Onsite Wastewater System Installation Manual

State of Alaska

Department of Environmental Conservation

Division of Water

Engineering Support and Plan Review

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This document contains information regarding the installation of onsite sewer systems. Certified Installers, contractors, homeowners and registered engineers are subject to 18 Alaska Administrative Code (AAC) 72 and this manual.

ADEC OFFICES

Please refer to the ADEC Office Contacts Handout for the current contact information in your area. Available at: http://dec.alaska.gov/water/wwdp/onsite/index.htm

DIVISION 10
STANDARD PROVISIONS

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SECTION 10.01 DEFINITIONS

In this publication, except as added or modified below, all definitions will be as listed in 18 AAC 72.990 and 18 AAC 80.1990.

Article 1.1 Modifications

Groundwater – The definition of "groundwater" shall be the one found in 18 AAC 72.990(36).

Aquifer – The Definition of "aquifer" shall be the following: "Aquifer" means an underground geological formation able to store water, also known as a zone of saturated soil, or saturated zone. The upper surface (top) of the aquifer is the water table (18 AAC 72.990(80)). The saturated zone (aquifer) contains groundwater (18 AAC 72.990(36)).

Article 1.2 – Additions

Unsaturated Zone – "Unsaturated Zone" means the zone below the land surface and above the water table (18 AAC 72.990(80)) where the soil pores contain both water and air, but are not completely saturated with water. The "unsaturated zone" is also known as the "vadose zone".

Impermeable Layer – "Impermeable Layer" means a layer of soil or other geologic formation with a characteristic that limits its ability to transmit significant quantities of water. Soil with a percolation rate slower than 120 minutes per inch shall be considered impermeable. An impermeable layer is also known as a "confining layer".

Percolation – "Percolation" means the downward movement of water through the unsaturated zone. For the purposes of meeting the requirements of this manual, only a registered professional engineer, registered in the State of Alaska, may perform a percolation test.

Monitor Well – "Monitor Well" means a pipe, generally of small diameter, and open along its length, that is used to measure the elevation or depth below the ground surface of the water table or aquifer. The monitor well may be open only at the top and bottom of the pipe (called a piezometer) or it may be perforated along its length.

Bedroom – "Bedroom" means a room which is designed or used for sleeping, **or** is a room which is 70 square feet or greater in size that is not a hallway, kitchen, bath, laundry, living or dining room **and** has a closet **and** two means of egress, one of which is to the outside. This definition is for the sole purpose of estimating design flows from dwellings and must not be used to determine the adequacy or safety of a room for sleeping purposes.

Building Sewer – "Building Sewer" means the horizontal pipe that extends from the building to the septic tank. Building Sewer also means "Private Sewer Line" and "Sewer Service Line", as described in the regulations 18 AAC 72.990(51) and 18 AAC 72.990(64).

Disposal Sewer – "Disposal Sewer" means the solid horizontal pipe that extends from the outlet of the septic tank to the soil absorption system.

Elevated Mound – "Elevated Mound" means any portion of the bottom of the sewer rock in a bed or shallow trench type system that is above the original ground level.

SECTION 10.02 PURPOSE AND AUTHORITY

Article 2.1 Purpose and Applicability

The purpose of this manual is to help Certified Installers, Approved Homeowners and Engineers design and construct conventional onsite systems. This manual provides certified installers, approved homeowners, and engineers with the background needed for the proper design and construction of conventional onsite systems that conform to the Wastewater Treatment and Disposal regulations (18 AAC 72). These systems consist of some form of passive wastewater treatment, followed by a discharge to an onsite soil absorption system. This manual does not apply to the engineering design and construction of alternate onsite systems or wastewater disposal systems which require engineered plan review under Articles 2 or 6 of 18 AAC 72.

This manual supplements the Alaska Administrative Codes (AAC) Wastewater Treatment and Disposal regulations (18 AAC 72) and Drinking Water regulations (18 AAC 80) that are in effect as of the date of this manual. The regulations are available from any ADEC Office or on the Internet at dec.alaska.gov/water.

SECTION 10.03 PLAN APPROVAL REQUIREMENTS

"Conventional onsite systems" installed in compliance with this manual that serve a private residence or a "small commercial facility" with design flows not exceeding 500 gallons per day and meet the 18 AAC 72.035(d) conditions are exempt from plan approval requirements (Article 2 of 18 AAC 72). Note that these systems are exempt only from the plan submittal/approval requirements, not from any of the other requirements of this manual or the Wastewater Treatment and Disposal regulations. All other systems must have plan approval prior to construction.

SECTION 10.04 RESTRICTIONS

18 AAC 72.015 restricts design and installation of conventional onsite systems to the following individuals:

Article 4.1 Alaska-Registered Professional Engineers

Alaska-Registered Professional Engineers (herein registered engineers) may design and install "conventional onsite systems" that serve a private residence, a multi-family dwelling with design flows not exceeding 2,500 gallons per day, or a "small commercial facility" with design flows not exceeding 500 gallons per day, if they meet 18 AAC 72.035(d).

Article 4.2 Certified Installers

Certified Installers may design and install "conventional onsite systems" that serve a private residence or a "small commercial facility" with design flows not exceeding 500 gallons per day, if they meet 18 AAC 72.035(d).

Article 4.3 Individuals who have their work inspected by a registered engineer

Individuals who have their work inspected by a registered engineer may install "conventional onsite systems" that serve a private residence or a "small commercial facility" with design flows not exceeding 500 gallons per day, if they meet 18 AAC 72.035(d).

Article 4.4 Approved Homeowners

Approved Homeowners may install "conventional onsite systems" that serve an owner occupied private residence if they meet 18 AAC 72.035(d). Approved Homeowners may not install a system serving a "small commercial facility".

SECTION 10.05 NOTIFICATION

Article 5.1 Notification Time

18 AAC 72.435 requires that Certified Installers and Approved Homeowners (both hereafter referred to as the "Installer") notify the nearest ADEC office **at least 24 hours in advance** of beginning work (construction, installation, or modification) on a conventional system. In this context, beginning work means the time when excavation will begin with the intent to proceed continuously toward completion of the work. If the installer begins work on a weekend or State holiday, they must notify the nearest ADEC office by the close of business on the last business day prior to the work **and** at least 24 hours in advance. If the installer is unable to begin work on the notification date given as described in this article, the installer shall notify the Department of the new scheduled date as soon as possible, but in any case before beginning work. ADEC contacts are located in the handout or at dec.alaska.gov/water.

Article 5.2 Notification Content

The installers must call their local office, or the office nearest the installation using the office listing and telephone numbers provided in the ADEC contacts handout and provide the following information:

A. The legal description, location of the property, and accurate directions to the site;
B. The physical address of the property including street name and house or business numbers;
C. The installer's name, installer's certification number (if applicable), phone number, and if applicable, the contractor's name and license number; and
D. The scheduled date when the installation or modification will begin.

Article 5.3 Emergency Notification

Current regulations allow "emergency" notification for times when the 24-hour prior notice is not possible. This provision applies when the timeframe for the work is moved ahead, through no fault of the installer, such as for a system that requires immediate repair or reconstruction. At these times, the installer shall provide notice to the Department as soon as possible, and in any case, before the work begins.

SECTION 10.06 DOCUMENTATION

Article 6.1 Documentation of Construction Requirements

18 AAC 72.010(c) requires that the installer of a conventional onsite domestic wastewater disposal system submit documentation of system construction within 90 days after construction has been completed. The installer shall submit this information on the Documentation of Construction form available from the Department at dec.alaska.gov/water. This requirement applies to systems installed by Certified Installers, Approved Homeowners and those completed or inspected by a registered engineer.

Certified Installers and Approved Homeowners shall provide the following additional information:

At least four photographs of the installation with the following views:

- septic tank with inlet or outlet exposed and capacity label showing;
- open excavation of absorption field and line leading to it;
- filter fabric pulled back to reveal screened gravel and perforated pipe in absorption field; and
- finished grading and landscaping with standpipes.

In addition, when applicable, any special items must also be photo-documented including but not limited to:

- sand liner excavation and the in-place sand;
- lift stations;
- drop connections;
- effluent filters; and

Submit these photographs with the Documentation of Construction form.

For installations completed by or under the direct supervision of a registered engineer, the Documentation of Construction form must be fully completed, sealed, and signed by the registered engineer responsible for providing the installation or inspection. Pictures of the installation are strongly encouraged.

Installers shall provide all other pertinent information such as an as-built survey if one is available or required by a financial institution, a well log (if available), test hole and percolation test results if required, septic tank pumping receipt if applicable, sand liner approvals, if applicable, and any other information important to an accurate description of the system. Installers shall also provide a sketch of the installed system meeting the Instructions for Diagram on the most current Documentation of Construction form.

