CIRCULAR DEQ 4

MONTANA STANDARDS

FOR SUBSURFACE WASTEWATER

TREATMENT SYSTEMS

PART 1 of 2

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

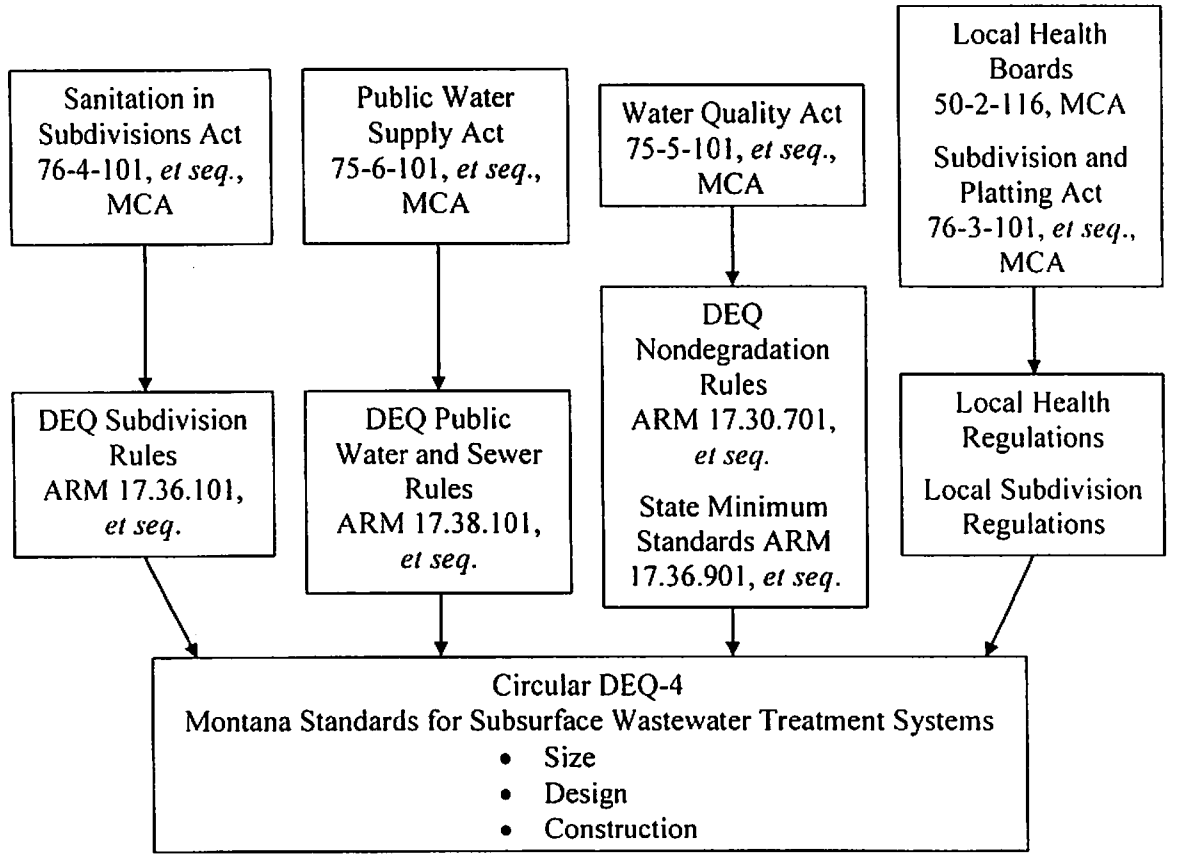
1.1. APPLICABILITY

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 (Not including a kitchen, food service facility, daycare, or camp)	Seat		3
Church (Including kitchen, but not including a food service facility, day care, or camp)	Seat		5
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 (Sanitary waste only)	Employee	10-16	13
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.

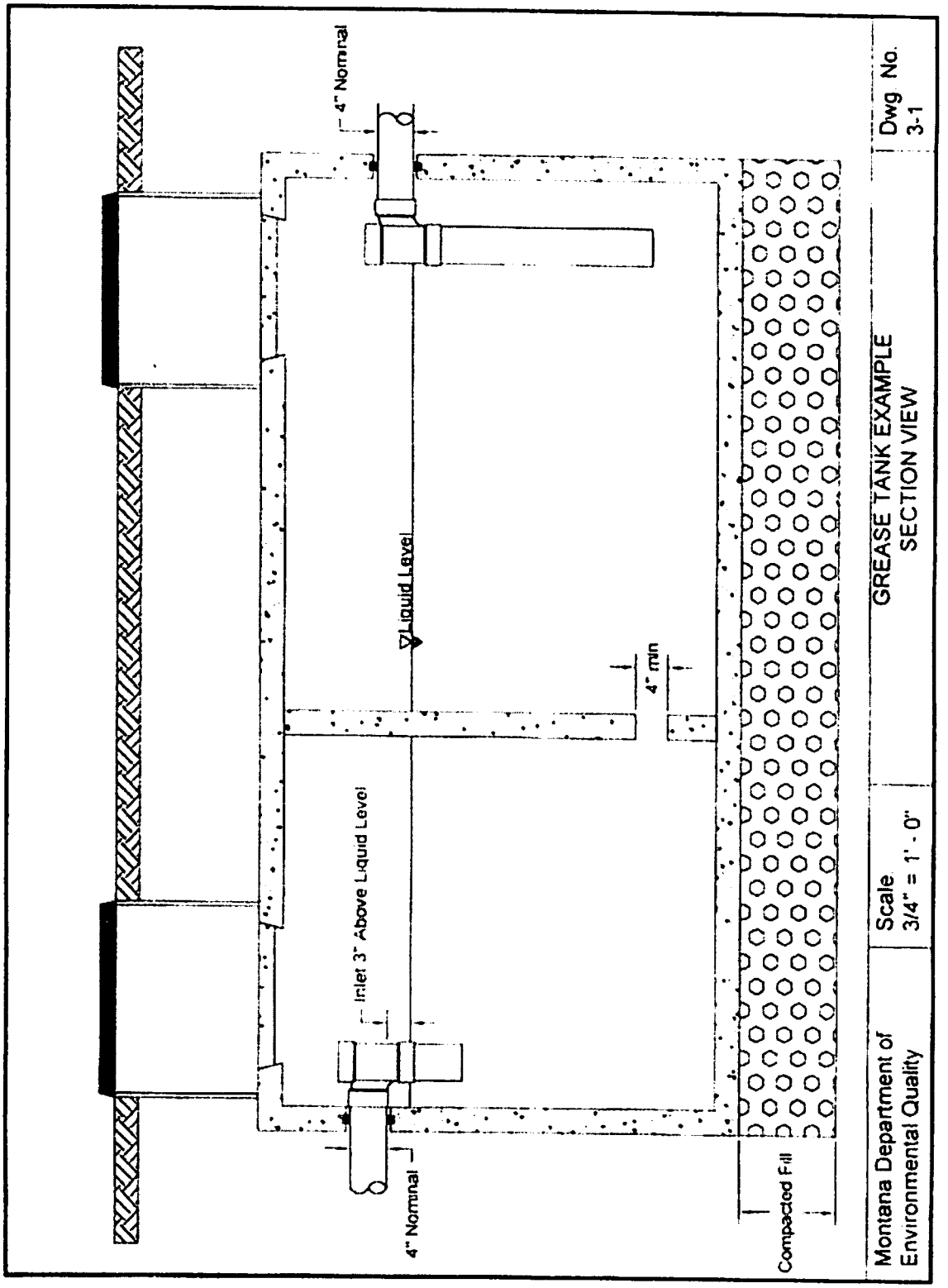
3.2.4. Operation and Maintenance, Certification, and As-builts

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 1, 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

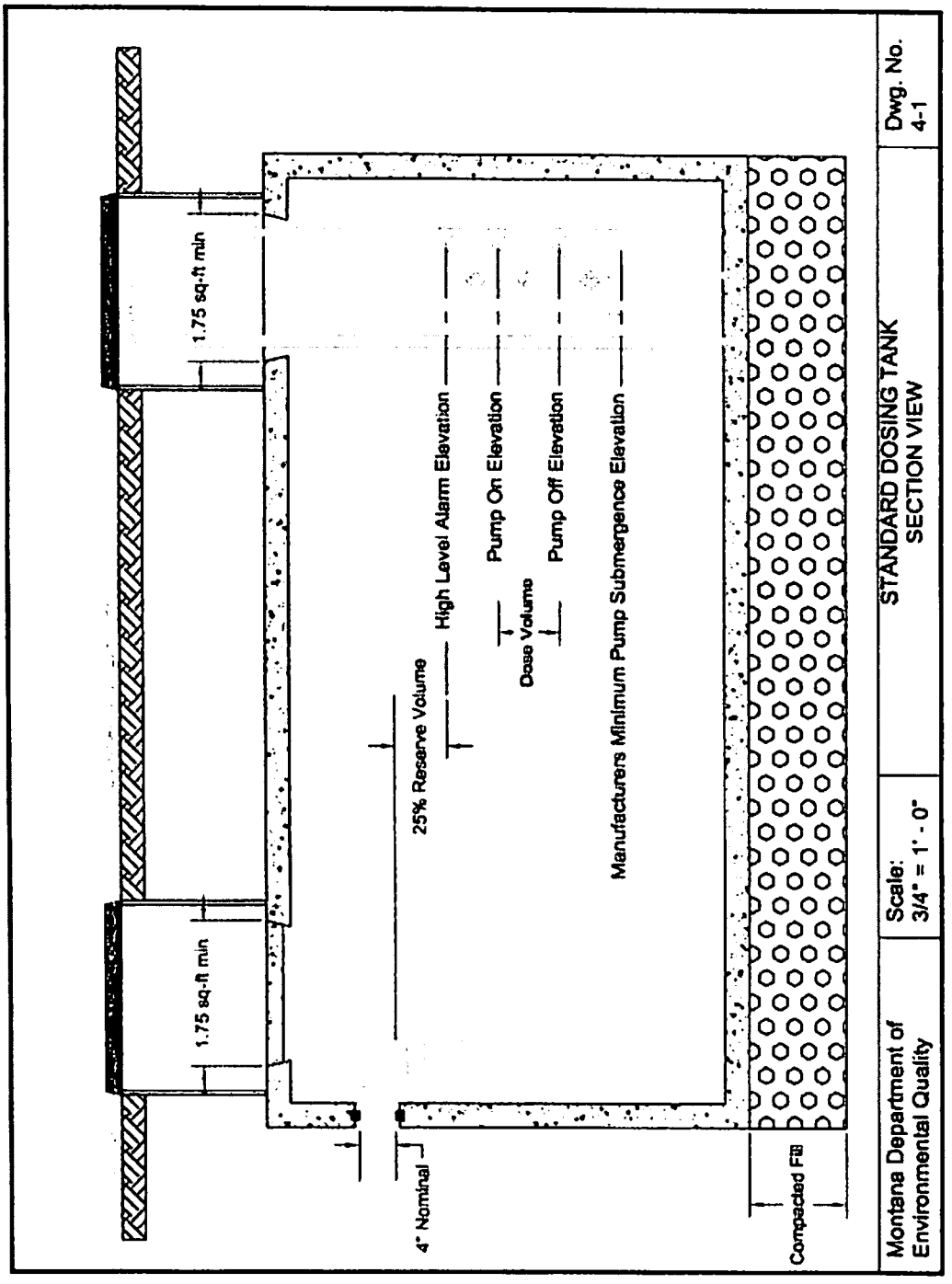
1. Dose tank volumes are not to be included in primary, advanced, or other required tank volumes.
2. The reserve storage volume of the dosing tank must be at least equivalent to 25 percent of the subsurface distribution system design flow. If a duplex pump station is used, where each pump doses the entire 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
25% Reserve Volume
High Level Alarm Elevation
Pump On Elevation
Dose Volume
Pump Off Elevation
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.

