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Local Government Interim Committee

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ON-SITE WASTEWATER TREATMENT SYSTEMS – STATE REGULATIONS

PURPOSE OF REGULATIONS

The Montana Department of Environmental Quality (DEQ) develops rules and regulations regarding the permitting, design, and installation of on-site waste treatment systems. These systems are used by landowners who do not have reasonable access to a municipal sewer system. To promote and protect the public and environmental health of the state, the DEQ establishes rules for acceptable systems that adequately treat waste while also maintaining healthy water quality and soil composition.

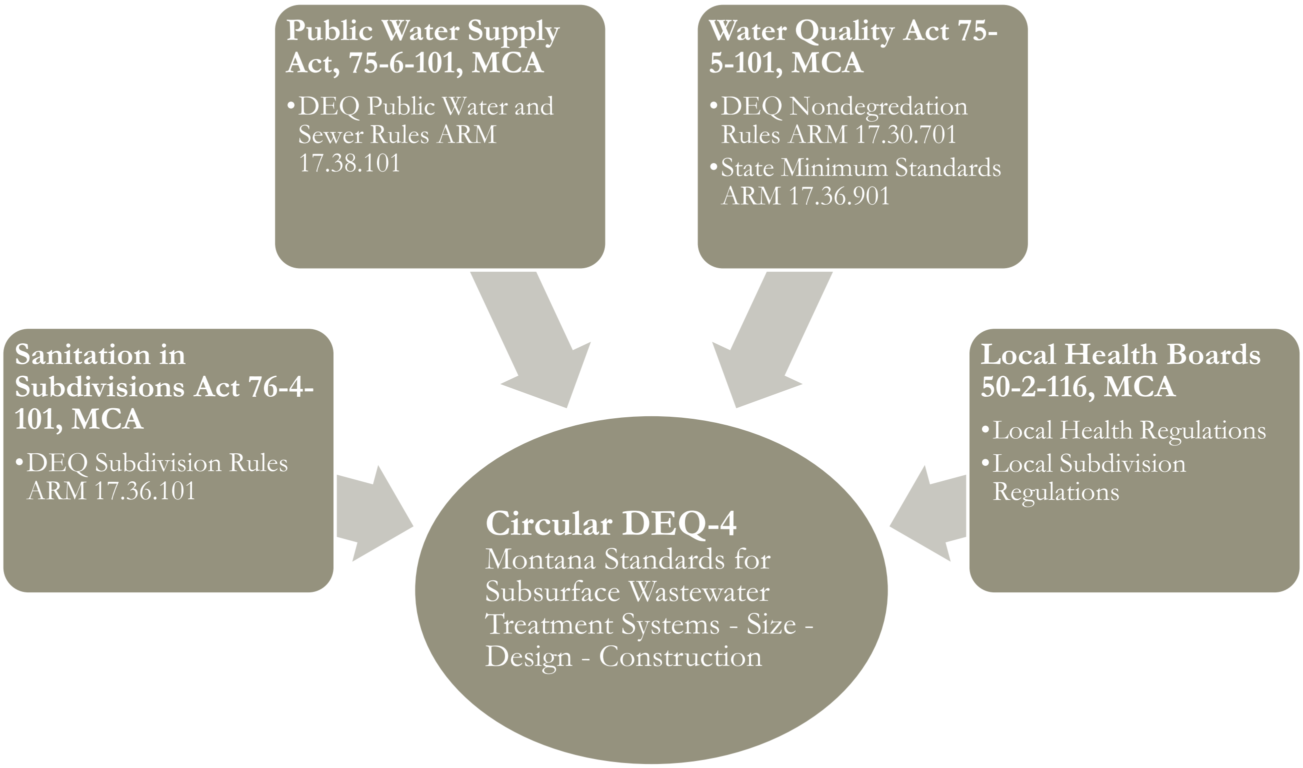
MINIMUM STANDARDS

The minimum standards for on-site wastewater treatment systems are found in Circular DEQ-4.

The minimum standards for on-site subsurface wastewater treatment and disposal systems are found in CIRCULAR DEQ-4, which is updated approximately every five years. Circular 4 lists and describes various types of systems currently permitted in Montana, including but not limited to septic tanks, absorption trenches, sand filters, aerobic wastewater treatment units, and holding tanks. Circular 4 also details the process to request a deviation from the minimum standards for existing system components or for new, experimental systems that may not have been thoroughly researched by the department.[1]

[1] The process for requesting a deviation is detailed on page 9 of this document.

The department develops the Circular 4 in compliance with various state statutes, administrative rule, and local regulations. The following chart illustrates the sources of authority that dictate many of the components of the Circular 4:



TYPES OF SYSTEMS

Wastewater can be treated and dispersed back into the environment using a variety of technologies that employ biological, physical, and chemical processes to digest, neutralize, or otherwise remove pollutants. Many types of on-site wastewater treatment systems exist, but, generally, a successful system consists of an apparatus to trap solids and begin nitrification and an absorption field to disperse and filter wastewater through the soil.

The most common form of on-site wastewater treatment system is a septic system that utilizes a septic tank and a subsurface soil absorption field (drain field). Buried in the ground, septic tanks are essentially watertight single or multiple chamber sedimentation and anaerobic digestion tanks. They are designed to receive and pretreat domestic wastewater, mediate peak flows, and keep settleable solids, oils, scum, and other floatable material out of the absorption field. Wastewater effluent is discharged from the tank and passes to the soil via a series of underground perforated pipes, perforated pipe wrapped in permeable synthetic materials, leaching chambers, pressure drip irrigation pipes or tubing, or other distribution system. From there, the partially treated effluent flows onto and through the developing biomat located at the soil infiltrative surface, and finally into the soil itself. Treatment occurs in the septic tank, on and within the biomat that forms at the soil infiltrative surface, in the soil, and continues as the effluent moves through the underlying soil toward groundwater or nearby surface waters.

