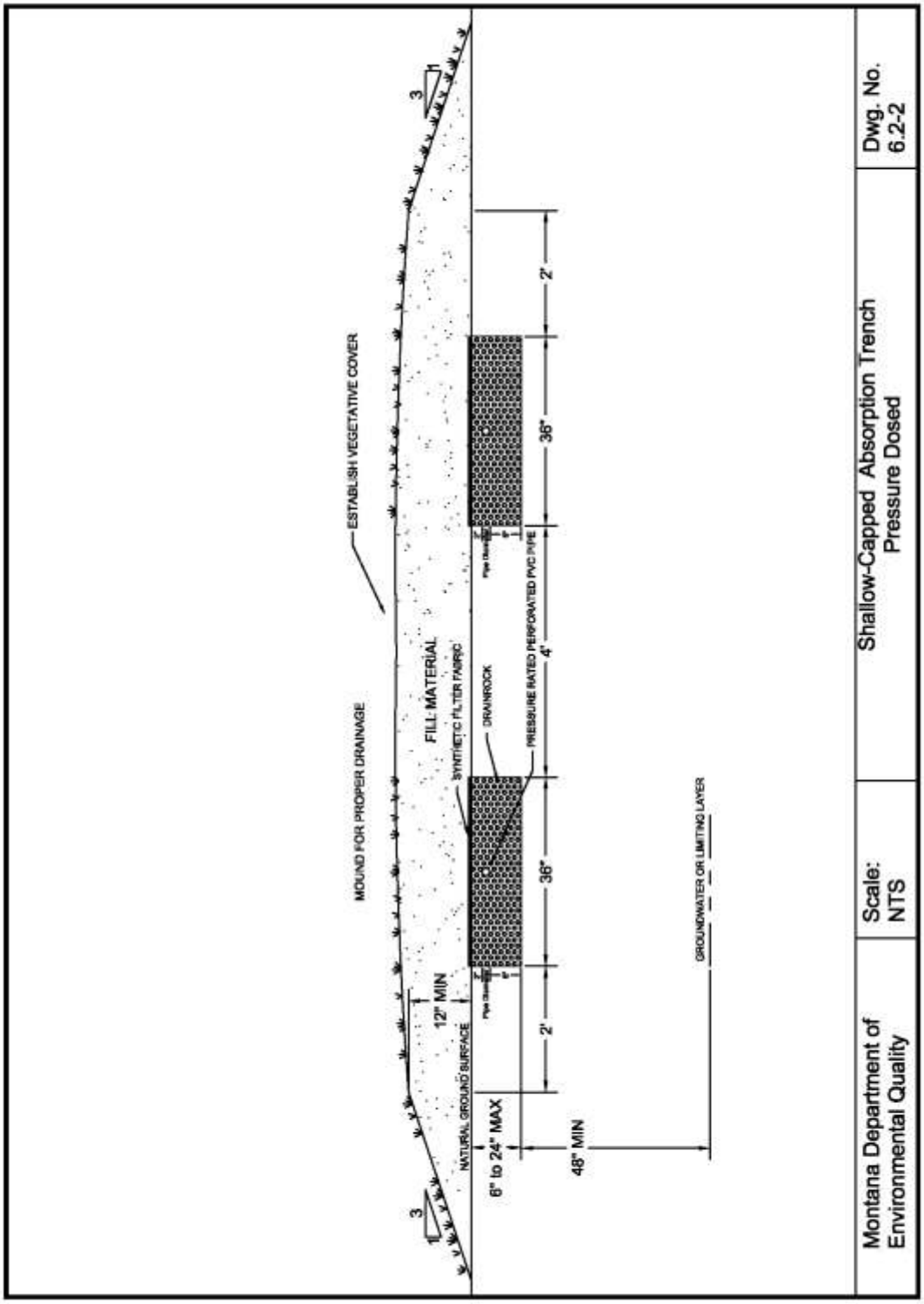
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
SYNTHETIC FILTER FABRIC
DRAINROCK
4" DIA. PERFORATED PIPE
NATURAL GROUND SURFACE
GROUNDWATER OR LIMITING LAYER
12" MIN
6" to 24" MAX
2'
18" to 24"
5'
2'
18" to 24"
2'
48" MIN
3
1
3
1
Montana Department of Environmental Quality
Scale: NTS
Shallow-Capped Absorption Trench
Gravity Fed
Dwg. No. 6.2-1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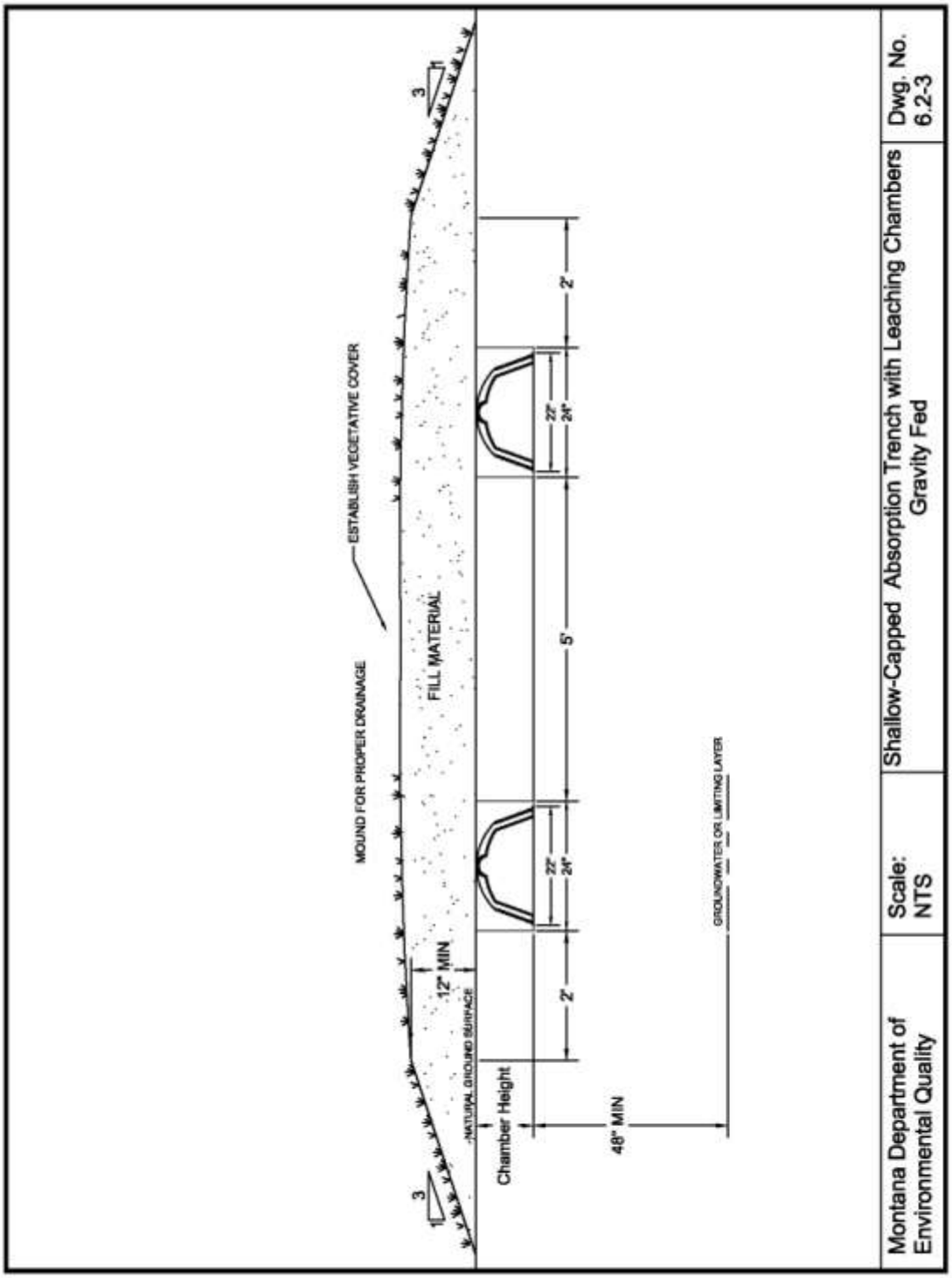
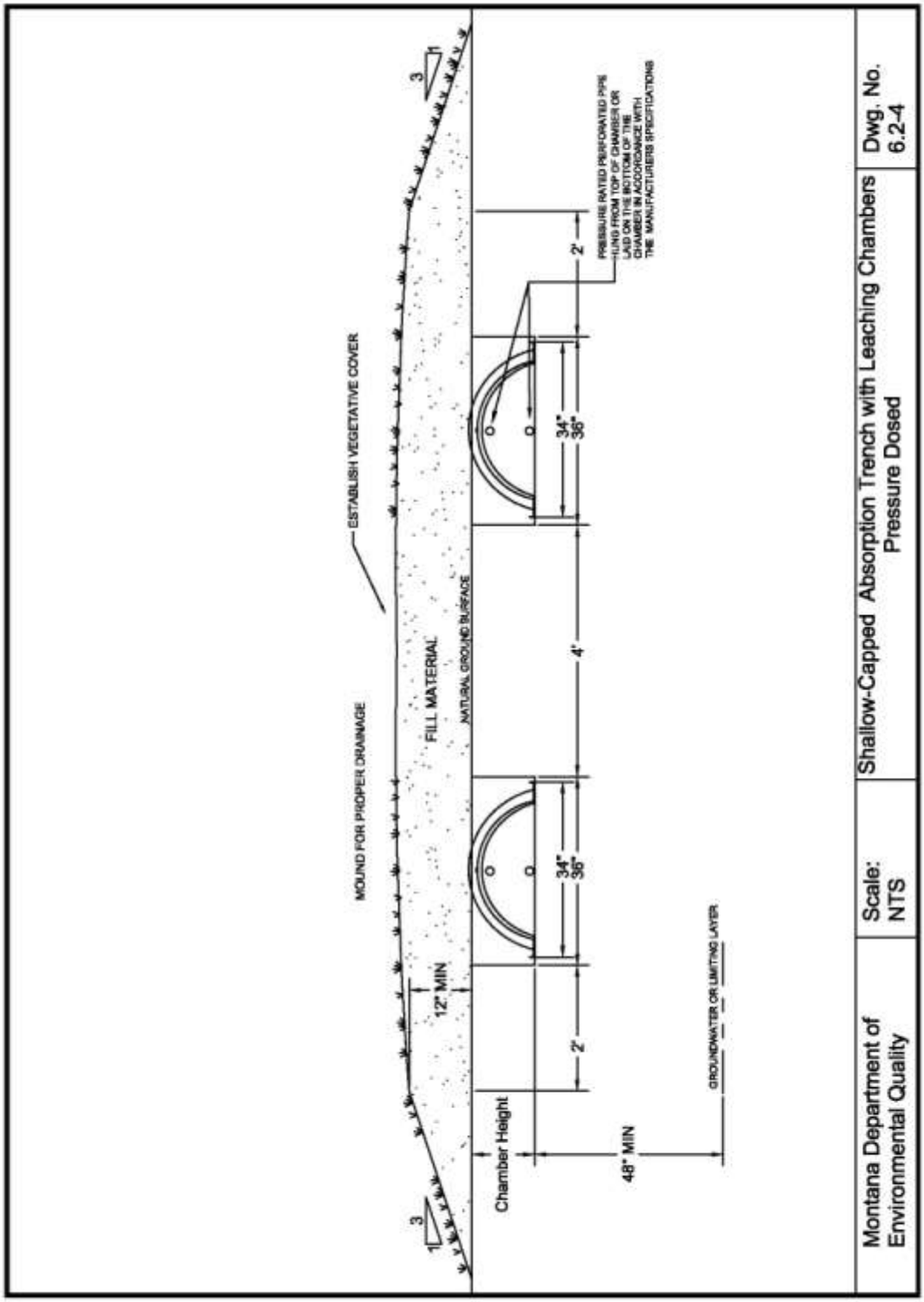
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PVC PIPE
NATURAL GROUND SURFACE
12" MIN
6" to 24" MAX
48" MIN
2'
36"
4"
36"
2'
GROUNDWATER OR LIMITING LAYER
3
1
Montana Department of Environmental Quality
Scale: NTS
Shallow-Capped Absorption Trench Pressure Dosed
Dwg. No. 6.2-2


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
12" MIN
NATURAL GROUND SURFACE
3
1
3
1
Chamber Height
2'
22"
24"
5'
22"
24"
2'
48" MIN
GROUNDWATER OR LIMITING LAYER
Montana Department of Environmental Quality
Scale: NTS
Shallow-Capped Absorption Trench with Leaching Chambers Gravity Fed
Dwg. No. 6.2-3


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
NATURAL GROUND SURFACE
12" MIN
3
1
3
1
Chamber Height
48" MIN
GROUNDWATER OR LIMITING LAYER
2'
34"
36"
4'
2'
34"
36"
PRESSURE RATED PERFORATED PIPE
LAID ON THE BOTTOM OF THE
CHAMBER IN ACCORDANCE WITH
THE MANUFACTURERS SPECIFICATIONS
Montana Department of Environmental Quality
Scale: NTS
Shallow-Capped Absorption Trench with Leaching Chambers Pressure Dosed
Dwg. No. 6.2-4

6.3. AT-GRADE ABSORPTION TRENCHES

6.3.1. General

At-grade systems may be used only for residential strength wastewater. At-grade systems must not be installed on land with a slope greater than 6 percent or where the percolation rate is slower than 40 mpi.

6.3.2. Effective Area

The effective area is that area which is available to accept effluent. Effective length of the absorption area is the actual length of the trench, which cannot exceed the length of the pipe by more than one-half the orifice spacing. The effective width is the actual width of the washed rock below the distribution pipe, not to exceed 3 feet for each pipe.

The effective area must be 1.5 times the area required for a standard absorption trench, as described in Section 6.1.4. Percolation tests must be conducted at a depth of not more than 12 inches below ground surface.

Pressure distribution is required for at-grade systems.

6.3.3. Construction

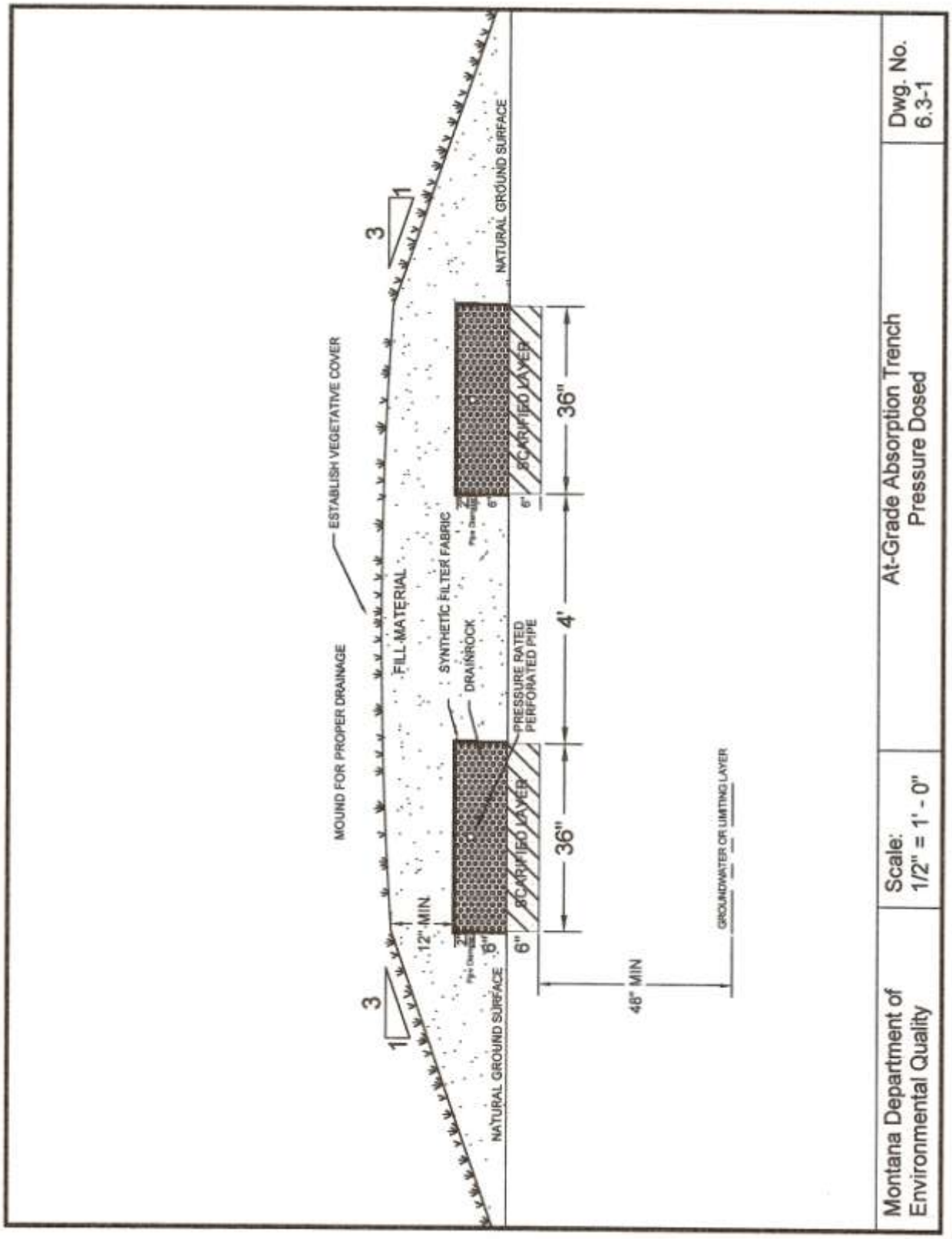
The ground surface where the system is to be placed must be plowed, scarified, or trenched less than 12 inches in depth. Trenching is preferred to plowing or scarifying to prevent horizontal migration of the effluent. There must be at least four feet of natural soil between the scarified layer and ground water or other limiting layer. The absorption trench is constructed by placing drain rock meeting the requirements of Section 1.2.25 on the scarified ground, with a minimum width of 24 inches at the bottom of the distribution pipe. A minimum of 6 inches of drain rock meeting the requirements of Section 1.2.25 must be placed under the distribution pipe and a minimum of 2 inches of drain rock meeting the requirements of Section 1.2.25 must be placed over the distribution pipe. If gravelless or other absorption systems are used, depth of bury must be in accordance with manufacturer's recommendations.

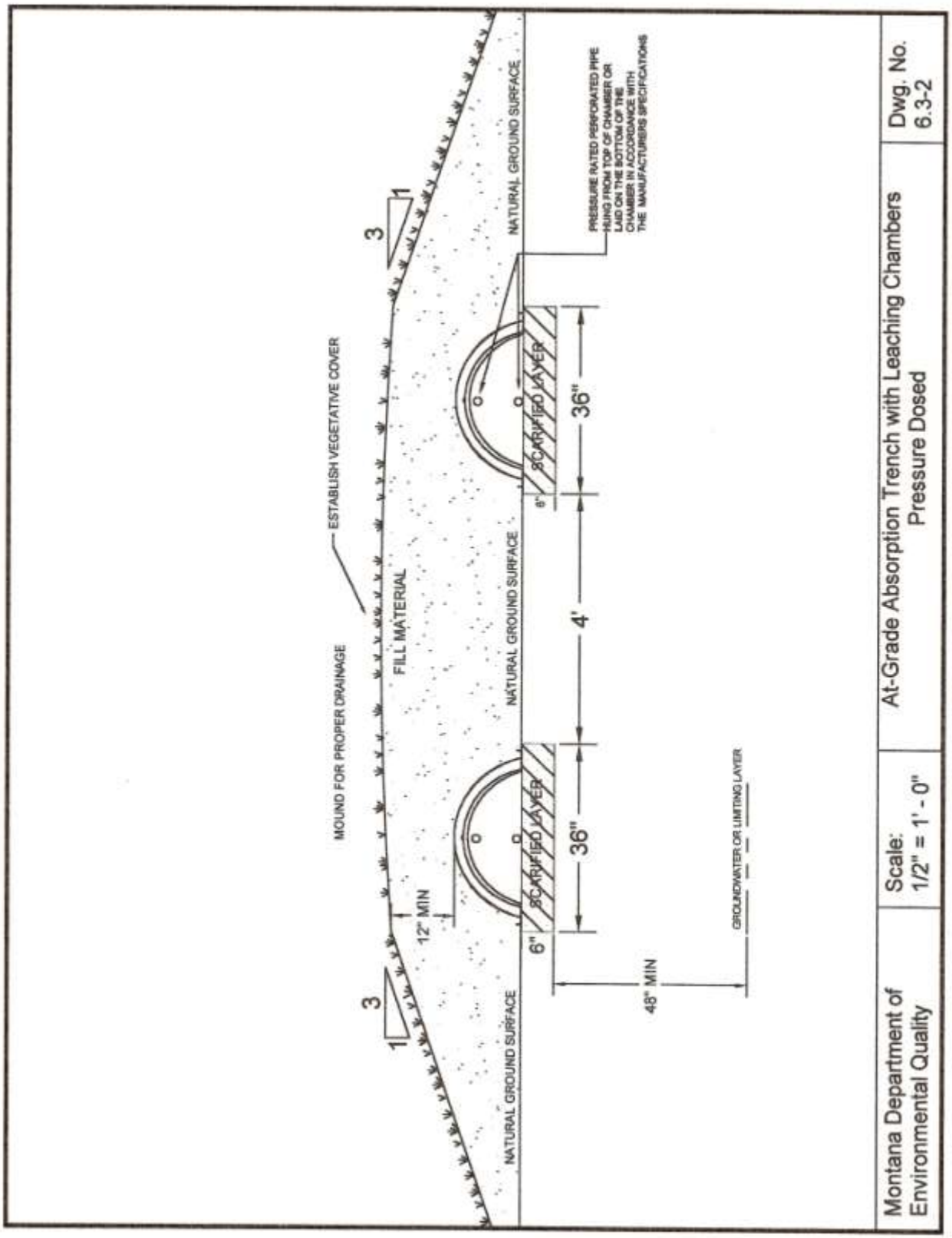
An appropriate geotextile fabric, untreated building paper, or straw must be placed over the drain rock and covered with approximately 1 foot of soil.

The fill over the distribution pipe must extend on all sides at least 5 feet beyond the edge of the aggregate below the distribution pipe.

Construction equipment which would cause undesirable compaction of the soils must not be moved across the plowed surface or the effluent disposal area. Construction and/or plowing must not be initiated when the soil moisture content is high.

Note: If a sample of soil within the working depth can be easily rolled into the shape of a wire or ribbon, the soil moisture content is too high for construction purposes.


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
SCARIFIED LAYER
NATURAL GROUND SURFACE
12" MIN
6"
36"
4'
48" MIN
GROUNDWATER OR LIMITING LAYER
3
1
Montana Department of Environmental Quality
Scale: 1/2" = 1' - 0"
At-Grade Absorption Trench
Pressure Dosed
Dwg. No. 6.3-1


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
NATURAL GROUND SURFACE
NATURAL GROUND SURFACE
NATURAL GROUND SURFACE
3
1
3
1
12" MIN
6"
8"
SCARIFIED LAYER
SCARIFIED LAYER
36"
36"
4'
48" MIN
GROUNDWATER OR LIMITING LAYER
PRESSURE RATED PERFORATED PIPE HUNG FROM TOP OF CHAMBER OR LAID ON THE BOTTOM OF THE CHAMBER IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS
Montana Department of Environmental Quality
Scale: 1/2" = 1' - 0"
At-Grade Absorption Trench with Leaching Chambers Pressure Dosed
Dwg. No. 6.3-2

6.4. DEEP ABSORPTION TRENCHES

6.4.1. General

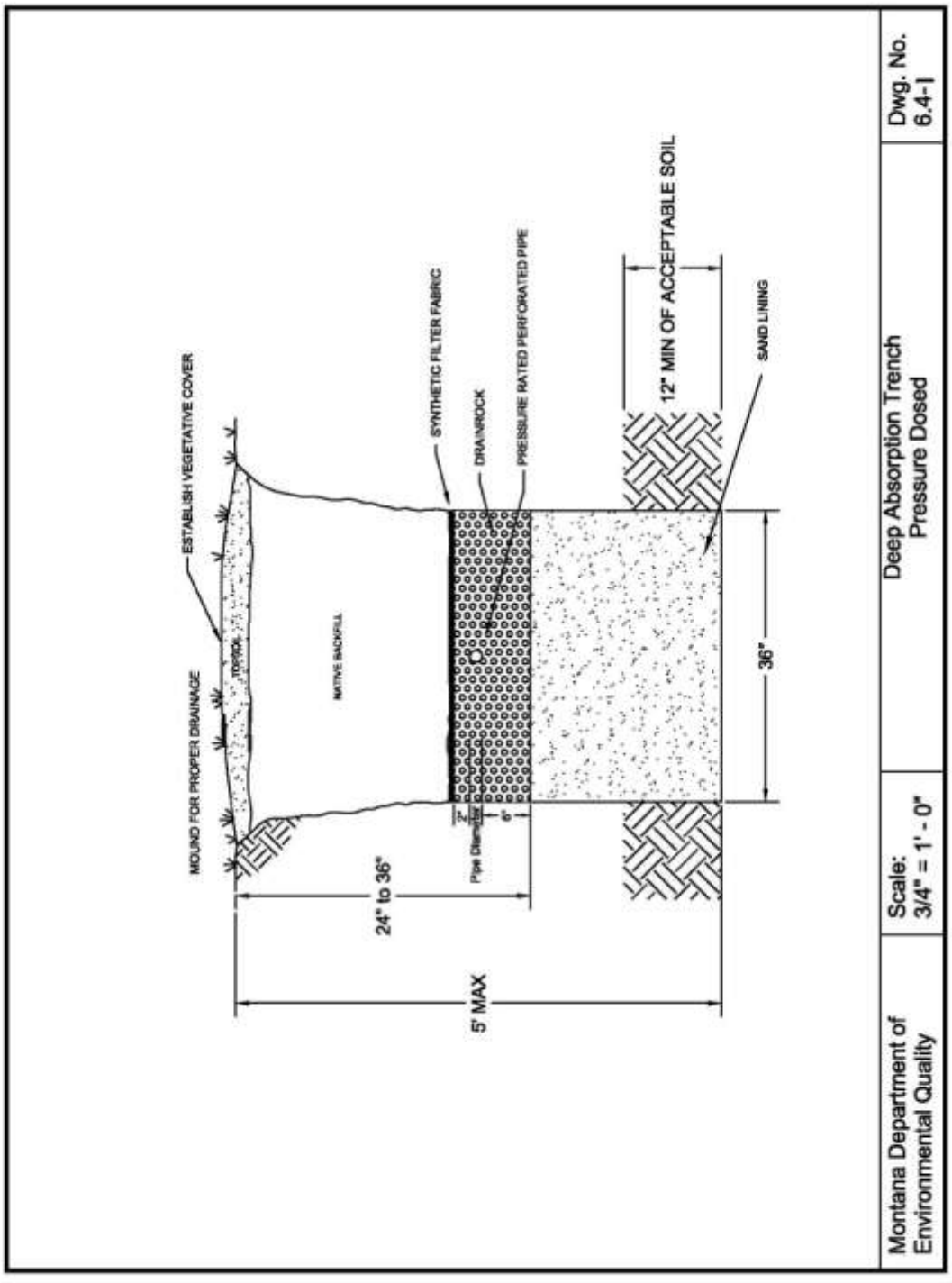
Deep absorption trenches are systems that have trenches excavated through a less permeable soil layer to allow effluent to infiltrate into a deeper and more permeable soil. The trench is then backfilled with a sandy soil to the depth of a standard absorption trench, 24 to 36 inches below natural ground surface. The bottom of the deep absorption trench must not be more than 5 feet below natural ground surface. Pressure distribution is required for all deep absorption trenches. Deep absorption trenches must meet the same requirements as a standard absorption trench as described in Subchapter 6.1, except where specifically modified in this chapter.