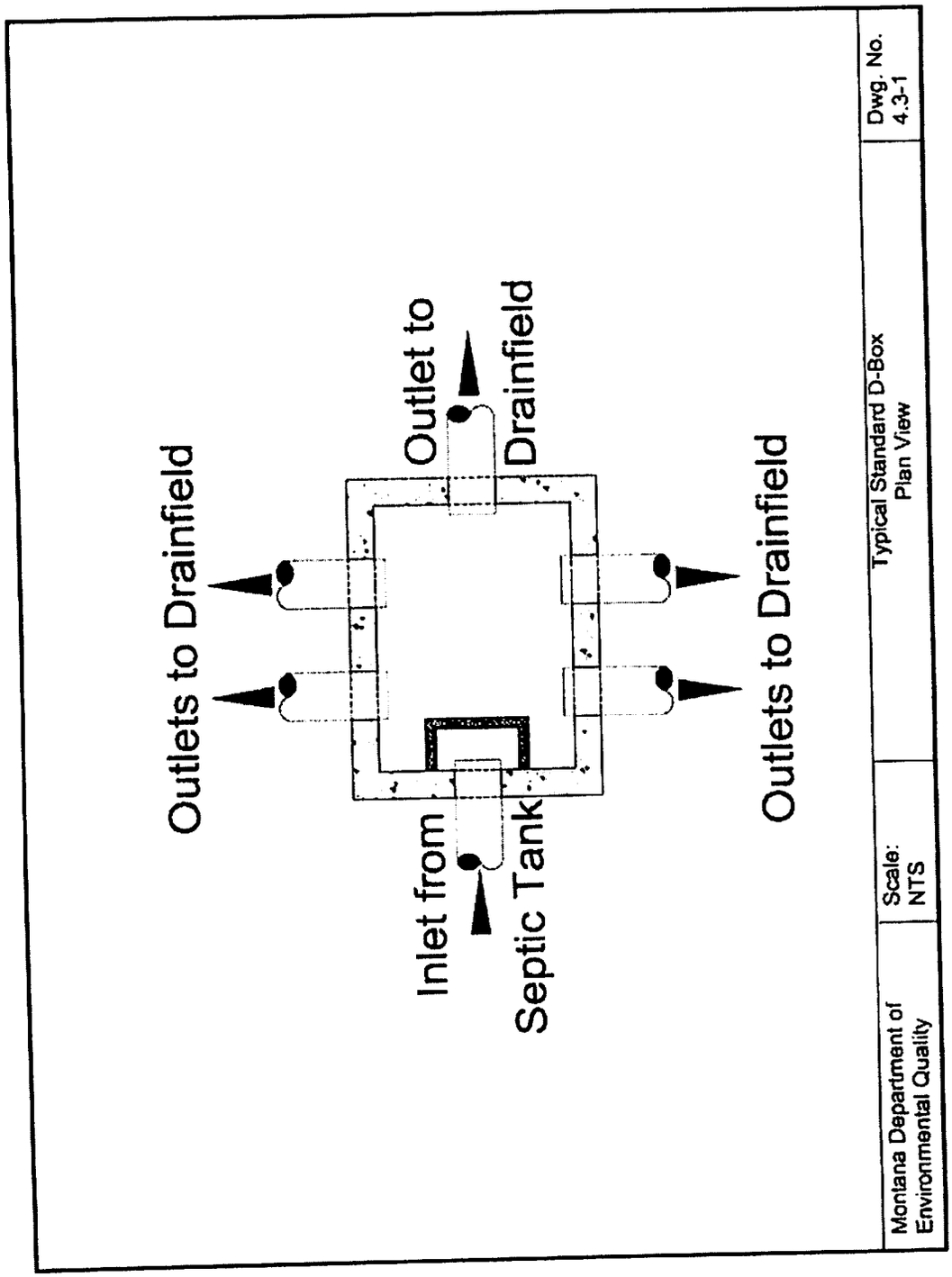
4.3.3.1. Distribution boxes must:

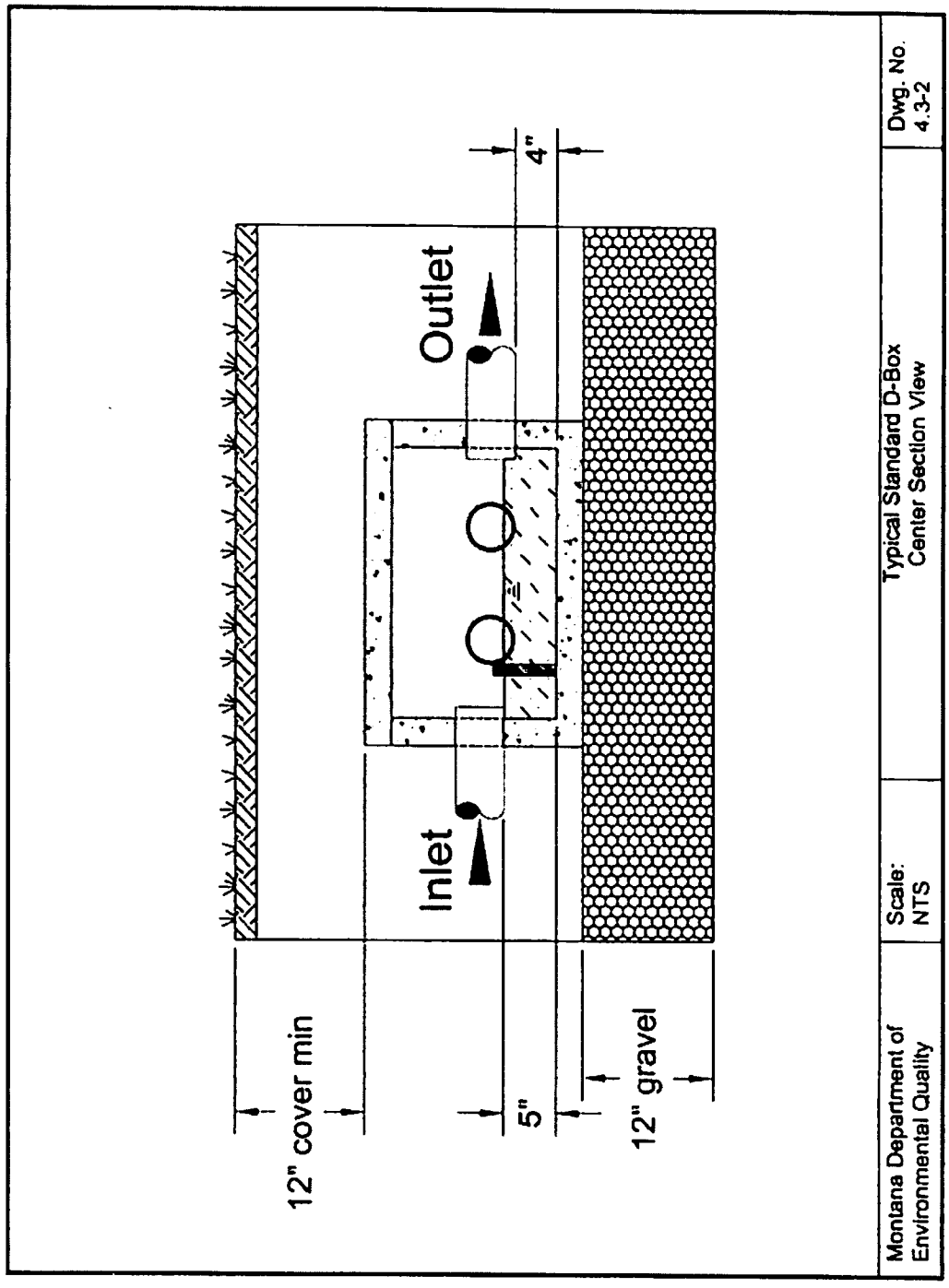
A. Be set level and bedded to prevent settling;
B. Use some flow control or baffling device to ensure equal distribution of effluent;

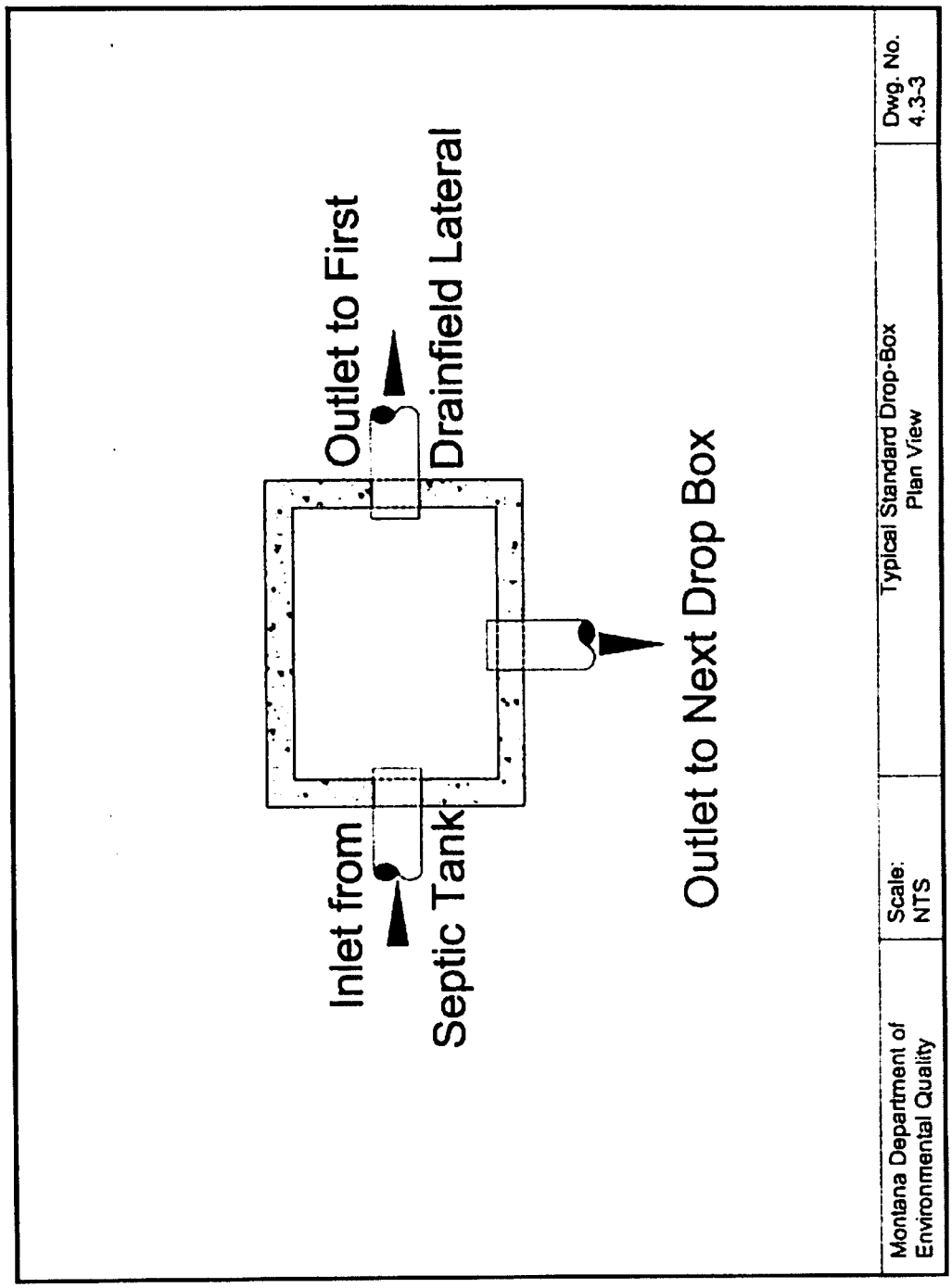
C. Be water tested for equal distribution;
D. Have each outlet serving an equal length of absorption trench;
E. If constructed using concrete, the concrete must meet the same requirements as concrete for septic tanks in Subsection 5.1.7.1. Minimum wall, floor, and lid thickness for concrete distribution 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.