The department maintains a list of approved types of systems to not only meet the needs of landowners but also to address the wide variety of environmental factors present in land parcels across the state. Not all systems may work in all areas, and thus many options exist to offer solutions for landowners who install and maintain their own system.

The following tables outline the most common types of on-site wastewater treatment system components permitted by DEQ; however, local health requirements may be more stringent than DEQ's requirements. Keep in mind that a successful system needs to address both solid waste and wastewater (gray water), thus a complete system utilizes multiple components. Additionally, some sites may require an advanced treatment system described in Table 3 to successfully treat wastewater.

TABLE 1: OPTIONS FOR SOLID WASTE SEGREGATION

Type of System	Description
Septic Tank *Chap. 5.1, Circular DEQ-4* (Appendix: Figure 1)	• All solids and wastewater are collected in tank • Effluent filter traps solids and allows wastewater to pass to absorption field (see Table 2 for options) • Solids must be pumped on regular schedule • May use a distribution box, drop box, or manifold to further aid in separating solids from wastewater Construction material options: concrete (precast or cast-in-place concrete), thermoplastic, or fiberglass
Holding Tank *Chap. 8.1, Circular DEQ-4*	• Holds all effluent (solids and wastewater) with no outlet • Used only for storage, not for treatment of any type of waste • Must be pumped regularly • May not be used for new systems unless the facility is licensed by DPHHS or operated by a government agency and a waiver is granted[2]
Sealed Pit (Vault) Privy *Chap. 8.2, Circular DEQ-4*	• Similar to holding tank – holds all waste without an outlet or treatment method • Must be pumped regularly • May not be used for new systems

[2] Holding tanks are prohibited for new systems under ARM 17.36.321 except for systems that qualify for a waiver. Holding tanks are also prohibited under ARM 17.36.916 except for seasonal use (120 days of the year). Some counties, like Flathead County, do not allow holding tanks in any capacity, so even if DEQ granted a waiver, a holding tank could not be installed in a county that does not allow holding tanks.

Unsealed Pit Privy *Chap. 8.3, Circular DEQ-4*	• May only be used with structures with no pumping fixtures or running water • Must be pumped regularly • May not be used for new systems
Seepage Pits (Cesspool) *Chap. 8.4, Circular DEQ-4*	• Perforated concrete rings are placed in drain rock and effluent is released over drain rock covered with appropriate geotextile fabric, untreated building paper, or straw • Very limited types of soil allow for a seepage pit (soil must have percolation rate greater than 60 mpi) and the seepage pit must be installed at least 25 feet above groundwater[3] • May not be used for new systems[4]
Composting Toilet *Chap. 8.5.3.1, Circular DEQ-4*	• Waste is broken down through aeration and microbial colonization • Must include continuous forced ventilation to the outside of storage or treatment chamber • Must be able to sustain suitable temperatures for biological activity (average range of 68°-130° F) • Must be used in conjunction with an absorption field (Table 2) to treat wastewater • Unit must be able to meet testing criteria and performance requirements for NSF Standard 41
Incinerating Toilet *Chap. 8.5.3.2, Circular DEQ-4*	• Electric or gas-fired • Vapor and products of combustion must be adequately vented independent of other household venting systems • Must comply with local air pollution requirements • Contents of incinerating toilet must be removed and disposed of in compliance with 40 CFR Part 503 and Title 75, Chapter 10, part 2, MCA • Must be used in conjunction with an absorption field (Table 2) to treat wastewater[5] • Unit must be able to meet testing criteria and performance requirements for NSF Standard 41

[3] As required in ARM 17.36.916.
[4] Under ARM 17.36.916, seepage pits can only be used for replacement systems and when no other means of disposal is available.
[5] The department recently approved via waiver an incinerating toilet for total incineration, so no drain field was required. See page 9 of this document for more information on system waivers.

TABLE 2: OPTIONS FOR WASTEWATER TREATMENT

Type of System	Description
Regardless of type, a successful wastewater treatment system is largely dependent upon wastewater quality and proper site selection. **Wastewater quality if often dependent upon the effectiveness of the effluent system in Table 1.**	
Absorption Trenches *Chaps. 6.1 – 6.6 Circular DEQ-4* (Appendix: Figures 2-4)	• Trench dug below the surface and lined with drain rock • Distribution pipes are installed and may be either gravity-fed or pressure dosed • Wastewater is filtered through soil to remove impurities and reenters the water supply • Design and size determined by flow and soil type Options: shallow, deep, at-grade, sand-lined, gravel-less, leaching chamber
Elevated Sand Mounds *Chap. 6.7 Circular DEQ-4* (Appendix: Fig. 5)	• Sand mounds are built above natural soil and are used to separate the distance between the treatment system and a limiting layer • Pressure distribution must be provided • Must have a minimum of 21 in. of sand above at least 4 ft. of natural soil surface Options: may utilize equipment used in absorption trenches: distribution pipes, drain rock, geotextile fabric, building paper, straw, leaching chambers
Evapotranspiration Absorption (ETA) & Evapotranspiration (ET) System *Chap. 6.8 Circular DEQ-4* (Appendix: Figs. 6 & 7)	• An ETA is used in soils with slow percolation rates (clay) and an ET is used in areas where discharging waste into the soil is undesirable • System installed at least 30 in. below ground surface and filled with drain rock or coarse sand and covered with a suitable medium (sandy loam, silt loam) that provides drainage and aeration • Effluent then passed to secondary system (absorption trench, distribution pipes, etc.) • Should be used with wastewater flow reduction strategies
Subsurface Drip *Chap. 6.9 Circular DEQ-4* (Appendix: Fig. 8)	• Uniformly spaced drip emitters discharge small volumes of wastewater throughout the day • Drip line normally installed directly into the soil without other media • Must not be placed where vehicles will cross them, and potable water lines may not pass under or through any part of the dispersal system • Must be designed to remain free-flowing during freezing conditions