DIVISION 20
MINIMUM REQUIREMENTS

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MINIMUM REQUIREMENTS
DIVISION 20

SECTION 20.01 ESTIMATING MINIMUM WASTEWATER QUANTITIES

Article 1.1 Residential Wastewater Quantities

Typical residential design flow is 75 gallons per day per person. This includes water used for bathing, laundry, toilet and other miscellaneous uses. Therefore, the installer shall use the design flow of **150 gallons per day per bedroom** (two people per bedroom) as the minimum design standard for estimating residential wastewater flows. Designers, and installers who are not registered engineers shall not reduce wastewater design flow estimates or system size because of circumstances that may be temporary, such as two people living in a three-bedroom home.

Article 1.2 Commercial Wastewater Quantities

Installers shall work with the ADEC office nearest the proposed project or a registered engineer to estimate the peak wastewater flows from commercial facilities. Please refer to the ADEC Office Contacts Handout for the current contact information in your area. Prior engineered plan approval is required for any commercial facility with an estimated peak wastewater flow greater than 500 gallons per day.

Article 1.3 Recreational Wastewater Quantities

Installers may become involved in some onsite wastewater treatment and disposal systems that serve small recreational facilities such as cabins and private camps. Installers shall work with a registered engineer and/or the ADEC office nearest the proposed project to estimate the peak wastewater flows from recreational facilities. Please refer to the ADEC Office Contacts Handout for the current contact information in your area. Note that all community and/or collection systems such as those serving two or more separate dwellings or an recreational vehicle (R/V) collection, treatment, and disposal systems require engineered plan approval prior to construction.

Article 1.4 Seasonal Wastewater Quantities

Installers must design systems with seasonal flows such as recreational cabins, campgrounds or R/V parks, etc. based on full occupancy. No reduction in drain field size or reduction in septic tank size is allowed for seasonal use. These systems must be able to handle the daily maximum wastewater flow during the peak usage period.

Article 1.5 Industrial Wastewater Quantities

Installers shall not install systems for industrial wastewater disposal without prior engineered plan approval. Installers shall construct industrial installations only with prior plan approval and under the supervision of a registered engineer.

SECTION 20.02 MINIMUM MATERIAL SPECIFICATIONS & SIZE

Article 2.1 Pipe Materials

Please refer to the ADEC Pipe Materials handout for the current approved list of pipe types or ASTM Designations. Acceptable pipe materials are broken down into four (4) categories.

Building Sewer (building to septic tank)	Schedule 40 ABS
Disposal Sewer (septic tank to drainfield)	Schedule 40 ABS, Schedule 40 PVC or SDR 35 PVC
Drainfield (both solid and perforated pipe)	Schedule 40 PVC or SDR 35 PVC
Cleanouts, Vents or Monitor pipes	Schedule 40 ABS, Schedule 40 PVC or SDR 35 PVC

Please contact the nearest ADEC office or at dec.alaska.gov/water for a copy of the current Pipe Materials handout.

Article 2.2 Sand Liner (filter) Material Specifications

Gravel soils with percolation rates faster than 1 minute per inch require a sand liner or additional treatment. A minimum infiltrative area of 150 square feet per bedroom is required where a sand liner is used. Sand liner material shall conform to either Standard 1 or Standard 2 below. The Department, at its discretion, and at the recommendation of a registered engineer, may approve a smaller infiltrative area on an individual basis. .

A. Standard 1 - Specific Sieve Criteria

U.S. Standard Sieve No.	% Passing
#10	85-100
#20	60-90
#40	25-50
#60	less than or equal to 15
#200	less than 5

The sand may not have more than 45% (of the total) passing any one sieve and retained on the next consecutive sieve of those shown above.

-OR-

B. Standard 2 - Cc and Cu Criteria

1) The Coefficient of Uniformity (Cu) must be less than 4;

2) The Coefficient of Curvature (Cc) must be equal to or less than 1;

3) The amount passing the #10 Standard U.S. sieve must be greater than or equal to 85% of the total;

4) The amount passing the #200 Standard U.S. sieve must be less than 5% of the total; and

5) The sand may not have more than 45% (of the total) passing any one sieve and retained on the

next consecutive sieve of those shown in Standard 1.

Article 2.3 Sewer Rock

There are two (2) specifications for sewer rock, coarse and fine. The fine graded sewer rock is for use in gravity fed bed or shallow trench type systems. Use the coarse graded sewer rock for all other types of systems.

A. Coarse Graded Sewer Rock - Specific Sieve Criteria

U.S. Standard Sieve No.	% Passing
3”	100
2”	0-100
1½”	0-71
1”	0-30
¾”	0-10
½”	0-5
#200	0-1

B. Fine Graded Sewer Rock - Specific Sieve Criteria

U.S. Standard Sieve No.	% Passing
2”	100
1½”	90-100
1”	0-100
¾”	0-10
½”	0-5
#200	0-1

Article 2.4 Couplings and Fittings

A. Mechanical Watertight Couplings

Manufacturers and types of banded rubber couplings include, but are not limited to Fernco brand, Mission brand, or equal.

B. Solvent Welded Couplings and Fittings

Building sewer lines, disposal sewer lines, drainfield lines, cleanouts, and standpipes shall use solvent welded couplings and fittings of the same designation as the pipe being joined. Please refer to the ADEC Pipe Materials handout for the current approved list of pipe types or ASTM Designations, and Article 2.1 of this section.

Article 2.5 Insulation

All geotechnical insulation products shall meet the current ASTM standard specifications for "Rigid Cellular Polystyrene Thermal Insulation," and have a minimum compressive strength of 40 psi. Examples of products that meet this standard are Dow Styrofoam Highload 40 and InsulFoam 40, or approved equal.

Article 2.6 Septic Tanks

Please refer to the ADEC Septic Tank handout for the current approved list of septic tanks. All septic tanks shall:

- Conform to Appendix H of the Uniform Plumbing Code,
- Bear proof of certification by the applicable quality control/assurance certifying organization.
- Have two (2) compartments; and
- Be installed in accordance with the manufacturer's recommendations.

Any septic tank plans that are not on the Department's approved list will require a pre-installation engineering plan review and approval. Minimum septic tank sizes are:

PRIVATE RESIDENCE SEPTIC TANK SIZE REQUIREMENTS

No. of Bedrooms	Liquid Capacity
1-3	1000
4	1250
5	1500
6	1750
7	2000
8	2250

Note:

- Over eight bedrooms, contact ADEC for septic tank sizes.
- If a garbage grinder is used, an additional 250 gallon capacity is recommended above the minimum bedroom size, to contain the extra sludge generated.
- When an integral lift station is contained in the tank, an additional 250 gallons is required to compensate for the loss in volume due to the pumping chamber.

Article 2.7 Filter Fabric

All geotechnical fabric products shall be Typar 3401 or equivalent. Geotechnical fabric products shall conform to AASHTO M288 Class 3 and have the following characteristics:

- Permittivity (ASTM D4491) - 0.5 to 0.7 sec^{-1}
- Maximum Apparent Opening Size (ASTM D4751) – 0.20 to 0.21 mm (US Sieve #70)

SECTION 20.03 MINIMUM CONSTRUCTION REQUIREMENTS

Article 3.1 Watertight Fittings

A. Private Residence

Mechanical watertight couplings, such as Fernco couplings, or equivalent are required on the inlet, outlet, and cleanout or vent pipes on septic tanks serving a private residence. The use of banded rubber couplings are only allowed for connecting the Building Sewer, the Disposal Sewer and the cleanout pipes to the septic tank. Do not use banded rubber couplings for any other purpose.

B. Community Sewer

An insulated, watertight, flanged manhole riser, and cover are required in place of cleanout or vent pipes on septic tanks serving a community soil absorption system. Mechanical watertight couplings, such as Fernco couplings, or equivalent are required on the inlet and outlet of these septic tanks. The use of banded rubber couplings are only for connecting the Building Sewer and the Disposal Sewer to the septic tank. Do not use banded rubber couplings for any other purpose.

Article 3.2 Pipe Joints

Solid pipe with no joints shall span 10 feet from the inlet and outlet of septic tanks onto undisturbed earth. All pipe joints in monitoring tubes, cleanouts, solid lines, manifolds, and distribution piping must be cleaned prior to gluing, and glued with proper cement for that pipe type.

Article 3.3 Elevated Mounds

All elevated mound type systems must be designed by a registered engineer and approved in writing by ADEC prior to construction. Elevated mounds are defined in Division 10.

Article 3.4 Pressurized Systems

All systems utilizing a lift station should use pressure distribution in the soil absorption system in lieu of gravity distribution. Please contact the local ADEC office for information on how to properly install a pressure distribution type system.

Article 3.5 Filter Fabric

A barrier of geotechnical filter fabric is always required on top of the sewer rock to prevent soil backfill from migrating into the rock. VISQUEEN or other impermeable material may not be used.

Article 3.6 Insulation

One (1) inch of approved insulation may be substituted for one (1) foot of soil cover, or two (2) inches of approved insulation may be substituted for two (2) feet of soil cover. The minimum soil cover shall not be reduced to less than two feet with insulation. Filter fabric is still required with insulation.

Article 3.7 Sidewall Construction

When the sidewalls have smearing (glazing) evident, an alternate strata should be used if possible. Otherwise, a soil test by a professional engineer registered in Alaska can be performed to determine the soils absorption ability. When installing a system in a soil with sidewall smearing, the sidewalls must be scarified before the sewer rock is installed to prevent sealing the soil's infiltrative surface.