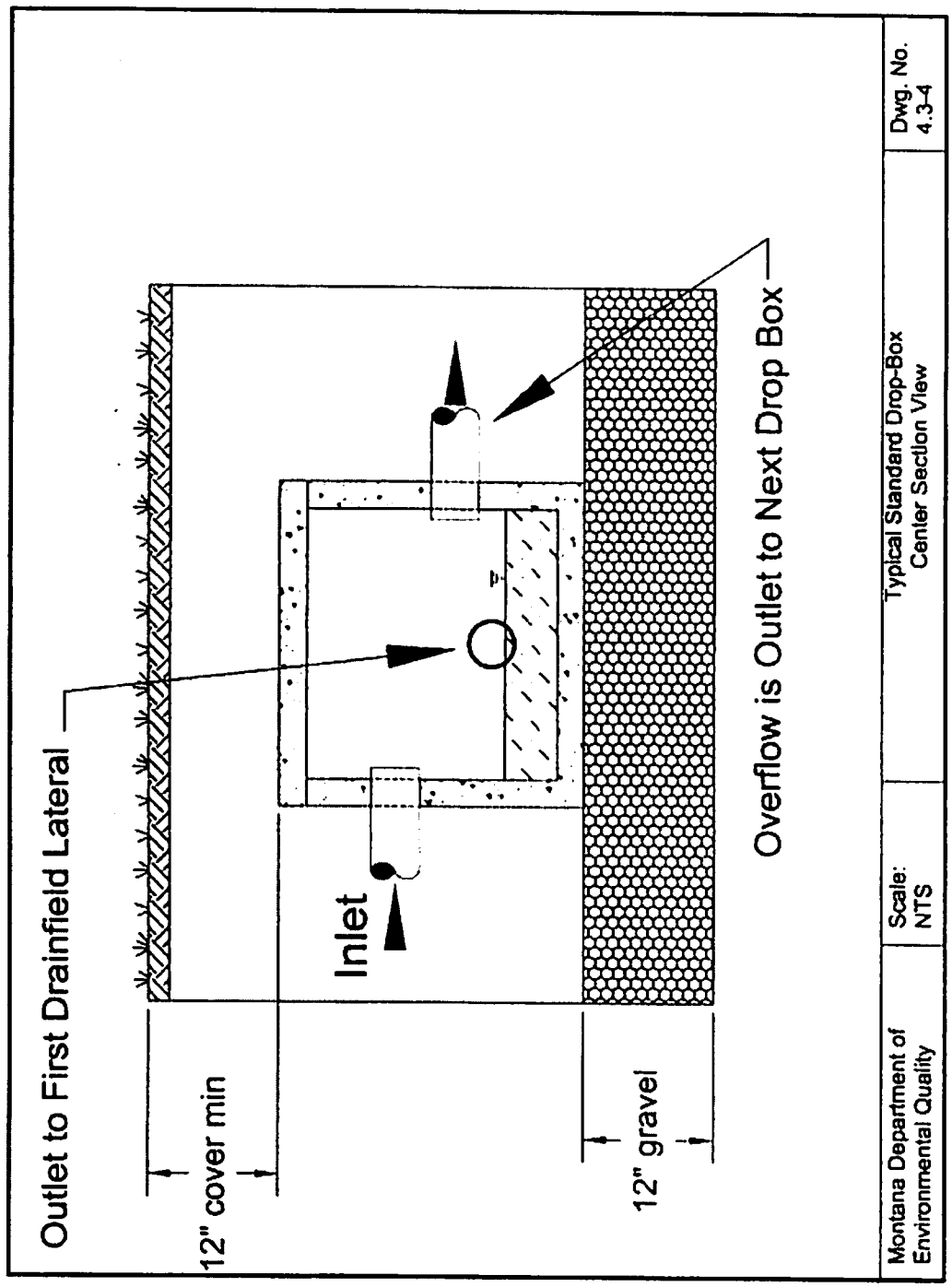
4.3.3.2. Drop boxes must:

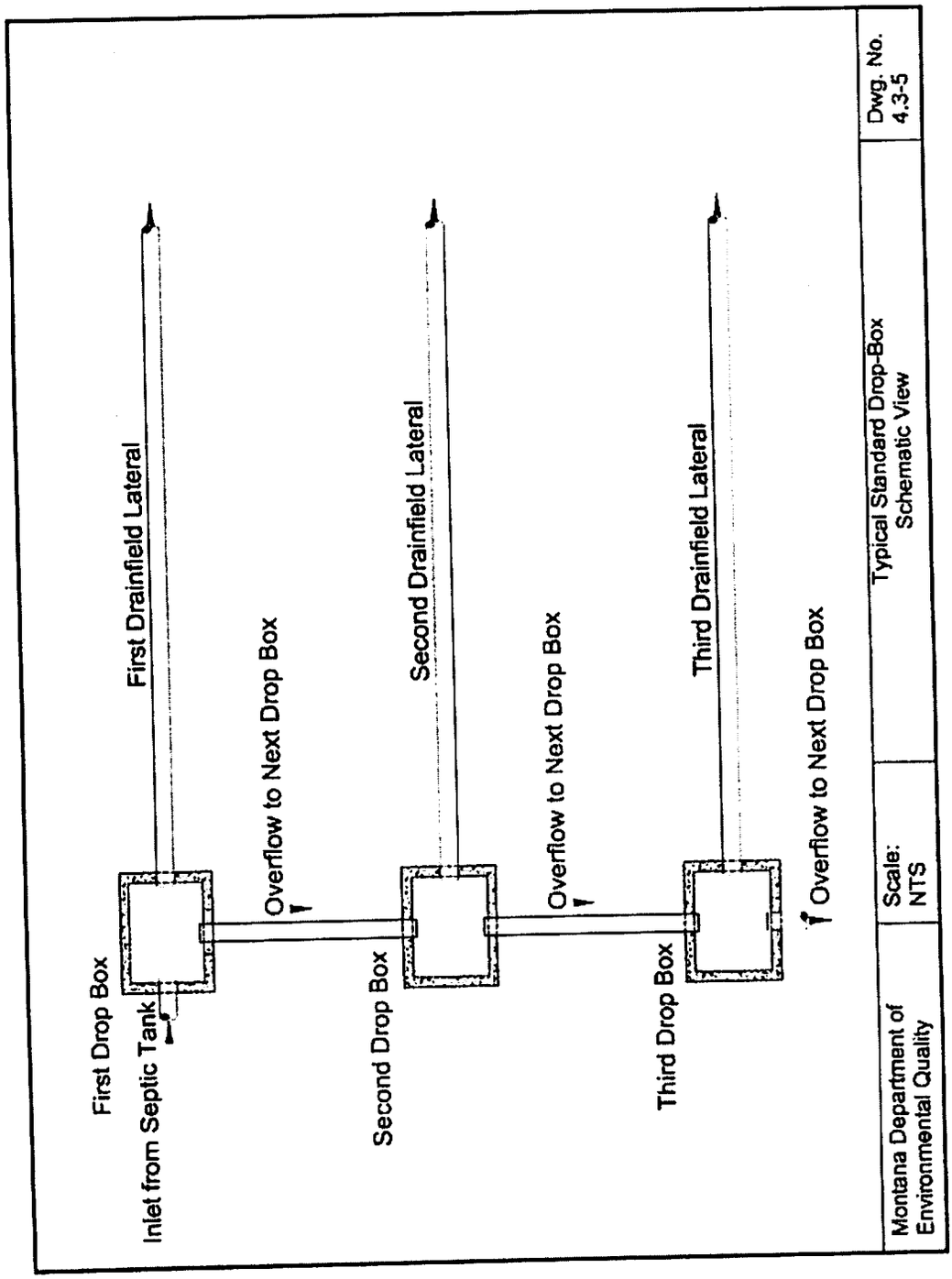
A. Be set level and bedded to prevent settling;
B. If constructed using concrete, the concrete must meet the same requirements as concrete for septic tanks in Subsection 5.1.7.1. Minimum wall, floor, and lid thickness for concrete drop boxes must be 2 inches; and
C. Have an access for inspection provided 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.

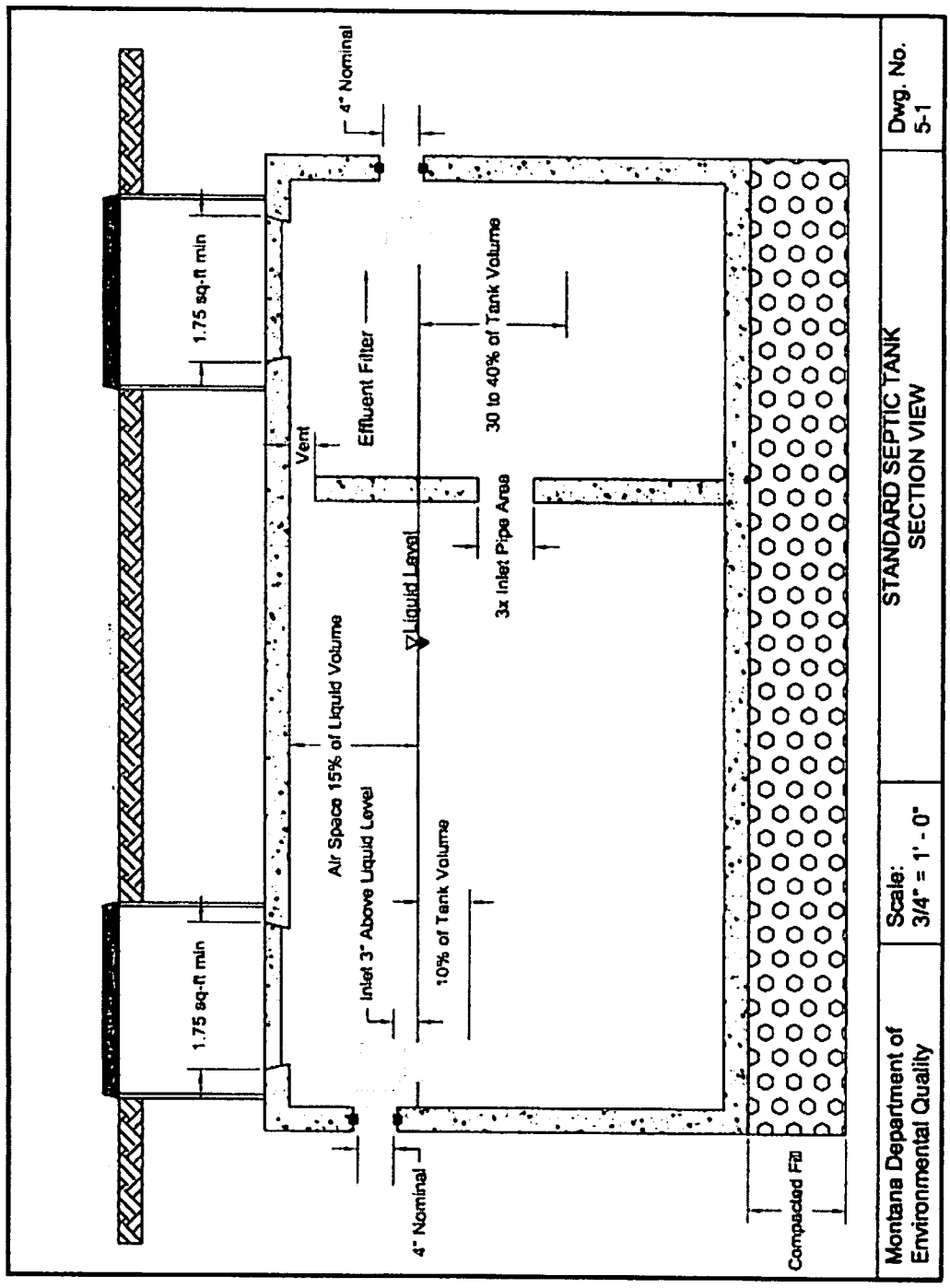
Tanks used for commercial facilities, multiple-user systems, public systems, or those with a design flow of 700 gpd or greater must be tested in place for water tightness. The reviewing authority may require tanks intended for other uses to be tested. For pressure testing a fiberglass or thermoplastic 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
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
1.75 sq-ft min
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.