	• Must use a septic tank (Table 1), an advanced wastewater treatment system (Table 3), pressure dosing, and use an effective pump to regulate the volume and pressure of the discharge
Gray Water Irrigation *Chap. 6.10 Circular DEQ-4*	• If the location meets criteria for gray water reuse, gray water (water from bath tubs, showers, sinks, dish and clothes washers, etc.) may be collected and used in a subsurface dispersal system at least 6 in. below the surface • Kitchen water must be used in conjunction with another wastewater treatment method • Systems must utilize filters, surge tanks, and regulator pumps • Must either be designed for freezing conditions or provide a drainfield for use during freezing conditions
Absorption Beds *Chap. 6.11 Circular DEQ-4*	• May be used where standard absorption trenches are not possible • May not be used for new systems • Absorption beds must be at least 3 ft. wide and 2 ft. deep unless circumstances provide otherwise. • Pressure distribution and a minimum of 2 distribution pipes must be provided • Excavated beds must be backfilled with appropriate drain rock

TABLE 3: ADDITIONAL ADVANCED TREATMENT SYSTEMS IF NEEDED OR REQUESTED

Type of System	Description
Recirculating Media Trickling Filter *Chap. 7.1, Circular DEQ-4*	• Utilizes aerobic processes to biologically oxidize organic material and convert ammonia to nitrate and then some recirculates back to the tank for anoxic denitrification • A bio-film is adhered to a bed of highly permeable medium in an unsaturated environment • Wastewater trickles through the media and microorganisms in the bio-film degrade organic material • An under-drain system collects treated water and any solids and transports it to a settling tank where the waste is recirculated back through the media or the septic tank
Intermittent Sand Filter *Chap. 7.2, Circular DEQ-4*	• A watertight container is filled with drain rock, gravel, sand, or loamy sand • Waste water is passed through the sand filter before being released in to a wastewater treatment system (Table 2) • Flow must be pressure dosed • Acts as a contained, additional filtration system
Recirculating Sand Filter *Chap. 7.3, Circular DEQ-4*	• Similar to an intermittent sand filter, but effluent is recirculated back through the filter
Aerobic Wastewater Treatment Unit (ATU) *Chap. 7.4, Circular DEQ-4*	• A container provides aerobic biodegradation or decomposition of the wastewater components in a saturated environment • Wastewater is brought into contact with air by mechanical means • Must demonstrate compliance with testing criteria and performance requirements of NSF Standard No. 40 for Class 1 certification • Must include a sampling port to test the quality of the effluent
Chemical Nutrient Reduction System *Chap. 7.5. Circular DEQ-4*	• Treats effluent from septic tanks using chemical processes • The reviewing authority has wide discretion to determine the complexity and maintenance required of the system.
Alternative Advanced Treatment Systems *Chap. 7.6, Circular DEQ-4*	• The reviewing authority may evaluate alternative advanced treatment systems and allow systems that meet requirements found in NSF Standard No. 40 for Class 1 certification

HOW TYPES OF SYSTEMS ARE CHOSEN

In many instances, landowners may choose the type of system that works best for their needs. When deciding, owners often consider the projected volume of wastewater expected to be treated, the cost of installing a certain kind of system, and the amount of maintenance the system requires.

However, many factors outside of a landowner's control ultimately determine the type of system required. The type of soil present where the system is to be installed, the proximity of the system to surface water, the ability of the system to handle the actual volume of waste, and other environmental factors may rule out certain types of systems allowable in a landowner's area. Also, many systems require a substantial amount of space to operate effectively, so some parcels may not qualify for certain systems simply based on their size or geography.

Ultimately, the choice of system is decided using a combination of factors derived from state and local regulations in conjunction with a landowner's preference and budget when possible.

SYSTEM COSTS

The following table[6] provides estimated costs for various system components. Be aware that costs vary widely, and the table should be used as an estimate rather than a standard.

Type of Onsite System	Installation Cost	% Cost Increase from Conventional Treatment
Conventional Septic Tank	$2,000-$6,000 ($4,000 average)	--
Absorption Trenches	$4,000-$7,000	38%
Elevated/Mound Systems	$7,000-$12,000	138%
Intermittent sand/media filters	$5,000-$10,000	88%
Recirculating sand/media filters	$8,000-$11,000	138%
Aerobic Treatment Units	$3,000-$6,000	13%
Constructed Wetlands	$10,000-$20,000	275%

[6] "Appendix K: On-Site Domestic Wastewater Treatment in the Lake Helena Watershed," prepared for the Montana Department of Environmental Quality by the U.S. Environmental Protection Agency, Montana Operations Office, 2006. https://deq.mt.gov/Portals/112/Water/WQPB/TMDL/PDF/LakeHelena/VolII/M09-TMDL-02a_App_K.pdf

EXPERIMENTAL SYSTEMS & DEVIATION REQUESTS

When revising the Circular 4 approximately every five years, DEQ often adds additional types of systems that have proven popular and successful. In order for a type of system to be considered standard, adequate research must be compiled and tests completed that prove a system is able to perform successfully in Montana.

In addition, a person may submit a written request for a deviation for any system, either one described above or for a system that is not included in the current Circular.

A written deviation[7] shall be submitted to the reviewing authority having jurisdiction and shall:

1. identify the specific section of the Circular to be considered;
2. include adequate justification for the deviation;
    - "engineering judgment" or "professional opinion" without supporting data is considered inadequate justification
3. address how the system allowed by the deviation would be unlikely to cause pollution of state waters in violation of 75-5-605, MCA;
4. address that granting 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 specified in 76-4-101, MCA; and
5. address that granting 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.