Article 3.8 Sloping Site

On sloping lots, leach lines should traverse the slope. Systems may be installed on sloping sites as follows:

0% - 10% slopes are suitable for all systems.
11% - 20% slopes are not suitable for bed or leach pit type systems.
21% - 25% slopes consult with the local ADEC office.
Greater than 25% slope is not suitable for the installation of an on-site system without engineering plan approval.

Article 3.9 Drop Connection

Drop connections shall have a maximum drop of 10 vertical feet. A drop connection shall be constructed using a combo fitting with the sweep pointing downward and a cleanout pipe to the surface. The bottom of the vertical drop shall be constructed with a 90 degree sweep.

Article 3.10 Soil Compaction

Avoid compaction of the soil strata to be used for absorption. Any system that utilizes the bottom area for absorption should not have equipment placed on it to prevent the sealing of the soil's infiltrative surface. For systems using sidewall area as the infiltrative surface, see Article 3.7. Some types of systems may use both the bottom area and sidewall area as infiltrative surface.

Article 3.11 Cleanouts

A foundation cleanout shall be installed within five (5) feet of the outside wall of the foundation. The use of double cleanouts is strongly encouraged. See the double cleanout detail in Division 40. Additional Building Sewer cleanouts shall be installed at intervals not to exceed one-hundred feet in straight runs and for each aggregate horizontal change in direction of 45 degrees or more.

Article 3.12 Installation & Grade

A. Minimum & Maximum Slopes

The slope of the Building Sewer pipe in the 10 feet immediately preceding the septic tank must be between 1/8" to 1/4" per foot (not to exceed 2% slope). In addition, the slope of the Disposal Sewer pipe in the 10 feet immediately preceding the drainfield must be between 1/8" to 1/4" per foot (not to exceed 2% slope). All other Building Sewer pipe shall conform to the following minimum and maximum grades:

Four (4) inch diameter pipe	minimum slope 2%	maximum slope 20%
Six (6) inch diameter pipe	minimum slope 2%	maximum slope 13%

The slope or grade of the sewer lines should be as uniform as possible. The minimum sewer line size is four inches to reduce the potential for plugging. Maintaining these pipe slopes assures an adequate cleansing velocity in the Building Sewer. Reducing the slope immediately before the septic tank and manifold moderates the entrance velocity of the wastewater into the tank and manifold, and minimizes the turbulence.

The maximum slope of any gravity sanitary sewage line shall be calculated from Manning's Formula using a coefficient of roughness of 0.013 to meet the maximum flow velocity of 10.0 fps while flowing full.

B. Pipe, Tank, Bedding & Installation

The sewer lines and septic tanks shall be laid on undisturbed or compacted soil and must be properly bedded and compacted to the spring line to prevent deflections and low points in the line where water and solids can accumulate and may freeze or otherwise block the pipe. Soil in the pipe zone must also be properly compacted to prevent excessive deflection or pipe collapse because of soil pressure from backfill.

Areas that are over-excavated, such as at the septic tank ends, should be carefully compacted to adequately support the piping yet protect the septic tank from deflection. In a multiple trench or bed type drainfield, the wastewater must be distributed to each lateral by a solid pipe manifold. All drainfield piping must be level, including manifold pipe and perforated pipes.

Article 3.13 Excavation

All excavation shall be accomplished according to OSHA safety regulations. The bottom of the drainfield excavation and the bottom of the septic tank excavation shall be level before the placement of the tank or drainfield appurtenances. Excavations shall not be left open.

Article 3.14 Final Grading, Topsoil, and Seeding

Final grading over a wastewater disposal system should be slightly mounded to allow for settling. Systems must be graded to drain water away from both the septic tank and the absorption area. If backfill has settled, or was not properly completed at the time of construction, the area should be re-graded to provide adequate drainage. System covering must be returned to the original condition and include adequate protection of mounded ground cover from erosion or sluffing. If the original disturbed area was grassy, the excavated areas must be covered adequately with topsoil and reseeded.

Article 3.15 Plat Notes

Check with the local ADEC office regarding the applicability of specific plat notes. The local ADEC office will determine how a plat note applies to the site specific installation of an on-site sewer, and how specific plat notes conform to current regulations.

Article 3.16 Acceptable System Types

Cesspools are not legal for use as a wastewater treatment and disposal system. Legal types of systems consist of deep trench, shallow trench, bed, leach pit, and five-wide type of systems. See Section 40 for more information. For system upgrades where existing sewer components do not meet current separation distance requirements or minimum material specifications, contact the local ADEC office for a determination of the need for system component relocation or replacement. Existing leach fields shall not be extended. Existing leach fields may be connected to new fields via a 3-way valve.

Article 3.17 Abandoning Systems

When wastewater disposal systems are abandoned, a septic tank and seepage pit must have the sewage removed by a septic tank pumper, and must be completely removed once empty or must be crushed in-place or completely filled with compacted soil, concrete, or other approved material, as required by the Uniform Plumbing Code. Depending upon specific site conditions, disinfection may also be required.

Article 3.18 Sand Liners

A two-foot thick sand liner meeting ADEC specifications, must be placed beneath all absorption systems when the receiving soil is classified as well graded gravel (GW) or poorly graded gravel (GP), unless either waived by the Department, additional treatment is provided, or a percolation test by an engineer verifies the percolation rate is one (1) minute per inch or slower. Verification that the sand used either meets the ADEC specification or is from an approved source must be submitted to ADEC, with the Documentation of Construction form. Sand liners can only be used on bed or shallow trench type systems unless special, previously approved methods are used. It is recommended that the size of the soil absorption area be increased by 50% to help extend the life of the system.

Article 3.19 Lift Stations or STEP Systems

Lift Stations or STEP (Septic Tank Effluent Pumping) systems shall be an approved package system that includes UL listed controls and panel with visible and audible high water alarms. Check with the local ADEC office for lift station packages that are approved for use. The electrical service and wiring shall be provided by a licensed electrician, licensed in the State of Alaska. Use of a lift station pump chamber within a septic tank requires the addition of 250 gallons to the minimum septic tank size.

The Lift Station or STEP system can be installed by a Certified Installer, Engineer or Approved Homeowner, provided it is a package system approved by ADEC, pumps only septic tank effluent with the discharge to a conventional soil absorption system. Special attention should be focused on freeze protection, preventing unwanted access, conformance to the National Electrical Code (NEC), and maintainability of the system.

Article 3.20 Monitor Tubes

Monitor tubes or vent pipes shall be installed on both compartments of the septic tank (except for community systems – see Section 20.03, Article 3.1, B) and are required as shown in Division 40 in each drainfield. Additional monitor tubes above the recommended minimum amount is highly recommended.

SECTION 20.04 MINIMUM SEPARATION DIST. REQUIREMENTS

Article 4.1 Drinking Water Wells

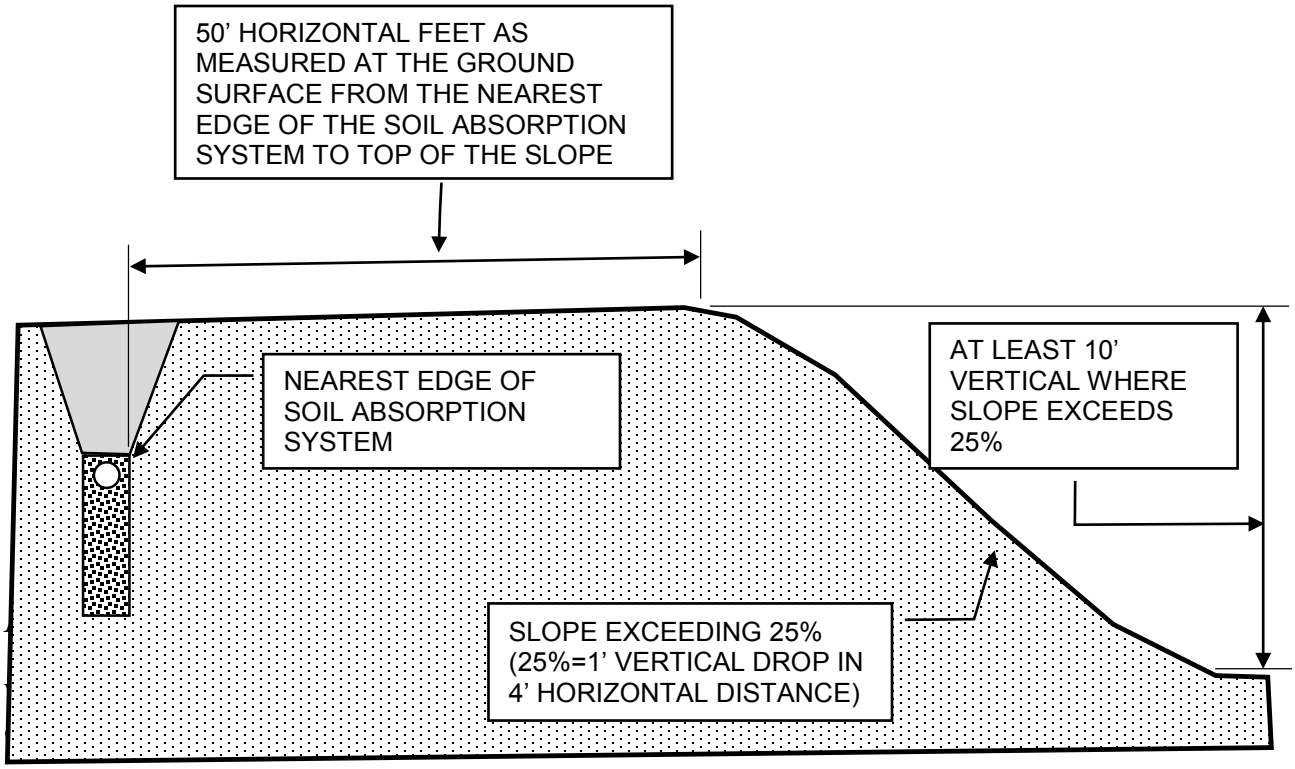
Regulations require a minimum separation distance of 200 feet between public Community Wells and on-site sewer systems. Regulations also require a minimum separation distance of 200 feet between public Non-Community Wells and on-site sewer systems. 100 feet is required between private wells and on-site sewer systems. All other public wells require a minimum separation distance of 150 feet to on-site sewer systems. For help classifying a public well, contact the Drinking Water Program at your local ADEC office.