6.4.2. Site Evaluation

The site evaluation as outlined in Chapter 2 must also include soil profile descriptions of at least 2 soil observation pits excavated to a minimum depth of 4 feet below the proposed deep absorption trench bottom.

6.4.3. Construction

The deep trench must be excavated 1 foot into the acceptable soil and backfilled with medium sand, with no more than 3 percent finer than the No. 100 sieve, or other approved material to the level of a standard absorption trench. The system must be sized based on the most conservative application rate when comparing the deep trench infiltrative surface or the backfill sand.


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
12" MIN OF ACCEPTABLE SOIL
SAND LINING
36"
24" to 36"
Pipe Diameter
6"
5' MAX
Montana Department of Environmental Quality
Scale: 3/4" = 1' - 0"
Deep Absorption Trench
Pressure Dosed
Dwg. No. 6.4-1

6.5. SAND-LINED ABSORPTION TRENCHES

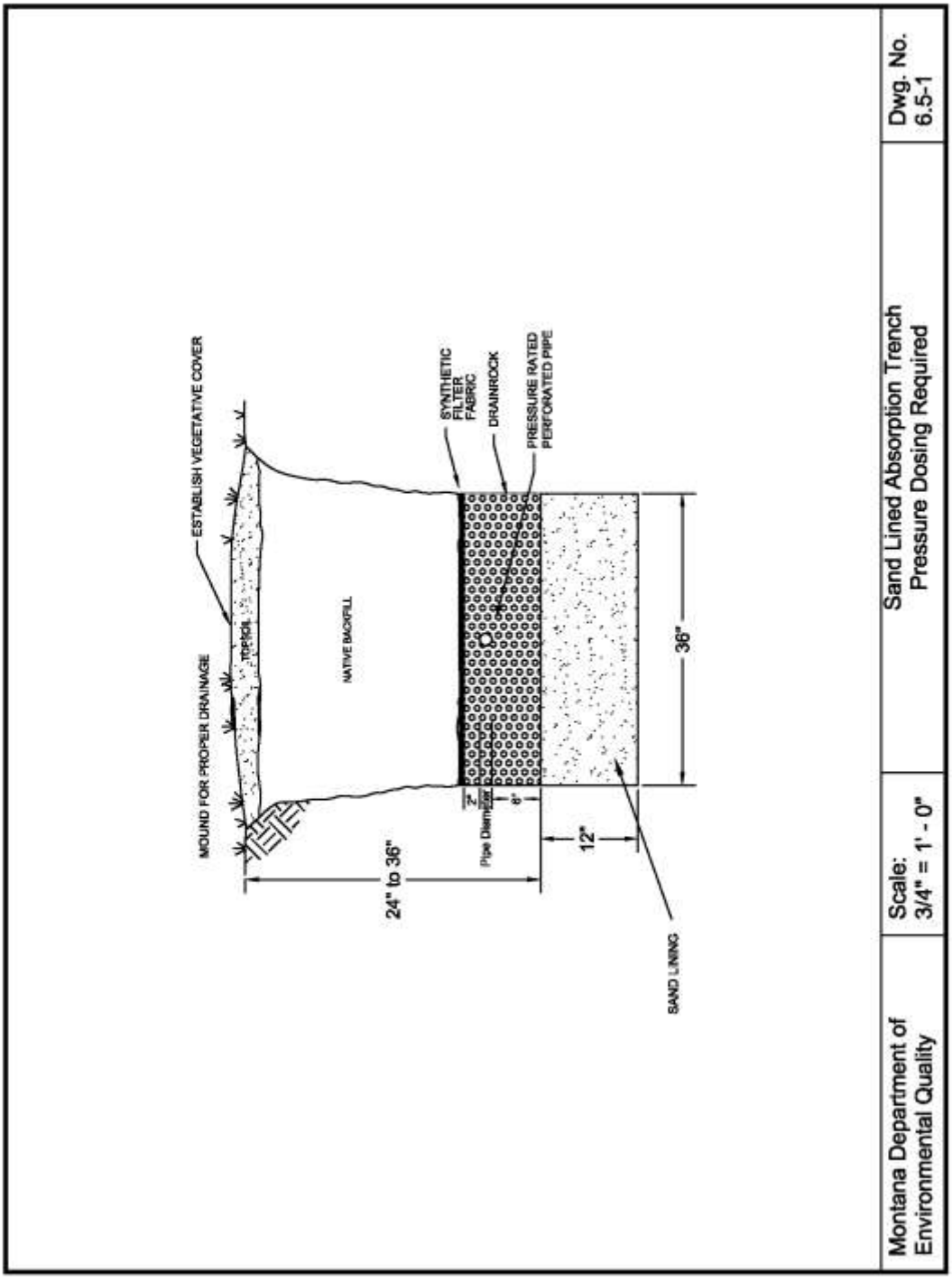
6.5.1. General

Sand-lined absorption trenches are used for rapid permeability situations. The trench below the drain rock is lined with sand to provide additional treatment. Sand-lined absorption trenches must meet the same requirements as a standard absorption trench as described in Subchapter 6.1, except where specifically modified in this chapter.

6.5.2. Design

Trenches must be lined with a minimum of 12 inches of fine to medium sand or loamy sand below the constructed absorption system. The system is to be sized in accordance with Section 6.1.4 using the most conservative application rate when comparing the natural soils and the sand used for lining the trench.

Pressure distribution must be provided for all sand-lined absorption trenches.


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
2"
Pipe Diameter
6"
24" to 36"
12"
36"
SAND LINING
Montana Department of Environmental Quality
Scale: 3/4" = 1' - 0"
Sand Lined Absorption Trench
Pressure Dosing Required
Dwg. No. 6.5-1

6.6. GRAVELLESS TRENCHES AND OTHER ABSORPTION METHODS

6.6.1. General

Gravelless trenches and other absorption systems include infiltration or leaching chambers and other wastewater distribution systems (single and multiple pipes, gravel substitutes, geo-composites, etc.). The purpose of these gravelless systems is to meet or exceed the characteristics, function, and performance of gravel in conventional gravel-filled absorption systems. Gravelless trenches and other absorption systems must meet the same requirements as a standard absorption trench as described in Subchapter 6.1, except where specifically modified in this chapter.

Gravelless trenches and other absorption systems may be used in lieu of pipe and drain rock for standard absorption trenches, deep absorption trenches, sand-lined absorption trenches, intermittent sand filters, recirculating sand filters, evapotranspiration systems, evapotranspiration absorption systems, sand mounds, and absorption beds.

Pressure dosed gravelless or other absorption systems must meet the design requirements of Subchapter 4.3.

Gravelless or other absorption systems must be installed according to the manufacturer's requirements and specifications. Specific absorption bed siting and minimum sizing requirements of this Circular override manufacturer's recommendations.

6.6.2. Leaching Chambers

6.6.2.1. Distribution Materials

A. Leaching chambers are chambers with an open bottom structurally designed to carry the earth loading.
B. Leaching chambers must be constructed of high-density polyolefin or other approved material and must comply with IAPMO PS 63-2005. Evidence that the chamber construction complies with these requirements must be made available to the reviewing authority upon request.

6.6.2.2. Design

The maximum trench width for leaching chambers is 36 inches. Pressure distribution must be provided for all trenches greater than 24 inches wide.

6.6.2.3. Construction

The total bottom area of the trench will be used to calculate the infiltration area. The absorption system size in square footage as described in Subchapter 6.1.**4** may be reduced in size by 25 percent when using infiltration or leaching chambers. Chambers that are 15 inches in width will be equal to an 18-inch trench width, a 22-inch width chamber will be equal to a 24-inch trench width, and a 34-inch width chamber will be equal to a 36-inch

trench width for calculating absorption system sizing. The size of the replacement absorption system must be large enough to accommodate a standard absorption system.

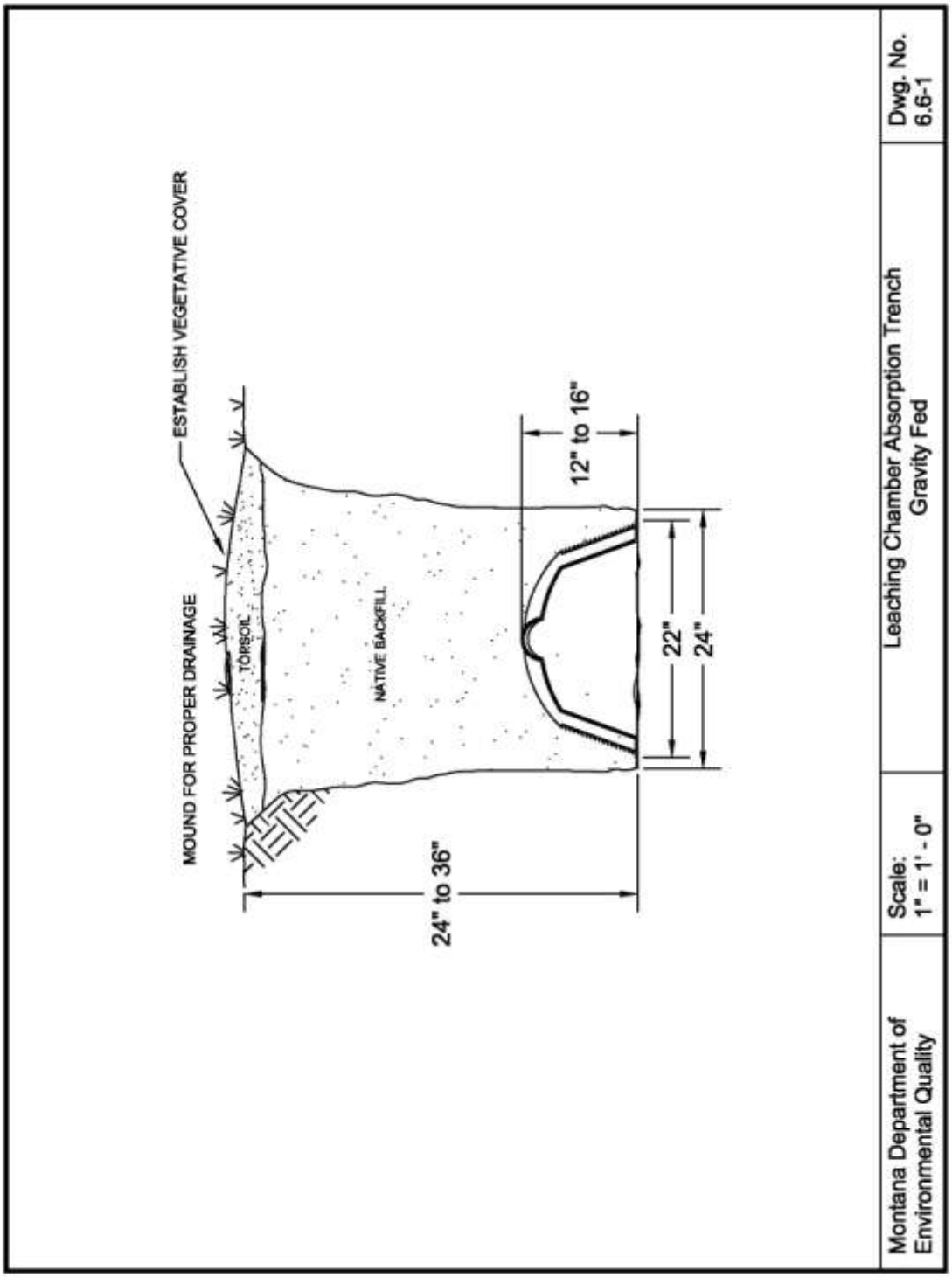
6.6.3. Other Absorption Systems

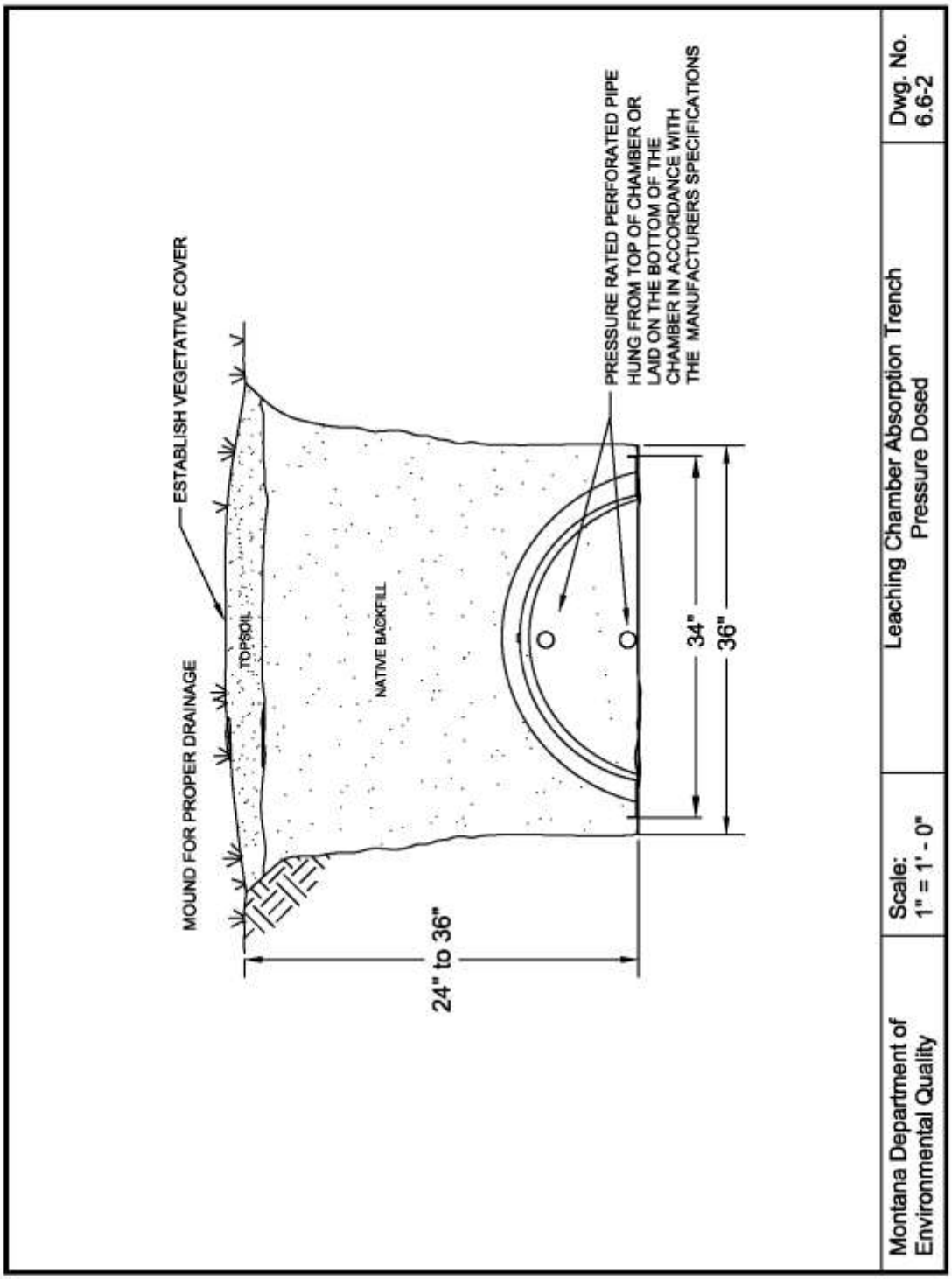
6.6.3.1. Other absorption systems must be able to meet or exceed the same system performance as conventional gravel-filled absorption systems with documentation presented by a third independent party.

6.6.3.2. Other absorption systems must be able to handle the pertinent depth of bury.

6.6.3.3. All other absorption systems must be installed in accordance with manufacturer's recommendations, although specific proprietary designs which conflict with requirements of this Circular will require reviewing authority approval.

6.6.3.4. A reduction in other absorption system sizing may be allowed on a case-by-case basis as supported by documentation and justification submitted by the manufacturer to the reviewing authority for approval.


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
12" to 16"
22"
24"
24" to 36"
Montana Department of Environmental Quality
Scale: 1" = 1' - 0"
Leaching Chamber Absorption Trench
Gravity Fed
Dwg. No. 6.6-1


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
PRESSURE RATED PERFORATED PIPE HUNG FROM TOP OF CHAMBER OR LAID ON THE BOTTOM OF THE CHAMBER IN ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS
34"
36"
24" to 36"
Montana Department of Environmental Quality
Scale: 1" = 1' - 0"
Leaching Chamber Absorption Trench
Pressure Dosed
Dwg. No. 6.6-2

6.7. ELEVATED SAND MOUNDS

6.7.1. General

Elevated sand mounds may be used to achieve separation distance between the treatment system and a limiting layer. Four feet of natural soil must be maintained between the modified site and the limiting layer.

Pressure distribution must be provided for all elevated sand mounds.

If an advanced wastewater treatment system is used prior to distribution in an elevated sand mound, or the distribution system meets the requirements of NSF 40 Class 1, as described in Subsection 6.1.4.3, the final absorption area may be downsized in accordance with the most conservative native soils found within 12 inches of the natural ground surface.

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

Gravelless trenches and other absorption systems installed in accordance with Subchapter 6.6 may be used in lieu of pipes and gravel, but no reduction in sizing will be permitted for the use of this technology.

6.7.2. Location

6.7.2.1. Elevated sand mounds must meet all of the site requirements of Chapter 2.

6.7.2.2. Elevated sand mounds must meet all minimum separation distances as stated in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable. Separation distances must be measured from the outside of the mound where the topsoil fill meets the natural ground surface, or, if the design uses a lesser slope for landscaping purposes, where the toe of the mound would be if the 3:1 slope were used.

6.7.2.3. Elevated sand mounds must be constructed only upon undisturbed, naturally occurring soils.

6.7.2.4. Elevated sand mounds with a basal soil application rate of 0.4 to 0.8 gpd/ft^2, as described in Chapter 2 and Appendix B may not be installed on land with a slope greater than 12 percent.

Elevated sand mounds with a basal soil application rate of 0.3 to 0.2 gpd/ft^2, as described in Chapter 2 and Appendix B may not be installed on land with a slope greater than 6 percent.

The land area 25 feet from the toe of the infiltrative surface on the down gradient side of the elevated sand mound must not be disturbed.

6.7.2.5. A separate replacement area for the elevated sand mound may be required by the reviewing authority. Each replacement area must be sized in accordance with this chapter.

6.7.3. Design

6.7.3.1. *The Wisconsin Mound Soil Absorption System Siting, Design, and Construction Manual*, January 2000, is recommended as a procedural guideline in the design of elevated sand mounds. Where the requirements of the Manual differ from those of this Circular, the requirements of this Circular will govern.

6.7.3.2. The required basal area of the mound must be based upon the method described in Section 6.1.4 at a soil depth no greater than 12 inches.

6.7.3.3. The required bottom area of the bed must be based upon flows as determined in Chapter 3 with an application rate of 0.8 gpd/ft^2 before any reduction in bed size allowed in this Circular.

6.7.3.4. There must be a minimum total depth of 21 inches of sand fill above the natural soil surface and 12 inches of sand fill between the bottom of the absorption area and the natural soil surface. Sand must be washed free of silts and clays. The in-place fill material must meet one of the following specifications:

A. ASTM C-33-13 for fine aggregate, with a maximum of 2 percent passing the No. 100 sieve; or
B. Fit within the following particle size distribution:

Sieve	Particle Size (mm)	Percent Passing
3/8 in	9.50	100
No. 4	4.75	95 to 100
No. 8	2.36	80 to 100
No. 16	1.18	45 to 85
No. 30	0.60	20 to 60
No. 50	0.30	10 to 30
No. 100	0.15	0 to 2

C. Have an effective size (D10) of 0.15 mm to 0.30 mm with a Uniformity Coefficient (D60/D10) of 4 to 6, with a maximum of 3 percent passing the No. 100 sieve.

6.7.3.5. Drain rock meeting the requirements of Section 1.2.25 must be washed and range in size from 3/4 to 2.5 inches. It must be at least 9 inches deep and must be covered with an appropriate geotextile fabric, untreated building paper, or straw.

6.7.3.6. The distribution pipes must be installed parallel to the land contour, with spacing between pipes of at least 3 feet and no more than 5 feet. The length of a sand bed should be at least 3 times the width of a sand bed. Leaching chambers must be placed in accordance with the manufacturer's recommendations.

6.7.3.7. The area of sand fill must be sufficient to extend 2 feet beyond the edges of the required absorption area before the sides are shaped to a 3 horizontal to 1 vertical or lesser slope.

6.7.3.8. The mound must be covered with a minimum of 12 inches, at the center of the mound, and 6 inches, at the edge of the mound, of a suitable medium, such as sandy loam, loamy sand, or silt loam, to provide drainage and aeration.

6.7.4. Construction

6.7.4.1. The ground surface where a mound is to be placed must be plowed, scarified, or keyed into the natural ground 4 inches to 8 inches parallel to the land contour. This must be achieved by removing a portion of the topsoil with the plow throwing the soil up slope to provide a proper interface between the fill and natural soils. When mounds are keyed in, the removed soil must be replaced with the same sand as required for the rest of the mound, and this sand will not count as part of the required 21 inches of sand in the mound as described in Subsection 6.7.3.4. A minimum of 4 feet of natural soil from the bottom of the plowed surface, scarified surface, or key to the limiting layer must be maintained.

6.7.4.2. Construction equipment that would cause undesirable compaction of the soils must not be moved across the plowed surface or the effluent disposal area until a minimum of 6 inches of sand fill has been placed over the plowed area. Construction and/or plowing must not be initiated when the soil moisture content is high.

Note: If a sample of soil within the working depth can be easily rolled into the shape of a wire or ribbon, the soil moisture content is too high for construction purposes.

6.7.4.3. Aboveground vegetation must be closely cut and removed from the ground surface throughout the area to be utilized for the placement of the fill material. Tree stumps should be cut flush with the surface of the ground and roots should not be pulled. Trees may be left in place within the 3:1 side sloped portion of the fill.

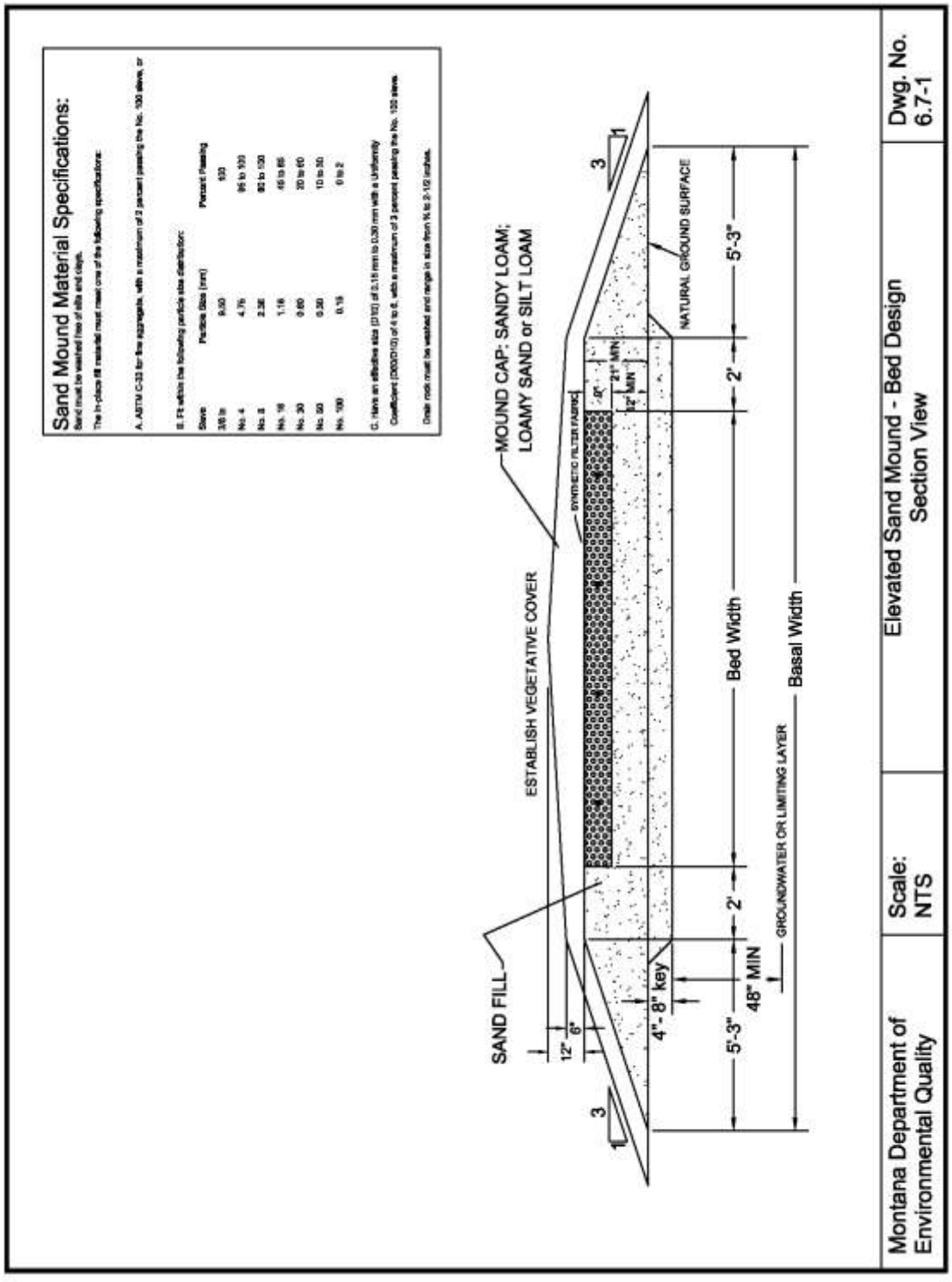
6.7.4.4. The area surrounding the elevated sand mound must be graded to provide diversion of surface runoff waters.