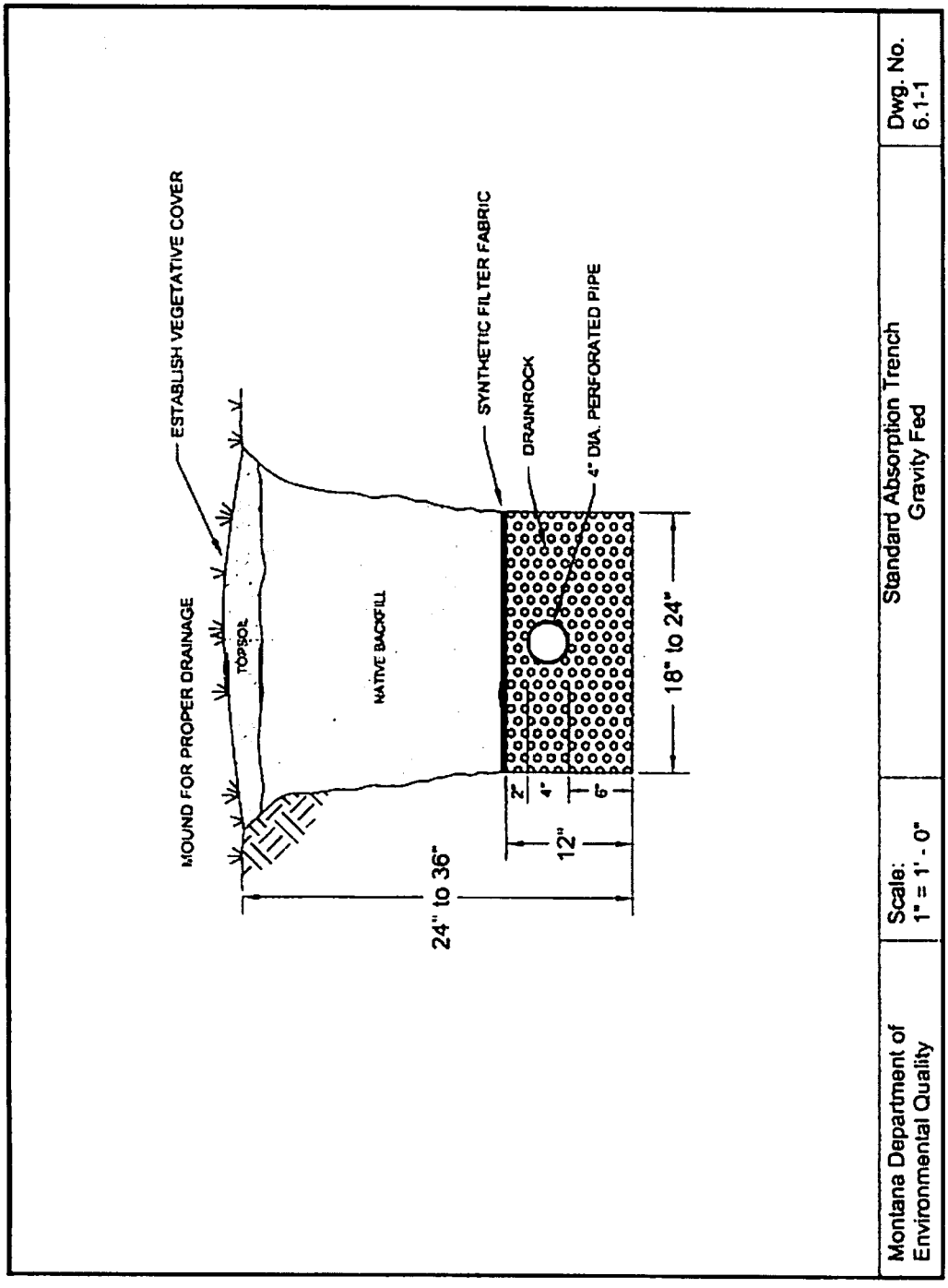
Note: If a sample of soil within the working depth can be easily rolled into the shape of a wire or ribbon, the soil moisture content is too high for construction purposes.

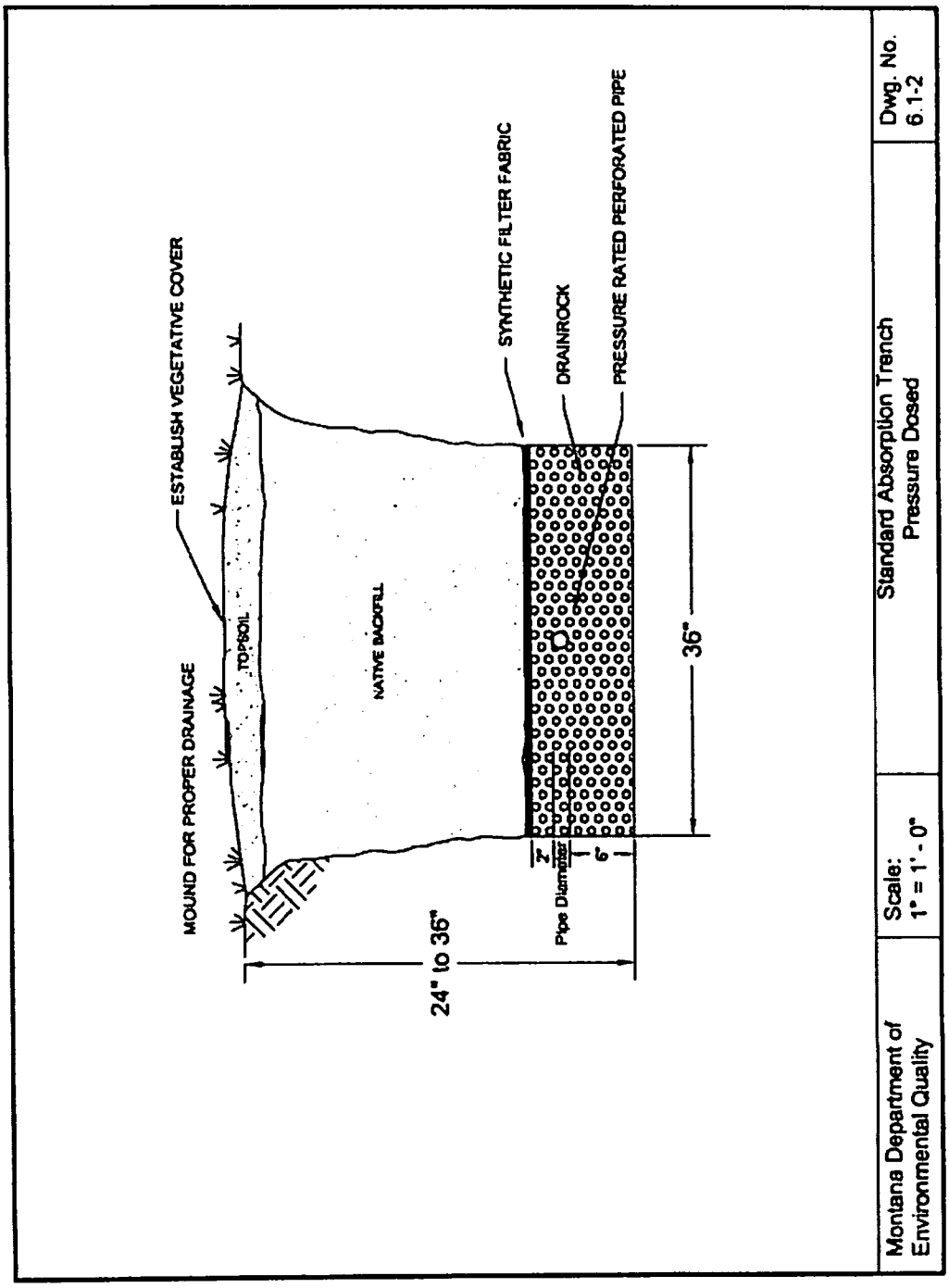
6.1.5.3. At least 6 inches of drain rock meeting the requirements of Section 1.2.25 must be placed in the bottom of the trench.

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
SYNTHETIC FILTER FABRIC
DRAINROCK
4" DIA. PERFORATED PIPE
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
18" to 24"
2"
4"
6"
12"
24" to 36"
Montana Department of Environmental Quality
Scale: 1" = 1' - 0"
Standard Absorption Trench
Gravity Fed
Dwg. No. 6.1-1


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
36"
24" to 36"
6"
Pipe Diameter
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.