Article 4.2 Surface Water

Regulations prohibit installing a lift station, holding tank, septic tank, soil absorption system, seepage pit, pit privy or other waste water collection, treatment, or disposal system within 100 feet measured horizontally, of the mean annual high water level of a lake, river, stream, spring or slough or the mean higher high water level of coastal waters. Note that this includes a slough which is further defined as a swamp, bog or marsh.

Article 4.3 Slopes & Cut Banks

Regulations require a 50 feet set back, measured at the ground surface, from the nearest edge of any type of soil absorption area and a slope exceeding 25% that has more than 10' of elevation change.



Article 4.5 Other Components

Other components of onsite wastewater systems such as private sewer lines, community sewer lines, cleanouts and manholes on community sewer pipes, lift stations and similar appurtenances must be separated from drinking water wells by the distances shown in the table below. Separation distances are measured from the nearest edge of the soil absorption system, seepage pit, septic tank, holding tank, or privy to a drinking water source or to surface water.

Article 4.6 Obstacles

Objects such as trees, boulders, gardens, or man-made structures may be located inside the area selected for the onsite sewer system. If the property owner does not want these items removed, the system can be redesigned or laid out to go around them.

MINIMUM SEPARATION DISTANCES

WELL CLASSIFICATION AND ABBREVIATED DEFINITIONS (SEE 18 AAC 80 FOR COMPLETE DEFINITIONS)

Private Water System: means a potable water system serving a private residence.

Public Water System: a potable water system serving 25 or more people at least 60 days per year (formerly known as Class "A" and Class "B" Water Systems). Public Water Systems are either:

1. Community Water Systems
2. Non-Community Water Systems

Other Water System: means all other potable regulated water systems that are not Private or Public (such as Class "C").

Waterline: means a distribution main line (see 18 AAC 80.1990)

Water Service Line: has the meaning found in 18 AAC 80.1990

Private Water Service Line: means a line or pipe serving a Private Water System (see 18 AAC 80.1990)

Distance From Well	Distance To Private Sewer Line or Cleanout	Distance To Community Sewer Line	Distance To Community Sewer Cleanout	Distance To Septic Tank	Distance To Holding Tank	Distance To Absorption Field	Distance To Fuel Tank
Public Water System Well	100 feet	200 feet	200 feet	200 feet	200 feet	200 feet	100 feet
Other Water System Well	75 feet	100 feet	150 feet	150 feet	100 feet	150 feet	75 feet
Private Water System Well	25 feet	75 feet	100 feet	100 feet	75 feet	100 feet	25 feet
Waterline	10 feet	10 feet	10 feet	10 feet	10 feet	10 feet	10 feet
Water Service Line	No State of Alaska separation distance requirement to sewer components. Please refer to the Uniform Plumbing Code for the current separation distance requirements.						10 feet
Private Water Service Line							10 feet

Distance From Sewer Component	Distance To River, Lake, Stream, Spring, Slough	Distance To Lot Line	Distance To Foundation	Distance To Absorption Field	Distance To Ground Surface (cover)	Other Absorption Fields	Seasonal High Water Table (vertically)	Impermeable Soil (vertically)	Slopes Greater than 25%
Septic Tank	100 feet	recommend 10 feet	10 feet	10 feet	See Note 1 Below	recommend 10 feet	Not Applicable	Not Applicable	Not Applicable
Absorption Field	100 feet	recommend 10 feet	10 feet	Not Applicable	See Note 1 Below	See Note 2 Below	4 feet	6 feet	50 feet

Note 1-Southwest Alaska (Kodiak and southwest of Chignik)=2 feet minimum ground cover; Southeast Alaska, Municipality of Anchorage & Valdez=3 feet minimum ground cover; All remaining areas of the State of Alaska=4 feet minimum ground cover **Note 2-**2x gravel depth or 6 feet whichever is greater.

SECTION 20.05 SIZING THE ABSORPTION FIELD

Article 5.1 Soil Classification/Investigation

Soil types are defined by the Unified Soil Classification System. Soils are classified as follows and are considered suitable for soil absorption systems:

- Well graded gravel (GW)
- Poorly graded gravel (GP)
- Silty gravel (GM)
- Well graded sand (SW)
- Poorly graded sand (SP)
- Silty sand (SM)
- Silt (ML)

In the Fairbanks area, an exception is the Fairbanks Silt Loam, as classified by the Natural Resources Conservation Service, which can be considered as a silty sand (SM) in regards to sizing. Other soil types that might be encountered are:

- Clay (CL or CH)
- Organic silt or clay (OL)
- Peat (PT)

These types of soils, classified as clays (CL or CH), organic silts and clays (OL), and peats (PT), are not considered suitable for soil absorption systems unless designed by a registered engineer. Systems installed in these soils must have engineering plan approval from ADEC prior to construction.

In order to identify subsurface soil conditions, a test hole or pit should be dug, preferably using a backhoe because a larger excavation provides the best opportunity to examine soils. The test hole(s) should be dug around the perimeter of the actual system site, rather than within. The test hole, however, should be within 25 feet of the perimeter of the proposed soil absorption area site. Equipment should be kept off the proposed system site to prevent compaction of the soil. When soil samples are taken, they shall be taken from the strata where the absorption field will be installed.

An alternate method of determining subsurface conditions is by boring, either by machine or by hand. This method should only be attempted by more experienced soil testers. Borings may be placed inside the perimeter of the system.

Article 5.2 Percolation Tests

Percolation rates are measured in minutes per inch (min/in), per the Environmental Protection Agency Design Manual. Prior to construction of an absorption field, certified installers must have a registered engineer perform a percolation test in soils classified as silty sand (SM), silty gravel (GM), and silts (ML). Percolation tests, when required, must be performed by, or under the direct supervision of, a registered engineer.

Gravelly soils with percolation rates faster than 1 minute per inch are generally not suitable for the construction of an absorption field, and require a sand liner or additional treatment. Soils classified as well graded gravel (GW) or poorly graded gravel (GP) must have a registered engineer perform a percolation test to determine if the percolation rate is faster than 1 minute per inch. The engineer or installer may, at his or her discretion, waive a percolation test in GW or GP soils and install a sand liner, as described below in Article 5.3, without performing the test.

The percolation rates can then be used to size the system. See Article 5.4, Sizing the Absorption Field for the required criteria.

Soils with percolation rates between 61 and 120 minutes per inch are not suitable for the construction of an absorption field without engineering plans and ADEC plan approval prior to construction of the field.

Article 5.3 Sand Liners

A two (2) foot thick sand liner beneath the sewer rock is required, (unless formally waived by the department) when well or poorly graded gravel (GW or GP) is found in the absorption area. In most cases, GP and GW soils have such rapid percolation that adequate treatment of the wastewater is not provided unless a 2' thick sand liner is installed to slow the rate at which the wastewater passes through the soil. The sand liner increases filtration effectiveness, and produces a much higher quality effluent. Sand liners should have a maximum wastewater application rate of 150 square feet per bedroom.

For sand filter systems, the sand must be from an approved source or shown to meet the minimum material specifications of Section 20.02, Article 2.2. To ensure quality control on absorption systems larger than 1000 square feet, ADEC may require separate sieve analysis for every 1000 square feet (75 cubic yards) of sand liner installed. It is recommended that compaction be kept to a minimum to ensure infiltration of the wastewater into and through the sand liner.

Sand liners may be used only on a bed or shallow trench system.

Article 5.4 Sizing the Absorption Field

After selecting the most appropriate type of absorption system for a given site, the infiltrative surface is sized based on soil conditions. Recognizing soil conditions and accurately rating the absorption capacity of the soils is vital to the design of a good system. At least two prospective areas should be investigated.