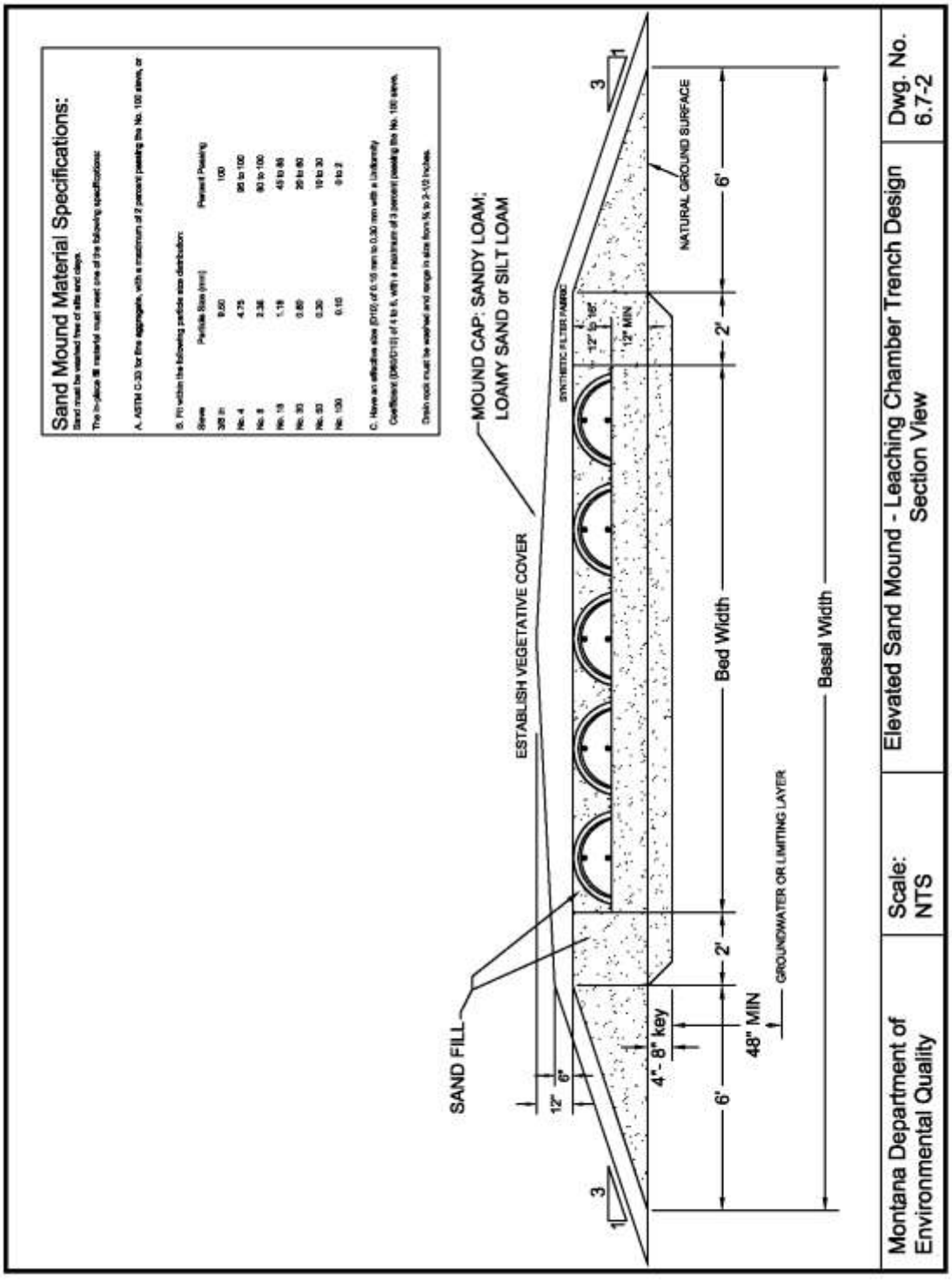
6.7.4.5. Construction should be initiated immediately after preparation of the soil interface by placing the sand fill needed for the mound to a minimum depth of 21 inches above the plowed surface. This depth will permit excavation in the sand fill to

accommodate the 9 inches of drain rock meeting the requirements of Section 1.2.25 necessary for the distribution piping. After hand leveling the absorption area, the drain rock should be placed and hand leveled. An observation port into the gravel is recommended but not required. An appropriate geotextile fabric, untreated building paper, or straw must be placed over the drain rock to separate the drain rock from the soil cover. After installation of the distribution system, the entire mound should be covered with 6 inches of a finer textured soil material, such as sandy loam to loam. A 4- to 6-inch layer of topsoil should then be added. The entire mound should be sloped to drain, either by providing a crown at the center or a uniform slope across the mound, with a minimum slope of 1 percent in either case. The entire mound must be seeded, sodded, or otherwise provided with shallow-rooted vegetative cover to ensure stability of the installation.

6.7.5. Certification and As-builts

Certification and as-built plans are required in accordance with Appendix D.


Sand Mound Material Specifications:
Sand must be washed (free of silts and clays.
The in-place fill material must meet one of the following specifications:
A. ASTM C-33 for fine aggregate, with a maximum of 2 percent passing the No. 100 sieve, or
B. Fit within the following particle size distribution:
Sieve
Particle Size (mm)
Percent Passing
3/8 in
9.50
100
No. 4
4.75
95 to 100
No. 8
2.36
80 to 100
No. 16
1.18
45 to 85
No. 30
0.60
20 to 60
No. 50
0.30
10 to 30
No. 100
0.15
0 to 2
C. Have an effective size (D10) of 0.15 mm to 0.30 mm with a Uniformity Coefficient (D60/D10) of 4 to 6, with a maximum of 3 percent passing the No. 100 sieve.
Grade mark must be washed and range in size from ¼ to 2-1/2 inches.
MOUND CAP: SANDY LOAM; LOAMY SAND or SILT LOAM
ESTABLISH VEGETATIVE COVER
SYNTHETIC FILTER FABRIC
NATURAL GROUND SURFACE
SAND FILL
12"
6"
4" - 8" key
48" MIN
GROUNDWATER OR LIMITING LAYER
5'-3"
2'
Bed Width
Basal Width
3
1
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Bed Design
Section View
Dwg. No. 6.7-1


Sand Mound Material Specifications:
MOUND CAP: SANDY LOAM; LOAMY SAND or SILT LOAM
ESTABLISH VEGETATIVE COVER
SAND FILL
SYNTHETIC FILTER FABRIC
NATURAL GROUND SURFACE
12" to 18"
12" MIN
12"
6"
4"- 8" key
6'
2'
Bed Width
48" MIN
GROUNDWATER OR LIMITING LAYER
Basal Width
3
1
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Leaching Chamber Trench Design
Section View
Dwg. No. 6.7-2

6.8. EVAPOTRANSPIRATION ABSORPTION AND EVAPOTRANSPIRATION SYSTEMS

6.8.1. General

Evapotranspiration absorption (ETA) systems are used where slow percolation rates or soil conditions would preclude the use of a standard absorption system.

Percolation tests conducted in accordance with Appendix A, with at least a 24-hour presoak of the hole prior to the test or a double-ring infiltrometer procedure outlined in ASTM D5093-02 must be conducted for all ETA systems, at the depth of the bottom of the bed.

Evapotranspiration systems (ET) are used where slow percolation rates or soil conditions would preclude the use of a soil absorption system or where discharge to the receiving soils is undesirable.

The primary difference between the ETA and ET system is the inclusion of a liner in ET systems.

ETA and ET systems should be used in conjunction with wastewater flow reduction strategies.

6.8.2. Location

6.8.2.1. ETA and ET systems must meet all minimum separation distances as stated in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable. Distances must be measured from the edge of the system.

6.8.2.2. ETA and ET systems must be level and must not be installed on land with a slope greater than 15 percent. Protective berms or drainage trenches must be installed to divert storm drainage and snow-melt run-off away from the system, if necessary.

6.8.3. Design

6.8.3.1. ETA and ET systems must not be deeper than 30 inches from the natural ground surface.

6.8.3.2. The fill material in the ETA and ET system must be washed coarse sand, drain rock meeting the requirements of Section 1.2.25, or other inert media approved by the reviewing authority. Information must be provided to document the void ratio used and, if available, the wicking characteristics of the material.

6.8.3.3. ETA and ET systems must be installed with the long dimension parallel to the land contour.

6.8.3.4. ET systems must include a watertight liner of at least 30-mil thickness to contain

the effluent. Seams for a synthetic liner must be completely sealed in accordance with the manufacturer's recommendations and the liner must be keyed into the native soils at its edges.

6.8.3.5. A minimum of 2 inches of sand fill must be placed between the native soil surface and/or any projecting rocks and the liner.

6.8.3.6. Standard absorption trenches, gravelless trenches, other absorption systems, or distribution pipes may be used to distribute effluent in an ETA and ET system.

Standard absorption trenches, gravelless trenches and other absorption systems must be constructed in accordance with Subchapters 6.1 or 6.6 and this chapter. No reduction in absorption area sizing will be allowed for the use of gravelless or other trench technology in ETA or ET systems.

The spacing between standard absorption trenches, gravelless trenches, other trenches, or distribution pipes in an ETA or ET system must be a minimum of 6 feet and maximum of 8 feet measured on center.

Gravel trenches or leaching chambers are required for ET and ETA systems constructed with a sand media. These methods of distribution may be used, but are not required, for ET and ETA systems constructed with a gravel medium.

6.8.3.7. Soils with an initial percolation rate between 121 and 240 mpi, with a 24-hour presoak of the hole prior to the test, may use an ET or ETA system. All calculations must be submitted for review.

Soils with an initial percolation rate of 241 mpi or slower may use an ETA system if the percolation rate, determined in the field, using the ASTM D5093-02 double-ring infiltrometer procedure shows a rate between 121 and 240 mpi. All calculations must be submitted for review.

6.8.3.8. Calculated storage capacity must provide a factor of safety of at least 1.5 for storage loss over time caused by plugging of the voids due to evaporated salts and residuals wastewater flow rates.

6.8.3.9. Water balance sizing calculations for ETA and ET systems must be based on a one-year period. A water balance analysis may include pan evaporation data, precipitation for the wettest year in a 10-year period, soils absorption information from the site, transpiration, and other site-specific design information.

A. Pan evaporation information may be included in the water balance where it can be adequately demonstrated. Very few locations exist where data has been tabulated in Montana and calculations must address site-specific pan evaporation conditions.
B. The design must show that total water lost through evaporation and absorption equals or exceeds the total water gained through precipitation

and effluent discharge. Precipitation information used must be for the wettest year in a 10-year period. Storage capacity must be built into the system to accommodate months with low evaporation.

C. Transpiration may be included in the water balance where it can be adequately demonstrated.

D. Other site-specific design information such as shade, area topography, or manmade structures must be considered.

6.8.4. Construction

6.8.4.1. Construction of an ET system must be initiated immediately after preparation of the liner.

6.8.4.2. Excavation for ETA systems may proceed only when the moisture content is below the soil's plastic limit. If a sample of soil taken at the depth of the proposed bottom of the system forms a ribbon, instead of crumbling, when one attempts to roll it between the hands, the soil is too wet to excavate.

6.8.4.3. ETA construction must be completed in such a manner to prevent compaction.

The fill material must be covered completely with an appropriate geotextile fabric, untreated building paper, or 2 inches of straw to prevent the soil cover from entering the media.

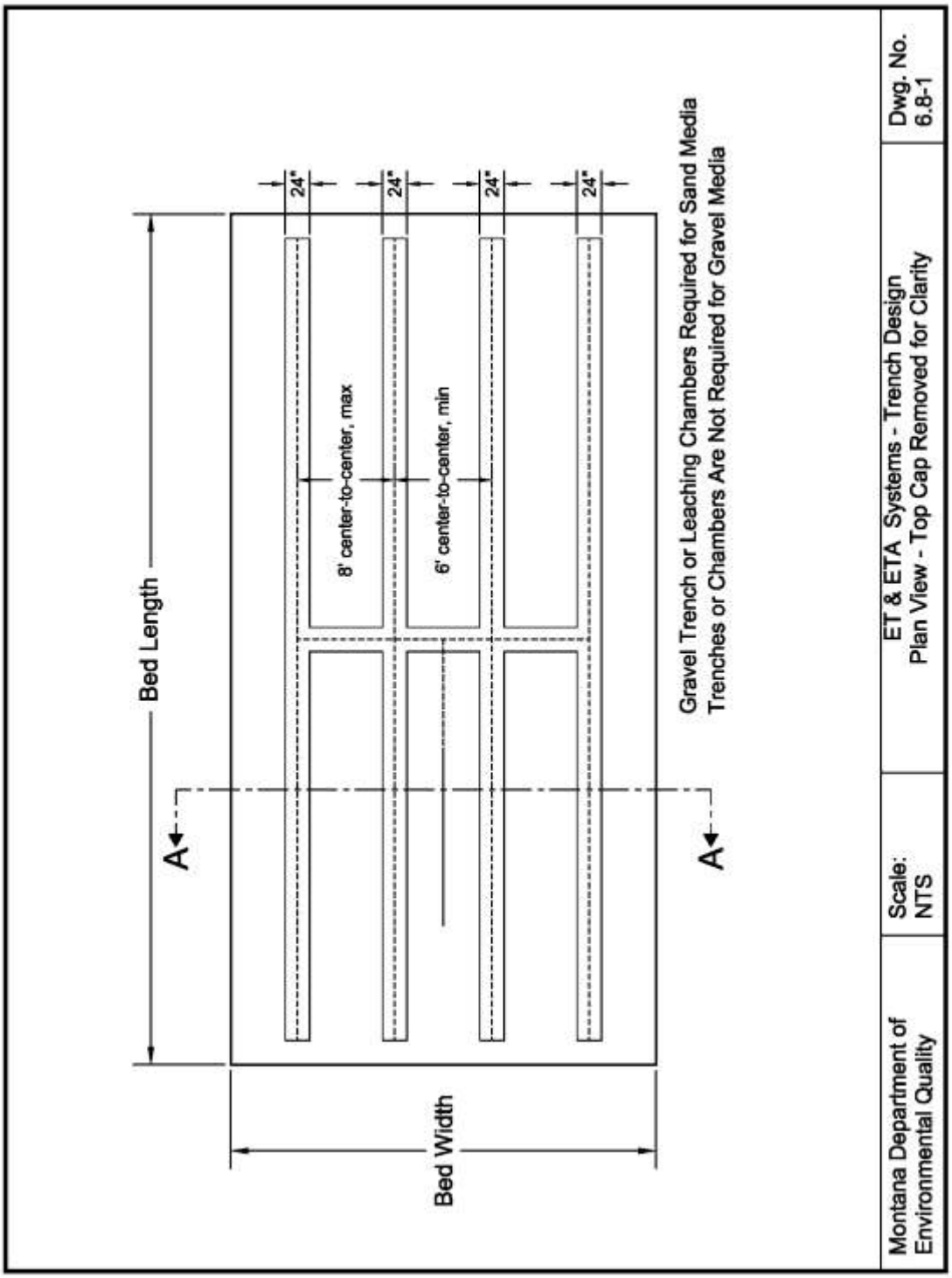
6.8.4.4. A 4-inch diameter standing check pipe with both ends capped (only the bottom cap should be glued) must be installed. Several 1/8-inch to 1/4-inch diameter holes should be drilled in the bottom half of the pipe and covered with a filter cloth sock. The check pipe should be anchored in fill material to prevent the pipe from being pulled out of the system.

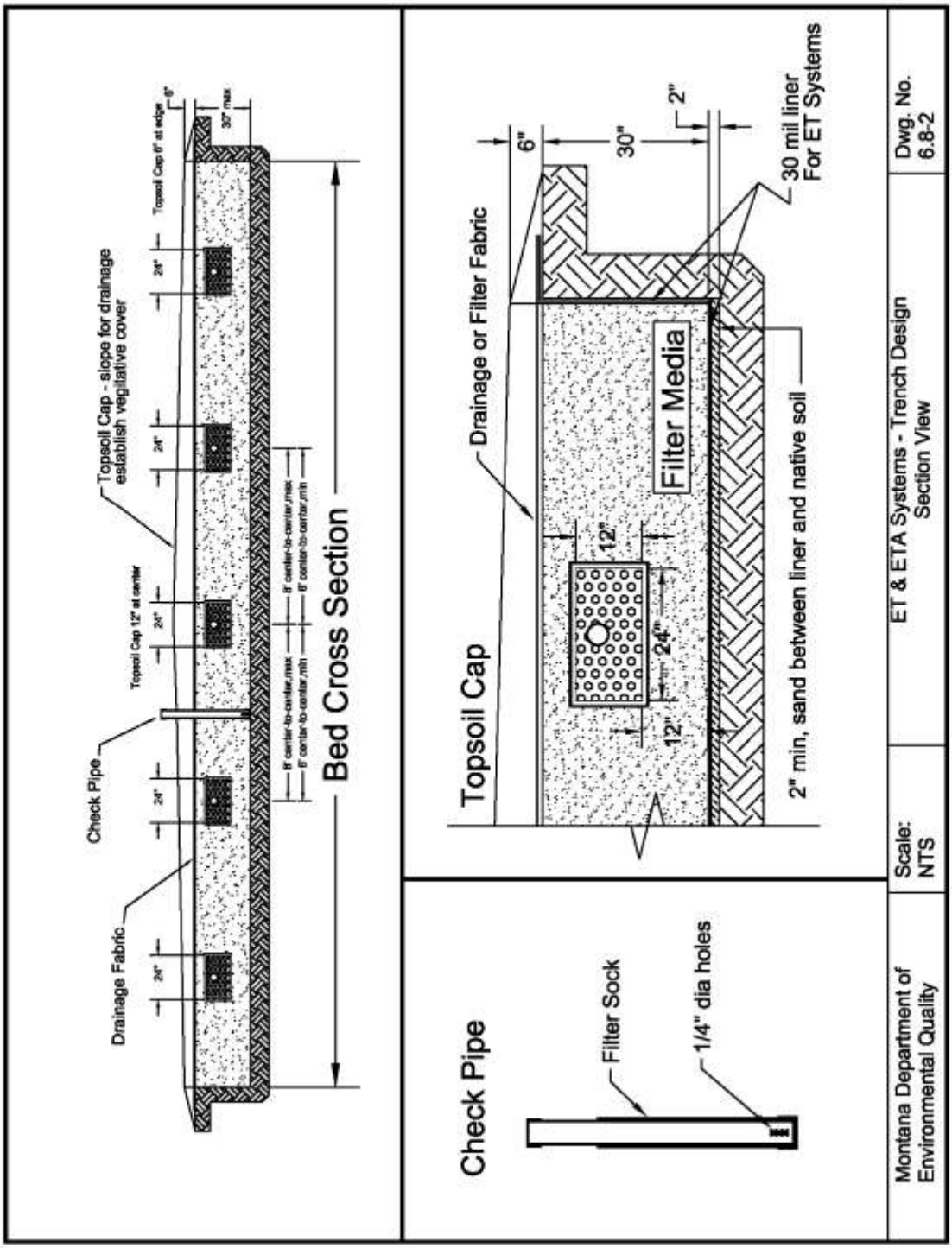
6.8.4.5. The ETA and ET system must be covered with a minimum of 12 inches at the center of the system and 6 inches at the edge of the system of a suitable medium, such as sandy loam, loamy sand, or silt loam to provide drainage and aeration. These depths are measured after settling.

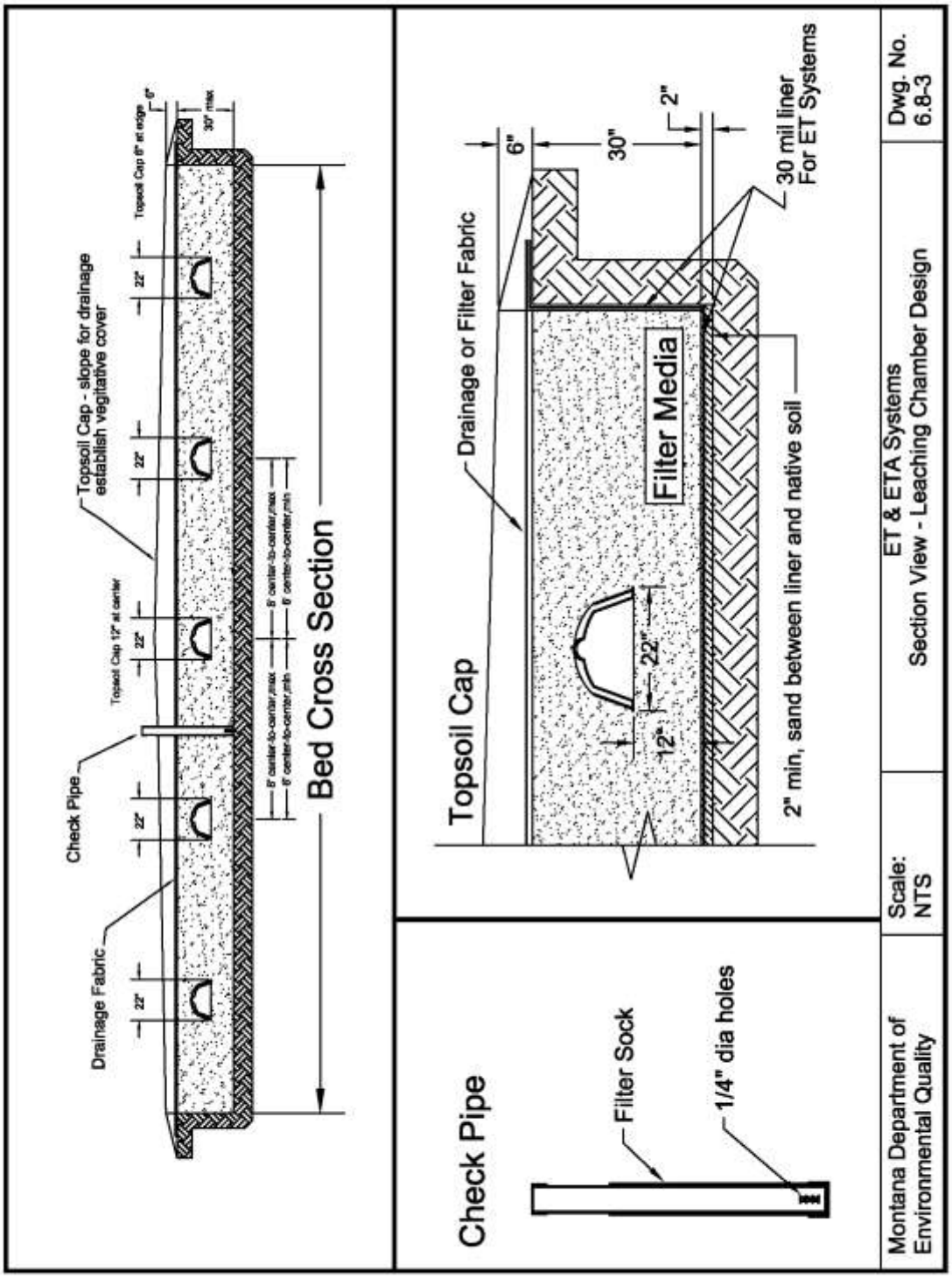
The topsoil cap must be immediately vegetated after construction with sod or other appropriate method.