Source:

Circular DEQ 4, *Montana Department of Environmental Quality,* 2013.

https://deq.mt.gov/Portals/112/Water/PWSUB/Documents/docs/engineers/2014/DEQ4-2013-Final.pdf.

[7] Deviation requirements are detailed in Chapter 1.1.4.2 Circular DEQ-4.

APPENDIX 1: SYSTEM DIAGRAMS

FIGURE 1: STANDARD SEPTIC TANK

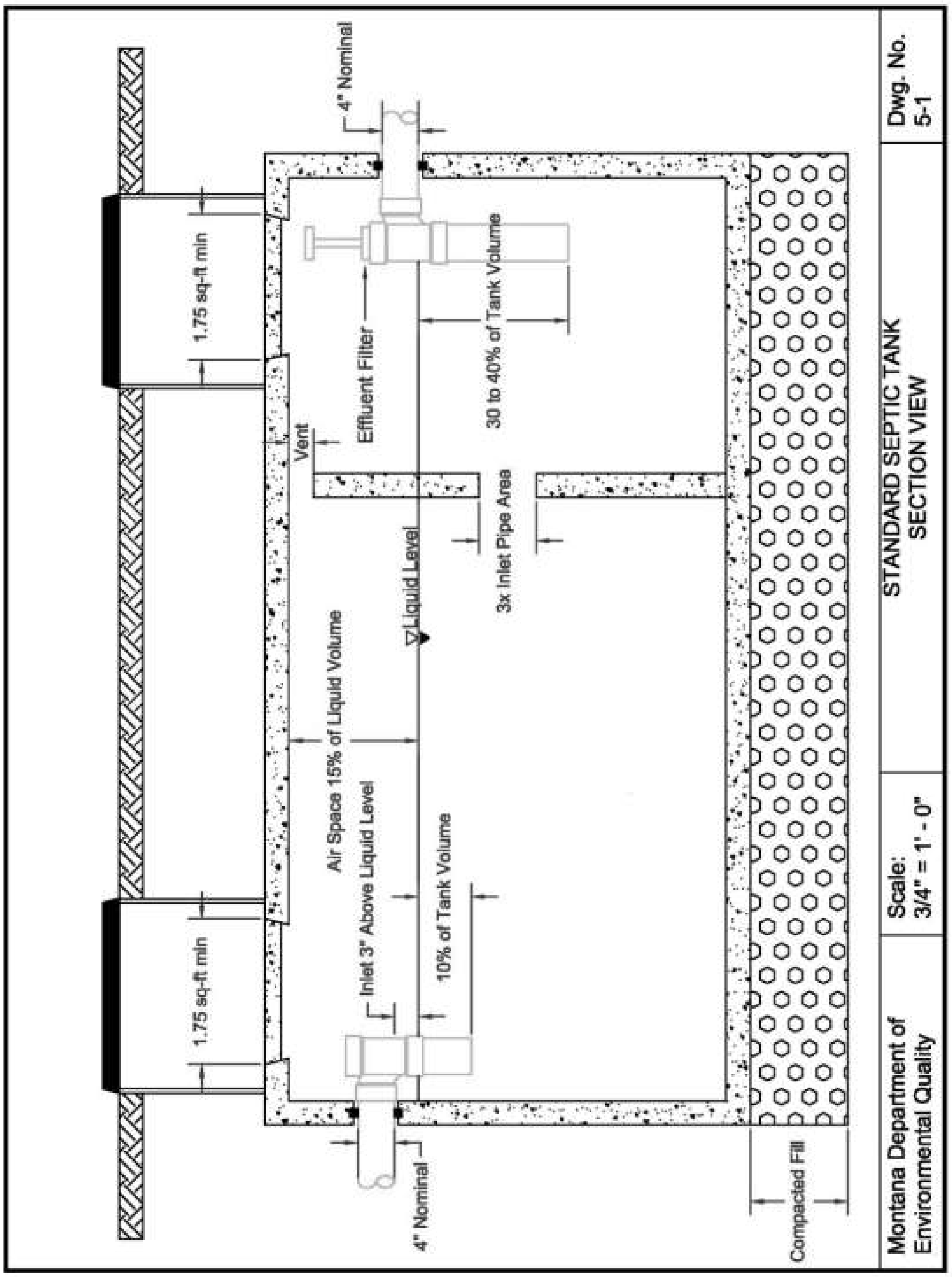


FIGURE 2: STANDARD ABSORPTION TRENCH – GRAVITY FED