When conditions are suitable, a deep trench soil absorption system is recommended and should be used because they tend to out-perform other system types.

The perimeter of each proposed absorption area should be temporarily marked using stakes and string line. Every effort should be made to keep heavy equipment and vehicular traffic outside of the marked areas to prevent compaction effects on the soil absorption characteristics.

The following sizing information shows the specific data needed to find the recommended soil loading or application rate, in square feet of infiltrative area per bedroom.

• GW (Well Graded Gravel with percolation rate faster than 1): A two (2) foot thick sand liner beneath the sewer rock is required. Use an application rate of 150 square feet per bedroom.

• GW (Well Graded Gravel with percolation rate of 1 or slower): A sand liner beneath the sewer rock is not required. Use an application rate of 125 square feet per bedroom.

• GP (Poorly Graded Gravel with percolation rate faster than 1): A two (2) foot thick sand liner beneath the sewer rock is required. Use an application rate of 150 square feet per bedroom.

• GP (Poorly Graded Gravel with percolation rate of 1 or slower): A sand liner beneath the sewer rock is not required. Use an application rate of 125 square feet per bedroom.

• SW (Well Graded Sand): Use an application rate of 150 square feet per bedroom.

• SP (Poorly Graded Sand): Use an application rate of 150 square feet per bedroom.

• GM (Silty Gravel), SM (Silty Sand), or ML (silt): Requires an engineer's soil log and percolation test. Sizing requirements are as follows:

	Percolation Rate (min/in)	Application Rate for GM, SM or ML
•	Between 1 & 5	use an application rate of 125 square feet per bedroom
•	Between 6 & 15	use an application rate of 190 square feet per bedroom
•	Between 16 & 30	use an application rate of 250 square feet per bedroom
•	Between 31 & 60	use an application rate of 335 square feet per bedroom
•	Between 61 & 120	requires engineering plans and prior ADEC plan approval
	Above 120 is considered to be impermeable and is not suitable	

• CL or CH (clay), OL (organic silt or clay), PT (peat): Requires engineering plans and prior ADEC plan approval.

If more than one soil horizon or soil type is to be used in the absorption area, then more than one percolation test may be required to size the system. When using soil horizons with differing percolation or application rates, the system should be sized based on the soil with the slowest percolation rate, or largest of the application rates for the soils encountered.

To determine the required infiltrative surface size of the absorption field, multiply the number of bedrooms in the household by the applicable application rate for the kind of soil in which the field will be installed. If SW or SP soils are encountered the soil may be visually rated by certified installers or engineers. Note that homeowners that install their own system under the Certified Homeowner program must have their soil tested by an engineer to size their system.

Refer to Division 40 of this manual for determining the absorption field dimensions for the various types of systems, such as deep trench, beds, and etcetera.

DIVISION 30
ON-SITE SYSTEM REQUIREMENTS

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ON-SITE SYSTEM REQUIREMENTS

DIVISION 30

SECTION 30.01 WASTEWATER TREATMENT AND DISPOSAL

Article 1.1 Elements of the Onsite Wastewater System

The typical conventional onsite wastewater system consists of two essential treatment elements, the pretreatment unit (septic tank) and the soil absorption system. The Building Sewer connects the building drain to the septic tank. The septic tank separates floating and settling materials from the liquid portion of the wastewater. Clarified effluent is then passed on from the septic tank to the soil absorption area via the Disposal Sewer for final treatment and disposal. The absorption area consists of a buried excavation filled with a porous medium such as sewer rock, or leaching chambers, and a piping system which distributes wastewater throughout the system. The primary purpose of the sewer rock or chambers is to help laterally distribute the wastewater and to provide a storage area for wastewater in the soil absorption system.

Under most conditions, soil is very effective in treating domestic wastewater by reducing contaminates prior to discharge to the ground water. Septic tanks and absorption systems are generally not effective in removing dissolved substances such as solvents, petroleum products, pesticides, or other chemicals. These substances should never be dumped into a septic system because little, if any, treatment will occur and the ground or ground water could become contaminated.

Article 1.2 Septic Tanks

Septic tanks separate solid material from liquid by providing time for heavier materials to settle to the tank bottom forming a sludge layer, and for lighter materials to float to the top forming a scum layer. These layers may later be reduced in volume by anaerobic digestion, which is the decomposition of organic and inorganic matter in the absence of oxygen. Septic tanks do not completely purify wastewater, eliminate odors, or digest all solid material, but they are effective in trapping most solids and grease so that reasonably clear wastewater is passed on to the absorption field. Improperly designed or damaged tanks, or designs that cause turbulence in the septic tank, can allow solid material to migrate out to the absorption area which usually results in premature failure.

A typical septic tank has two-compartments. The two-compartment design has been shown in some studies to exhibit a slightly better removal of suspended solids than single compartment tanks. Regulations require that two compartment tanks be used. Baffles are located at the inlet, compartment divider, and outlet of a septic tank. The inlet baffle is designed to slow down the incoming wastewater and direct it downward. The interior baffle keeps most of the solid material in the first compartment and the outlet baffle retains the lightweight floating material, such as grease and wax, within the tank, keeping it out of the soil absorption field. A built-in vertical drop of approximately two to three inches between the inlet and outlet pipe is common. During installation, if the inlet and outlet ends of the septic tank are reversed, water will back up into the building sewer, stranding solids that could block the line. The requirement to not have any joints in the disposal

sewer within the first 10 feet of the outlet assures the first joint is on undisturbed soil for maximum support.

Adequate storage volume for accumulated sludge and scum, must be designed into the septic tank to provide a reasonable time between tank pumping. Current state regulations (18 AAC 72) requires at least a 1000 gallon tank for a residence with three bedrooms or less and an additional capacity of 250 gallons for each bedroom in excess of three. If a septic tank incorporates an integral lift station pumping chamber, the required tank size must be increased by 250 gallons. In warmer climates, the volume of the sludge is reduced through anaerobic digestion, thus helping extend the time interval between septic tank pumping. Alaskan climates typically result in septic tank temperatures in the 40-60° F range, where little or no anaerobic digestion takes place so settled material and scum accumulates faster than it would in the more temperate climates.

Septic tank sizing for commercial facilities is based on peak estimated design flows. Installers shall work with their engineer and the ADEC office nearest the proposed project to estimate the peak wastewater flows from commercial facilities, and the minimum septic tank size.

Materials that degrade slowly, such as coffee grounds, oil and grease, paper towels, disposable diapers, feminine hygiene products, and similar materials should not be disposed of in septic tanks. Water treatment wastes add a significant hydraulic load to the system and may contribute to the corrosion of steel septic tanks, which must be considered in the design. Household cleaning chemicals and detergents, in quantities normally used, are generally not harmful to the system.

Performance additives, such as yeast, bacteria and enzymes, have not been found to be beneficial to the septic tank performance, particularly in cold climates, and should not be used.

Septic tanks should be pumped when the sludge layer or floating scum layer exceeds 6 inches. **A two-year pumping cycle is recommended**. If septic tanks are not pumped periodically, accumulated sludge will overflow with the wastewater into the soil absorption field, resulting in premature failure of the field. **The single most important maintenance item a homeowner can do is to pump a septic tank every two years at a minimum**.

Tanks should be located so that a pump truck can readily access the tank and in areas away from driveways or parking lots where snow is typically removed during winter months. The tank must also be constructed so that cleanout pipes can be attached to the tank. Cleanout pipes must be at least four inches in diameter to accommodate a pumping hose, and should extend above grade and the tops capped. Cleanout locations should be "tied" to permanent landmarks by measuring and recording the distance between the cleanout pipes and permanent features such as house corners, so that the pipes may be found if covered with snow or soil.

Septic tanks shall conform to Division 20, Section 20.02 and Article 2.6. In all cases, installation recommendations or requirements of the manufacturer must be followed.

Article 1.3 Soil Absorption Systems

The soil absorption area or field is used as the final treatment and disposal point for the clarified effluent from the septic tank. Physical, chemical, and biological processes occurring within the soil

will reduce the organic and microbial constituents of the wastewater. Four feet of unsaturated soil under the soil absorption field is required to effectively reduce the bacteria to an acceptable level. Current regulation requires at least 4 feet of vertical separation between the bottom most portion of the soil absorption system and the groundwater table measured during the time of year when it is expected to be the highest. The local ADEC office may have records available that would be of use in estimating the location of the seasonal high groundwater table.

The most important consideration in design construction and operation of an onsite system, is assuring adequate wastewater treatment prior to disposal to the ground water system. Other important considerations include designing an efficient treatment system that incorporates long life, simple maintenance and proper sizing, and meets all required separation distances.

Once an absorption system is put into operation, a clogging mat or zone may form at the infiltrative surface, which slows the movement of water into soil. Many factors, some of which can be prevented by taking proper precautions during construction, contribute to the development of a clogging mat. Using unwashed drain rock, compaction of the receiving soil and smearing of the infiltrative surface are probably the most significant errors made during construction that leads to the development of the clogging mat.