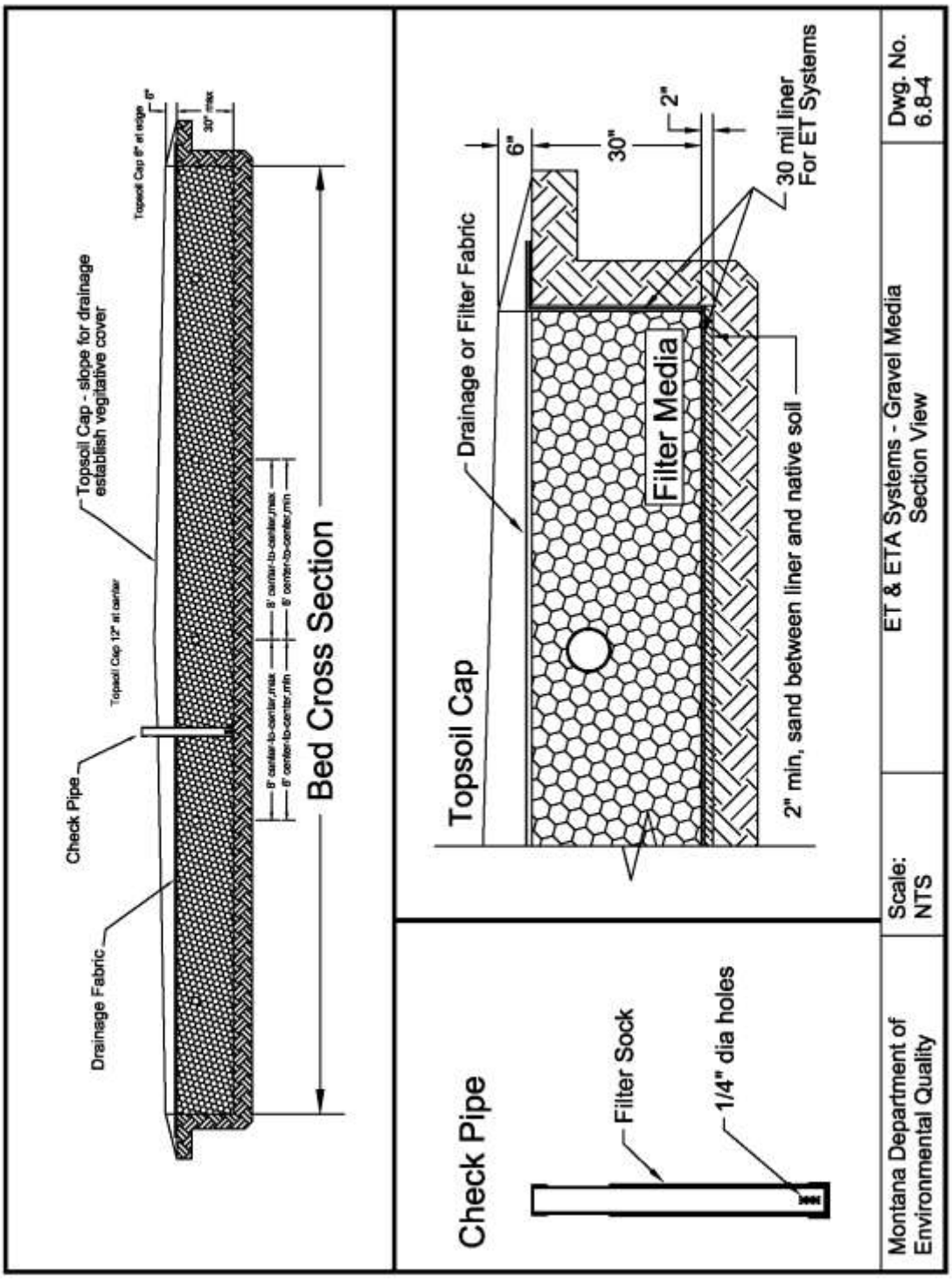
6.8.5. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements in Appendix D. Certification and as-built plans are required in accordance with Appendix D.


Bed Length
Bed Width
A
A
24"
24"
24"
24"
8' center-to-center, max
6' center-to-center, min
Gravel Trench or Leaching Chambers Required for Sand Media
Trenches or Chambers Are Not Required for Gravel Media
Montana Department of Environmental Quality
Scale: NTS
ET & ETA Systems - Trench Design
Plan View - Top Cap Removed for Clarity
Dwg. No. 6.8-1


Bed Cross Section
Topsoil Cap - slope for drainage establish vegitative cover
Topsoil Cap 12" at center
Topsoil Cap 6" at edge
Check Pipe
Drainage Fabric
24"
30" max
8' center-to-center, max
8' center-to-center, min
Topsoil Cap
Drainage or Filter Fabric
6"
30"
2"
30 mil liner
For ET Systems
Filter Media
12"
24"
12"
2" min, sand between liner and native soil
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
ET & ETA Systems - Trench Design
Section View
Dwg. No. 6.8-2


Bed Cross Section
Topsoil Cap - slope for drainage establish vegitative cover
Check Pipe
Drainage Fabric
Topsoil Cap
Drainage or Filter Fabric
Filter Media
6"
30"
2"
30 mil liner For ET Systems
2" min, sand between liner and native soil
22"
12"
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
ET & ETA Systems
Section View - Leaching Chamber Design
Dwg. No. 6.8-3


Topsoil Cap - slope for drainage establish vegitative cover
Topsoil Cap 6" el edge
6"
30" max
Topsoil Cap 12" el center
Check Pipe
Drainage Fabric
8' center-to-center max
8' center-to-center min
Bed Cross Section
Topsoil Cap
Drainage or Filter Fabric
6"
30"
2"
Filter Media
30 mil liner
For ET Systems
2" min, sand between liner and native soil
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
ET & ETA Systems - Gravel Media
Section View
Dwg. No. 6.8-4

6.9. SUBSURFACE DRIP

6.9.1. General

Subsurface drip systems are an efficient method for dispersal of wastewater and/or gray water into the soil in small volume doses throughout the day. Uniformly spaced drip emitters in flexible polyethylene tubing control the rate of wastewater discharge and are available in either turbulent flow or pressure compensating configurations.

Each emitter's pressure compensating feature controls discharge at a nearly constant rate along the entire drip line lateral's length over a wide range of pressures. Typically, the drip line is installed directly into the soil without aggregate or other media. Pumps fill and pressurize the drip line sufficiently to achieve uniform distribution.

Monitoring system function and performance along with effluent metering is essential to proper operation. The subsurface drip system is typically operated by an integrated controller programmed to activate the pumps to dose the drip line at appropriate intervals and duration. The controller must be programmable to perform a forward flush of the drip line and back flushing of a filter. The controller should also store operating data for documenting system performance and diagnosing system malfunctions.

6.9.2. Location

Subsurface drip systems must meet the site evaluation criteria of Chapter 2.

Subsurface drip systems must meet the location criteria in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable. The subsurface drip system may not be located where vehicles will cross the drip lines. Potable water lines may not pass under or through any part of the dispersal system.

Each submittal must address how the service provider can access the subsurface drip system for maintenance and how property use can be controlled to prevent unauthorized access to components.

6.9.3. Design

6.9.3.1. Wastewater Quantity and Quality Characterization

The quantity of expected wastewater or gray water shall be estimated using the guidelines outlined in Chapter 3 or Subchapter 6.10.

6.9.3.2. Materials

All subsurface drip system materials must be warranted by the manufacturer for use with sewage and be resistant to plugging from solids, bacterial slime, and root intrusion.

Fittings used to join the drip line to the distribution line and for flushing the manifolds must be installed in accordance with manufacturer's recommendations. Either compression or barb fittings may be specified, depending on the manufacturer's recommendations and system operating pressure.

6.9.3.3. System Components

A. Primary Treatment

All subsurface drip systems must include a septic tank in compliance with Chapter 5.

B. Advanced Wastewater Treatment System

An advanced wastewater treatment system is required prior to final subsurface disposal in compliance with Chapter 7.

C. Dosing System

Pressure distribution must be provided.

All subsurface drip systems must operate at pressures indicated in the manufacturer's specifications. These operating pressures are typically between 15 to 45 psi.

Timed dosing is required. A minimum number of 12 equally spaced doses per day are required. A method to track and verify dosing volumes and times, such as a digital control panel, pump elapsed time meters (ETMs), event counters, etc., must be provided.

D. Pumps/System Flushing

Pump selection must take into account the operating volume and pressure for the drip dispersal field when calculating the total dynamic head required for filter flushing and/or back flushing, field dosing, and drip line flushing. All disposal and flushing parameters must fall within the operational range of the pump selected.

All subsurface drip systems must include means to backwash the filters and flush drip lines and manifolds.

Filter backwash and drip line flushing must be automatic. Filter backwash and drip line flushing must be accomplished according to manufacturer's recommendations to prevent damage to the drip line and maintain product warranty.

Filter backwash and drip line flushing debris must be returned to the septic

tank or the primary treatment tank.

Hose bibs are not allowed for use as a flushing component, to prevent cross contamination of potable water supply.

Field flushing velocity must be designed at the distal end of each drip line lateral connection. This velocity must be the same as required by the drip line manufacturer.

The flush return volume may not exceed the hydraulic capacity of the pretreatment unit.

E. Supply and Return Manifolds

Both supply and return manifolds are required on all subsurface drip systems.

F. Component Design and Construction

All piping, valves, fittings, level control switches, and all other components must be designed and manufactured to resist the corrosive effects of wastewater and common household chemicals.

G. Drip Line/Dispersal Line

Drip line tubing is typically a flexible polyethylene (PE) available in several diameters with a nominal 1/2 inch as the typical size in wastewater applications.

The drip line must be color coded purple by the manufacturer to be easily recognized as suitable for subsurface drip dispersal.

The drip line must be warranted fully by the manufacturer for protection against root intrusion for a minimum period of 10 years.

Drip lines should always be installed as level as possible on the contour line.

Drip lines must be installed to facilitate positive drainage back to the manifold. No standing water may pool within the system. Subsurface drip systems located on sloped sites must be designed and installed to prevent drainage to lower elevated components (drip lines, tanks, valve boxes, etc.).

Minimum installation depth for drip lines and manifolds is 8 inches beneath grade. Site specific characteristics and land use practices may require a deeper depth of installation.

Drip lines should be installed on 2-foot centers.

H. Emitters

Emitter size and type must be specifically designed for use in a subsurface drip system.

All subsurface drip systems must be equipped with self-cleaning, pressure compensating, or turbulent flow emitters.

Emitters should be installed on 2-foot intervals along the drip line with an effective subsurface infiltrative area of 4 square feet. This spacing may be altered for specific reuse systems per both the manufacturer's recommendations and the reviewing authority's approval. Spacing of emitters closer than 2 feet does not change the required subsurface infiltrative area.

The discharge rate of emitters may not vary by more than 10 percent over the entire drip line lateral in order to ensure that the effluent is uniformly distributed over the disposal area.

I. Filters

Designers shall specify the filter that is recommended by the drip line manufacturer.

All filters used must be resistant to corrosion. The manufacturer shall warrant the filters for wastewater use.

All filters must be sized to operate at a flow rate at least equal to the maximum design discharge rate of the system. Filter backwash must be included in calculating the maximum discharge rate, where applicable.

Filters may either require backwashing in accordance with manufacturer's recommendations or may be the continuously self-cleaning type.

All subsurface drip system filters must be readily accessible for inspection and servicing.

J. Flow Meter

Flow meters or some other means to monitor flow must be installed in a readily accessible location for reading and servicing. Flow meters must be warranted by the manufacturer for use with wastewater and must be accurate within the expected flow range of the installed system.

K. Electronic control panel

A controller capable of timed dosing and automatic line/filter flushing is required.

L. Air/Vacuum Relief Valve(s)

Air/vacuum relief valve(s) must be installed at the high point(s) of each supply or return manifold. All valves must be installed in a valve box with access to grade and include a gravel sump. They must have constant venting to the atmosphere.

M. Control Valves

Valves must be readily accessible for inspection and/or service, such as in a valve box with access to grade.

Control valves used for system flushing and zone distribution must operate automatically.

Pressure regulators are recommended for all subsurface drip systems.

Pressure gauge access points (Schrader valves or equal) are required at appropriate locations on system networks utilizing turbulent flow emitters to verify design and operational performance. Pressure gauge access points are recommended to be installed on all systems.

6.9.3.4. Sizing

Subsurface drip systems must be sized in accordance with soil descriptions of Chapter 2 and Appendix B. Unless otherwise approved by the reviewing authority, the effective width of the absorption area will be 2 feet per drip line.

No reduction in absorption field size will be granted for advanced wastewater treatment systems.

6.9.3.5 All subsurface drip systems must be designed to remain free flowing during freezing conditions. The reviewing authority may direct the timing for installation of the subsurface drip system to correspond to favorable weather conditions.

6.9.4 Construction

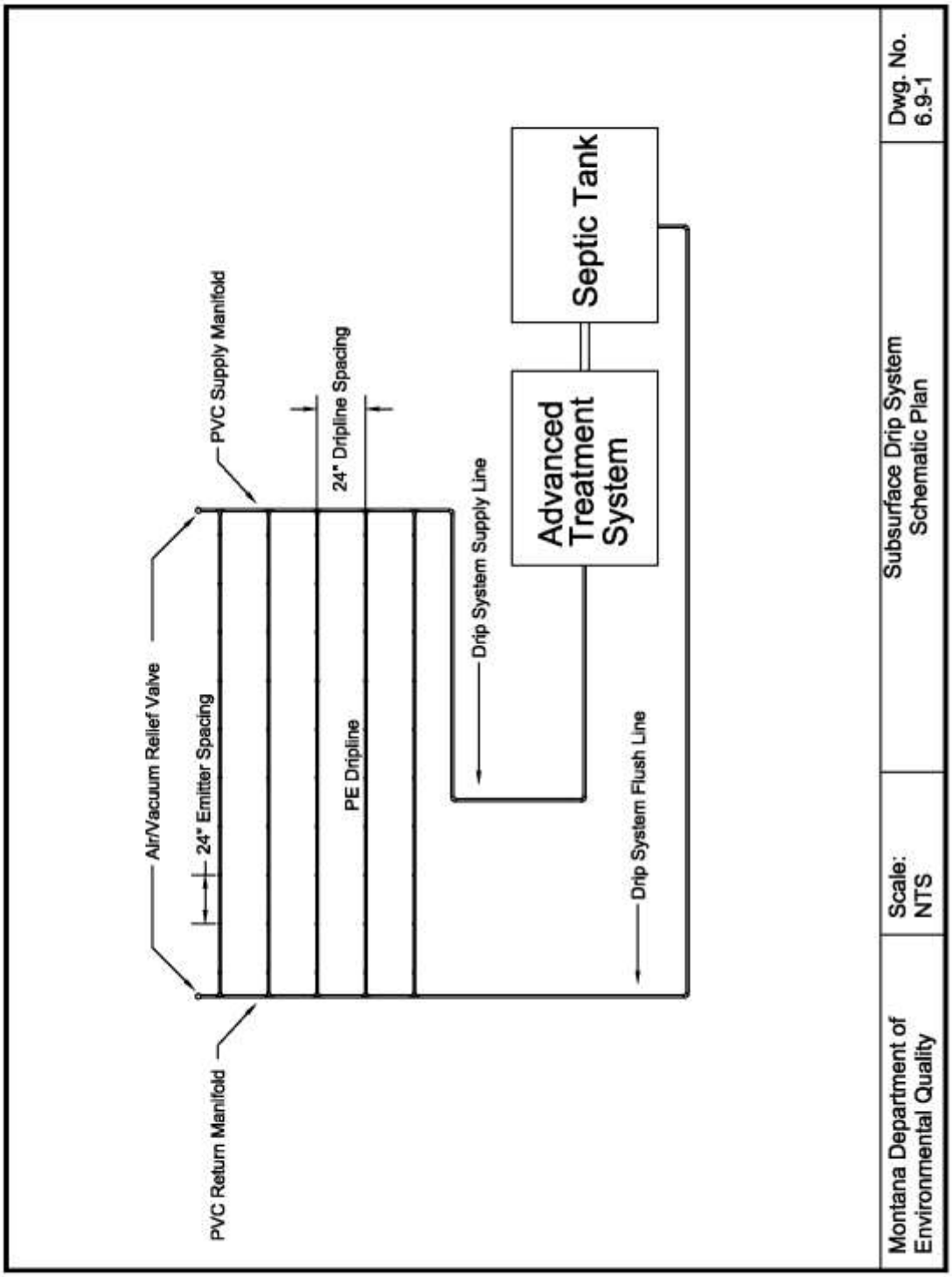
Installation instructions and recommendations vary by manufacturer. Installation knowledge and skill may be product-specific. Installers are responsible for obtaining proper training before attempting to install subsurface drip systems.

A ground cover (turf or other appropriate landscaping) must be planted over the dispersal field after installation to prevent erosion. Selection of the ground cover type and subsequent maintenance requirements must not compromise the integrity of the disposal area.

In addition to these standards, all systems must be constructed in accordance with manufacturer's recommendations.

6.9.5 Operation and Maintenance

A detailed set of plans and specifications and an operation and maintenance plan are required for all components of the system. The operation and maintenance plan must meet the requirements outlined in Appendix D.


Septic Tank
Advanced Treatment System
PVC Supply Manifold
24" Dripline Spacing
Air/Vacuum Reilef Valve
24" Emitter Spacing
PE Dripline
Drip System Supply Line
Drip System Flush Line
PVC Return Manifold
Montana Department of Environmental Quality
Scale: NTS
Subsurface Drip System Schematic Plan
Dwg. No. 6.9-1

6.10 GRAY WATER IRRIGATION SYSTEMS

6.10.1. General

Gray water is untreated wastewater collected from bath tubs, showers, lavatory sinks, clothes washing machines, and laundry tubs. Gray water systems used in conjunction with a waste segregation system may also use wastewater collected from kitchens. Gray water can be contaminated with organic matter, suspended solids, or microorganisms that are potentially pathogenic. In general, treatment and disposal of gray water is subject to all applicable provisions in this Circular, except that gray water may be used for irrigation as provided in this chapter.

Gray water reuse within a building or residence, for uses such as toilet flushing, is permitted without review, provided that the gray water is ultimately disposed of by means of an approved wastewater treatment system that meets all applicable requirements of this Circular.

Gray water irrigation systems that meet the requirements of this chapter are not subject to the other chapters in this Circular, except as specifically referenced in this chapter.

6.10.2. Location

Gray water irrigation systems must meet the location criteria for gray water reuse set out in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

6.10.3. Design

6.10.3.1. The collection, storage, and distribution portions of a gray water irrigation system must be designed in accordance with this chapter. The reviewing authority may allow the use of other designs and material pursuant to the review of manufacturer's information and data to substantiate the proposed alternative.

6.10.3.2. Except for lots with waste segregation systems, lots with gray water irrigation systems must be served by an existing approved alternate wastewater treatment system that is adequate to treat both the gray water and the other wastewater from the lot. Lots with waste segregation systems must have an alternate approved waste water treatment system for treating gray water, although the system need not be installed if gray water irrigation is conducted pursuant to this chapter.

6.10.3.3. Gray water from kitchen sources may be used for irrigation only where a waste segregation system is used.

6.10.3.4. All effluent from sources that are not gray water must be disposed of in an approved wastewater system.

6.10.3.5. The reviewing authority may require sampling data to ensure that the strength of gray water used for irrigation does not exceed typical residential strength

parameters.

6.10.3.6. Gray water irrigation systems must use subsurface dispersal. All systems must be a minimum of 6 inches below the ground surface. Ponding or water surfacing may not occur at any gray water irrigation location.

6.10.3.7. Gray water irrigation system designs may be augmented with potable water. If potable water is used to augment gray water for irrigation within the same distribution network, a method of backflow prevention for the potable water source must be included that is consistent with the requirements of ARM Title 17, Chapter 38, subchapter 3.

6.10.3.8. All gray water irrigation system piping and appurtenances must be easily identifiable as non-potable through the use of purple piping and continuous marking at a minimum of 4-foot intervals. Tanks, pumps, and other equipment must also be labeled as "non-potable" using a permanent label placed in a conspicuous location.

6.10.3.9. If a gray water irrigation system is proposed for a lot served by a public wastewater system, the reviewing authority may not approve the gray water system unless the managing entity of the public system provides a letter of approval.

6.10.3.10. Gray water design flow rates must be estimated as follows:

A. Estimated Residential Flow Rates:

To determine total flow rate for the gray water irrigation system, the number of occupants must be multiplied by the estimated flow shown in this subsection, Table 6.10-1.

Table 6.10-1

Number of occupants per residential living unit:		
	1st bedroom	2
	each additional bedroom	1
Flow for each occupant is:		
	showers, tubs, wash basins	25 gpd
	laundry	15 gpd
	kitchen	10 gpd

B. Estimated Nonresidential Flow Rates:

Nonresidential flow rates must be substantiated by the system designer in order to be approved by the reviewing authority.

6.10.3.11. Gray water irrigation systems must have a minimum absorption area based on soil types as described in accordance with Chapter 2 and Appendix B and Section

6.1.4.

6.10.3.12. Gray water irrigation systems that are not designed to prevent freezing must be used in conjunction with a supplemental year-round method for wastewater treatment and disposal that meets applicable state and local requirements.

6.10.3.13. When a supplemental year-round system is used, gray water irrigation systems must include a three-way diverter valve to easily direct gray water to the year-round wastewater treatment system when needed. A backflow prevention device must be installed to prevent black water from entering the gray water irrigation system.

6.10.3.14. The year-round wastewater treatment system must be sized to accept and treat the total flow from the gray water irrigation system together with any other effluent in the system.

6.10.3.15. A gray water irrigation system may not adversely impact the functioning of the year-round wastewater treatment system.

6.10.3.16. Gray water systems may be installed in fill.

6.10.4. Collection and Distribution

6.10.4.1. Hose bib or hose-type attachments, including frost-free hydrants, may not be present on a gray water irrigation system.

6.10.4.2. The design must include appropriate valves or other methods to isolate the surge tank, irrigation zones, and connection to a wastewater treatment system.

6.10.4.3. Surge tanks may be incorporated into a gray water irrigation system design. Surge tanks allow for uniform distribution of the gray water despite variable flow from the source. If a gray water irrigation system contains a surge tank, the tank must meet the following requirements:

A. Surge tanks used for the storage and distribution of gray water must be designed by the manufacturer for use with wastewater;
B. Surge tanks must be easily accessible for maintenance with a locking gasketed access opening or approved equivalent;
C. Surge tanks must be covered;
D. The minimum capacity of the surge tank must be 50 gallons;
E. Surge tanks may be installed either inside or outside a building, above or below ground;
F. Aboveground surge tanks must be installed on a level, 3-inch concrete slab or equivalent, and must be anchored to prevent overturning;
G. Below ground surge tanks must be installed in dry, level, well-compacted soil. Buoyancy of the surge tank must be prevented with appropriate construction where high ground water exists;

H. Surge tanks must be equipped with an overflow pipe of the same diameter as the gray water influent pipe. The overflow must be permanently connected to an approved wastewater treatment system. This connection should be made to the building sewer, or septic tank, if any. The overflow drain may not be equipped with a shutoff valve. For waste segregation systems without an approved alternate wastewater treatment system installed, the overflow from the surge tank must be connected to a second surge tank. The second surge tank must also connect to the gray water irrigation system;

I. Above ground surge tanks must be equipped with an emergency drain of the same diameter as the gray water influent pipe. The emergency drain must be permanently connected to an approved wastewater treatment system. This connection should be made to the building drain, building sewer, or septic tank, if any;

J. The surge tank must include a method of backflow prevention that complies with ARM Title 17, Chapter 38, subchapter 3;

K. Surge tanks must include vents to the atmosphere; and

L. If storage time within the collection system is going to exceed 24 hours, appropriate treatment for odor control may be necessary.

6.10.4.4. All gray water irrigation systems should include a filter to prevent the buildup of solids and to ensure proper system functioning. If no filter is included in the design, at least 3 valved irrigation zones must be designated. Each irrigation zone must have the required length of trench to accommodate the entire gray water flow per day with automatic valves to rotate the distribution of gray water between irrigation zones.

6.10.4.5. Gravity fed absorption trenches may not exceed 100 feet in length.

6.10.4.6. All pressure dosed gray water irrigation systems must meet the following minimum requirements:

A. Surge tanks must provide sufficient access to allow maintenance of the tank and pump. Surge tanks using a siphon should have a dose counter installed to check for continued function of the siphon;

B. High-water alarms must be provided for all surge tanks utilizing pumps;

C. The minimum dose volume must be equal to the drained volume of the discharge line and manifold plus a volume equal to at least 2 times the lateral volume;

D. The duration of each discharge should not exceed 15 minutes to promote uniform distribution and soil absorption;

E. The reserve volume of the dosing system surge tank must be at least equivalent to 25 percent of the design flow. This reserve volume is computed from the high-level alarm;

F. Cleanouts must be provided at the end of every lateral. Cleanouts must be within 6 inches of finished grade and should be made with either a long sweep elbow or 2 45-degree bends; and

G. Dosed irrigation systems should be field-tested to verify uniform distribution.

6.10.5. Operation and Maintenance, Certification, and As-builts

6.10.5.1. Property owners are responsible for proper operation and maintenance of their gray water irrigation systems. Gray water systems that include kitchen wastewater may have increased maintenance requirements.

6.10.5.2. All public gray water irrigation systems must submit a detailed set of plans, specifications, and an operation and maintenance plan to the reviewing authority in accordance with Appendix D. Certification and as-built plans are required in accordance with Appendix D.

6.11. ABSORPTION BEDS

6.11.1. General

Absorption beds may be used as replacement wastewater treatment systems in existing lots where standard absorption trenches cannot be utilized. Absorption beds may be used as replacement for previously approved seepage pits. Absorption beds may not be used on new lots without an existing wastewater treatment system that has been in continuous use and that was permitted by the reviewing authority.

Absorption beds must meet the same requirements as standard absorption trenches as described in Subchapter 6.1, except where specifically modified in this chapter.

Rapid infiltration basins designed for effluent disposal rather than subsurface treatment must be designed in accordance with DEQ-2.

6.11.2. Design

6.11.2.1. Absorption beds must be more than 3 feet wide, and must be at least 2 feet in depth, unless a limiting condition requires a lesser depth, but in no case may the bed be less than 1 foot in depth.

6.11.2.2. Pressure distribution must be provided for all absorption beds with a minimum of 2 distribution pipes installed per system.

6.11.2.3. Distribution piping should be separated by a minimum of 30 inches and a maximum of 48 inches and 18 to 30 inches from the edge of the excavation.

6.11.2.4. Absorption bed sizing is determined by flows described in Chapter 3, the application rates in Chapter 2, along with the procedure described in Section 6.1.4 or by using the maximum area available. Absorption beds shall not be installed with soils that have percolation rates greater than 60 mpi.

6.11.3. Construction

6.11.3.1. Absorption beds may be constructed in accordance with Chapter 2 but must not be constructed on unstabilized fill.

6.11.3.2. The excavation must be filled with a minimum of 6 inches of washed rock or 6 inches of ASTM C-33-13 sand.

6.11.3.3. Distribution piping should be covered by 2 inches of drain rock meeting the requirements of Section 1.2.25.

6.11.3.4 Distribution piping must be installed to ensure uniform distribution of effluent.

6.11.3.5 Drain rock must be covered with an appropriate geotextile fabric, untreated

building paper, or straw at least 4 inches in depth.

6.11.3.6 Backfill for beds should be loam type soils that do not form an impervious seal. High clay or silt content soils may not be used for backfill.

6.11.4. Gravelless or other absorption systems may be used in absorption beds. Gravelless or other absorption systems must be installed in accordance with Subchapter 6.6 and this subchapter. No reduction in sizing will be allowed for the use of gravelless or other systems in absorption beds.