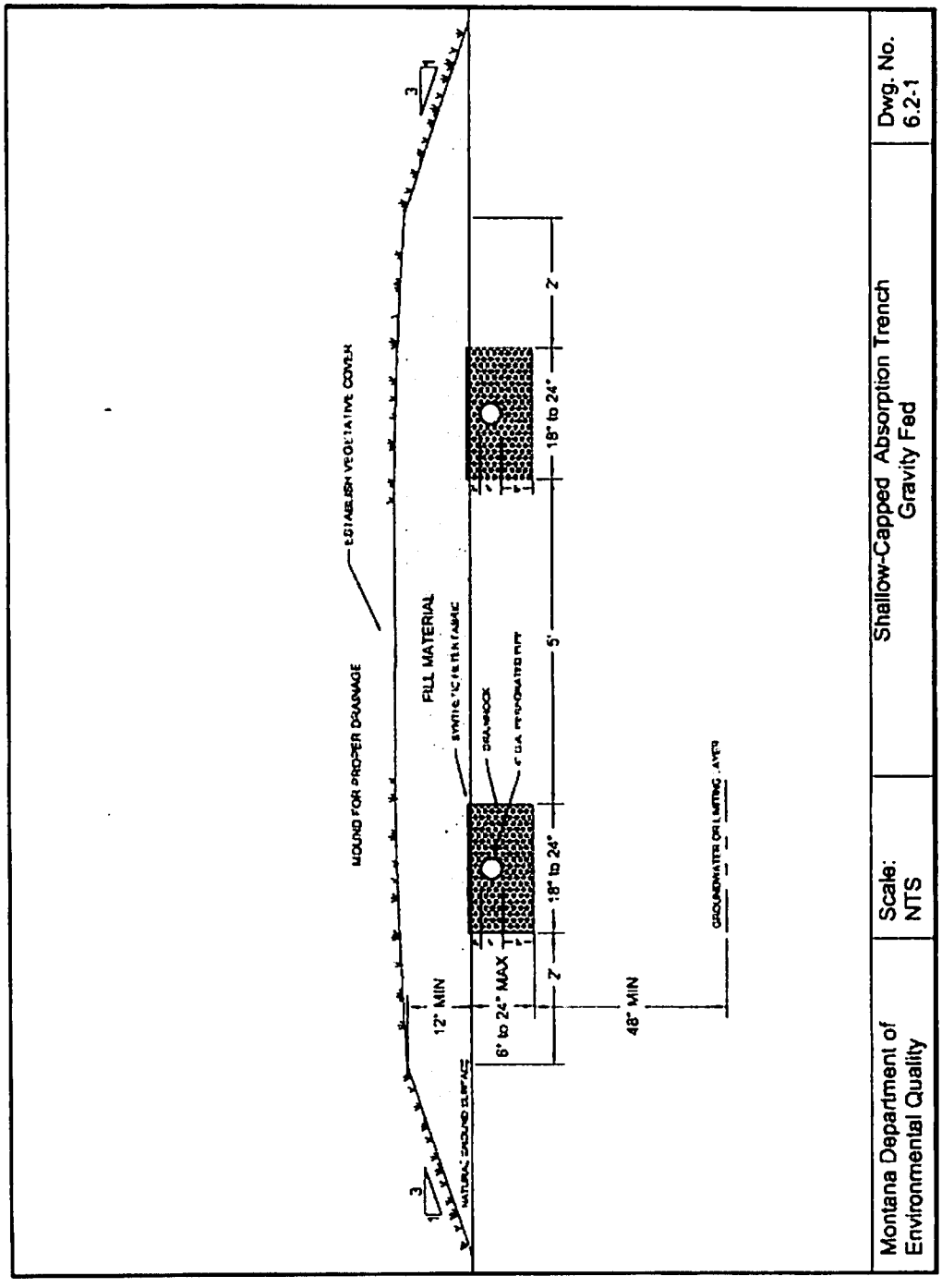
6.2.2. Design

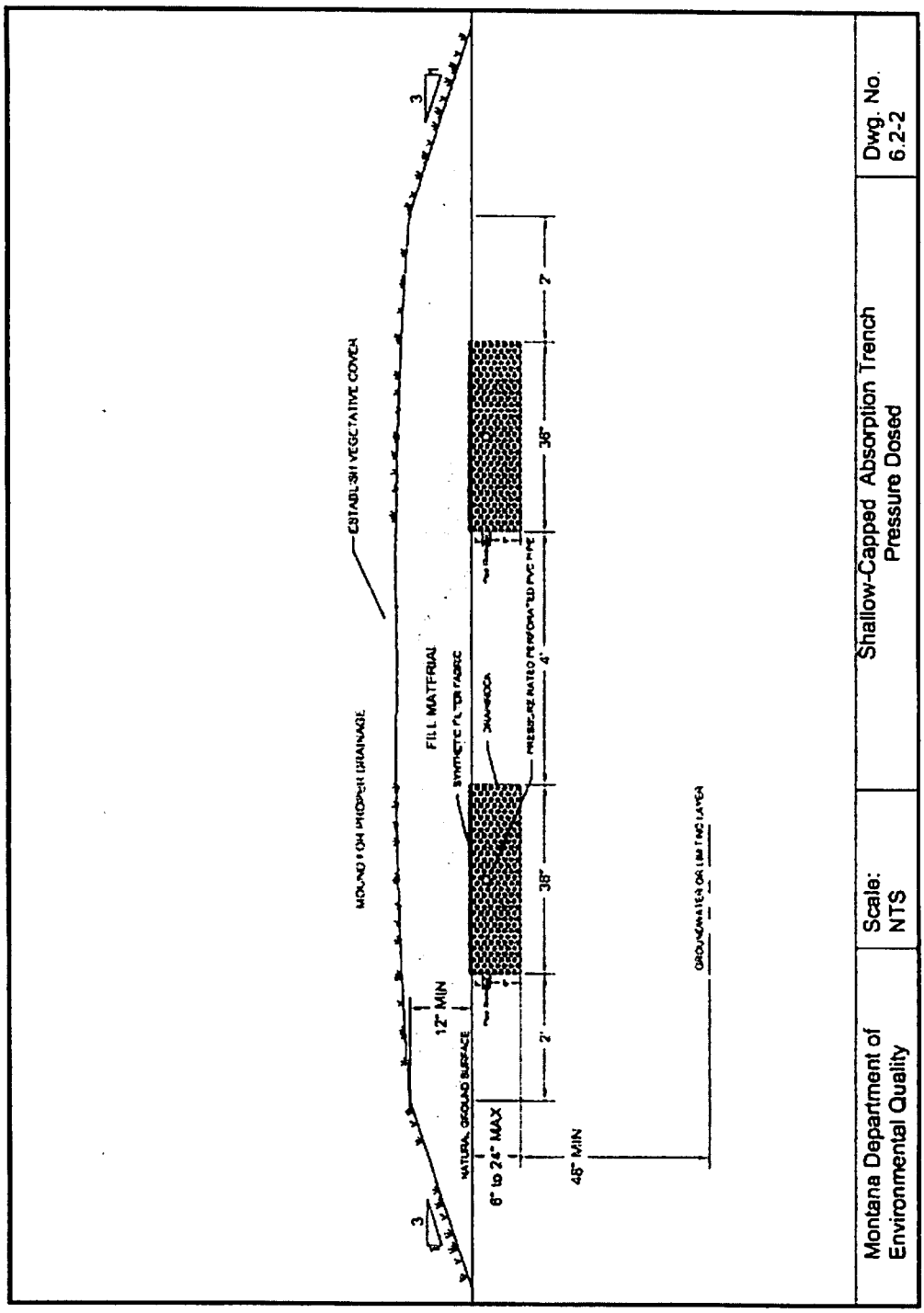
Shallow-capped absorption trenches must be 6 to 24 inches below the natural ground.

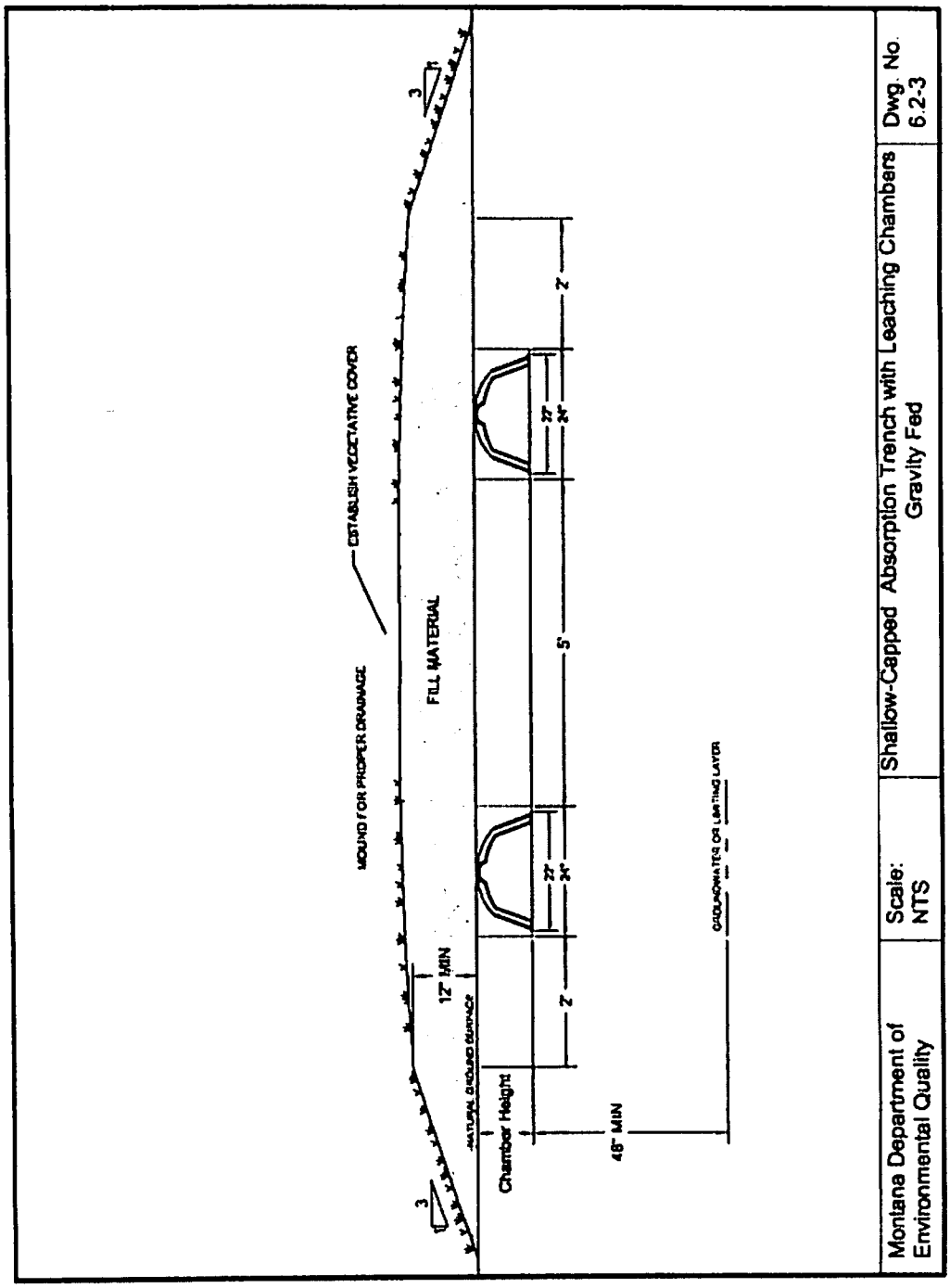
6.2.3. Construction

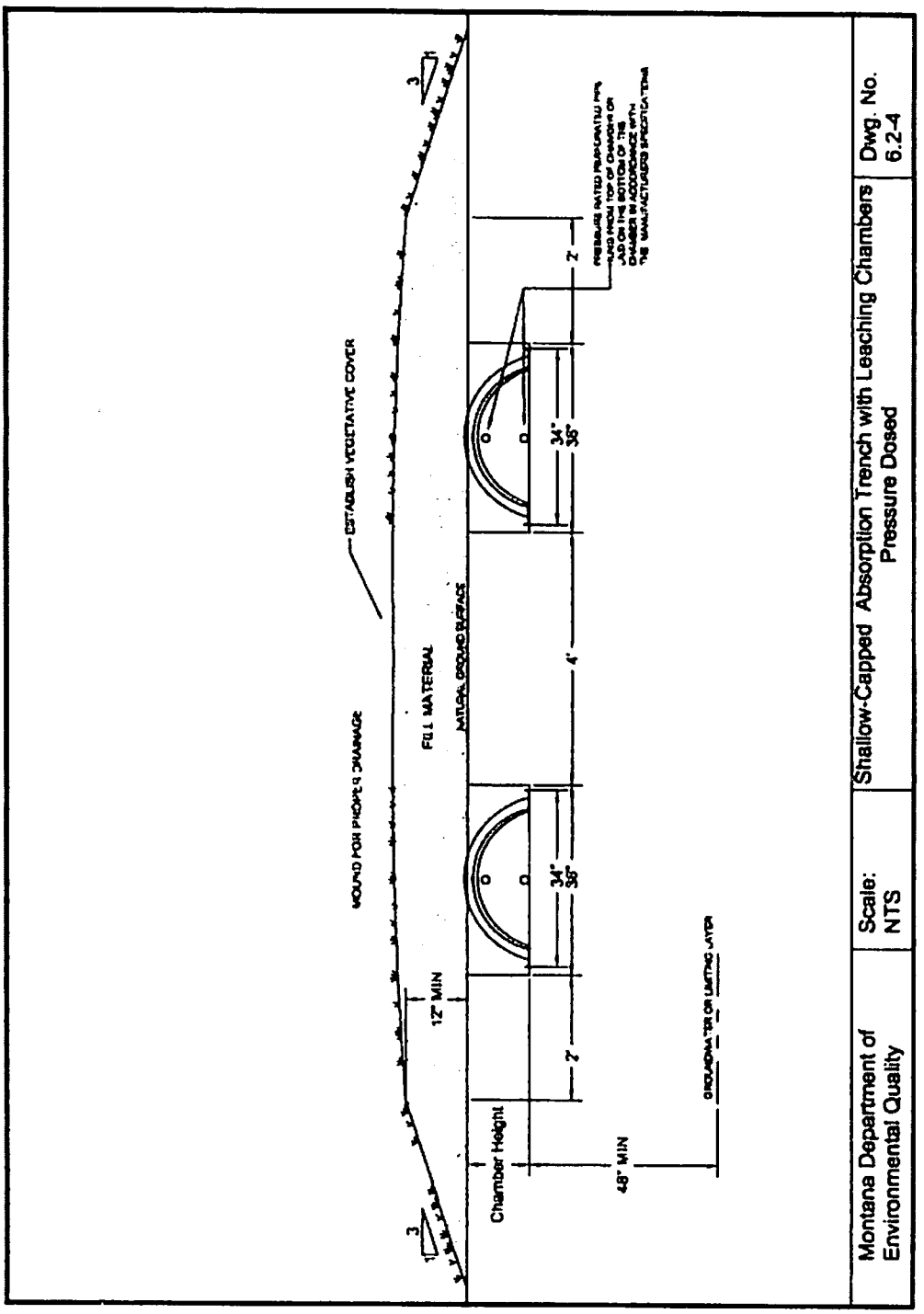
6.2.3.1. Shallow-capped absorption trench systems require a cap of topsoil material a minimum of 12 inches deep. This cap must be loamy sand or sandy loam and must extend 2 feet beyond the edges of the required absorption area before the sides are shaped to a 3 horizontal to 1 vertical or lesser slope. 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.