Construction machinery should not be driven over the infiltrative area. Beds and trenches should be excavated using a backhoe or similar apparatus, not using a dozer. If during the excavation process, the infiltrative surface becomes smeared, the surface should be raked or otherwise roughened, to remove the smeared soils. To overcome the smearing that naturally occurs when a backhoe bucket is drawn through soil, some contractors have installed rakes on the side of their buckets.

Article 1.4 Soil Absorption System Design

Soil absorption systems must be designed based on site specific information as well as the quantity of wastewater to be treated. Required site information consists of:

- Subsurface soil conditions and percolation rate(s) of the receiving soil.
- Depth to the seasonal high groundwater table.
- Location of topographical features such as steep slopes, gullies, surface water and existing nearby sewer systems.
- Location of all nearby drinking water wells and determining the well classification, whether public or private.
- Location of permafrost or impermeable soil or bedrock.
- Lot layout may affect the type and location of onsite systems.

Article 1.5 Soil Absorption System Siting

For new construction, the location of the onsite system should always be determined first before siting the well or constructing other improvements.

A. Preliminary assessment.

A preliminary assessment should be performed that consists of collecting all available information concerning the site and the surrounding area including the location of any public or individual drinking water wells. Sources of information may be the local ADEC Office, the U.S. Department of Agriculture, Natural Resources Conservation Service, the State Division of Geological and Geophysical Surveys, aerial photos, local government offices, neighboring property owners, and local well driller's logs (available at ADNR's WELTS database online). When replacing an existing system, the local ADEC office should be checked for record information on the existing system as well as any plat approval restrictions. In some cases, percolation tests may have already been performed on the specific area in question, and could be used if appropriate.

SITE CHARACTERISTICS

	SITE RATINGS GOOD	SITE RATINGS MODERATE	SITE RATINGS POOR
Texture	----	----	Permafrost and compacted silts
Flooding	None (protected)	Rare	Common
*Depth to Bedrock	>11 ft.	7-11 ft.	<7 ft.
*Depth to Cemented Soil (Clay-Silt)	>11 ft.	7-11 ft.	<7 ft.
*Depth to Seasonal High Water Table	>9 ft.	7-9 ft.	<7 ft.
Permeability (Percolation Rate)	3-10 min/in	1-3 or 10-45 min/in	<1 min/in or >45 min/in
Slope	0-10%	10-20%	>20%
Soil Classification	**GW, ** GP, SW SP	GM & SM	ML & CL

* Depth from ground level.
** These soils require a sand liner, unless waived by the department.

A preliminary field evaluation should then be performed that consists of a site inspection to locate areas on the lot best suited for a soil absorption system. Features such as gullies, surface water, onsite and neighboring wells, and roads must be noted in relation to proposed soil absorption system location. Once the most suitable site for the system is determined, a test pit or boring is dug within 25 feet of the perimeter of the proposed soil absorption system, to confirm subsurface conditions.

The test pit or boring needs to extend to at least 6 feet below the bottom of the proposed soil absorption system, to verify that no impermeable soil layers are within 6 vertical feet of the proposed bottom of the distribution rock. Data to be collected from the explorations include an estimate of soil texture or classification, soil structure, soil density, groundwater depth, location of any impermeable layers, and soil moisture conditions.

During the preliminary evaluation phase, a designer should be able to determine the type of system that may be required and whether ADEC plan approval is required. The installer should always look for the best possible site conditions when locating an onsite system.

B. Evaluating surface conditions

In many cases topographic features limit where an on-site wastewater treatment and disposal system may be located. When evaluating a site, one of the first things that should be done is to locate all surface features that will limit the location of an on-site system as follows:

- Drinking water wells: All drinking water wells in the vicinity of the system should be located. This includes wells on the property itself and on adjacent properties. See Division 20, Minimum Separation Distance Requirements, for all separation distances. If the proposed onsite wastewater system is within 200 feet of any well, the classification of that well must be known before proceeding. ADEC files may contain information on well locations and classification. If in doubt about a well class, do not proceed until the classification and the required separation distances are known.

- Surface water: A lift station, holding tank, septic tank, soil absorption system, or other waste water collection, treatment, or disposal system shall be evaluated for the minimum separation distance requirement to surface water as shown in Division 20, Minimum Separation Distance Requirements.

- Slope and cut banks: A soil absorption system shall be evaluated for the minimum separation distance requirement to a slope exceeding 25% that has more than 10' of elevation change as shown in Division 20, Minimum Separation Distance Requirements.

- Lot Lines: The wastewater disposal should be 10 feet or more from the lot lines, and should be entirely within the boundaries of the lot the building is on.

- Other wastewater systems: Adjacent onsite system absorption fields should be horizontally separated from one another by the distances shown in Division 20, Minimum Separation Distance Requirements.

- Other components of onsite wastewater systems such as private sewer lines, community sewer lines, cleanouts and manholes on community sewer pipes, lift stations and similar appurtenances must be separated from drinking water wells by the distances shown in Division 20, Minimum Separation Distance Requirements.

- Obstacles: Objects such as trees, boulders, gardens, or man-made structures may be located inside the area selected for the onsite sewer system. If the property owner does not want these items removed, the system can be redesigned or laid out to go around them. Typically, a shallow or deep trench design would be used in these cases. Including curves or angles in the system layout would have negligible effects on the system's performance.

Article 1.6 Pump Stations

Most septic systems rely on gravity to sustain flow through the system. This requires the septic tank inlet to be lower than the building drain and the absorption area to be lower than the septic tank outlet. Occasionally, site conditions prohibit a gravity flow installation, because either the septic tank or the absorption area must be placed higher than the building drain. In these cases, an appropriate pump must be used to lift the sewage or septic tank effluent to the required elevation.

In cases where the septic tank must be higher than the building drain, a basement sump is used, utilizing a solids handling pump or a grinder pump, located in a pumping chamber (or sump) to handle the solid material in domestic sewage. Sumps may be located in a basement or crawl space or outside the building foundation. **Pumping raw or non-clarified sewage should be avoided whenever possible.**

In cases where the absorption area must be higher than the septic tank, a Septic Tank Effluent Pumping (STEP) system is usually employed, because most of the solid material is retained in the septic tank. STEP systems may be integrally located in the septic tank, or may be in a separate pumping chamber located downstream from the septic tank or other acceptable configurations (see Division 20 for minimum requirements).

A. Basement Sump

When wastewater fixtures are positioned below the building sewer, the sewage must be pumped from the lower elevation to the higher elevation. Most often, a sump is installed in the basement to collect the wastewater and to provide a chamber for the pump. **Pumping systems handling raw sewage shall be avoided whenever possible, by adjusting the house elevation or the onsite system elevation during the planning stages.**

The sump is usually installed at the time of pouring the basement floor so that it can be cast into the floor. The basin shall be made from corrosion resistant material and have a sealed cover. All connections must be water-tight. Because raw sewage contains large solids, a submersible grinder pump or a properly sized solids handling centrifugal pump, capable of passing two (2) inch minimum or larger solids must be used. Grinder pumps have cutting blades that grind solids to a size that will not clog the pump or piping.

The liquid level in the basin is usually controlled by a float switch that automatically cycles the pump when a pre-set liquid level is reached. Many pump manufacturers offer a complete packaged basin with pump, controls, and a high level alarm. A pump must be selected that is capable of meeting the total dynamic head requirements of the system (elevation change, pipe friction loss, and energy losses). All pumping systems must conform to the requirements of the Uniform Plumbing Code and contain a high level alarm.

The basement sump system falls under the jurisdiction of the Department of Labor, the agency responsible for enforcement of the Uniform Plumbing Code (UPC). Typically, plumbing done <u>within the residence</u> must be performed by a licensed plumber and in accordance with the Uniform Plumbing Code. The basement sump must have the same separation distance from a

drinking water supply source as a private sewer line (see Division 20 for minimum separation distances).

B. Septic Tank Effluent Pumping (STEP) System

When the absorption area must be located above the outlet of the septic tank, an appropriately sized pump must be used to lift the effluent from the sump or dosing chamber to the absorption area. The STEP system shall be sized to provide the volume of discharge desired per pump cycle. The quantity of effluent pumped to the absorption area in each dose must not exceed the capacity of the field.

STEP system manufacturers offer package pump and sump combinations complete with installed controls and alarms.

Proper pump selection, plumbing, and electrical wiring that meets current codes and the use of watertight pump basins, are necessary for a safe and reliable installation. Pumps shall be selected according to manufacturer recommendations, considering the quality and quantity of sewage to be pumped AND the elevation and friction heads to be overcome. The pump vault must be watertight and corrosion resistant.

Regardless of the configuration used, the design shall provide easy maintenance and long lasting, dependable components. An accessible disconnect fitting shall be used on pump discharge piping so that all maintenance can performed without entering the pumping vault. Special attention shall be given to the use of corrosion resistant materials.