7. ADVANCED WASTEWATER TREATMENT SYSTEMS

7.1. RECIRCULATING MEDIA TRICKLING FILTERS

7.1.1. General

These systems utilize aerobic, attached-growth treatment processes to biologically oxidize organic material and convert ammonia to nitrate (nitrification). A trickling filter consists of a bed of highly permeable medium to which a bio-film adheres in an unsaturated environment. Wastewater is applied to the top of the bed and trickles through the media. Microorganisms in the bio-film degrade organic material and may also nitrify the wastewater. An under-drain system collects the treated wastewater and any sloughed solids and transports it to a settling tank from which it is recirculated and trickled back through the media.

Due to the reduced amount of BOD_5 and TSS produced by this technology, the absorption system used for final disposal may be reduced, except where specifically prohibited in this Circular, for the following soil types:

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

The reviewing authority may request data from the recirculating trickling media filter to demonstrate performance criteria.

A separate subsurface absorption replacement area, sized without reductions, must be designated for each site using a recirculating trickling media filter.

Classification of a recirculating media trickling filter as a Level 1a, Level 1b, or Level 2 system for nutrient reduction, under ARM 17.30.718, must be made under separate application. The reviewing authority may impose additional design requirements for systems with extremely low BOD_5 levels to ensure adequate treatment of effluent in the soil.

7.1.2. Design

7.1.2.1. The design criteria must include, but not necessarily be limited to, primary treatment, filter size, filter media, organic loading, hydraulic loading, dosing rate, and recirculation rate. The level of treatment provided by the recirculating media trickling filter must be provided.

7.1.2.2. Recirculating media trickling filter systems must have a means of primary and secondary settling. Additional components such as pump chambers, pumps,

controls, recirculation valves, etc. may be used as required.

7.1.2.3. Filter media must be resistant to spalling or flaking, and must be relatively insoluble in wastewater. The type, size, depth, volume, and clogging potential of the medium used must be based on published criteria and proven through monitoring and testing in accordance with Appendix D.

7.1.2.4. The vessel containing the media must be watertight and corrosion resistant.

7.1.2.5. Waste effluent must be distributed uniformly across the design surface area of the filter.

7.1.2.6. The means of aerating the media must be described.

7.1.2.7. The method of recirculation and recirculation rate must be discussed and justified to show adequate functioning of the system. The recirculation tank must meet the same material and construction specifications as a septic tank. The reviewing authority may require systems with large surge flows to have recirculation tank size based on the estimated or actual surge flow volume.

7.1.2.8. All recirculating trickling systems must operate in a manner such that, if a component of the system fails and treatment diminishes or ceases, untreated effluent will not be discharged to the absorption system. Systems must be equipped with adequate alarms.

7.1.3. A detailed set of plans and specifications and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements in Appendix D.

7.1.4. Gravelless or other absorption systems constructed in accordance with the requirements of Subchapter 6.6 may be used in lieu of a standard absorption trench. The use of gravelless trenches and other absorption systems will not qualify for any additional reduction beyond that listed in Section 7.1.1.

7.2. INTERMITTENT SAND FILTERS

7.2.1. General

The design criteria must include, but not necessarily be limited to, the type of usage, primary treatment, filter media, filtration rate, and dosage rate.

The wastewater strength discharged to the filter must not exceed residential strength wastewater. Intermittent sand filters must discharge to a subsurface absorption system.

Due to the reduced amount of BOD_5 and TSS produced by intermittent sand filters, the absorption system used for final disposal may be reduced for the following soil types except where specifically addressed in this Circular:

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

A separate subsurface absorption replacement area, sized without reductions, must be designated for each site using an intermittent sand filter.

Intermittent sand filters classified as Level 1a, Level 1b, or Level 2 systems, as defined in ARM 17.30.718, may have additional requirements beyond those listed in this Circular.

7.2.2. Design

7.2.2.1. The minimum area in any subsurface sand filter must be based upon flow rates as determined in Chapter 3.

7.2.2.2. The application rate for intermittent sand filters may not exceed 1.0 gpd/ft^2. This must be computed by dividing the effluent flow rate by the area, in square feet, of the filter.

7.2.2.3. A minimum of one 4-inch in diameter collection line must be provided at the bottom of the intermittent sand filter. The upper end of the collection line(s) must be provided with a 90-degree elbow turned up, a pipe to the surface of the filter, and a removable cap. The collection(s) line may be level. The bottom of the filter may be level or sloped to the collection line(s).

7.2.2.4. Distribution lines must be level and must be horizontally spaced a maximum of 3 feet apart, center-to-center. Orifices must be placed such that that there is at least one orifice for each 4 square feet of sand surface area. All intermittent sand filter dosing must be controlled by a programmable timer. The minimum depth of filter media must be 24 inches.

7.2.2.5. A watertight, 30-mil PVC liner, or equivalent, must be used to line the sand filter.

7.2.2.6. There must be a minimum of 2 inches of sand fill between the natural soil surface and/or any projecting rocks and the liner.

7.2.2.7. Washed drain rock meeting the requirements of Section 1.2.25 must be placed in the bottom of the system to provide a minimum depth of 8 inches in all places and to provide a minimum of 4 inches of material over the top of the collection lines.

7.2.2.8. The drain rock must be covered with a 3-inch thick layer of 1/4-inch to 1-inch washed gravel.

7.2.2.9. A minimum of 24 inches of filter sand media must be placed above the 1/4-inch to 1-inch washed gravel.

7.2.2.10. A layer of 1/4-inch to 1-inch washed gravel must be placed over the sand media, with at least 3 inches placed over the distribution lines and 3 inches placed under the distribution lines. The distribution pipes must be installed in the center of this layer, and all parts of the distribution system must drain between cycles.

7.2.2.11. An appropriate geotextile fabric, untreated building paper, or straw must be used to separate the top layer of washed gravel containing the distribution lines and the sand media to keep silt from moving into the sand while allowing air and water to pass through the fabric.

7.2.2.12. The intermittent sand filter must be backfilled with 6 inches at the edges to 8 inches at the center of a suitable medium, such as sandy loam or loamy sand that is then planted with sod or other shallow-rooted vegetative cover.

7.2.2.13. Monitoring pipes to detect filter clogging must be installed. A means for sampling effluent quality must be provided.

7.2.3. Pressure distribution in accordance with Subsection 4.2.3.3, except Subsection 4.2.3.3.D, must be provided for all sand filters.

7.2.4. The dose volume must not exceed 0.25 gallons per dose per orifice. The dose frequency must not exceed 1 dose per hour per zone. The dose tank must include a minimum surge volume of 1/2 the daily flow for individual or shared systems. For multiple-user and public systems, the applicant must demonstrate that a smaller surge volume is adequate. The surge volume is the liquid storage capacity between the "timer-on" float and the "timer-override" float. The "timer-override" float and the "high-water alarm" float may be combined. Note that the surge volume defined here is not the same as the reserve storage volume defined in Chapter 4.

7.2.5. Materials

7.2.5.1. Washed drain rock meeting the requirements of Section 1.2.25 must be a minimum

of 1 inch in diameter to prevent clogging.

7.2.5.2. Washed gravel measuring 1/4-inch to 3/4 inch in diameter must meet the following gradation:

Sieve	Particle Size (mm)	Percent Passing
1 inch	25	100
3/4 inch	19	50 to 100
3/8 inch	9.5	30 to 80
No. 4	4.75	0 to 10
No. 8	2.36	0 to 2
No. 16	1.18	0 to 1

7.2.5.3. The filter media must be washed and free of clay or silt and contain the following criteria in place:

Sieve	Particle Size (mm)	Percent Passing
3/8 in	9.50	100
No. 4	4.75	95 to 100
No. 8	2.36	80 to 100
No. 16	1.18	45 to 85
No. 30	0.60	15 to 60
No. 50	0.30	3 to 10
No. 100	0.15	0 to 2

7.2.5.4. The intermittent sand filter must be covered by a suitable medium, such as sandy loam or loamy sand, to provide drainage and aeration. The material must be seeded, sodded, or otherwise provided with shallow-rooted vegetative cover to ensure stability of the installation.

7.2.6. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

7.2.7. Gravelless trenches and other absorption systems, constructed in accordance with the requirements of Subchapter 6.6, may be used in lieu of a standard absorption trench. The use of gravelless trenches and other absorption systems will not qualify for any additional reduction beyond that listed in Section 7.2.1.

7.3. RECIRCULATING SAND FILTERS

7.3.1. General

The design criteria must include, but not necessarily be limited to, the type of usage, primary treatment, filter media, filtration rate, and dosage rate. The wastewater strength discharged to the sand filter must not exceed residential strength wastewater. Recirculating sand filters must discharge to a subsurface absorption system.

Due to the reduced amount of BOD_5 and TSS produced by recirculating sand filters, the absorption system used for final disposal may be reduced for the following soil types except where specifically addressed in this Circular:

A. For subsurface absorption systems, constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

A separate subsurface absorption replacement area, sized without reductions, must be designated for each site using a recirculating sand filter.

Recirculating sand filters classified as Level 1a, Level 1b, or Level 2 systems, as defined in ARM 17.30.718, may have additional requirements beyond those listed in this Circular.

7.3.2. Design

7.3.2.1. A watertight, 30-mil PVC liner, or equivalent must be used to line the sand filter. There must be a minimum of 2 inches of sand fill between the soil surface and/or any projecting rocks and the liner.

7.3.2.2. Entrance and exit points resulting in liner penetration must be water tight.

7.3.2.3. Drain rock meeting the requirements of Section 1.2.25 must be placed in the bottom of the filter, providing a minimum depth of 6 inches in all places and providing a minimum of 2 inches of material over the top of the collection lines. The drain rock must be covered with a 3-inch layer of 1/4-inch to 3/4-inch washed gravel meeting the gradation chart in Subsection 7.2.5.2. Drain rock for the under-drain lines must meet the requirements for a standard absorption system, except it must be a minimum of 1 inch in diameter to prevent clogging.

7.3.2.4. The depth of filter media must be at least 24 inches. The media must have a Uniformity Coefficient of 2 or less, must be washed, and must meet the following gradation:

Sieve	Particle Size (mm)	Percent Passing
1/2 in	12.5	100
3/8 in	9.50	50 to 95
No. 4	4.75	0 to 15
No. 8	2.36	0 to 1.6

7.3.2.5. The filter media must be covered with a layer of 3/4- to 1.5-inch washed gravel at least 6 inches thick. The distribution pipes must be installed in the center of this layer, and all parts of the distribution system must drain between cycles.

7.3.2.6. For sizing the filter, the application rate must not exceed 5 gallons per day per square foot of filter area. This must be computed by dividing the effluent flow rate, not considering the amount of recirculation, by the area, in square feet, of the filter.

7.3.2.7. The liquid capacity of the recirculation tank must be at least 1.5 times the daily design wastewater flow. The recirculation tank must meet the same material and construction specifications as a septic tank. The minimum liquid level in the recirculation tank must be at least 80 percent of the daily flow at all times during the 24-hour daily cycle. The reviewing authority may require systems with large surge flows to have recirculation tank size based on the estimated or actual surge flow volume.

7.3.2.8. The filter-effluent line passing through the recirculation tank must be provided with a control device that directs the flow of the filter effluent. The filter effluent will be returned to the recirculation tank for recycling or be discharged to the subsurface absorption system, depending upon the liquid level in the recirculation tank. The recirculation pump(s) must be located at the opposite end of the recirculation tank from the filter return line and the tank inlet(s).

7.3.2.9. The system must be designed with a minimum recirculation ratio of not less than four. Each orifice must be dosed at least every 30 minutes, and the maximum dose volume must be 2 gallons per orifice per dose. All recirculating sand-filter dosing must be controlled with a programmable timer.

7.3.2.10. A minimum of 1 4-inch in diameter collection line must be provided. The upper end of the collection line(s) must be provided with a sweep to the surface which includes a 90-degree elbow turned up, a pipe to the surface of the filter, and a removable cap. The collection line(s) may be level. The bottom of the filter may be level or sloped to the collection line(s)

7.3.2.11. Distribution lines must be level and must be horizontally spaced a maximum of 3 feet apart, center-to-center. Orifices must be placed such that there is at least one orifice for each 4 square feet of filter media surface area.

7.3.2.12. The effluent must be discharged in such a manner as to provide uniform distribution in accordance with Subsection 4.2.3.3, except for Subsection

4.2.3.3.D.

7.3.2.13. The distribution line must be designed for freezing conditions. The plans and engineering report will specify how this is accomplished.

7.3.2.14. Topsoil or other oxygen-limiting materials must not be placed over the filter.

7.3.3. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

7.3.4. Gravelless trenches and other absorption systems, constructed in accordance with the requirements of Subchapter 6.6, may be used in lieu of a standard absorption trench. The use of gravelless trenches and other absorption systems will not qualify for any additional reduction beyond that listed in Section 7.3.1.

7.4. AEROBIC WASTEWATER TREATMENT UNITS

7.4.1. General

Aerobic treatment units (ATUs) are concrete tanks or other containers of various configurations that provide for aerobic biodegradation or decomposition of the wastewater components in a saturated environment by bringing the wastewater in contact with air by some mechanical means. ATUs are exclusively proprietary products representing a wide variety of designs, materials, and methods of assembly.

Classification of ATUs as Level 1a, Level 1b, or Level 2 systems for nutrient reduction, under ARM 17.30.718, must be made under separate application.

All ATUs must discharge to a subsurface wastewater treatment system. This treatment system must be sized in accordance with Chapters 2~~,~~ and 3~~,~~ and Section 6.1.4. Aerobic treatment devices must demonstrate compliance with the testing criteria and performance requirements for NSF Standard No. 40 for Class 1 certification. This compliance may be demonstrated either through NSF, through a third independent party using comparable protocol, or through the testing requirements outlined in ARM 17.30.718 for 30 mg/L BOD_5 and 30 mg/L TSS only. ATUs may apply the following sizing reduction to the subsurface absorption area:

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

A separate subsurface absorption replacement area, sized without reductions, must be designated for each site using an ATU.

7.4.2. An adequate form of positive filtration will be required between the treatment device and the disposal component to prevent excessive solids from being carried over into the disposal component during periods of bulking.

7.4.3. ATU systems must provide primary treatment for wastewater through a septic tank that meets all of the requirements of Chapter 5. Designs for the use of an external trash rack will be evaluated on a case-by-case basis.

7.4.4. Access ports

7.4.4.1. Ground level access ports must be sized and located to facilitate installation, removal, sampling, examination, maintenance, and servicing of components or compartments that require routine maintenance or inspection.

7.4.4.2. Access ports must be protected against unauthorized intrusion. Acceptable

protective measures include, but are not limited to, padlocks or covers that can be removed only with tools.

7.4.5. Failure sensing and signaling equipment

7.4.5.1. The ATU must possess a mechanism or process capable of detecting:

A. failure of electrical and mechanical components that are critical to the treatment process; and,
B. high liquid level conditions above the normal operation specifications.

7.4.5.2. The ATU must possess a mechanism or process capable of notifying the system owner of failure identified by the failure sensing components. The mechanism must deliver a visible and audible signal.

7.4.6. Installation

ATUs must be installed according to the manufacturer's instructions.

7.4.7. Sampling ports

7.4.7.1. A sampling port must be designed, constructed, and installed to provide easy access for collecting a water sample from the effluent stream. The sampling port may be located within the ATU or other system component, such as a pump chamber, provided that the wastewater stream being sampled is representative of the effluent stream from the ATU.

For ATUs using effluent disinfection to meet the fecal coliform criteria, the sampling port must be located downstream of the disinfection component, including the contact chamber if chemical disinfection is used, so that samples will accurately reflect disinfection performance.

7.4.7.2. Sampling ports must be protected against unauthorized intrusion, as described in Subsection 7.4.4.2.

7.4.8. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements outlined in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

7.5. CHEMICAL NUTRIENT REDUCTION SYSTEMS

7.5.1. General

Chemical nutrient reduction systems are used to provide advanced treatment of septic tank effluent. The monitoring frequency must be sufficient to establish the treatment efficiency and response to varying wastewater flows, strengths, and climatic conditions. The reviewing authority will consider the complexity and maintenance required of the system, the stability of the processes, and the monitoring data in determining the adequacy, level of maintenance, and monitoring frequency of the system.

A means of securing continuous maintenance and operation of the system must be approved by the reviewing authority.

7.5.2. Design

Specific design criteria will not be outlined in this document due to the various alternatives and design complexity involved. The EPA manual, *On-Site Wastewater Treatment Systems Manual* (February 2002), pages TFS-41 to 52, will be used as a guideline for the design of these systems.

7.5.3. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements outlined in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

7.6. ALTERNATIVE ADVANCED TREATMENT SYSTEMS

7.6.1. General

Alternative advanced treatment systems will be evaluated by the reviewing authority on a case-by-case basis.

7.6.2. Design

Specific design criteria will not be outlined in this document due to the various alternatives and design complexity involved.

Those systems that provide documentation or demonstrate through a third independent party that the unit is able to meet the testing criteria and performance requirements for NSF Standard No. 40 for Class 1 certification or meet the testing requirements outlined in ARM 17.30.718 for 30 mg/L BOD_5 and 30 mg/L TSS only may apply the following sizing reduction to the subsurface absorption area:

A. For subsurface absorption systems constructed in soils with percolation rates between 3 and 50 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 50 percent;
B. For subsurface absorption systems constructed in soils with percolation rates between 51 and 120 mpi as described in Chapter 2 and Appendix B, the final absorption area may be reduced by 25 percent.

A separate subsurface absorption replacement area, sized without reductions, must be designated for each site using an alternative advanced treatment system.

7.6.3. Classification as a Level 1a, Level 1b, or Level 2 system for nutrient reduction, under ARM 17.30.718, must be made under separate application. Additional design requirements may apply.

7.6.4. Operation and Maintenance, Certification, and As-builts

A detailed set of plans, specifications, and an operation and maintenance plan are required. The operation and maintenance plan must meet the requirements outlined in Appendix D. Certification and as-built plans are required in accordance with Appendix D.

8. MISCELLANEOUS

8.1. HOLDING TANKS

8.1.1. General

Holding tanks are used to hold wastewater until pumping occurs by a licensed septic tank pumping service and wastewater is disposed at an approved location. They are used for storage and do not, as part of their normal operation, dispose of or treat the wastewater**.**

8.1.2. Holding tanks are septic tanks that have no standard outlets and are modified to provide full time access for pumping.

8.1.3. Holding tanks must have a minimum capacity of 1,000 gallons. Larger tank capacity may be required by the reviewing authority.

8.1.4. Holding tanks must meet the construction standards for septic tanks in Chapter 5, except that no outlet opening shall be cast in the tank walls.

8.1.5. Holding tanks must have an audible or visual warning alarm that signals when the tank level has reached 75 percent of capacity. The tank must be pumped as soon as possible after the alarm is triggered and before the tank reaches 100 percent capacity.

8.1.6. Holding tanks installed where the seasonal ground water table may reach any portion of the tank must be evaluated for buoyancy by a qualified individual and flotation prevented. The tanks must be a single pour (seamless) tank design, and must be waterproofed against infiltration.

8.1.7. Holding tanks must meet the separation distances and other applicable requirements in ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

8.2. SEALED (VAULT) PIT PRIVY

8.2.1. General

A sealed pit privy is an underground vault for the temporary storage of non-water-carried wastewater. The vault must be pumped periodically and the wastewater disposed of at a treatment site.

8.2.2. Construction

8.2.2.1. The vault must be watertight, constructed of durable material, and not subject to excessive corrosion, decay, frost damage, or cracking.

8.2.2.2. The vault may be used in a floodplain or high ground water area provided that the floor surface is 1 foot above the floodplain elevation and the weight of the structure is adequate to prevent the vault from floating during high ground water or a flood even when the vault is empty. The vault must be evaluated for buoyancy by a qualified individual and flotation prevented.

8.2.2.3. The access or pumping port should be located outside of any structure and should have a minimum diameter of 8 inches. This access must have a tight, locking lid.

8.2.2.4. The vault may be a modified septic tank with the inlet and outlet opening sealed. The toilet structure over the tank vault must meet construction standards for a pit privy, as described in Section 8.3.2.

8.2.3. Maintenance and Operation

The vault must be pumped prior to reaching the maximum capacity of the tank by a licensed septic tank pumper and wastewater is disposed of at an approved location.

8.3. UNSEALED PIT PRIVY

8.3.1. General

A pit privy is a building containing a stool, urinal, or seat over an excavation in natural soil for the disposal of undiluted black wastes (toilet wastes). Pit privies may only serve structures that have no pumping fixtures or running water (piped water supply). Pit privies must meet the location requirements of ARM Title 17, Chapter 36, subchapter 3 or 9, as applicable.

8.3.2. Construction

8.3.2.1. Pit privies must be located to exclude surface water.

8.3.2.2. Pit privy buildings must be constructed with openings no greater than 1/16 inch to prohibit access of insects.

8.3.2.3. The pit must be vented with a screened flu or vent stack having a cross-sectional area of at least 7 inches per seat and extending at least 12 inches above the roof of the building.

8.3.2.4. The pit privy must be constructed on a level site with the base of the building being at least 6 inches above the natural ground surface as measured 18 inches from the sides of the building.

8.3.2.5. The bottom of the pit should be between 3 feet and 6 feet below the original ground surface.

8.3.3. Abandoning Pit Privies

8.3.3.1. A pit privy should be abandoned when the waste comes within 16 inches of the ground surface.

8.3.3.2. A pit privy building should be either dismantled or moved to cover a new pit.

8.3.3.3. The abandoned pit must be filled with soil, free of rock, with sufficient fill material to allow for 12 inches or more of settling.

8.4. SEEPAGE PITS

8.4.1. General

Seepage pits may be used for replacement systems only. Seepage pits are excavations in which a subsurface concrete ring(s) is placed in drain rock to receive effluent from the septic tank.

8.4.2. Design

8.4.2.1. Seepage pits must be sized according to the permeability of the vertical stratum where wastewater will contact the soils.

8.4.2.2. A seepage pit that is excavated to a 4-foot depth and a 5-foot diameter must be equivalent to 50 square feet of absorption area.

8.4.2.3. A seepage pit must have a concrete ring with a minimum diameter of 3 feet and a minimum height of 3.5 feet. Concrete rings may be stacked to provide for additional absorption area.

8.4.2.4. The seepage pit must have 6 inches of drain rock meeting the requirements of Section 1.2.25 placed in the bottom of the excavation for bedding.

8.4.2.5. The concrete ring must have a minimum of 1 foot of drain rock meeting the requirements of Section 1.2.25 placed on the outside of the ring. A concrete lid shall be installed on each concrete ring or on the top-most concrete ring if stacked.

8.4.2.6. Schedule 40 piping, or equivalent strength, must be used to connect the septic tank or the distribution box to the concrete ring(s).

8.4.2.7. Drain rock must be covered with an appropriate geotextile fabric, untreated building paper, or straw at least 5 inches in depth.

8.4.2.8. Effluent distribution to multiple seepage pits must use a distribution box.

8.4.2.9. Seepage pits must not be installed in soils that have percolation rates greater than 60 mpi.

8.5. WASTE SEGREGATION

8.5.1. General

Waste segregation systems consist of dry disposal for human waste, such as various biological or composting and incinerator type systems, with separate disposal for gray water.

8.5.2. Location

A complete layout must be provided showing the location of the absorption system and the location of a replacement site with adequate area for a full-size system, if waste segregation is not used, or an alternate approved wastewater treatment system for future development needs.

8.5.3. Design

This Circular addresses the specific requirements relating to the use of composting and incinerating toilets. The reviewing authority may allow the use of other designs and materials pursuant to the review of manufacturer's information and data to substantiate the proposed alternative.

8.5.3.1. Composting Toilets

A. An applicant for a composting toilet must have documentation, or demonstrate through a third independent party, that the unit is able to meet the testing criteria and performance requirements for NSF Standard 41.
B. All materials used must be durable, easily cleanable, and impervious to strong acid or alkaline solutions and corrosive environments.
C. Composting toilets must be used in accordance with the manufacturer's recommendation to serve the anticipated number of persons.
D. The composting unit must be constructed to separate the solid fraction from the liquid fraction and produce a stable humus material with less than 200 most probable number (MPN) per gram of fecal coliform.
E. Bulking agents may be added to provide spaces for aeration and microbial colonization.
F. When operated at the design rated capacity, the device must be capable of accommodating full- or part-time usage.
G. Continuous forced ventilation to the outside (e.g. electric fan or wind-driven turbo vent) of the storage or treatment chamber must be provided. Ventilation components must be independent of other household venting systems. Venting connections must not be made to room vents or to chimneys. All vents must be designed to prevent flies and other insects from entering the treatment chamber. Vent conduits and pipes must be adequately insulated to prevent the formation of interior-condensed vapors.
H. Components in which biological activity is intended to occur must be insulated, heated, or otherwise protected from low temperature conditions.

In order to maintain the stored wastes at temperatures conducive to aerobic biological decomposition, it is recommended that the components maintain a temperature range of 20° C - 55° C (68° F - 130° F). The device must be capable of maintaining wastes within a moisture range of 40 percent to 75 percent.

I. The device must be designed to prevent the deposition of inadequately treated waste near the clean-out port. The solid end product (i.e. waste humus) must be stabilized to meet NSF criteria prior to removal at the clean-out port.

J. Any liquid overflow must be discharged to a disposal field designed and approved in accordance with this Circular.

K. The contents of a composting toilet shall be removed and disposed of in compliance with 40 CFR Part 503 and Title 75, Chapter 10, MCA.

L. The owner of a composting toilet shall maintain the waste disposal system.

8.5.3.2. Incinerating Toilets

A. Incinerating toilets may be electric or gas-fired.

B. An applicant for an incinerating toilet must have documentation, or demonstrate through a third independent party, that the unit is able to meet the testing criteria and performance requirements for NSF Standard 41.

C. Incinerating toilets must be used in accordance with the manufacturer's recommendation to serve the anticipated number of persons.

D. All gas-fired incinerating toilets must be plumbed and installed as per the manufacture's recommendation and local requirements.

E. An anti-foaming agent may be added to incinerating toilets to prevent boil-over of liquid waste.

F. When operated at the design rated capacity, the device must be capable of accommodating full- or part-time usage.

G. The contents of an incinerating toilet must be removed and disposed of in compliance with 40 CFR Part 503 and Title 75, Chapter 10, part 2, MCA.