MOUND FOR PROPER DRAINAGE
FILL MATERIAL
12" MIN
6" to 24" MAX
2'
18" to 24"
5'
2'
48" MIN
3
1
Montana Department of Environmental Quality
Scale: NTS
Shallow-Capped Absorption Trench Gravity Fed
Dwg. No. 6.2-1


ESTABLISH VEGETATIVE COVER
MOUND FOR PROPER DRAINAGE
FILL MATERIAL
SYNTHETIC FILTER FABRIC
3
1
12" MIN
NATURAL GROUND SURFACE
6" to 24" MAX
2'
38"
4"
36"
2'
45" MIN
GROUNDWATER OR LIMITING LAYER
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
Chamber Height
48" MIN
GROUNDWATER OR LIMITING LAYER
3
1
22"
24"
2'
5'
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
Chamber Height
48" MIN
DESIGNATED RESTRICTIVE LAYER
34"
36"
2'
4'
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

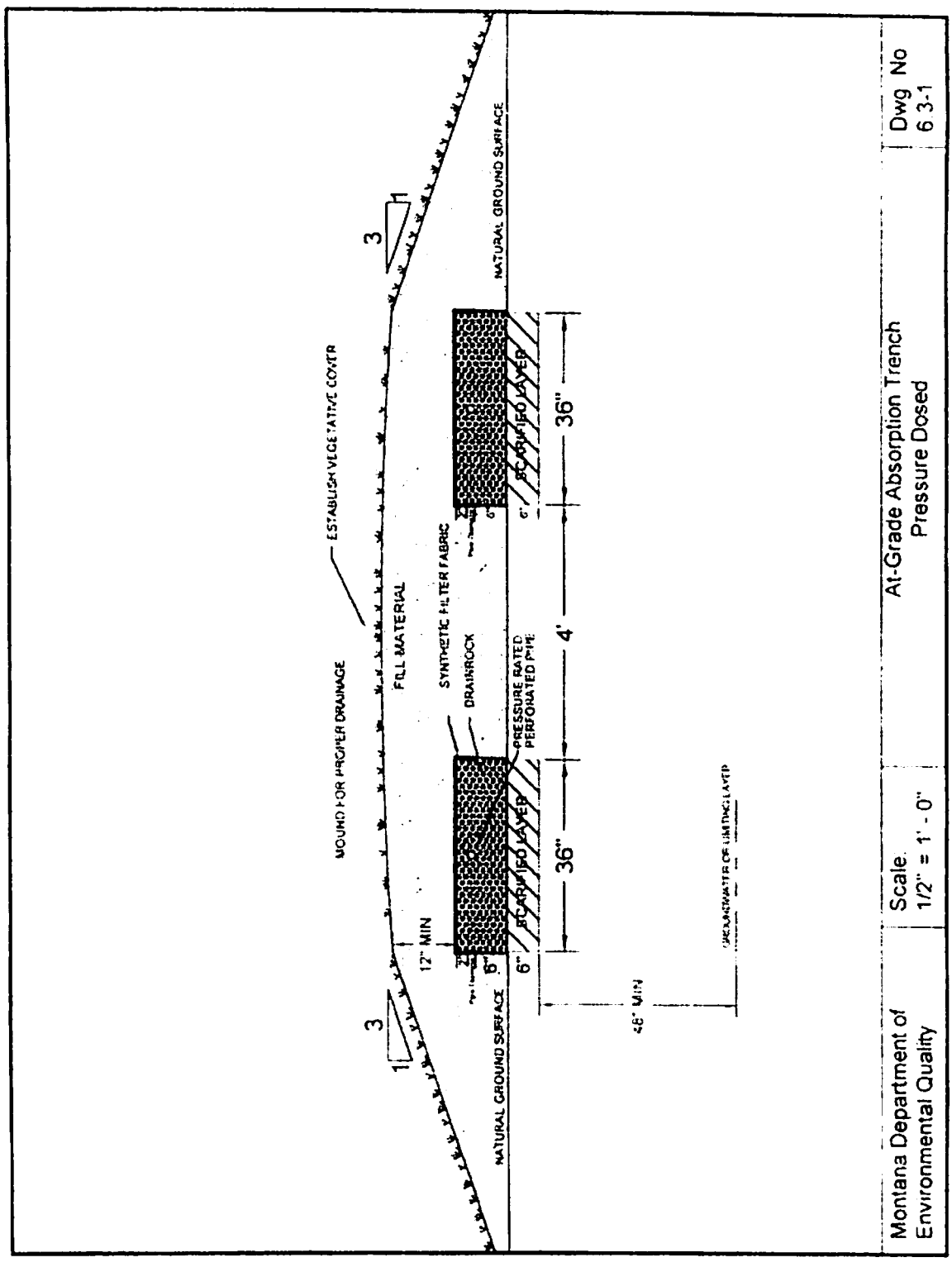
The ground surface where the system is to be placed must be plowed, scarified, or trenched less than 12 inches in depth. Trenching is preferred to plowing or scarifying to prevent horizontal migration of the effluent. There must be at least four feet of natural soil between the scarified layer and ground 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.

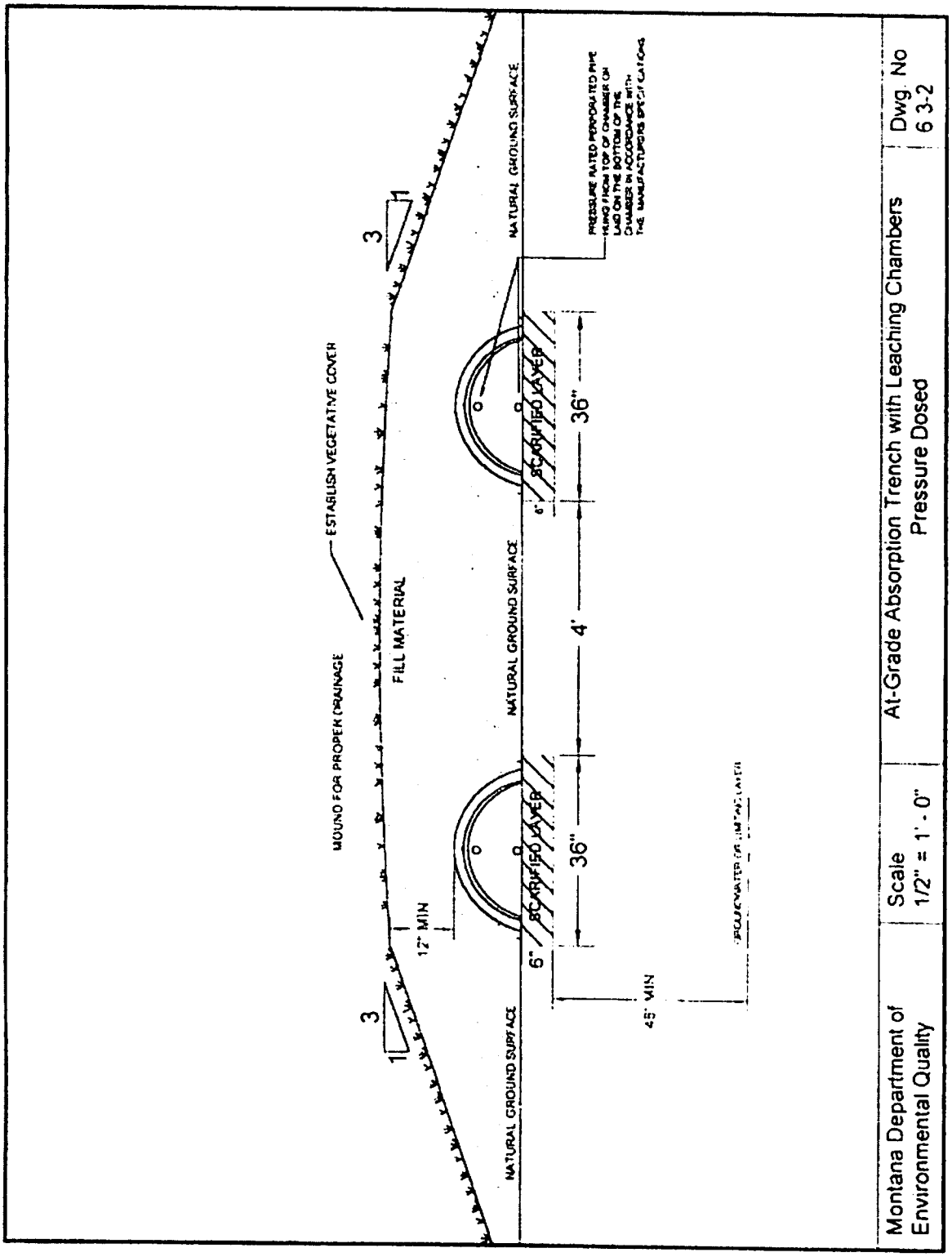
An appropriate geotextile fabric, untreated building paper, or straw must be placed over the drain rock and covered with approximately 1 foot of soil.