DIVISION 40
STANDARD DETAILS & SYSTEM DESIGN

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SECTION 40.01 DEEP TRENCH SYSTEM

Article 1.1 Designing and Sizing a Deep Trench Type System

Perform the following calculations to determine the absorption area dimensions for an example deep trench system for a 3 bedroom home. This is only an example. Apply site specific data for each project design.

A. Step 1

A 15 foot deep test hole dug within 25 feet of the proposed Deep Trench type system revealed SP (poorly graded sand) soils with no groundwater encountered in the test hole. The application rate shown in Division 20 for these soils is 150 square feet per bedroom. Therefore, the total required absorption area will be 150 square feet per bedroom multiplied by 3 bedrooms as follows:

150 square feet per bedroom × 3 bedrooms = 450 square feet total absorption area required.

B. Step 2

Multiply the chosen depth of the trench (use 5 feet for this example) by a depth factor of 2 to get the effective absorption area (square feet) per linear foot of trench. The depth factor "2" is used because the trench uses both side walls for absorption. The effective absorption area in this example is:

5 feet of sewer rock × 2 (depth factor) = 10 square feet per linear foot of trench.

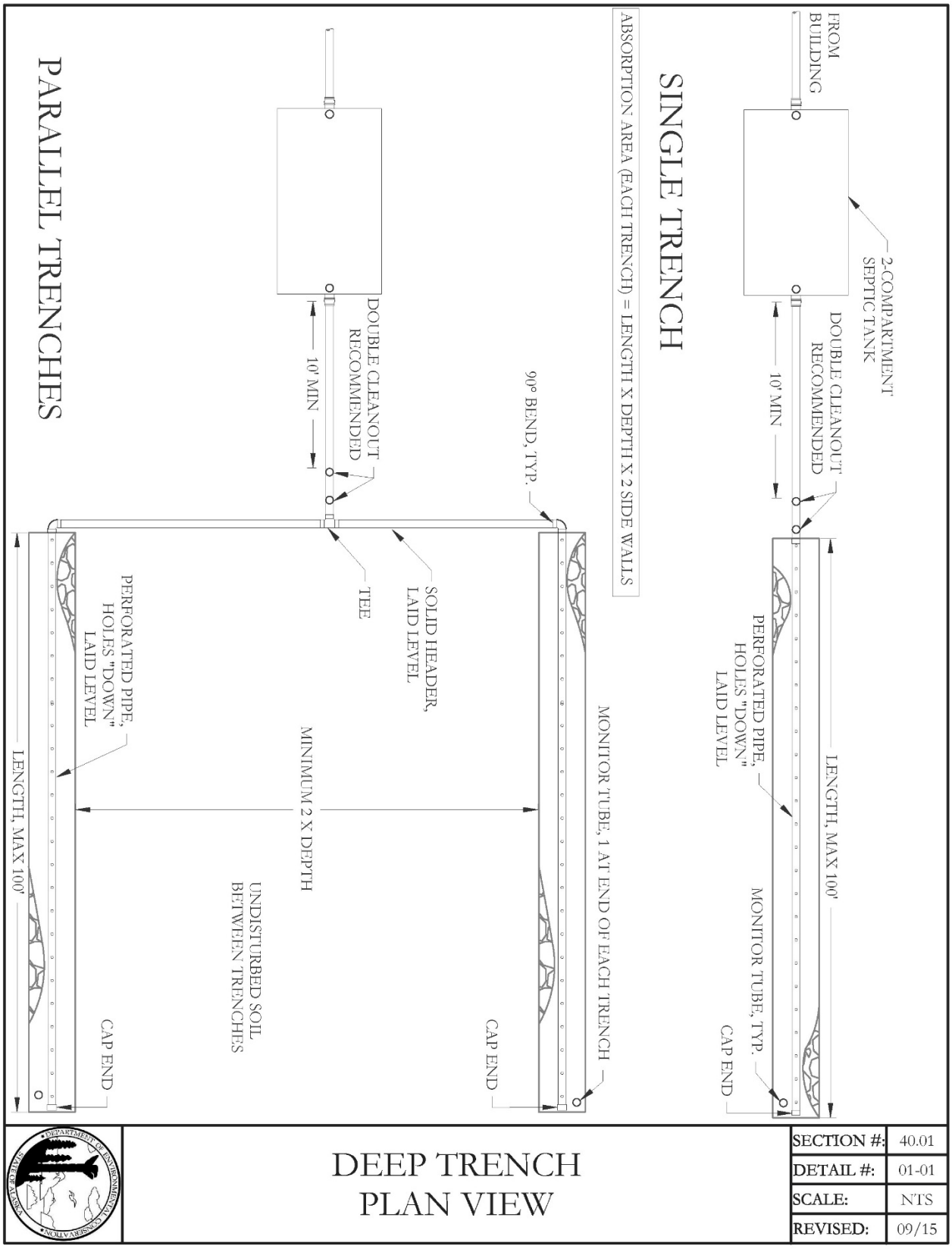
C. Step 3

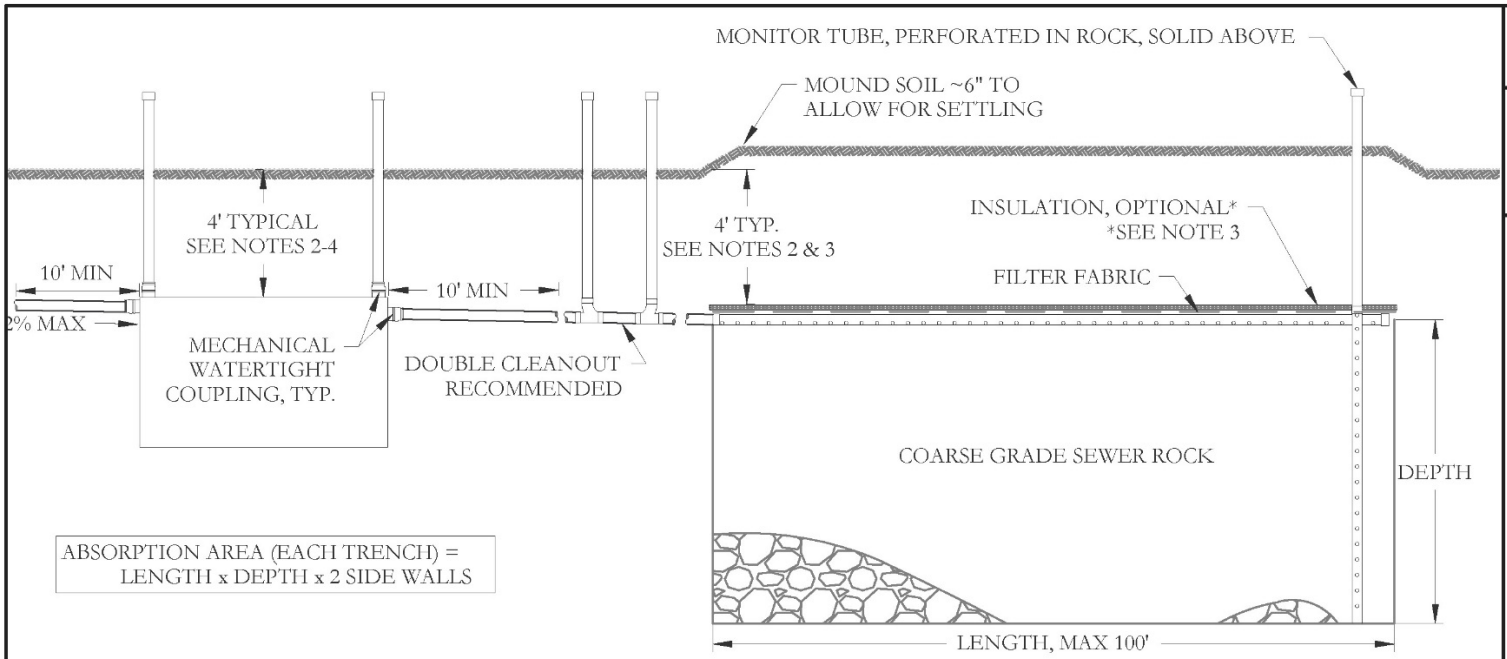
Determine the total trench length required by dividing the required absorption area determined in Step 1 (450 square feet) by the effective absorption area per linear foot determined in Step 2 (10 square feet per linear foot of trench). The total length of trench in this example is:

450 square feet (Step 1) ÷ 10 square feet per linear foot (Step 2) = 45 linear feet of trench.

In this example the design for the deep trench system is for 45 linear feet of deep trench, with a 5 foot depth of sewer rock and a minimum of 4 feet of soil cover. Therefore the required depth to ground water is 13 feet and the required depth to an impermeable layer is 15 feet. The test hole depth must be a minimum of 15 feet to meet the minimum required depth of the test hole.