H. Vapor and products of combustion must be vented. Ventilation components must be independent of other household venting systems.

I. Incinerating toilets must be installed and operated in accordance with local air pollution requirements.

J. The owner of an incinerating toilet shall maintain the waste disposal system.

8.6. EXPERIMENTAL SYSTEMS

8.6.1. General

Treatment systems not listed in this Circular may receive a waiver for use as experimental systems. Experimental systems may be considered only under the following conditions:

8.6.1.1. The applicant shall provide adequate information to the reviewing authority that ensures the system will effectively treat the wastewater in a manner that will prevent ground water contamination and will meet all of the requirements of ARM Title 17, Chapter 36, subchapter 9.

8.6.1.2. The applicant shall include a complete description of a scientific evaluation process to be carried out by a scientific, educational, governmental, or engineering organization.

8.6.1.3. The applicant shall provide for any funding necessary to provide adequate design, installation, monitoring, and maintenance.

8.6.1.4. A professional engineer, sanitarian, or other professional, acceptable to the reviewing authority, shall design the system.

8.6.2. Reviewing Authority

The reviewing authority may place any requirements or restrictions it deems necessary on an experimental system. All requirements for conventional systems must apply to experimental systems, except those specifically exempted by waiver. Applicants shall provide for inspections to be made by persons acceptable to the reviewing authority. Monitoring and inspections must be conducted as required by the reviewing authority. The monitoring and inspection results must be submitted to the reviewing authority. The reviewing authority may require that a redundant system (i.e., a system that meets the requirements of another chapter of this Circular) be installed in parallel with the experimental system.

8.6.3. Seller's Disclosure

Any person who sells a property containing an experimental system shall disclose all permit, monitoring, and maintenance requirements to the buyer.

8.6.4. Maintenance and Operation

8.6.4.1. Continuous maintenance and operation must be provided for the life of the system by a management entity acceptable to the reviewing authority. The type of entity required and the degree of management must be commensurate with the complexity of the system and the site conditions.

8.6.4.2. The management entity shall be responsible for monitoring the operation of the

system.

8.6.4.3. Frequent inspections, as determined by the reviewing authority, of the mechanical equipment must be provided during the first 90-day start-up period.

8.6.4.4. The routine inspection schedule must be quarterly at a minimum.

8.6.4.5. Records, both of maintenance and performance, must be kept and made available to the reviewing authority upon request.

8.6.4.6. All manufacturers of experimental systems shall provide an operation and maintenance plan in accordance with Appendix D.

APPENDIX A - PERCOLATION TEST PROCEDURE

Properly conducted percolation tests may be needed to determine absorption system site suitability and to size the absorption system. If needed, percolation tests must be conducted within the boundary of the proposed absorption system. The percolation test must be completed by a qualified site evaluator approved by the reviewing authority. Some system designs may dictate different test procedures than those outlined below. Please see applicable chapters for further requirements.

Procedures outlined in ASTM D5093-02, Field Measurement of Infiltration Rate Using a Double-Ring Infiltrometer with a Sealed-Inner Ring, may be required in addition to those listed below.

Test Hole Preparation

1. Dig or bore holes 6 to 10 inches in diameter with vertical sides. The depth of the holes must be at the approximate depth of the proposed absorption trenches, typically 24 inches below ground. If the hole is larger than 6 to 8 inches, place a piece of 4-inch diameter, perforated pipe inside the hole, and fill the space between the pipe and the walls of the hole with drain rock. It is recommended that a sketch or photograph of the hole be provided to the reviewing authority.

2. Roughen or scratch the bottoms and sides of the holes to provide natural unsmeared surfaces. Remove loose material. Place about 2 inches of 3/4-inch washed gravel in the bottom of holes to prevent scouring during water addition.

3. Establish a reference point for measurements in or above each hole.

Soaking

1. Fill holes with clear water to a level of at least 12 inches above the gravel.

2. If the soil is coarser than sandy clay loam and the first 12 inches of water seeps away in 60 minutes or less, add 12 inches of water a second time. If the second filling seeps away in 60 minutes or less, the percolation test should be run immediately in accordance with the sandy soil test. If both the first and second fillings have percolation rates faster than 3 mpi, the test may be stopped.

3. If either the soil is sandy clay loam or finer, or the first 12 inches or the second 12 inches does not seep away in 60 minutes, the percolation test must be run in accordance with the test for other soils. In these other soils, maintain at least 12 inches of water in the hole for at least 4 hours to presoak the hole.

Sandy Soils Test (percolation rate of 10 mpi or faster)

This test is applicable to sandy soils only (percolation rate of 10 mpi or faster). Add water to provide a depth of 6 inches above gravel. Measure water level drop at least four times, in equally spaced intervals, in a 1-hour time period. Measure to

nearest 1/4 inch. Refill to 6-inch depth after each measurement. Do not exceed 6-inch depth of water. Use final water-level drop to calculate rate.

Other Soils Test (percolation rate slower than 10 mpi)

This test is applicable to other soils (percolation rate slower than 10 mpi). Remove loose material on top of gravel. Add water to provide a depth of 6 inches above gravel. Measure water levels for a minimum of 1 hour. A minimum of 4 measurements must be taken. The test must continue until 2 successive readings yield percolation rates that do not vary by more than 15 percent, or until measurements have been taken for 4 hours. Do not exceed 6-inch depth of water. Use final water-level drop to calculate rate.

Records

Record the following information on the attached form and include as part of the application:

- Date(s) of test(s)
- Location, diameter, and depth of each test hole,
- Time of day that each soak period began and ended
- Time of day for beginning and end of each water-level drop interval
- Each water-level drop measurement
- Calculated percolation rate
- Name and signature of person performing test
- Name of owner or project name.

Rate Calculation

Percolation Rate = Time interval in minutes/water-level drop in inches.

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
PERCOLATION TEST FORM

Owner Name _____

Project Name _____

Lot of Tract Number _____ Test Number _____

Diameter of Test Hole _____ Depth of Test Hole _____

Date and Time Soak Period Began _____ Ended _____

Date Test Began _____

Distance of the reference point above the bottom of the hole _____

Test Results

Start Time of Day	End Time of Day	Time Interval (minutes)	Initial Distance Below Reference Point	Final Distance Below Reference Point	Drop in Water Level (inches)	Percolation Rate (mpi)

I certify that this percolation test was done by a qualified site evaluator in accordance with DEQ-4 Section 1.2.68 and Appendix A.

_____ _____ _____
Name (printed) Signature Date

_____
Company

APPENDIX B - SOILS AND SITE CHARACTERIZATION

Accurate description of soil types must be based on information within Appendix B for evaluating the soils in the area of the proposed absorption system to determine if suitable conditions for wastewater treatment and disposal exist. Appendix B provides guidance for reporting soil characteristics using terminology generally accepted by the field of soil science. Application rate for wastewater treatment and disposal is based on soil characteristics using this terminology and the relative proportions of sand, silt and clay within a soil matrix.

Soil Texture

Soil texture refers to the weight proportion of the separates for particles less than 2 mm. Field criteria for estimating soil texture must be chosen to fit the soils of the area. Sand particles feel gritty and can be seen individually with the naked eye. Silt particles cannot be seen individually without magnification. They have a smooth feel to the fingers when dry or wet. In some places, clay soils are sticky, in others, they are not. Soils dominated by montmorillonite clays, for example, feel different than soils that contain similar amounts of micaceous or kaolinitic clay. The reviewing authority may require that field estimates of soil texture be checked against laboratory determinations and adjusted as necessary when soil texture cannot be identified.

Definitions of the soil texture classes according to distribution of size classes of mineral particles less than 2 mm in diameter are as follows:

Sands: 85 percent or more sand and the percentage of silt plus 1.5 times the percentage of clay is 15 or less.

Coarse sand: 25 percent or more very coarse and coarse sand and less than 50 percent any other single grade of sand.

Sand: 25 percent or more very coarse, coarse, and medium sand, but less than 25 percent very coarse and coarse sand, and less than 50 percent either fine sand or very fine sand.

Fine sand: 50 percent or more fine sand, or less than 25 percent very coarse, coarse, and medium sand, and less than 50 percent very fine sand.

Very fine sand: 50 percent or more very fine sand.

Loamy sands: At the upper limit, 85 to 90 percent sand and the percentage of silt, plus 1.5 times the percentage of clay, is 15 or more. -At the lower limit, 70 to 85 percent sand and the percentage of silt, plus twice the percentage of clay, is 30 or less.

Loamy coarse sand: 25 percent or more very coarse and coarse sand and less than 50 percent any other single grade of sand.

Loamy sand: 25 percent or more very coarse, coarse, and medium sand, but less than 25 percent very coarse and coarse sand, and less than 50 percent either fine sand or very fine sand.

Loamy fine sand: 50 percent or more fine sand or less than 50 percent very fine sand and less than 25 percent very coarse, coarse, and medium sand.

Loamy very fine sand: 50 percent or more very fine sand.

Sandy loams: 20 percent or less clay and 52 percent or more sand and the percentage of silt, plus twice the percentage of clay, exceeds 30, or less than 7 percent clay, less than 50 percent silt, and between 43 and 52 percent sand.

Coarse sandy loam: 25 percent or more very coarse and coarse sand and less than 50 percent any other single grade of sand.

Sandy loam: 30 percent or more very coarse, coarse, and medium sand, ~~(~~but less than 25 percent very coarse and coarse sand~~)~~, and less than 30 percent either fine sand or very fine sand.

Fine sandy loam: 30 percent or more fine sand and less than 30 percent, or between 15 to 30 percent very coarse, coarse, and medium sand, or more than 40 percent fine and very fine sand, at least half of which is fine sand, and less than 15 percent very coarse, coarse, and medium sand.

Very fine sandy loam: 30 percent or more very fine sand or more than 40 percent fine and very fine sand, at least half of which is very fine sand, and less than 15 percent very coarse, coarse, and medium sand.

Loam: 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

Silt loam: 50 percent or more silt and 12 to 27 percent clay or 50 to 80 percent silt and less than 12 percent clay.

Silt: 80 percent or more silt and less than 12 percent clay.

Sandy clay loam: 20 to 35 percent clay, less than 28 percent silt, and 45 percent or more sand.

Clay loam: 27 to 40 percent clay and 20 to 45 percent sand.

Silty clay loam: 27 to 40 percent clay and less than 20 percent sand.

Sandy clay: 35 percent or more clay and 45 percent or more sand.

Silty clay: 40 percent or more clay and 40 percent or more silt.

Clay: 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Necessarily, these verbal definitions are somewhat complicated. The texture triangle is used to resolve problems related to word definitions. The eight distinctions in the sand and loamy sand

groups provide refinement greater than can be consistently determined by field techniques. Only those distinctions that are significant and that can be consistently made in the field should be applied.

Particle Size Distribution

Particle size distribution (fine earth or less than 2 mm) is determined in the field mainly by feel. The content of rock fragments is determined by estimating the proportion of the soil volume that they occupy.

Soil

The United States Department of Agriculture uses the following size separates for the <2 mm mineral material:

Very coarse sand: 2.0 – 1.0 mm
Coarse sand: 1.0 – 0.5 mm
Medium sand: 0.5 – 0.25 mm
Fine sand: 0.25 – 0.10 mm
Very fine sand: 0.10 – 0.05 mm
Silt: 0.05 – 0.002 mm
Clay: <0.002 mm

The texture classes are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. Subclasses of sand are subdivided into coarse sand, sand, fine sand, and very fine sand. Subclasses of loamy sands and sandy loams that are based on sand size are named similarly.

Rock Fragments

Rock fragments are unattached pieces of rock 2 mm in diameter, or larger, that are strongly cemented or more resistant to rupture. Rock fragments include all sizes that have horizontal dimensions less than the size of a pedon.

Rock fragments are described by size, shape, and, for some, the kind of rock. The classes are pebbles, cobbles, channers, flagstones, stones, and boulders. If a size or range of sizes predominates, the class is modified as, for example: "fine pebbles," "cobbles 100 to 150 mm in diameter," and "channers 25 to 50 mm in length."

Gravel is a collection of pebbles that have diameters ranging from 2 to 75 mm. The terms "pebble" and "cobble" are usually restricted to rounded or subrounded fragments. However, they can be used to describe angular fragments if they are not flat. Words like chert, limestone, and shale refer to a kind of rock, not a piece of rock. The upper size of gravel is 3 inches (75 mm). The 5-mm and 20-mm divisions for the separation of fine, medium, and coarse gravel coincide with the sizes of openings in the "number 4" screen (4.76 mm) and the "3/4-inch" screen (19.05 mm) used in engineering.

The 75-mm (3-inch) limit separates gravel from cobbles. The 250-mm (10-inch) limit separates cobbles from stones and the 600-mm (24-inch) limit separates stones from boulders. The 150-mm (channers) and the 380-mm (flagstones) limits for thin, flat fragments follow conventions used for many years to provide class limits for plate-shaped and crudely spherical rock fragments that have about the same soil use implications as the 250-mm limit for spherical shapes.

Rock Fragments in Soil

The adjectival form of a class name of rock fragments (Appendix B, Table B-1) is used as a modifier of the textural class name: "gravelly loam," and "stony loam." The following classes, based on volume percentages, are used:

Less than 15 percent: No adjectival or modifying terms are used in writing for contrast with soils having less than 15 percent pebbles, cobbles, or flagstones. The adjective "slightly" may be used, however, to recognize those soils used for special purposes.

15 to 35 percent: The adjectival term of the dominant kind of rock fragment is used as a modifier of the textural terms: "gravelly loam," "channery loam," and "cobbly loam."

35 to 60 percent: The adjectival term of the dominant kind of rock fragment is used with the word "very" as a modifier of the textural term: "very gravelly loam" and "very flaggy loam."

More than 60 percent: If enough fine earth is present to determine the textural class (approximately 10 percent or more by volume), the adjectival term of the dominant kind of rock fragment is used with the word "extremely" as a modifier of the textural term: "extremely gravelly loam," and "extremely bouldery loam." If there is too little fine earth to determine the textural class (less than about 10 percent by volume), the terms "gravel," "cobbles," "stones," or "boulders" are used as appropriate.

The class limits apply to the volume of the layer occupied by all pieces of rock larger than 2 mm. The soil generally contains fragments smaller or larger than those identified in the term. For example, a stony loam usually contains pebbles, but "gravelly" is not mentioned in the name. The use of a term for larger pieces of rock, such as boulders does not imply that the pieces are entirely within a given soil layer. A simple boulder may extend through several layers.

Table B-1
Terms for Rock Fragments

Shape and size	Noun	Adjective
Spherical, cubelike, or equiaxial:		
2-75 mm diameter	Pebbles	Gravelly
2-5 mm diameter	Fine	Fine gravelly
5-20 mm diameter	Medium	Medium gravelly
20-75 mm diameter	Coarse	Coarse gravelly
75-250 mm diameter	Cobbles	Cobbly
250-600 mm diameter	Stones	Stony
> 600 mm diameter	Boulders	Bouldery
Flat:		
2-150 mm long	Channers	Channery
150-380 mm long	Flagstones	Flaggy
380-600 mm long	Stones	Stony
> 600 mm long	Boulders	Bouldery

Table B-2
Classes of Surface Stones and Boulders in Terms of Cover and Spacing

Class	Percentage of surface covered	Distance in meters between stones or boulders if the diameter is:			Name
		0.25m	0.6m	1.2m	
1	0.01 - 0.1	>8	>20	>37	Stony or bouldery
2	0.1 - 3.0	1 - 8	3 - 20	6 - 37	Very stony or very bouldery
3	3.0 - 15	0.5 - 1	1 - 3	2 - 6	Extremely stony or extremely bouldery
4	15 - 50	0.3 - 0.5	0.5 - 1	1 - 2	Rubbly
5	50 - 90	<0.3	<0.05 - 1	<1	Very rubbly

Soil Color

Elements of soil color descriptions are the color name, the Munsell notation, the water state, and the physical state: "brown (10YR 5/3), dry, crushed, and smoothed."

Physical state is recorded as broken, rubbed, crushed, or crushed and smoothed. The term "crushed" usually applies to dry samples and "rubbed" to moist samples. If unspecified, the surface is broken. The color of the soil is recorded for a surface broken through a ped, if a ped can be broken as a unit.

The color value of most soil material becomes lower after moistening. Consequently, the water state of a sample is always given. The water state is either "moist" or "dry." The dry state for color determinations is air-dry and should be made at the point where the color does not change with additional drying. Color in the moist state is determined on moderately moist or very moist soil material and should be made at the point where the color does not change with additional moistening. The soil should not be moistened to the extent that glistening takes place, as color determinations of wet soil may be in error because of the light reflection of water films.

Munsell notation is obtained by comparison with a Munsell system color chart. The most commonly used chart includes only about 1/5 of the entire range of hues. It consists of about 250 different colored papers, or chips, systematically arranged on hue cards according to their Munsell notations.

The Munsell color system uses 3 elements of color – hue, value, and chroma – to make up a color notation. The notation is recorded in the form: hue, value/chroma – for example, 5Y 6/3.

Hue is a measure of the chromatic composition of light that reaches the eye. The Munsell system is based on five principle hues: red (R), yellow (Y), green (G), blue (B), and purple (P). Five intermediate hues representing midpoints between each pair of principle hues complete the 10 major hue names used to describe the notation. The intermediate hues are yellow-red (YR), green-yellow (GY), blue-green (BG), purple-blue (PB), and red-purple (RP).

Value indicates the degree of lightness or darkness of a color in relation to a neutral gray scale. On a neutral gray (achromatic) scale, value extends from pure black (0/) to pure white (10/). The value notation is a measure of the amount of light that reaches the eye under standard lighting conditions.

Chroma is the relative purity or strength of the spectral color. Chroma indicates the degree of saturation of neutral gray by the spectral color. The scales of chroma for soils extend from /0 to a chroma of /8 as the strongest expression of color used for soils.

Conditions for Measuring Color

The quality and intensity of the light affect the amount and quality of the light reflected from the sample to the eye. The moisture content of the sample and the roughness of its surface affect the light reflected. The visual impression of color from the standard color chips is accurate only under standard conditions of light intensity and quality. Color determination may be inaccurate

early in the morning or late in the evening. When the sun is low in the sky or the atmosphere is smoky, the light reaching the sample and the light reflected is redder. Even though the same kind of light reaches the color standard and the sample, the reading of sample color at these times is commonly one or more intervals of hue redder than at midday. Colors also appear different in the subdued light of a cloudy day than in bright sunlight. If artificial light is used, as for color determinations in an office, the light source used must be as near the white light of midday as possible. With practice, compensation can be made for the differences, unless the light is so subdued that the distinctions between color chips are not apparent. The intensity of incidental light is especially critical when matching soil to chips of low chroma and low value.

Roughness of the reflecting surface affects the amount of reflected light, especially if the incidental light falls at an acute angle. The incidental light should be as nearly as possible at a right angle. For crushed samples, the surface is smoothed and the state is recorded as "dry, crushed, and smoothed."

Recording Guidelines

Uncertainty exists under field conditions. Measurements of color are reproducible by different individuals within 2.5 units of hue (1 card) and 1 unit of value and chroma.

Dominant color is the color that occupies the greatest volume of the layer. Dominant color (or colors) is always given first among those of a multicolored layer. It is judged on the basis of colors of a broken sample. For only 2 colors, the dominant color makes up more than 50 percent of the volume. For 3 or more colors, the dominant color makes up more of the volume of the layer than any other color, although it may occupy less than 50 percent.

Mottling refers to repetitive color changes that cannot be associated with compositional properties of the soil. Redoximorphic features are a type of mottling that is associated with wetness. A color pattern that can be related to the proximity to a ped surface of other organizational or compositional feature is not mottling. Mottle description follows the dominant color. Mottles are described by quantity, contrast, color, and other attributes in that order.

Quantity is indicated by three areal percentage classes of the observed surface:

Few: less than 2 percent
Common: 2 to 20 percent
Many: more than 20 percent

The notations must clearly indicate to which colors the terms for quantity apply.

Size refers to dimensions as seen on a plane surface. If the length of a mottle is not more than 2 or 3 times the width, the dimension recorded is the greater of the 2. If the mottle is long and narrow, as a band of color at the periphery of a ped, the dimension recorded is the smaller of the 2 and the shape and location are also described. Three size classes are used:

Fine: smaller than 5 mm
Medium: 5 to 15 mm

Coarse: larger than 15 mm

Contrast refers to the degree of visual distinction that is evident between associated colors:

Faint: Evident only on close examination, faint mottles commonly have the same hue as the color to which they are compared and differ by no more than 1 unit of chroma or 2 units of value. Some faint mottles of similar but low chroma and value differ by 2.5 units (one card) of hue.

Distinct: Readily seen but contrast only moderately with the color to which they are compared. Distinct mottles commonly have the same hue as the color at which they are compared, but differ by 2 to 4 units of chroma or 3 to 4 units of value, or differ from the color to which they are compared by 2 units (1 card) of hue, but by no more than 1 unit of chroma or 2 units of value.

Prominent: Contrast strongly with the color to which they are compared. Prominent mottles are commonly the most obvious color feature of the section described. Prominent mottles that have medium chroma and value commonly differ from the color to which they are compared by at least 5 units (two pages) of hue, if chroma and value are the same, at least 4 units of value or chroma, if the hue is the same, or at least 2 units of chroma or 2 units of value, if hue differs by 2.5 units (one card).

Contrast is often not a simple comparison of one color with another, but is a visual impression of the prominence of the one color against a background, commonly involving several colors.

Soil Structure

Soil structure refers to units composed of primary particles. The cohesion within these units is greater than the adhesion among units. As a consequence, under stress, the soil mass tends to rupture along predetermined planes or zones. Three planes or zones, in turn, form the boundary. A structural unit that is the consequence of soil development is called a ped. The surfaces of peds persist through cycles of wetting and drying in place. Commonly, the surface of the ped and its interior differ as to composition or organization, or both, because of soil development.

Some soils lack structure and are referred to as structureless. In structureless layers or horizons, no units are observable in place or after the soil has been gently disturbed, such as by tapping a space containing a slice of soil against a hard surface or by dropping a large fragment on the ground. When structureless soils are ruptured, soil fragments, single grains, or both, result. Structureless soil material may be either single grain or massive. Soil material of single grains lacks structure. In addition, it is loose. On rupture, more than 50 percent of the mass consists of discrete mineral particles.

Some soils have simple structure, each unit being an entity without component smaller units. Others have compound structure, in which large units are composed of smaller units separated by persistent planes of weakness.

In soils that have structure, the shape, size, and grade (distinctness) of the units are described.

Field terminology for soil structure consists of separate sets of terms designating each of the 3 properties, which by combination form the names for structure.

Shape

Several basic shapes of structural units are recognized in soils:

Platy: The units are flat and platelike. They are generally oriented horizontally. A special form, lenticular platy structure, is recognized for plates that are thickest in the middle and thin toward the edges.

Prismatic: The individual units are bounded by flat to rounded vertical faces. Units are distinctly longer vertically and the faces are typically casts or molds of adjoining units. Vertices are angular or subrounded. The tops of prisms are somewhat indistinct and normally flat.

Columnar: The units are similar to prisms and are bounded by flat or slightly rounded vertical faces. The tops of columns, in contrast to those prisms, are very distinct and normally rounded.

Blocky: The units are block like or polyhedral. They are bounded by flat or slightly rounded surfaces that are casts of the faces of surrounding peds. Typically, blocky structural units are nearly equidimensional but grade to prisms and to plates. The structure is described as angular blocky if the faces intersect at relatively sharp angles. The structure is described as subangular blocky if the faces are a mixture of rounded and plane faces and the corners are mostly rounded.

Granular: The units are approximately spherical or polyhedral and are bounded by curved or very irregular faces that are not casts of adjoining peds.

Size

Five classes are employed: very fine, fine, medium, coarse, and very coarse. The size limits differ according to the shape of the units. The size limit classes are given in Appendix B, Table B-3. The size limits refer to the smallest dimension of plates, prisms, and columns.

Table B-3
Size Classes of Soil Structure

	Shape of Structure			
Size Classes	**Platy[1]**	**Prismatic & Columnar**	**Blocky**	**Granular**
	mm	**mm**	**mm**	**mm**
Very Fine	<1	<10	<5	<1
Fine	1 – 2	10 – 20	5 – 10	1 – 2
Medium	2 – 5	20 – 50	10 – 20	2 – 5
Coarse	5 – 10	50 – 100	20 – 50	5 – 10
Very Coarse	>10	>100	>50	>10

[1] In describing plates, "thin" is used instead of "fine" and "thick" instead of "coarse."

Grade

Grade describes the distinctness of units. Criteria are the ease of separation into discrete units and the proportion of units that hold together when the soil is handled. Three classes are used:

Weak: The units are barely observable in place. When gently disturbed, the soil material parts into a mixture of whole and broken units and much material that exhibits no planes of weakness. Faces that indicate persistence through wet-dry-wet cycles are evident if the soil is handled carefully. Distinguishing structurelessness from weak structure is sometimes difficult. Weakly expressed structural units in virtually all soil materials have surfaces that differ in some way from the interiors.

Moderate: The units are well formed and evident in undisturbed soil. When disturbed, the soil material parts into a mixture of mostly whole units, some broken units, and material that is not in units. Peds part from adjoining peds to reveal nearly entire faces that have properties distinct from those of fractured surfaces.

Strong: The units are distinct in undisturbed soil. They separate cleanly when the soil is disturbed. When removed, the soil material separates mainly into whole units. Peds have distinctive surface properties.

Three terms for soil structure are combined in order (1) grade, (2) size, (3) shape. "Strong fine granular structure" is used to describe a soil that separates almost entirely into discrete units that are loosely packed, roughly spherical, and mostly between 1 and 2 mm in diameter.

Compound Structure

Smaller structural units may be held together to form larger units. Grade, size, and shape are given for both, and the relationship of one set to the other is indicated: "strong medium blocks within moderate coarse prisms" or "moderate coarse prismatic structure parting to strong medium blocky."