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
NATURAL GROUND SURFACE
NATURAL GROUND SURFACE
3
1
3
1
12" MIN
6"
36"
4'
36"
6"
48" MIN
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"
SCARIFIED LAYER
36"
4'
36"
6"
SCARIFIED LAYER
48" MIN
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

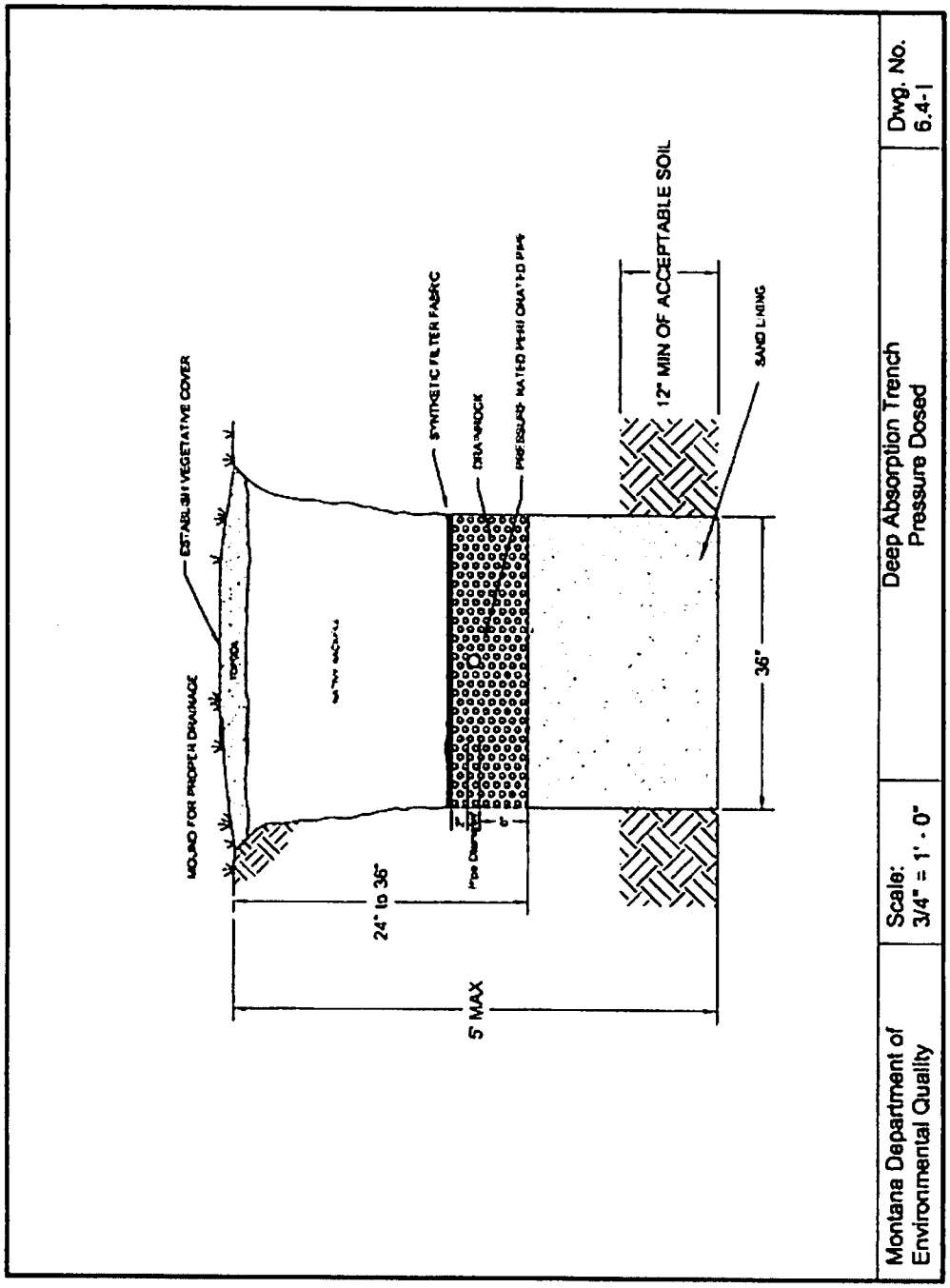
Deep absorption trenches are systems that have trenches excavated through a less permeable soil layer to allow effluent to infiltrate into a deeper and more permeable soil. The trench is then backfilled with a sandy soil to the depth of a standard absorption trench, 24 to 36 inches below natural ground 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.


MOUND FOR PROPER DRAINAGE
ESTABLISH VEGETATIVE COVER
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
12" MIN OF ACCEPTABLE SOIL
SAND LINING
24" to 36"
5' MAX
36"
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

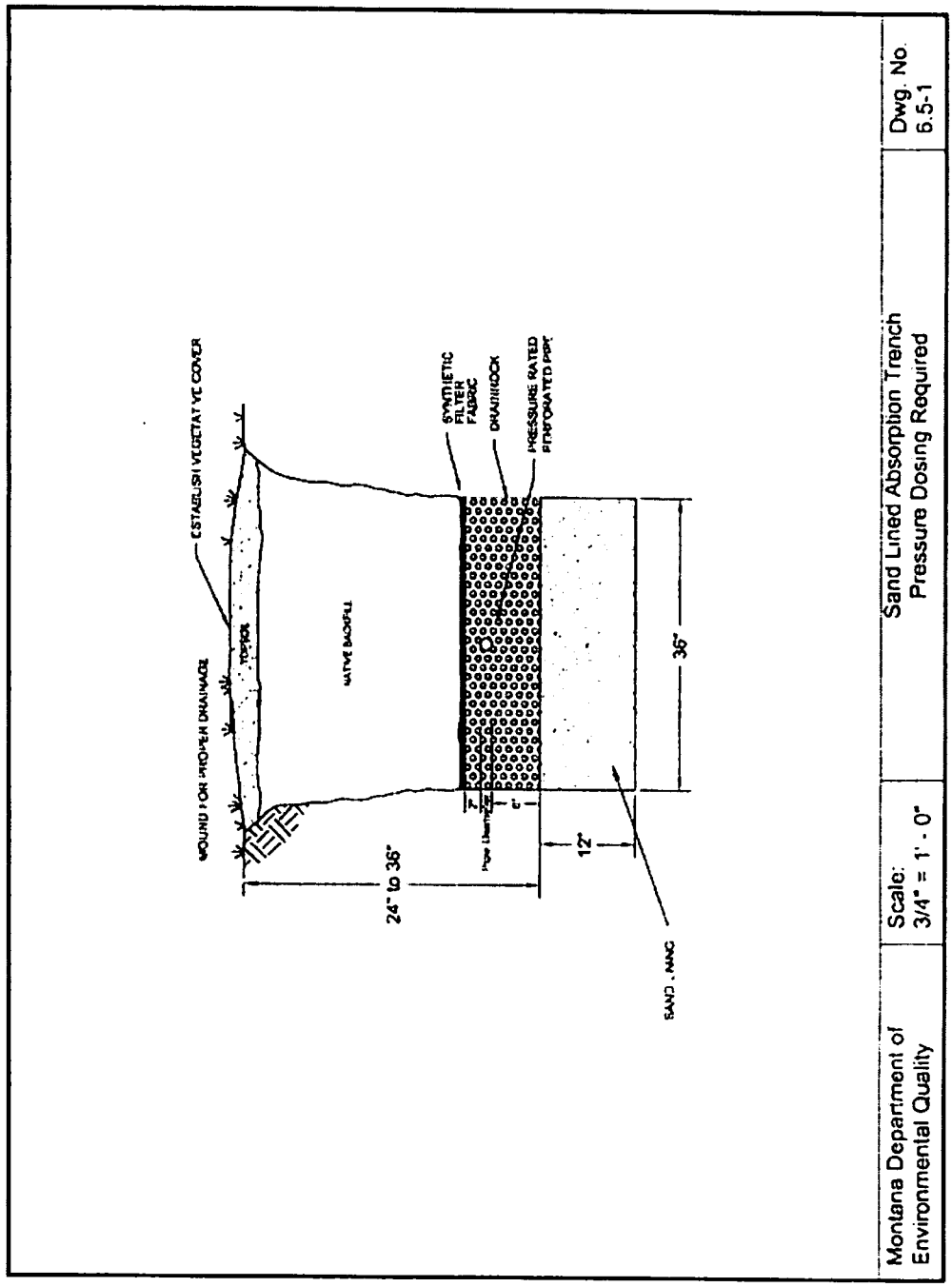
6.5.1. General

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
TOPSOIL
NATIVE BACKFILL
SYNTHETIC FILTER FABRIC
DRAINROCK
PRESSURE RATED PERFORATED PIPE
36"
12"
24" to 36"
SAND - MIN
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.