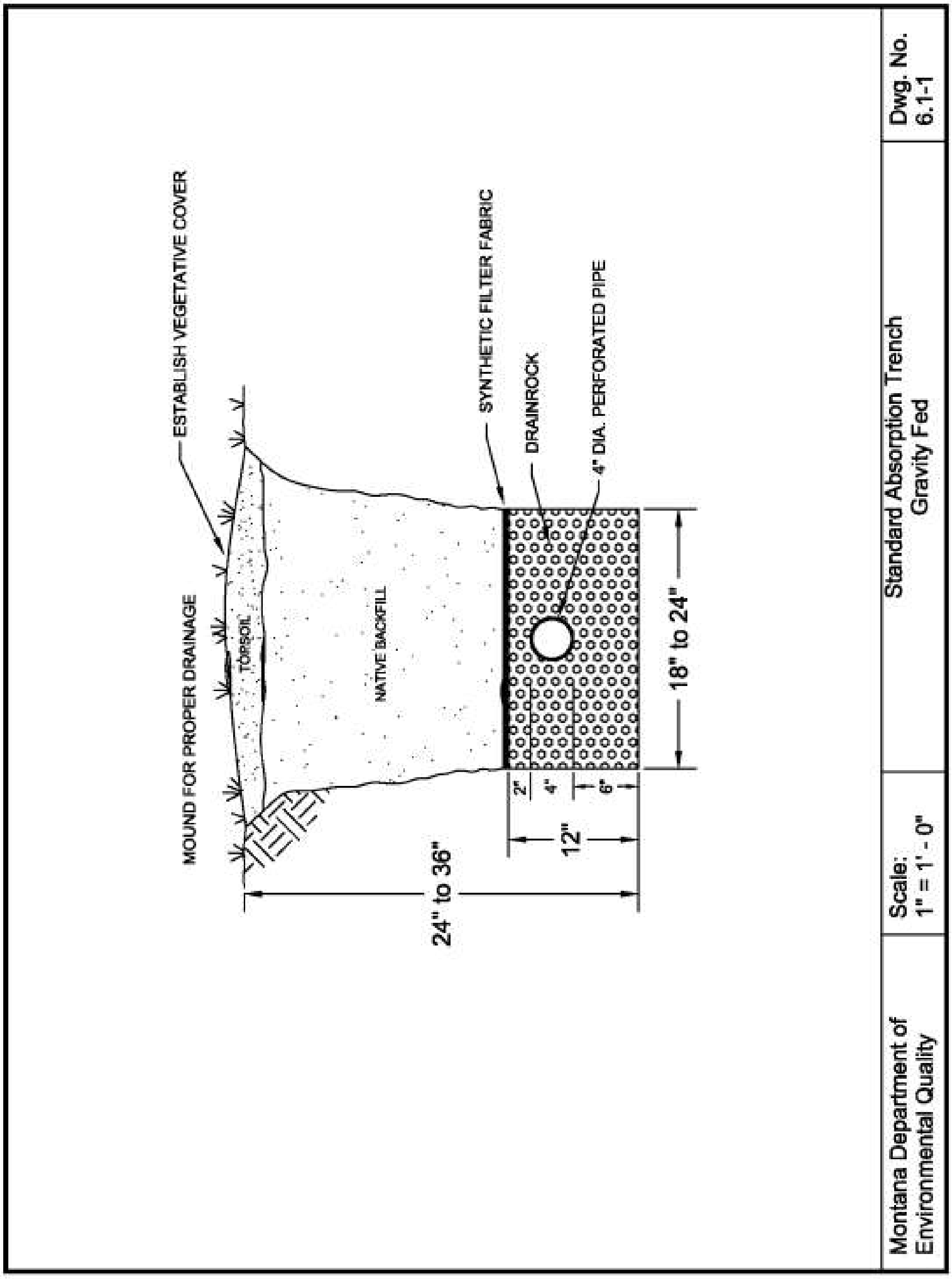


FIGURE 3: STANDARD ABSORPTION TRENCH – PRESSURE DOSED

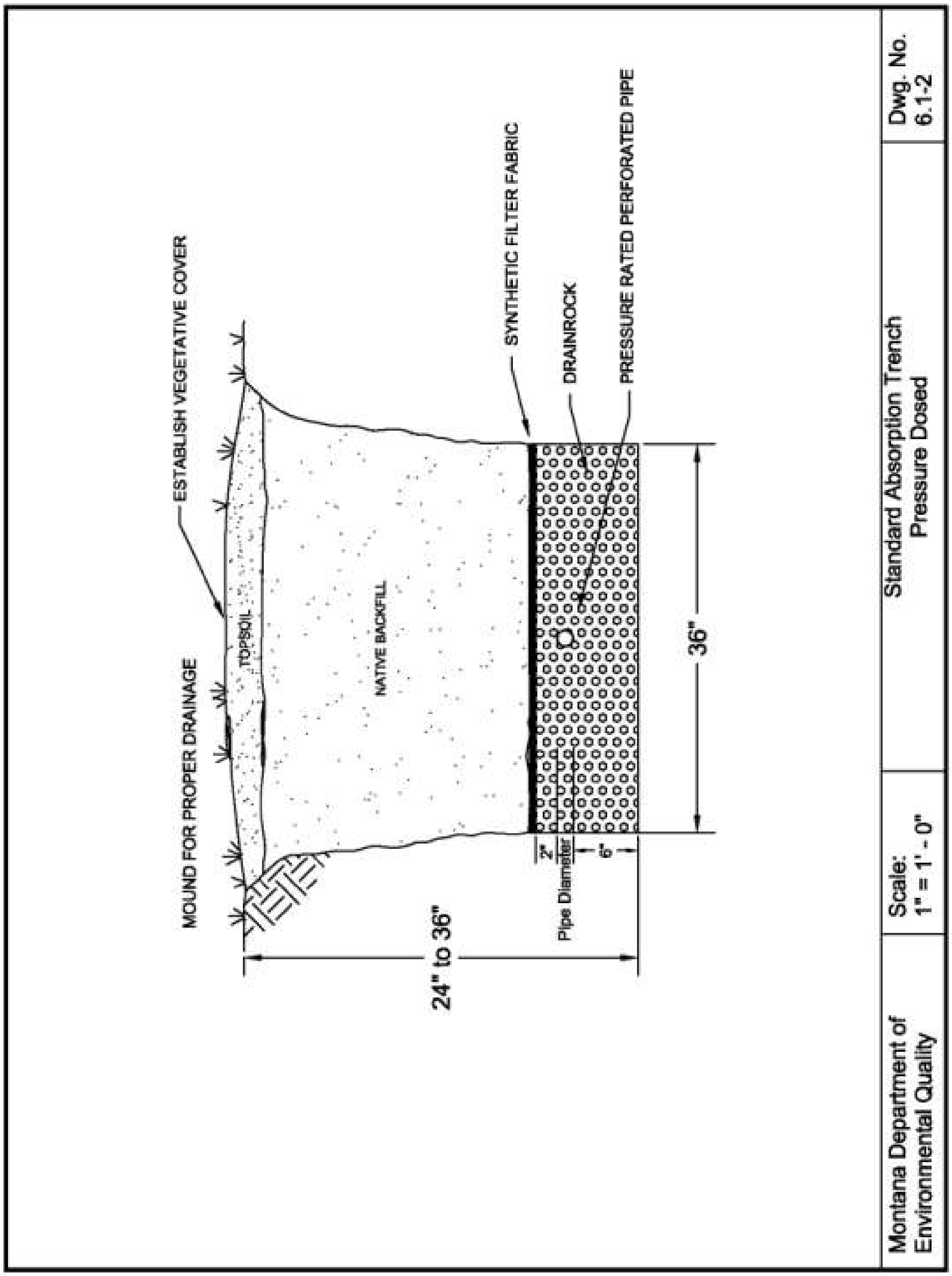


FIGURE 4: SHALLOW-CAPPED ABSORPTION