Concentrations

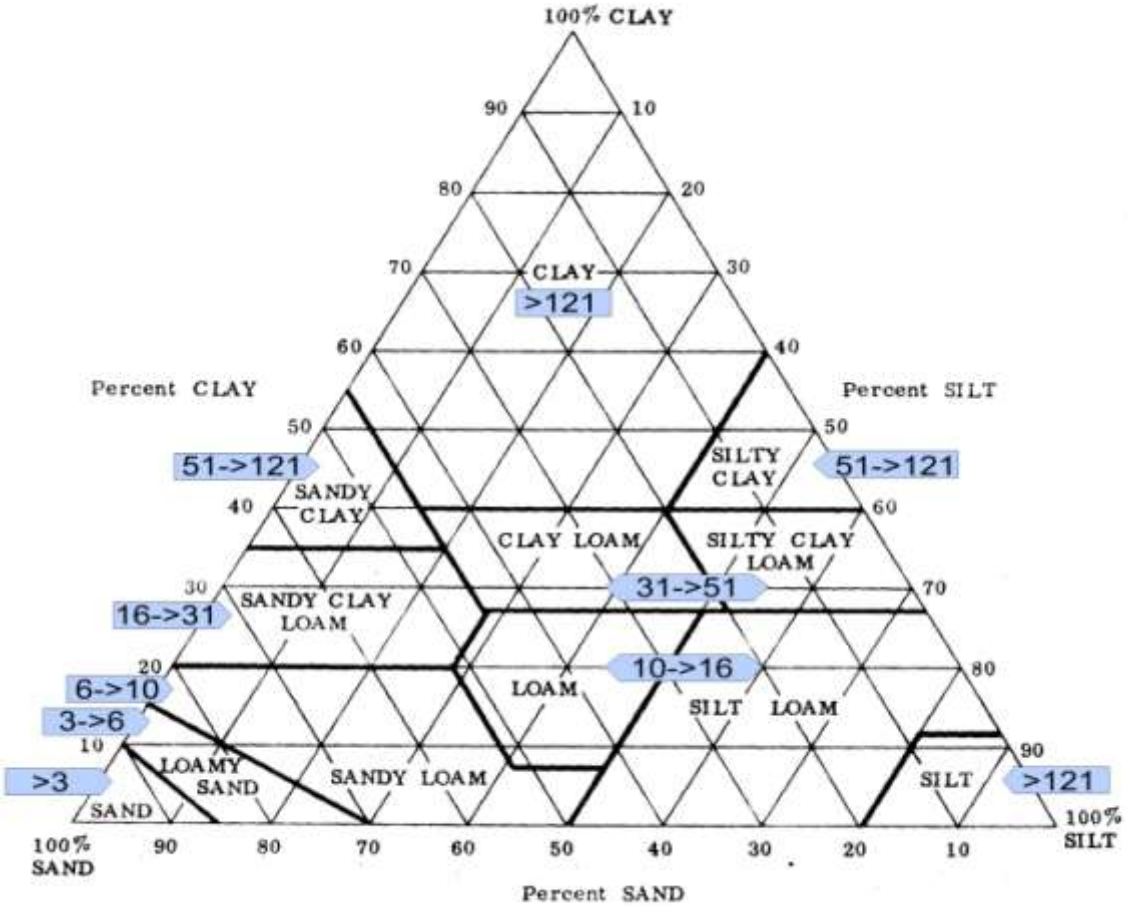
The features discussed here are identifiable bodies within the soil that were formed by pedogenesis. Some of these bodies are thin and sheetlike, some are nearly equidimensional, and others have irregular shapes. They may contrast sharply with the surrounding material in strength, composition, or internal organization. Masses are non-cemented concentrations of substances that commonly cannot be removed from the soil as a discrete unit. Most accumulations consist of calcium carbonate, fine crystals of gypsum or more soluble salts, or iron and manganese oxides. Except for very unusual conditions, masses have formed in place.

Nodules and concretions are cemented bodies that can be removed from the soil intact. Composition ranges from material dominantly like that of the surrounding soil to nearly pure chemical substances entirely different from the surrounding material.

Concretions are distinguished from nodules on the basis of internal organization. Concretions have crude internal symmetry organized around a point, a line, or a plane. Nodules lack evident, orderly internal organization.

Textural Triangle

Soil Percolation Rate min/in



APPENDIX C - GROUND WATER OBSERVATION WELL INSTALLATION AND MEASURING PROCEDURES

Observation Schedule

Observation must be done during the time when ground water levels are highest. This is typically during spring runoff or during the irrigation period, but may also be at some other time during the year. Observation must be done weekly or more frequently during the appropriate periods of suspected high ground water. Observation must include at least two weeks of observation prior to and after the ground water peak, otherwise the reviewing authority may reject the results. The applicant is encouraged to consult with the state and/or county before installing wells. The monitoring of the observation well must be completed by a qualified site evaluator as defined in Section 1.2.68 approved by the reviewing authority.

Surface water levels may be indicative of the ground water levels that may peak several weeks after spring runoff and irrigation seasons.

Local conditions may indicate that there is more than one geologic horizon that can become seasonally saturated. This may require observation wells to be installed at different horizons. The well should be placed in, but not extended through, the horizon that is to be monitored.

The reviewing authority may refuse to accept seasonal high ground water data when the total precipitation for the previous year, defined as May 1 of the previous year to April 30 of the current year, of April 1 snowpack equivalent, measured at the nearest officially recognized observation station, is more than 25 percent below the 30-year historical average. This is based upon the definition of drought conditions created by the National Drought Mitigation Center. The reviewing authority may consider soil morphology and data from nearby ground water observation sites with similar soil, geology, and proximity to streams or irrigation ditches, if available, to determine maximum ground water elevation during periods of drought.

Where to Install

The observation well(s) must be installed within 25 feet of the proposed absorption trench and on the same elevation. The reviewing authority may require the placement of the well(s) in an exact location. Additional observation wells may be required if the recommended observation sites show ground water higher than 6 feet below the ground surface.

Installation Process

The observation well must be installed vertically into a dug or drilled hole.

A slotted water well pipe should be used that is 2 to 4 inches in diameter and 10 feet long.

A. Slotted pipe (PVC is the most common material) with slot sizes between 40 and 100 (i.e. slot widths between 0.04 and 0.10 inches wide) is suggested. Slots should be horizontal and spaced at intervals less than or equal to 0.5 inches.
B. Check with the reviewing authority to determine if an alternate well material is

acceptable.

The pipe should be perforated from 1 foot below the ground surface to 8 feet below the ground surface unless multiple horizons exist.

The casing must be unperforated 1 foot below the ground surface to the top of the observation well. The well must extend at least 2 feet above the ground surface.

The top of the observation well must be sealed with a watertight cap.

The area around the well must be backfilled with native material to 1 foot below the ground surface.

The observation well must be sealed in such a manner that prevents surface runoff from running along the outside of the well casing. The well should be sealed from 1 foot below the ground surface to slightly above grade to allow for subsidence and to maintain a positive ground slope away from well casing. The material used to seal the well can be either fine-grained material or bentonite.

Each observation well should be flagged to facilitate locating the well and labeled with the lot number, location, and subdivision name.

Measuring Procedures

Lower a measuring tape or stick to the water level and measure the distance from the water level to the top of the pipe (see example on next page). Water levels should be measured to the nearest inch. A plunking device or electronic water sensor can also be used. Data should be submitted in a similar form to that of the example.

Measure the distance from the top of the pipe to the natural ground surface (B distance) (see example). Then measure the distance from the top of the pipe to the water level (A distance) (see example). Subtract B from A. This value equals the actual separation between the water table and the natural ground surface.

Decommissioning

The applicant should consult with the reviewing authority before decommissioning observation wells.

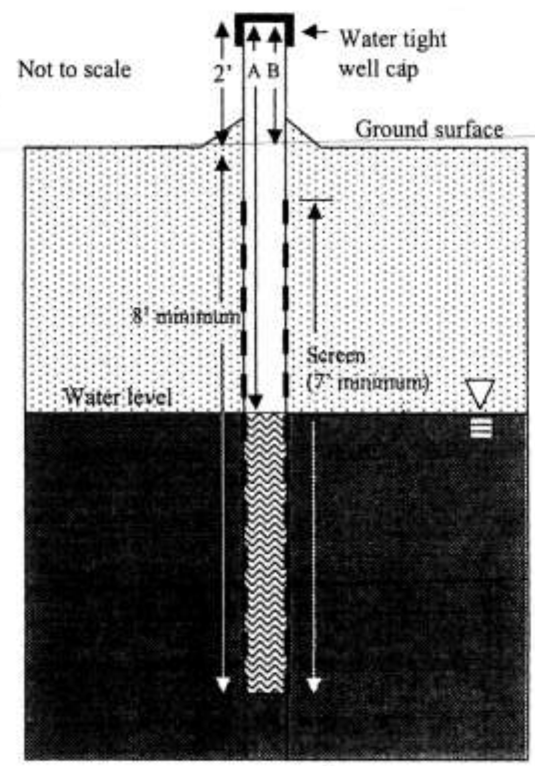
Ground Water Observation Results
Monitored By:
Location :
Section __________ Township_________ Range______ Lot #______
Observation Well # ________

Other Location Information:

Date	Time	A (inches)	B (inches)	A-B (inches)

A= Distance to top of casing to the ground water level in pipe (inches).
Note: If the observation pipe is dry, enter the total depth measured and "dry" in this column.
B= Distance from top of casing to the natural ground surface (inches).

Ground Water Observation Well Design



APPENDIX D - OPERATION AND MAINTENANCE PLAN

Continued service and maintenance of the wastewater system must be addressed for the life of the system by an approved operation and maintenance plan.

The owner of the residence or facility is responsible for assuring proper operation and providing timely maintenance of the system. A copy of the approved operation and maintenance plan must be given to the local health department for their files. Some health departments may require that this document be presented in electronic format. If observations reveal a system failure, absorption trench failure, or history of effluent ponding within the absorption trench, the owner of the system must take appropriate action. Notification to the local health department and, if appropriate, the service provider must be made within two business days if any unit of the system fails to function properly.

The reviewing authority will consider the complexity and maintenance required of the system along with the stability of the processes in determining the adequacy, level of maintenance, and monitoring frequency of the system. The monitoring frequency should be sufficient to establish the treatment efficiency and response to varying wastewater flows, strengths, and climatic condition.

The operation and maintenance plan must include: an owner's manual, a system installation manual, an operation and maintenance manual, and as-built plans with the name of the designer and installer.

Certification and As-builts
The following wastewater treatment systems require certification and as-builts:

Public Wastewater Systems, regardless of type, in accordance with ARM 17.38.101
Cut, Fill, and Artificially Drained Systems
Drainfields that serve 10 or More Living Units
High Strength Wastewater Treatment Systems
Alternative Wastewater Collection Systems
Raw Wastewater Pumping Stations
Elevated Sand Mounds
Evapotranspiration Absorption and Evapotranspiration Systems
Gray Water Irrigation Systems
Intermittent Sand Filters
Recirculating Sand Filters
Aerobic Wastewater Treatment Units
Chemical Nutrient Reduction Systems
Alternate Advanced Treatment Systems

The wastewater system owner may not commence or continue the operation of the wastewater systems listed above, or any portion of such system, prior to certifying by letter to the reviewing authority that the system, or portion of the system constructed, altered, or extended to that date, was completed in accordance with plans and specifications approved by the reviewing authority. Within 90 days after the completion of construction, alteration, or extension of the wastewater

systems listed above, or any portion of such system, a complete set of certified "as-built" drawings must be signed and submitted to the reviewing authority.

Owner's Manual

A comprehensive owner's manual must be submitted to the reviewing authority and include:

A. A clear statement providing examples of the types of waste that can be effectively treated by the system;
B. Requirements for periodic removal of residuals from the system. The septic tank, grease trap, or other settling tanks should be pumped as specified by the manufacturer;
C. A course of action to be applied if the system will be used intermittently or if extended periods of non-use are anticipated;
D. The name and telephone number of a service representative, pumpers, and the local health department to be contacted in the event that the system experiences a problem; and
E. Description of the initial and extended service policies.

Installation Manual

A comprehensive installation manual must be submitted to the reviewing authority and include:

A. A numbered parts list of system components with accompanying illustrations, photographs, or prints in which the components are respectively identified;

B. Design, construction, and material specifications for the system's components;

C. Schematic drawings of the system's electrical components;

D. A process overview explaining the function of each component and a description of how the entire system functions when all components are properly assembled and connected;

E. A clear description of installation requirements for, but not limited to, plumbing, electrical power, ventilation, air intake protection, bedding, hydrostatic displacement protection (floating in high ground water conditions), watertightness, slope, and miscellaneous fittings and appurtenances;

F. A sequential installation procedure from the residence out to the effluent discharge connection; and

G. A detailed start-up procedure.

Operations and Maintenance Manual

Comprehensive instruction in the operation and maintenance of the system must be provided to the reviewing authority and must include:

A. Maintenance procedures and schedules for all components;

B. Requirements and recommended procedures for periodic removal of residuals from the system;

C. A detailed procedure for visually evaluating function of system components; and

D. Safety concerns that may need to be addressed.

As-built Plans

A comprehensive set of as-built plans must be submitted to the reviewing authority and include the name of the designer and installer. As-builts will be added to the operation and maintenance plan after initial approval and construction of the system.

Proprietary and High Strength Wastewater Treatment Systems

In addition to the requirements of this Appendix, all proprietary and high strength wastewater treatment systems must have both an initial and a renewed service contract for the life of the system. Service contracts must include:

A. Owner's name and address;

B. Property address and legal description;

C. Local health department permit requirements;

D. Detail of service to be provided. The owner must be notified, in writing, about any improper system function that cannot be remedied during the time of inspection, and an estimate for the date of correction;

E. Schedule of service provider duties. Initial 2-year service policies must stipulate a minimum of 4 inspection/service visits, scheduled at least once every 6 months over the 2-year period, during which electrical, mechanical, and other components are inspected, adjusted, and serviced;

F. Cost and length of service contract/time period;

G. Details of product warranty; and

H. Owner's responsibilities.

For subsurface wastewater treatment systems, classified under ARM 17.30.718 as Level 1a, Level 1b, or Level 2 for nutrient reduction, the system vendor or manufacturer must offer an operation

and maintenance plan that meets the requirements of this Appendix and ARM 17.30.718.

APPENDIX E - DESIGN EXAMPLES

ESM - Elevated Sand Mound Example

ELEVATED SAND MOUND - DESIGN EXAMPLE

Parameters:

4-bedroom house

Design Flow: 350 gallons per day (gpd)

Land Slope: Flat

Underlying Soil Type: Clay Loam

Soil Application Rate: 0.3 gallons per day per square foot (gpd/sf)

Sand Loading Rate per DEQ-4: 0.8 gpd/sf

Basal Loading Rate per DEQ-4: 0.3 gpd/sf

Bed size based upon sand loading rate:

350 gpd ÷ 0.8 gpd/sf = 438 sf of required absorption area.

Required Minimum Basal Area based upon soil loading rate:

350 gpd ÷ 0.3 gpd/sf = 1,167 sf of Basal Area required.

Montana Department of Environmental Quality	Scale: NTS	Elevated Sand Mound Design Parameters	Dwg. No. ESM-1

BED DESIGN

438 sf of bed required.

§6.6.3.7 requires a minimum 3:1 ratio of length to width.

Let "x" = width, then "3x = length

Thus:

$3x^2 = 438$

$x = \sqrt{438/3}$

x = 12.08' ; 3x = 32.25'

Round to 12.5' x 37.5' so §6.6.3.7 is still met.

Check Basal Area Requirements:

Overall Width of Mound:

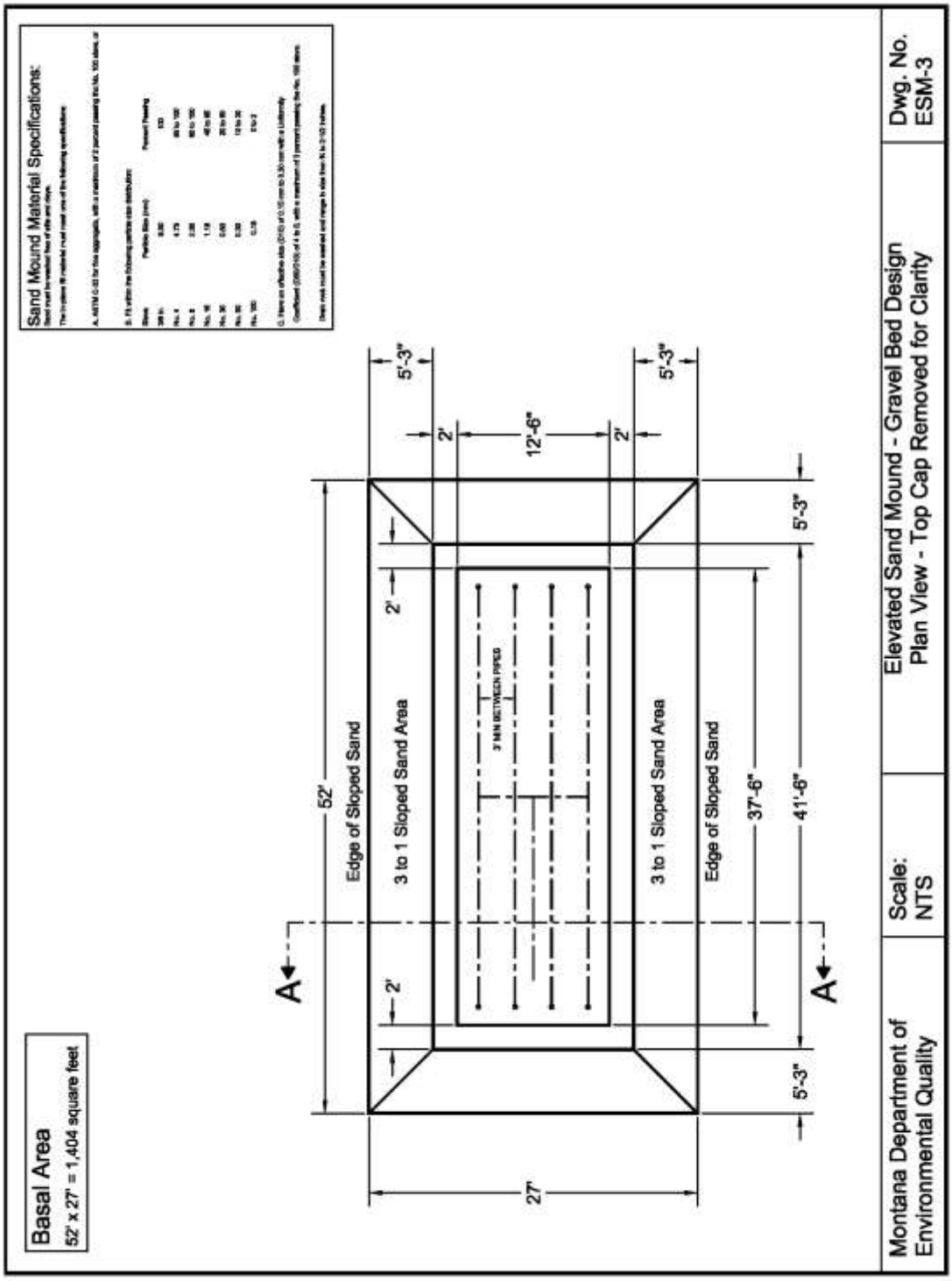
5.25' + 2' + 12.5' + 2' + 5.25' = 27'

Overall Length of Mound:

5.25' + 2' + 37.5' + 2' + 5.25' = 52'

52' x 27' = 1,404 sf > 1,167 sf so §6.6.3.3 requirement met

Montana Department of Environmental Quality	Scale: NTS	Elevated Sand Mound Gravel Bed Design Parameters	Dwg. No. ESM-2


Sand Mound Material Specifications:
Basal Area
52' x 27' = 1,404 square feet
A
52'
Edge of Sloped Sand
3 to 1 Sloped Sand Area
2'
3' MIN BETWEEN PIPES
5'-3"
12'-6"
37'-6"
41'-6"
27'
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Gravel Bed Design
Plan View - Top Cap Removed for Clarity
Dwg. No. ESM-3

Sand Mound Material Specifications:

Sand must be washed free of silts and clays.

The in-place fill material must meet one of the following specifications:

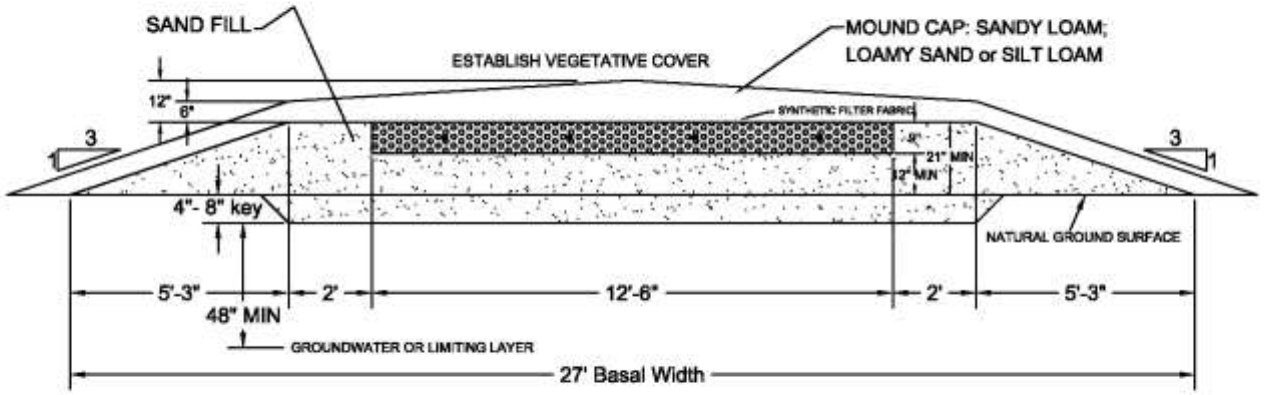
A. ASTM C-33 for fine aggregate, with a maximum of 2 percent passing the No. 100 sieve, or

B. Fit within the following particle size distribution:

Sieve	Particle Size (mm)	Percent Passing
3/8 in	9.50	100
No. 4	4.75	95 to 100
No. 8	2.36	80 to 100
No. 16	1.18	45 to 85
No. 30	0.60	20 to 55
No. 50	0.30	10 to 30
No. 100	0.15	0 to 2

C. Have an effective size (D10) of 0.15 mm to 0.30 mm with a Uniformity Coefficient (D60/D10) of 4 to 6, with a maximum of 3 percent passing the No. 100 sieve.

Drain rock must be washed and range in size from ¾ to 2-1/2 inches.



Montana Department of Environmental Quality	Scale: NTS	Elevated Sand Mound - Bed Design Section A-A View	Dwg. No. ESM-4

LEECHING BED DESIGN

438 sf of bed required.

§6.6.3.7 requires a minimum 3:1 ratio of length to width.

Let "x" = width, then "3x = length

Thus:

$3x^2 = 438$

$x = \sqrt{438/3}$

x = 12.08' ; 3x = 32.25'

Round to 15' x 36' for standard 3' wide x 4' long chambers: §6.6.3.7 is met.