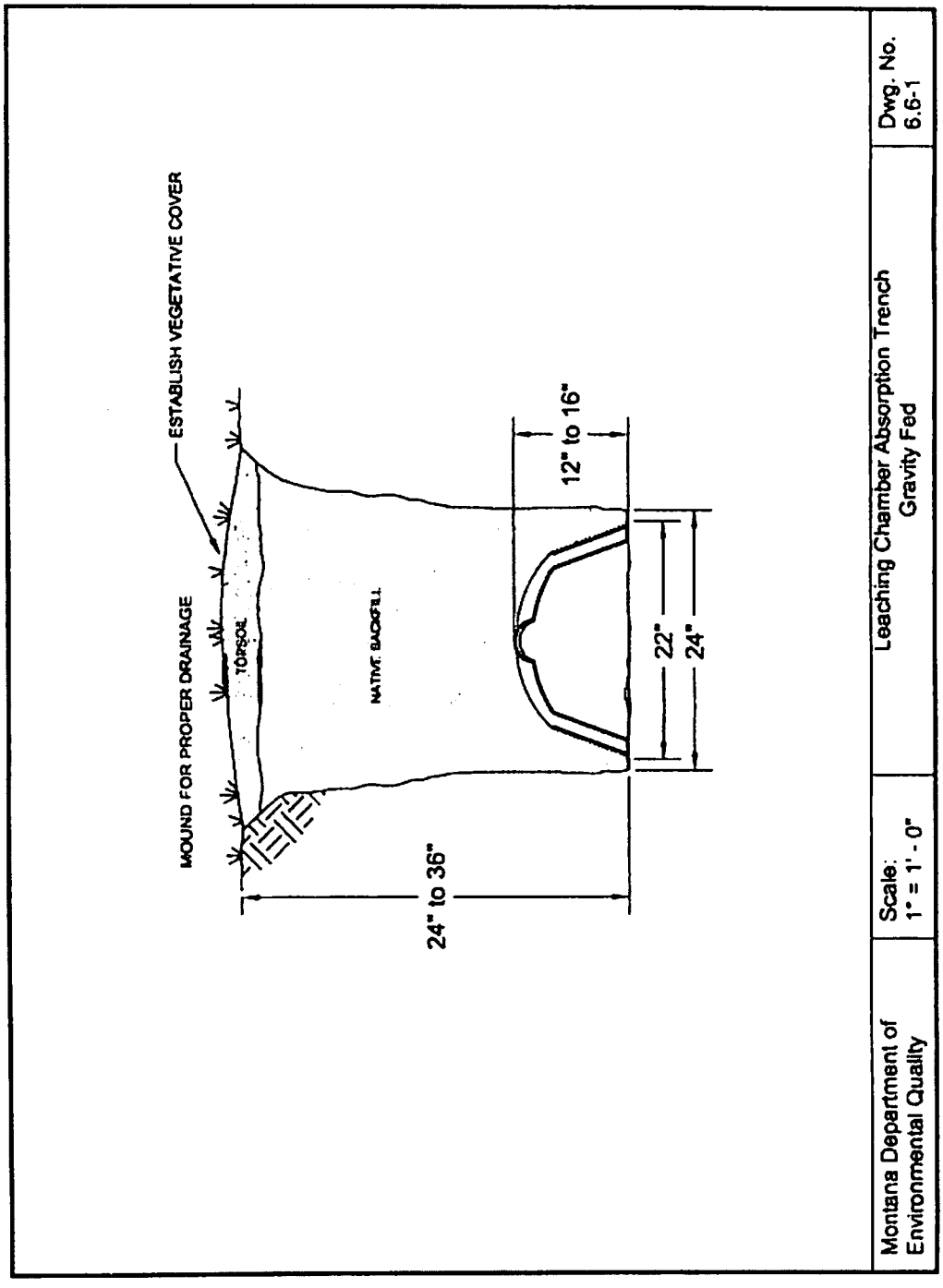
6.6.3. Other Absorption Systems

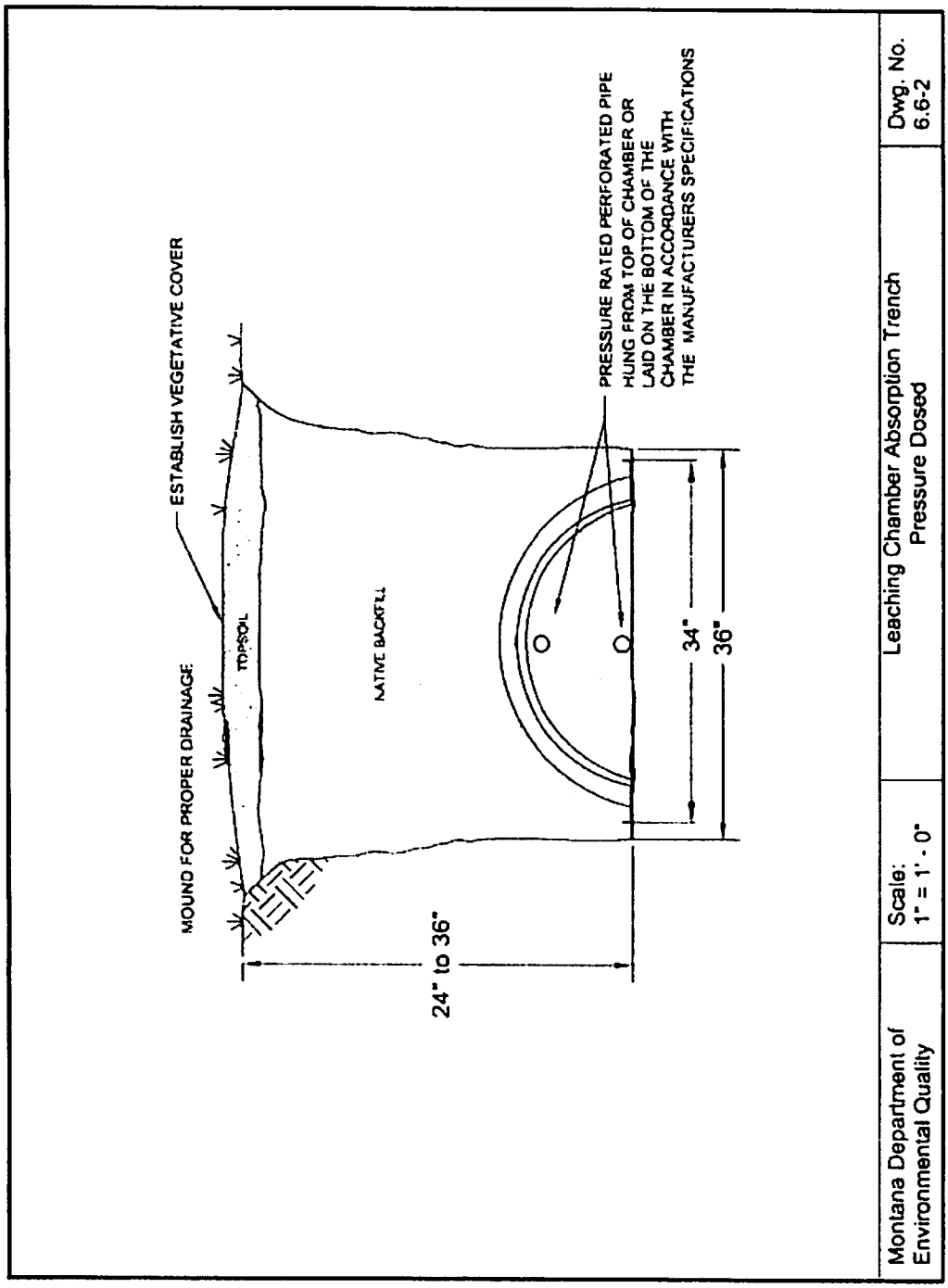
6.6.3.1. Other absorption systems must be able to meet or exceed the same system performance as conventional gravel-filled absorption systems with documentation presented by a third independent party.

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
24" to 36"
34"
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.

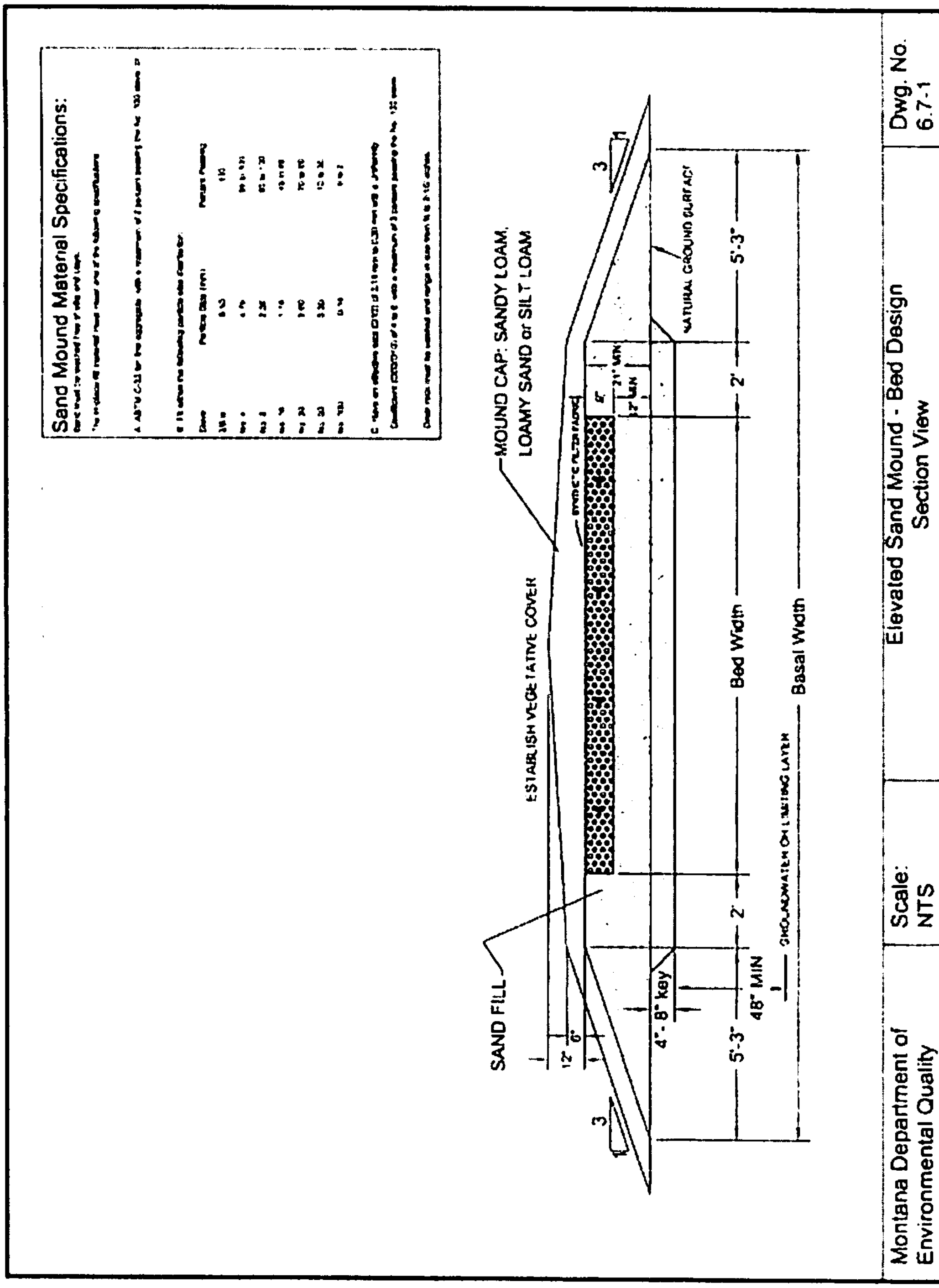
6.7.4.4. The area surrounding the elevated sand mound must be graded to provide diversion of surface runoff waters.

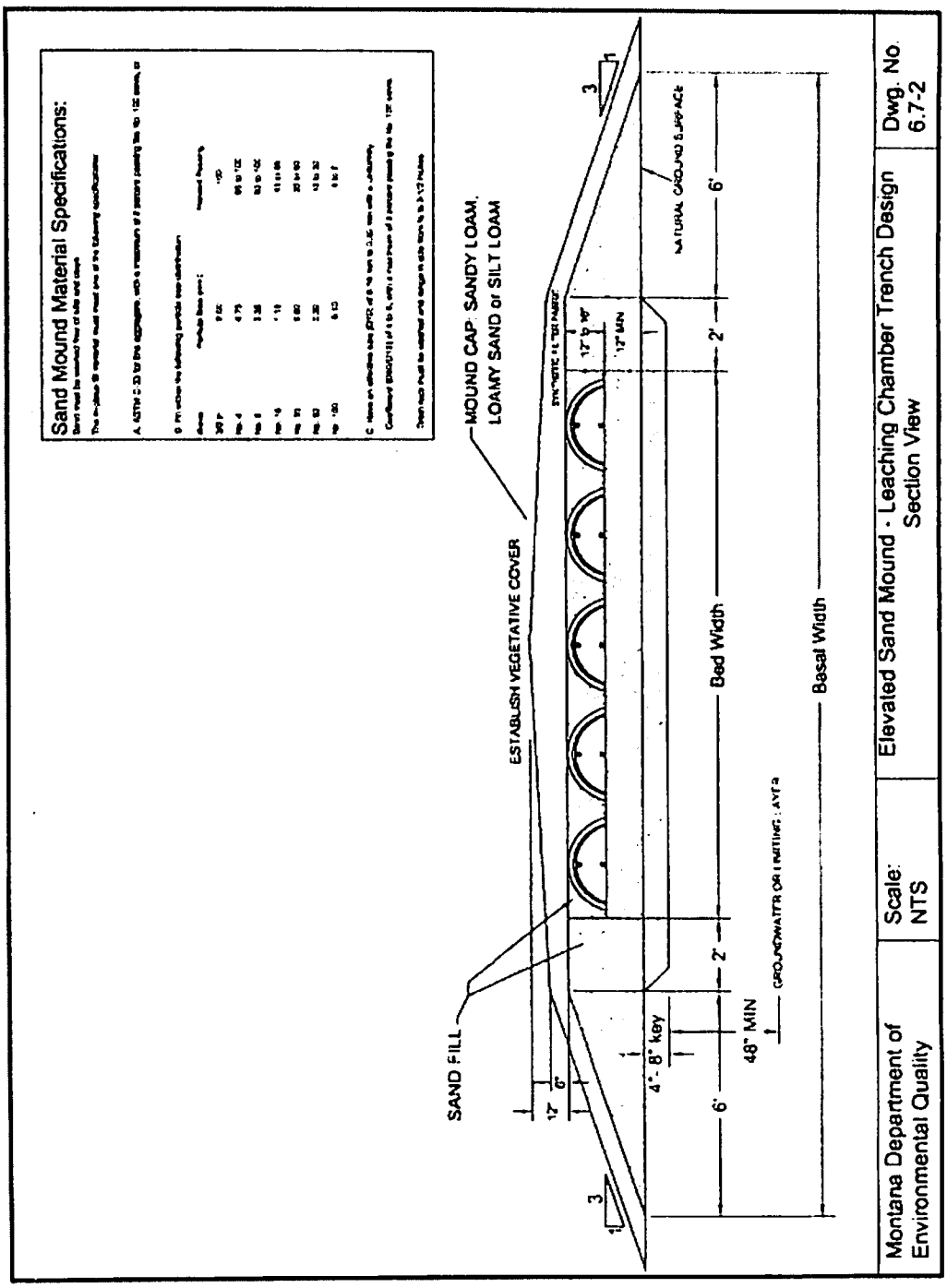
6.7.4.5. Construction should be initiated immediately after preparation of the soil interface by placing the sand fill needed for the mound to a minimum depth of 21 inches above the plowed surface. This depth will permit excavation in the sand fill to

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:
MOUND CAP: SANDY LOAM, LOAMY SAND or SILT LOAM
ESTABLISH VEGETATIVE COVER
SAND FILL
NATURAL GROUND SURFACE
GROUNDWATER OR LIMITING LAYER
12"
6"
4" - 8" key
48" MIN
21" MIN
12" MIN
5'-3"
2'
2'
5'-3"
Bed Width
Basal Width
3
1
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
NATURAL GROUND SURFACE
Bed Width
Basal Width
48" MIN
4" - 8" key
12" MIN
6'
2'
3
1
Montana Department of Environmental Quality
Scale: NTS
Elevated Sand Mound - Leaching Chamber Trench Design
Section View
Dwg. No. 6.7-2