TRENCH WITH LEECHING CHAMBERS

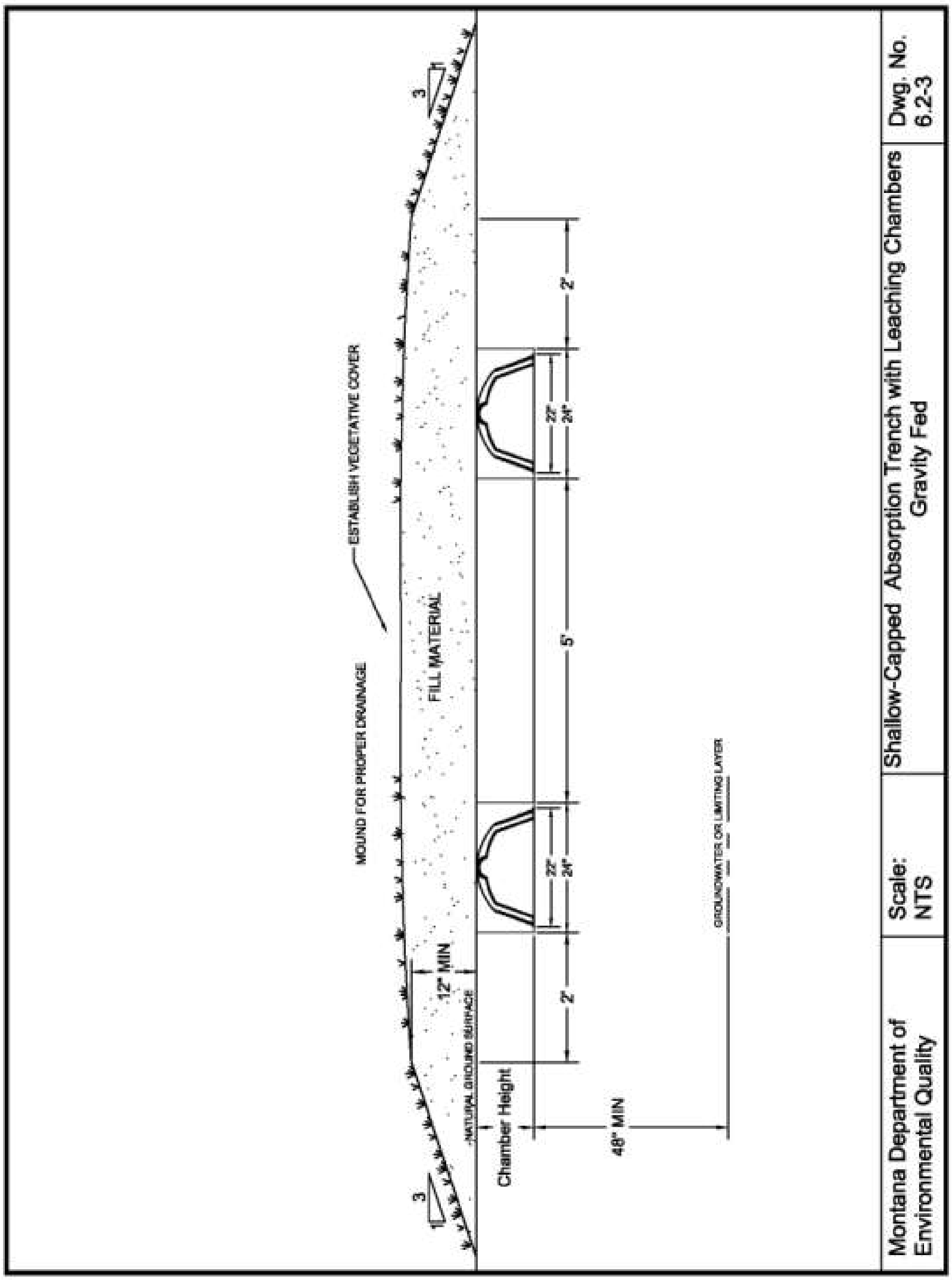


FIGURE 5: ELEVATED SAND MOUND

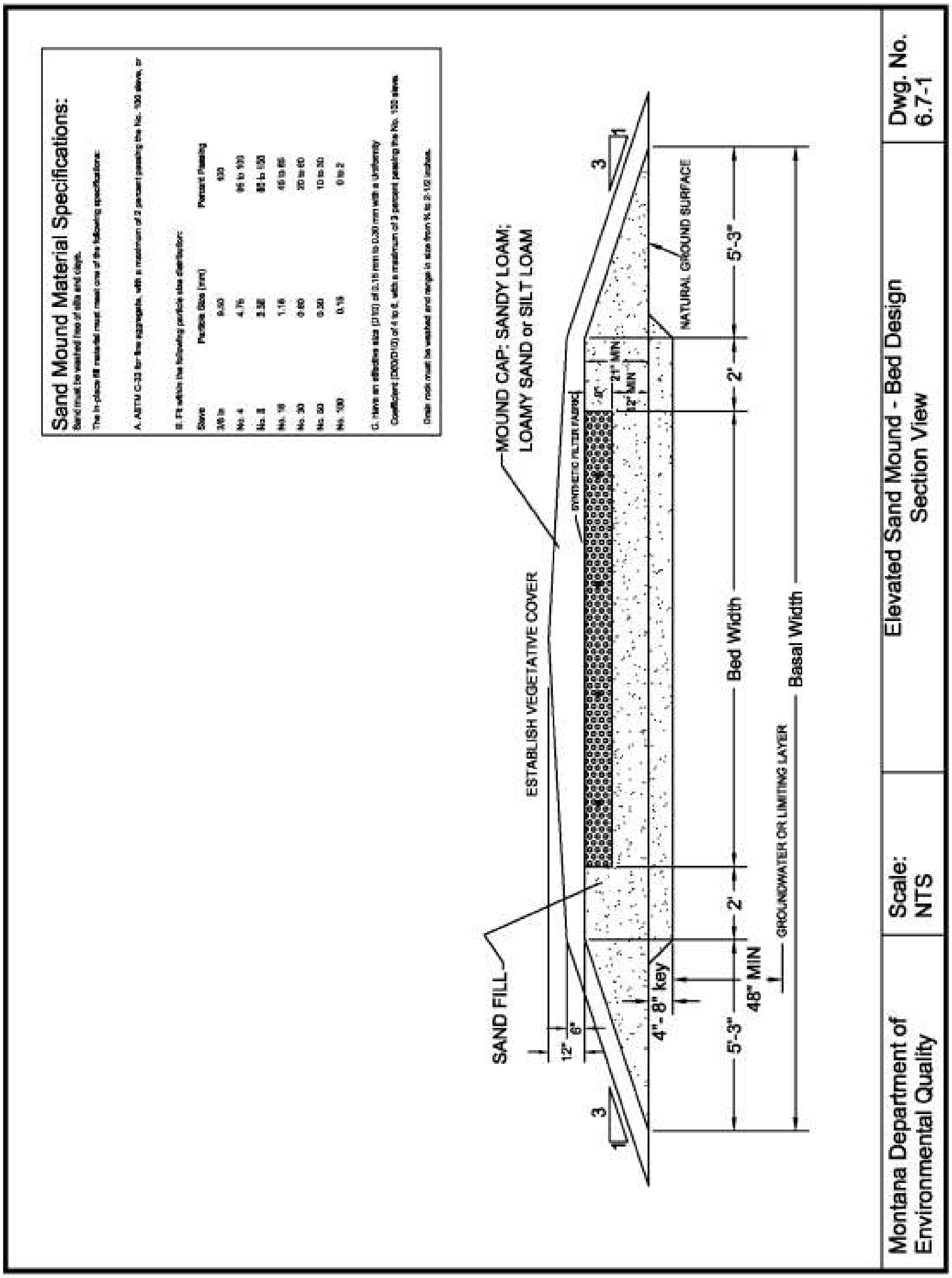
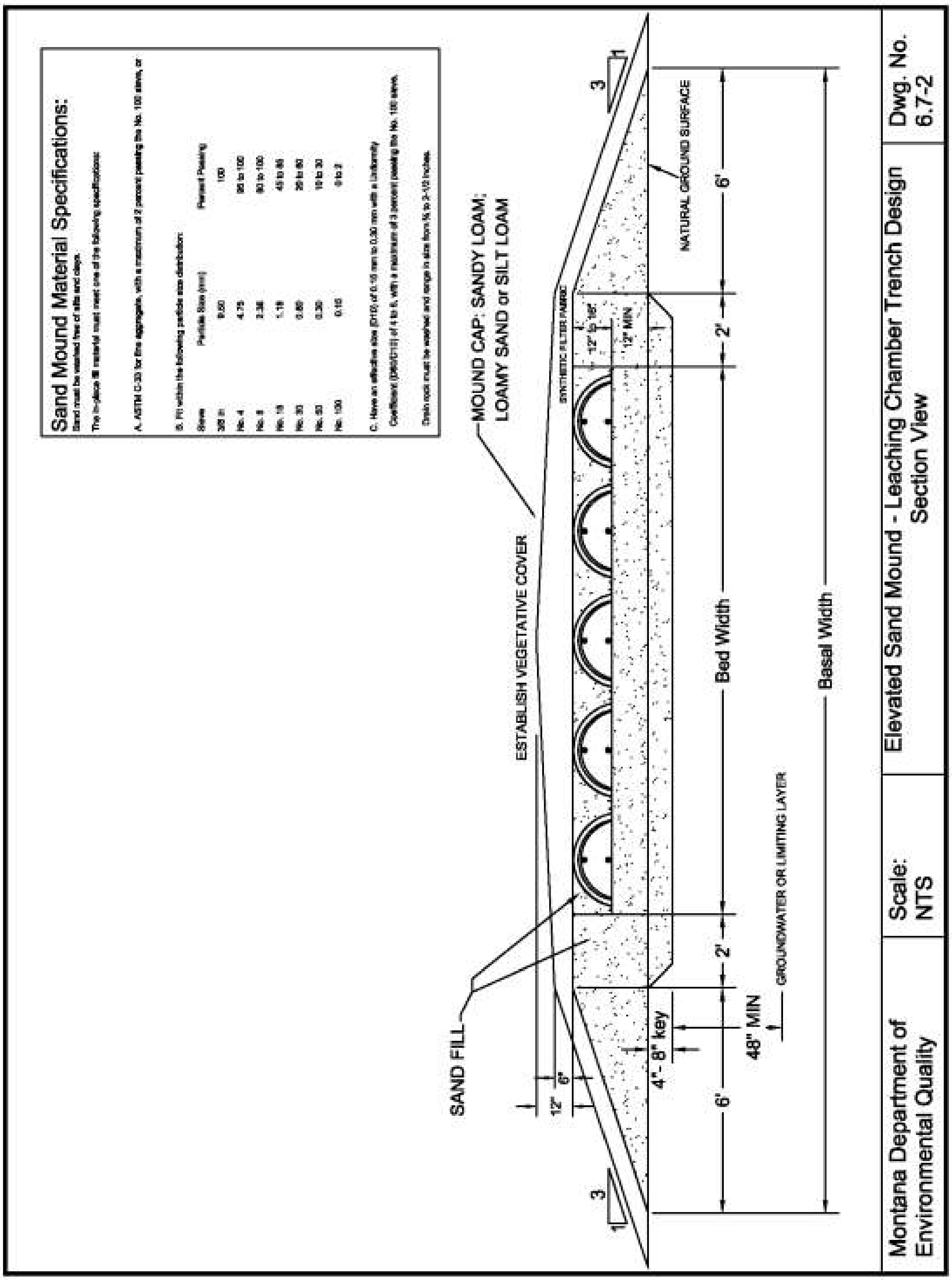