Check Basal Area Requirements:

Overall Width of Mound:

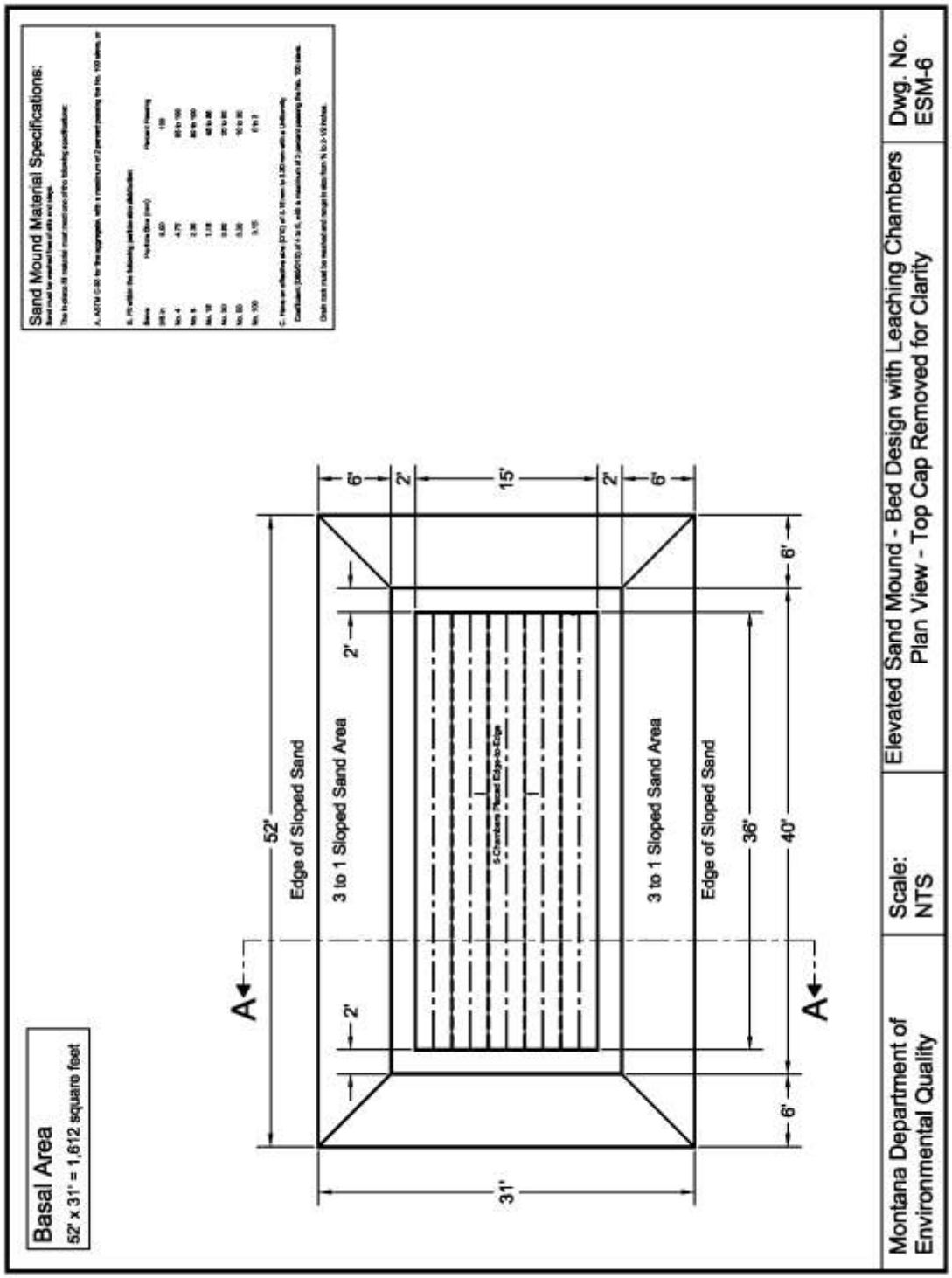
6' + 2' + 15' + 2' + 6' = 31'

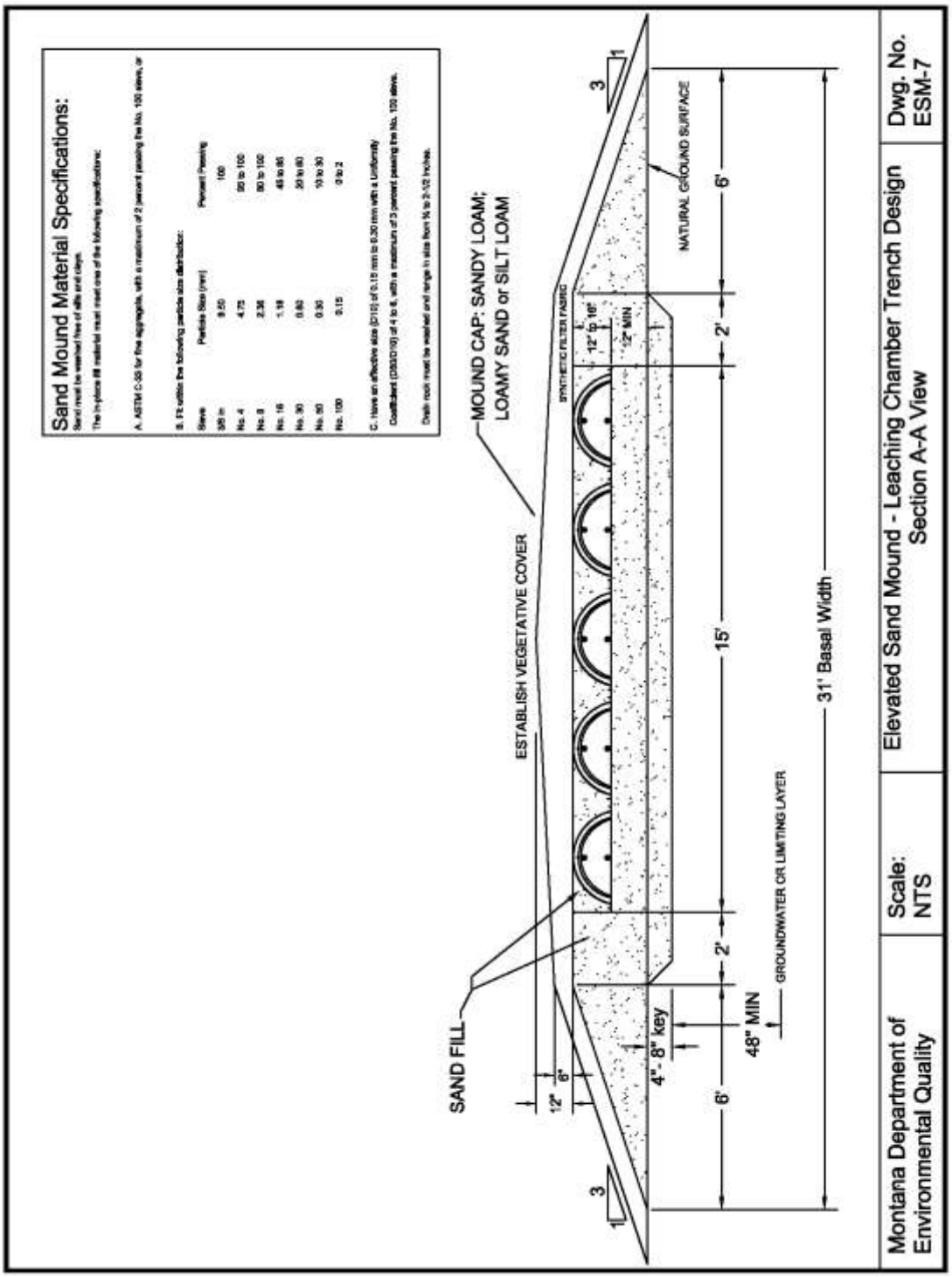
Overall Length of Mound:

6' + 2' + 36' + 2' + 6' = 52'

52' x 31' = 1,612 sf > 1,167 sf so §6.6.3.3 requirement met

Montana Department of Environmental Quality	Scale: 1" = 1' - 0"	Elevated Sand Mound Leeching Chamber Bed Design Parameters	Dwg. No. ESM-5


Sand Mound Material Specifications:
Basal Area
52' x 31' = 1,612 square feet
52'
Edge of Sloped Sand
3 to 1 Sloped Sand Area
2'
6'
15'
31'
36'
40'
A
5-Chambers Placed Edge-to-Edge
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Bed Design with Leaching Chambers
Plan View - Top Cap Removed for Clarity
Dwg. No. ESM-6


Sand Mound Material Specifications:
MOUND CAP: SANDY LOAM; LOAMY SAND or SILT LOAM
ESTABLISH VEGETATIVE COVER
SAND FILL
SYNTHETIC FILTER FABRIC
NATURAL GROUND SURFACE
GROUNDWATER OR LIMITING LAYER
12" to 16"
12" MIN
12"
6"
4" - 8" key
48" MIN
6'
2'
15'
2'
6'
3
1
31' Basal Width
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Leaching Chamber Trench Design
Section A-A View
Dwg. No. ESM-7

ETA Evapotranspiration Absorption System Example

EVAPOTRANSPIRATION ABSORPTION SYSTEM - DESIGN EXAMPLE

Parameters: 4-bedroom house near Terry; design flow 350 gallons per day (gpd)

Land Slope: Flat;   Underlying Soil Type: Clay

Soil Application Rate Based Upon Percolation Test: 0.15 gpd/sf (Section 6.7.3.5)

Bed Material Void Ratio 40 %

Required Factor of Safety: 1.5 (per Section 6.7.3.7)

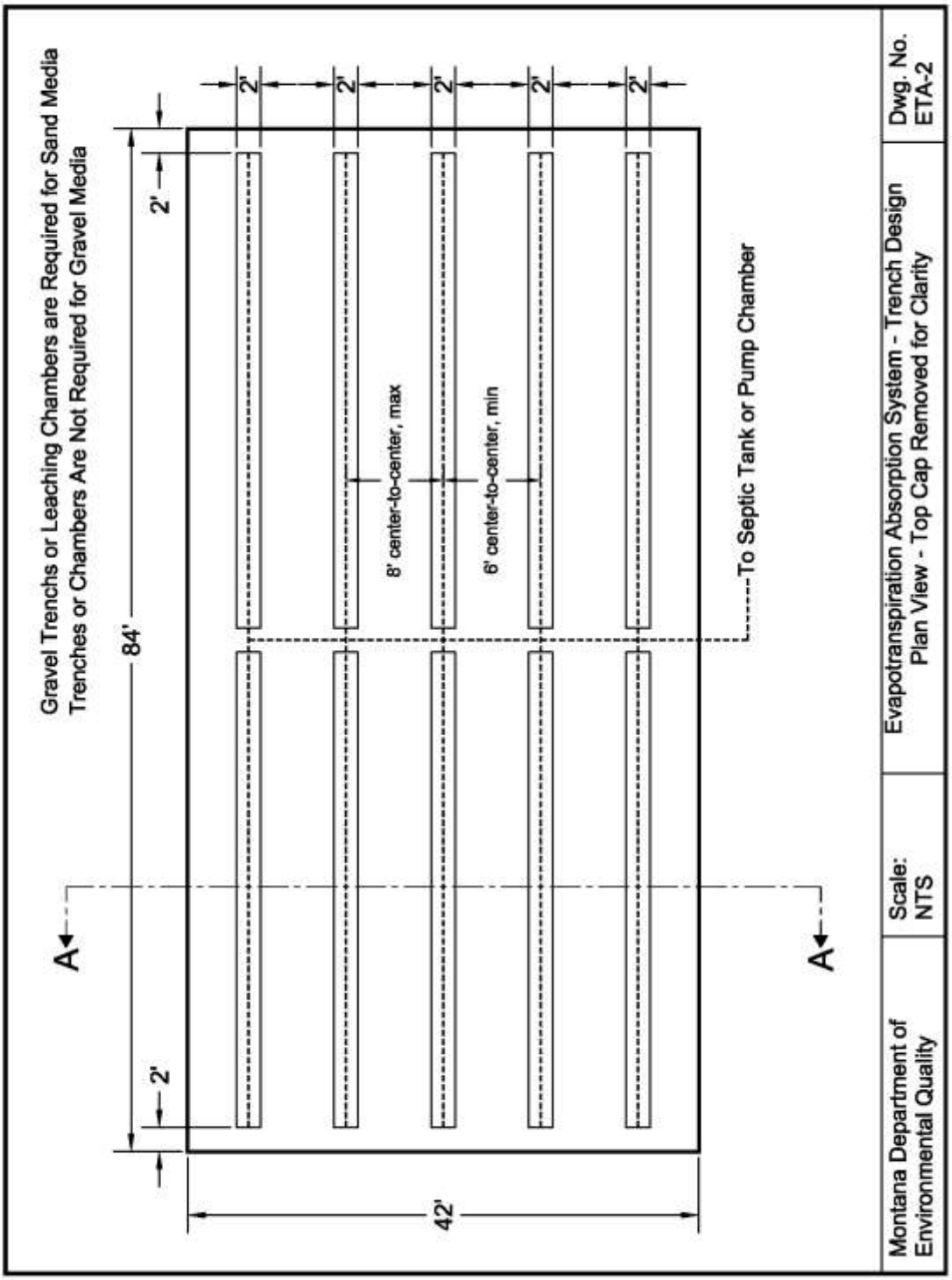
ET Bed Size Based Upon Maximum Allowed Application Rate: 0.15gpd/sf (per Section 6.7.3.5)

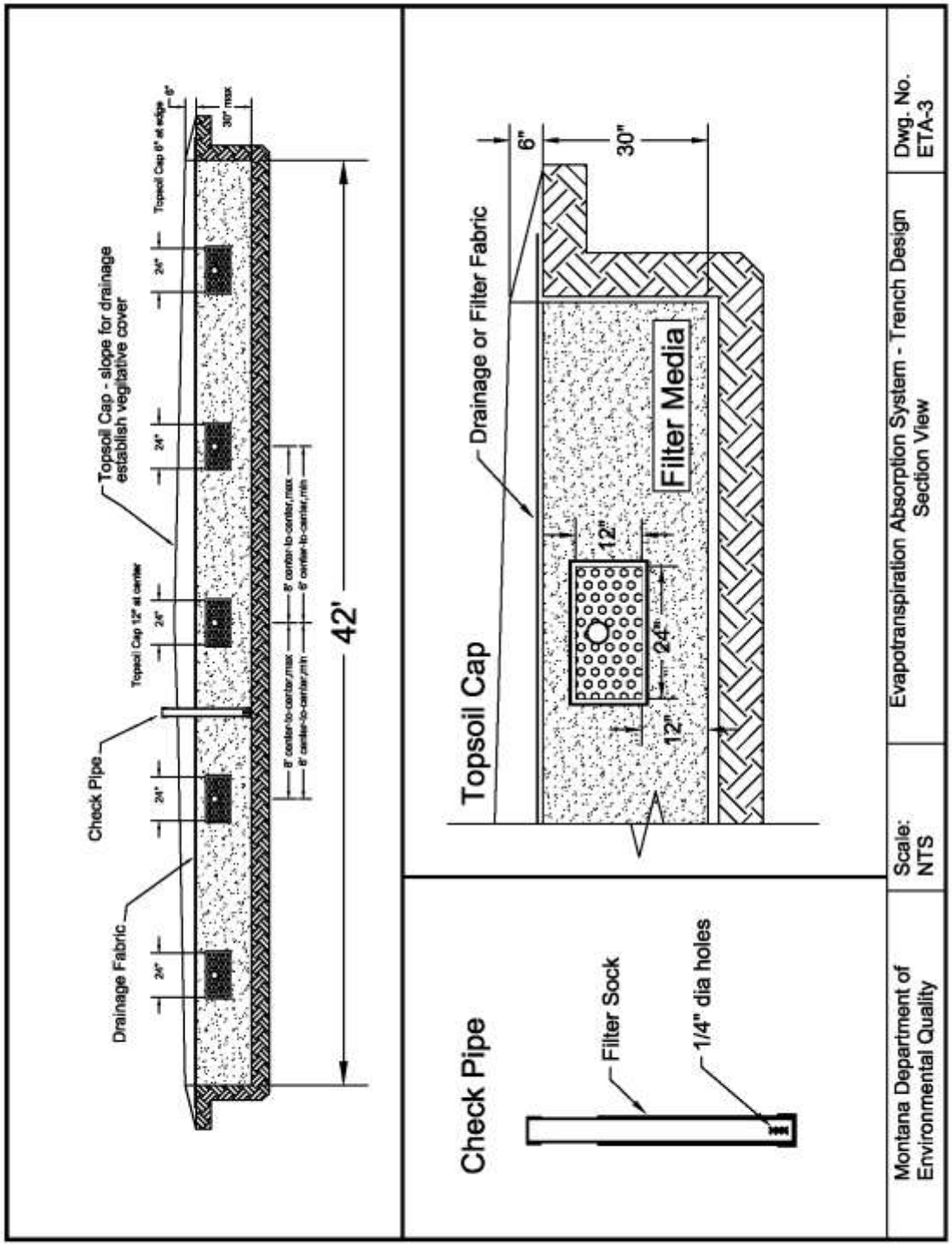
350/0.15 = 2,333 square feet.   2,333 square feet x 1.5 factor of safety = 3,500 square feet

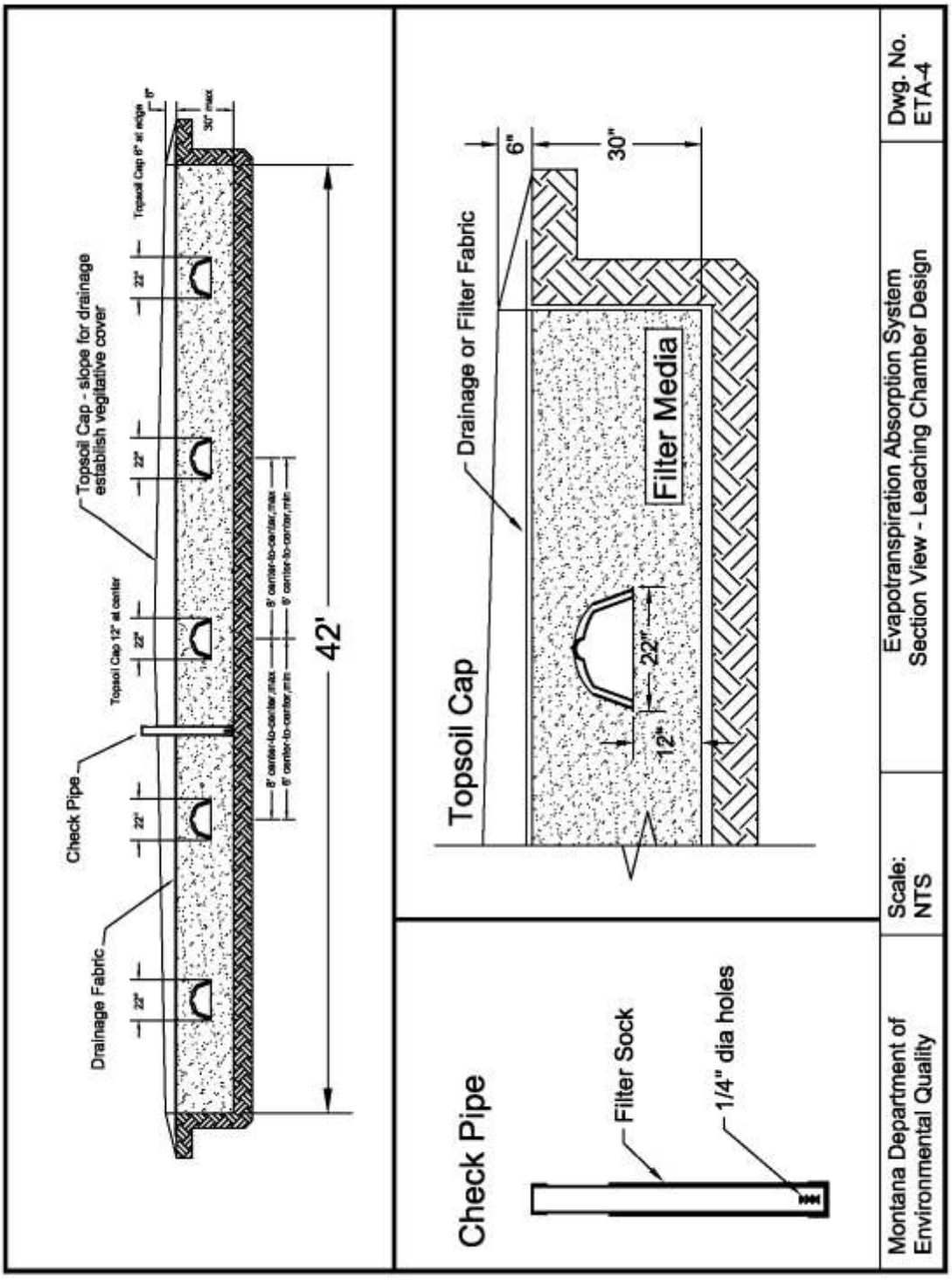
Bed Dimensions: Square 59' x 59'

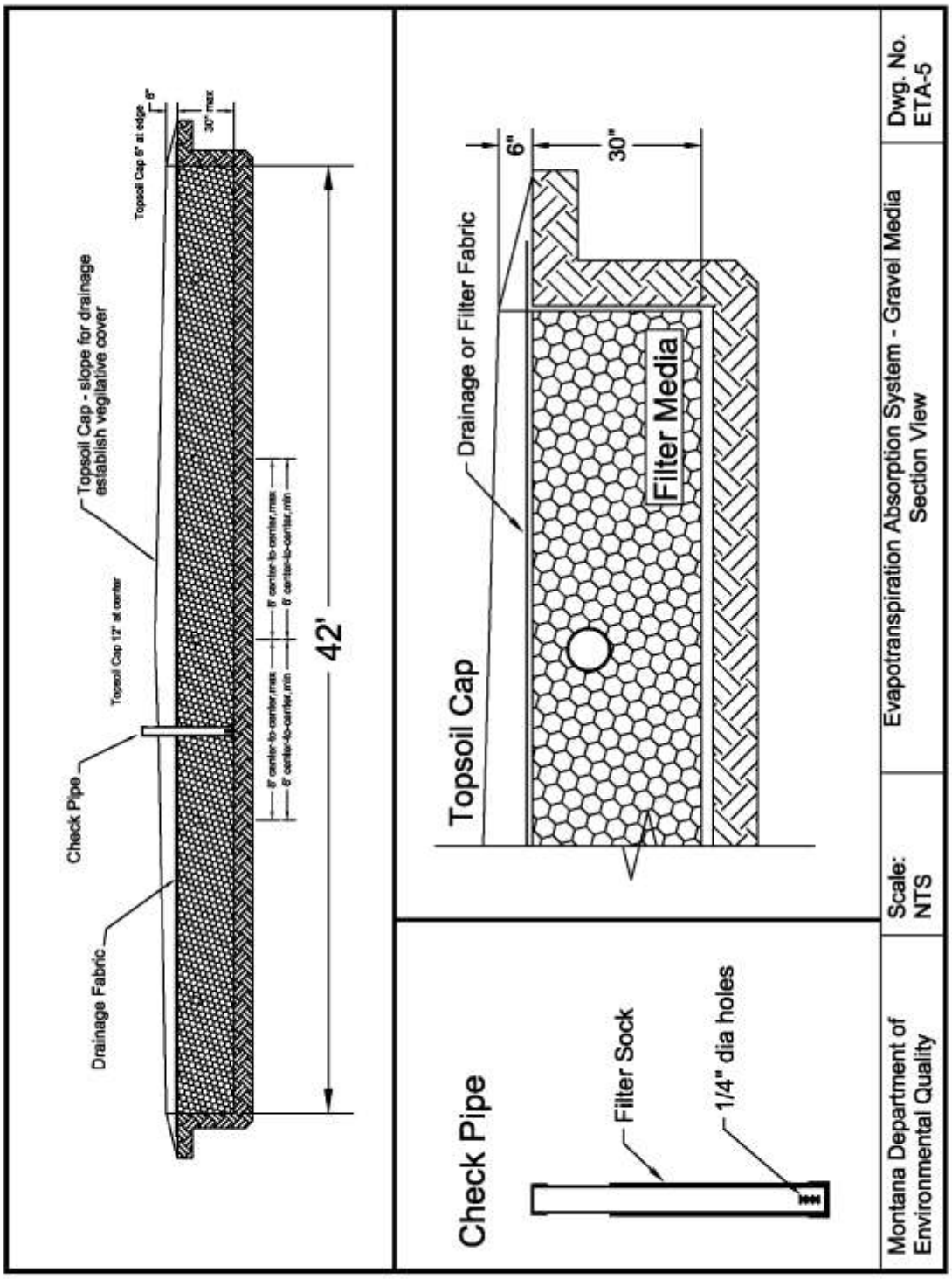
Bed Dimensions: 2:1 Rectangle 42' x 84'

Montana Department of Environmental Quality	Scale: NTS	Evapotranspiration Absorption System Design Parameters	Dwg. No. ETA-1


Gravel Trenchs or Leaching Chambers are Required for Sand Media
Trenches or Chambers Are Not Required for Gravel Media
84'
2'
2'
2'
2'
2'
2'
2'
8' center-to-center, max
6' center-to-center, min
To Septic Tank or Pump Chamber
A
A
42'
Montana Department of Environmental Quality
Scale: NTS
Evapotranspiration Absorption System - Trench Design
Plan View - Top Cap Removed for Clarity
Dwg. No. ETA-2


Topsoil Cap - slope for drainage establish vegitative cover
Topsoil Cap 12" at center
Topsoil Cap 6" at edge
6"
30" max
24"
8' center-to-center, max
8' center-to-center, min
Check Pipe
Drainage Fabric
42'
Drainage or Filter Fabric
6"
30"
Topsoil Cap
Filter Media
12"
24"
12"
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
Evapotranspiration Absorption System - Trench Design Section View
Dwg. No. ETA-3


Topsoil Cap - slope for drainage establish vegitative cover
Topsoil Cap 12" at center
Check Pipe
Drainage Fabric
42'
Drainage or Filter Fabric
6"
30"
Topsoil Cap
Filter Media
22"
12"
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
Evapotranspiration Absorption System
Section View - Leaching Chamber Design
Dwg. No. ETA-4


Topsoil Cap - slope for drainage establish vegitative cover
Topsoil Cap 6" at edge
6"
30" max
Topsoil Cap 12" at center
Check Pipe
Drainage Fabric
8' center-to-center,max
8' center-to-center,min
42'
Drainage or Filter Fabric
6"
30"
Topsoil Cap
Filter Media
Check Pipe
Filter Sock
1/4" dia holes
Montana Department of Environmental Quality
Scale: NTS
Evapotranspiration Absorption System - Gravel Media Section View
Dwg. No. ETA-5

APPENDIX F
Documents Adopted by Reference And Other Referenced Documents

A Montana agency adopting a standard by reference in a rule must provide a citation to the material adopted by reference and a statement of the general subject matter of the omitted rule and must state where a copy of the omitted material may be obtained. § 2-4-307(2), Montana Code Annotated (MCA). Standards developers have copyrights that protect against unauthorized use of their standards, and an agency cannot, without permission, provide free paper or internet copies of those standards. Table 1, column 2, provides the web address where the sources of all standards being proposed for adoption by reference in DEQ-4 can be purchased. Copies of the documents also may be viewed at the Helena office of the Public Water and Subdivision Section, Department of Environmental Quality, 1520 East 6th Ave., Helena, MT.

Table 1

Adopted-by-Reference	Web Addresses Where Documents can be Purchased
ASTM C117-13	http://global.ihs.com
ASTM D5093-02	http://global.ihs.com
ASTM D3034-08	http://global.ihs.com
ASTM D1785-12	http://global.ihs.com
ASTM D3350-12	http://global.ihs.com
ASTM D2729-11	http://global.ihs.com
ASTM D2241-09	http://global.ihs.com
ASTM C1227-12	http://global.ihs.com
ASTM C150-12	http://global.ihs.com
ASTM C 990-09	http://global.ihs.com
ASTM C 33-13	http://global.ihs.com
IAPMO/ ANSI Z1000-07	http://webstore.ansi.org

IAPMO PS 63-2005	http://iapmomembership.org
ACI 318-11	http://www.concrete.org

Table2 contains web addresses to other sources of information referenced in DEQ-4.

Table2

Underwriters Laboratories (http://www.ul.com)
Canadian Standards Association (http://www.csagroup.org)
National Electric Code Class 1, Division 2 locations (http://www.osha.gov)
ANSI/NSF Standard 46 (http://www.nsf.org)
USDA Soils Report (http://www.nrcs.usda.gov)
NSF Standard 40 (for class 1 certification) (http://www.nsf.org)
"The Wisconsin Mound Soil Absorption System Siting, Design, and Construction Manual", January 2000 (recommended) (http://www.soils.wisc.edu)
EPA Manual, "On-Site Wastewater Treatment Systems Manual", February 2002, pages TFS 41 to 52 (http://www.norweco.com)
NSF Standard 41 (http://www.nsf.org)
National Drought Mitigation Center (definition of drought) (http://drought.unl.edu)
MSU Extension Service, "Septic Tank and Drainfield Operations" (http://msuextension.org)
MSU Extension Service, "Maintenance and Septic System Inspection and Troubleshooting" (http://msuextension.org)