FIGURE 6: ELEVATED SAND MOUND WITH LEACHING CHAMBERS



LEGISLATIVE SERVICES DIVISION

FIGURE 7: EVAPOTRANPIRATION/EVAPOTRANSPIRATION ABSORPTION SYSTEM

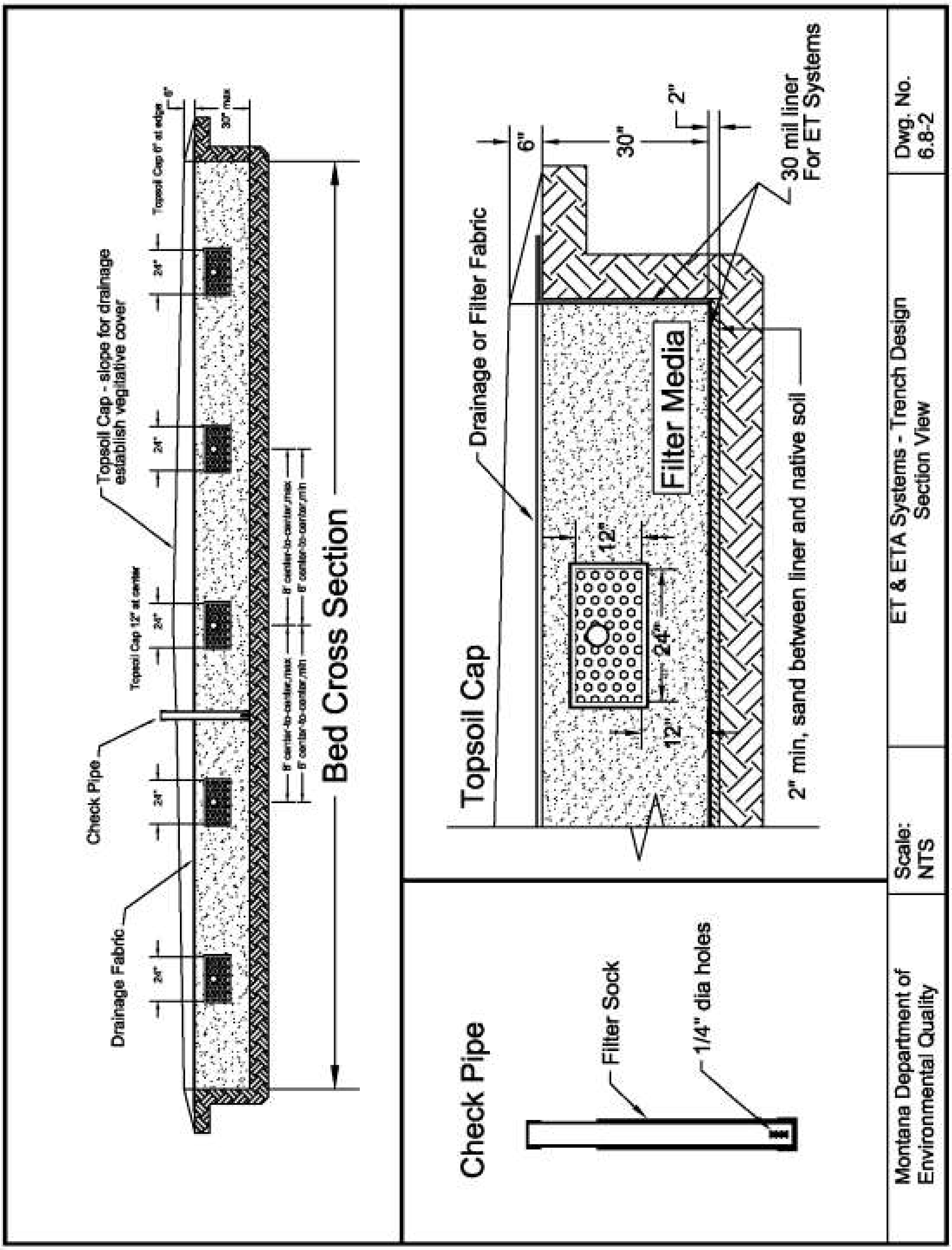


FIGURE 8: SUBSURFACE DRIP SYSTEM