Article 1.2 Standard Drawings for Deep Trench Systems

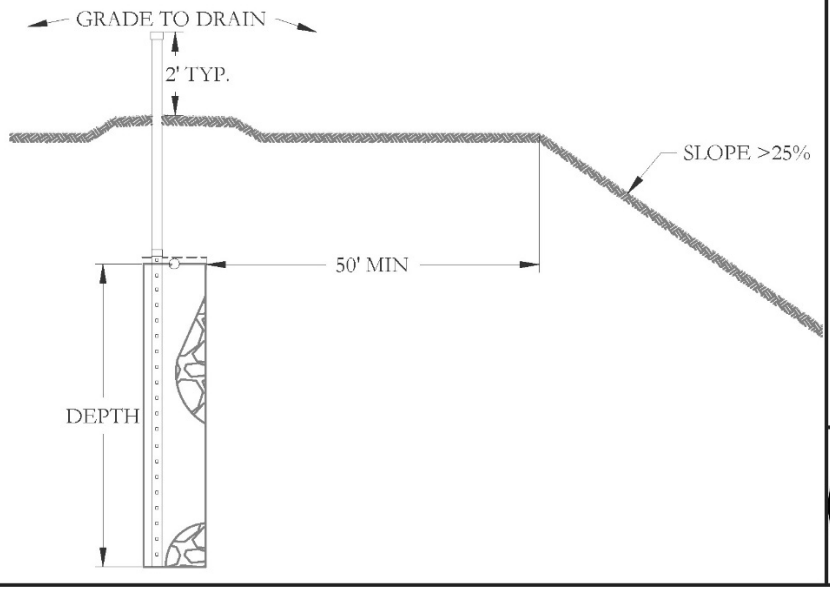




ABSORPTION AREA (EACH TRENCH) = LENGTH x DEPTH x 2 SIDE WALLS

CONSTRUCTION NOTES:

1. ALL LEACH FIELD PIPING (SOLID HEADERS AND PERFORATED) SHALL BE LAID LEVEL.LEACH FIELD PIPING SHALL BE BEDDED IN ROCK TO THE SPRINGLINE (CENTER LINE OF PIPE).
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGION. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION IN ACCORDANCE WITH ARTICLE 2.5 MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN 2 FEET.
4. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH MUST NOT BE EXCEEDED.
5. SMEARED SIDEWALLS AND BOTTOM MUST BE RAKED OR SCARAFIED PRIOR TO GRAVEL PLACEMENT.
6. MAXIMUM TRENCH LENGTH IS 100 FEET. RECOMMENDED MAXIMUM DEPTH IS 10 FEET.



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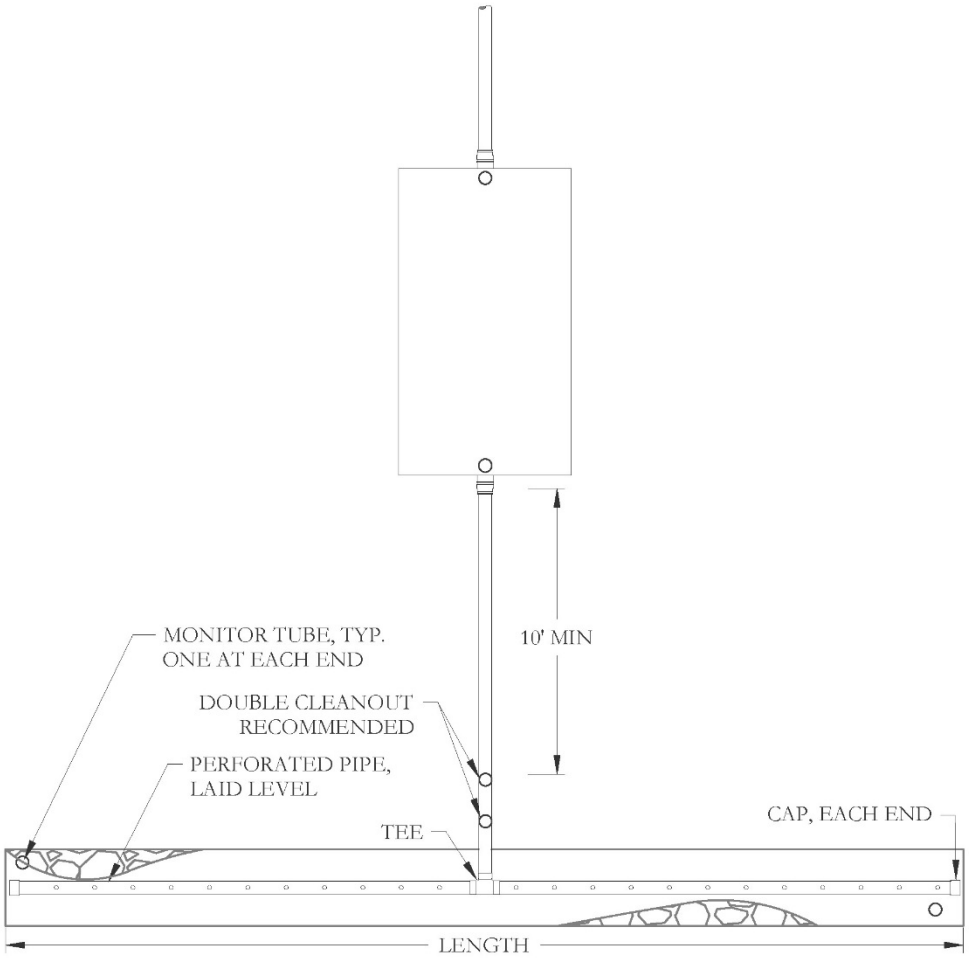
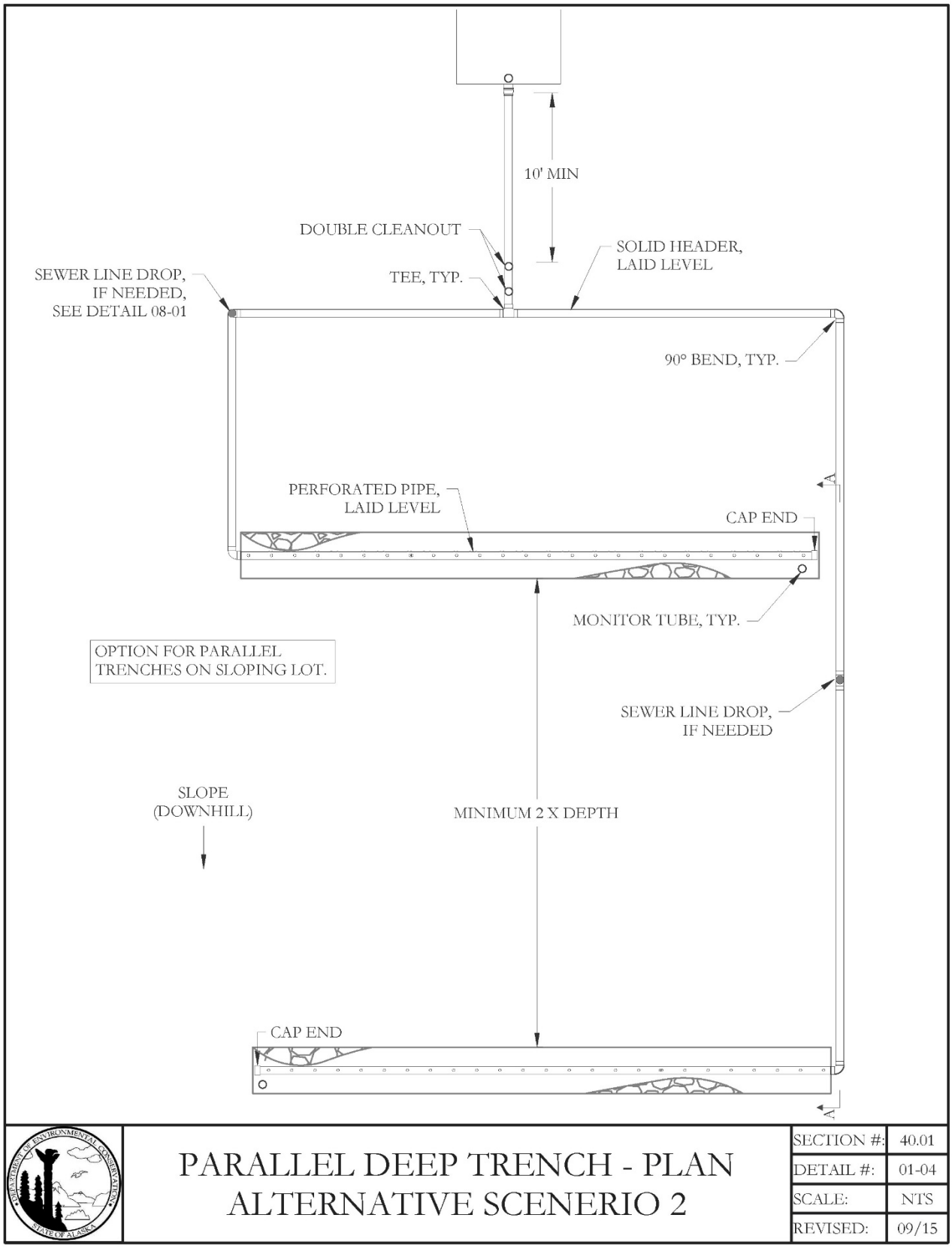
DETAIL #:	01-02
SCALE:	NTS
REVISED:	09/15

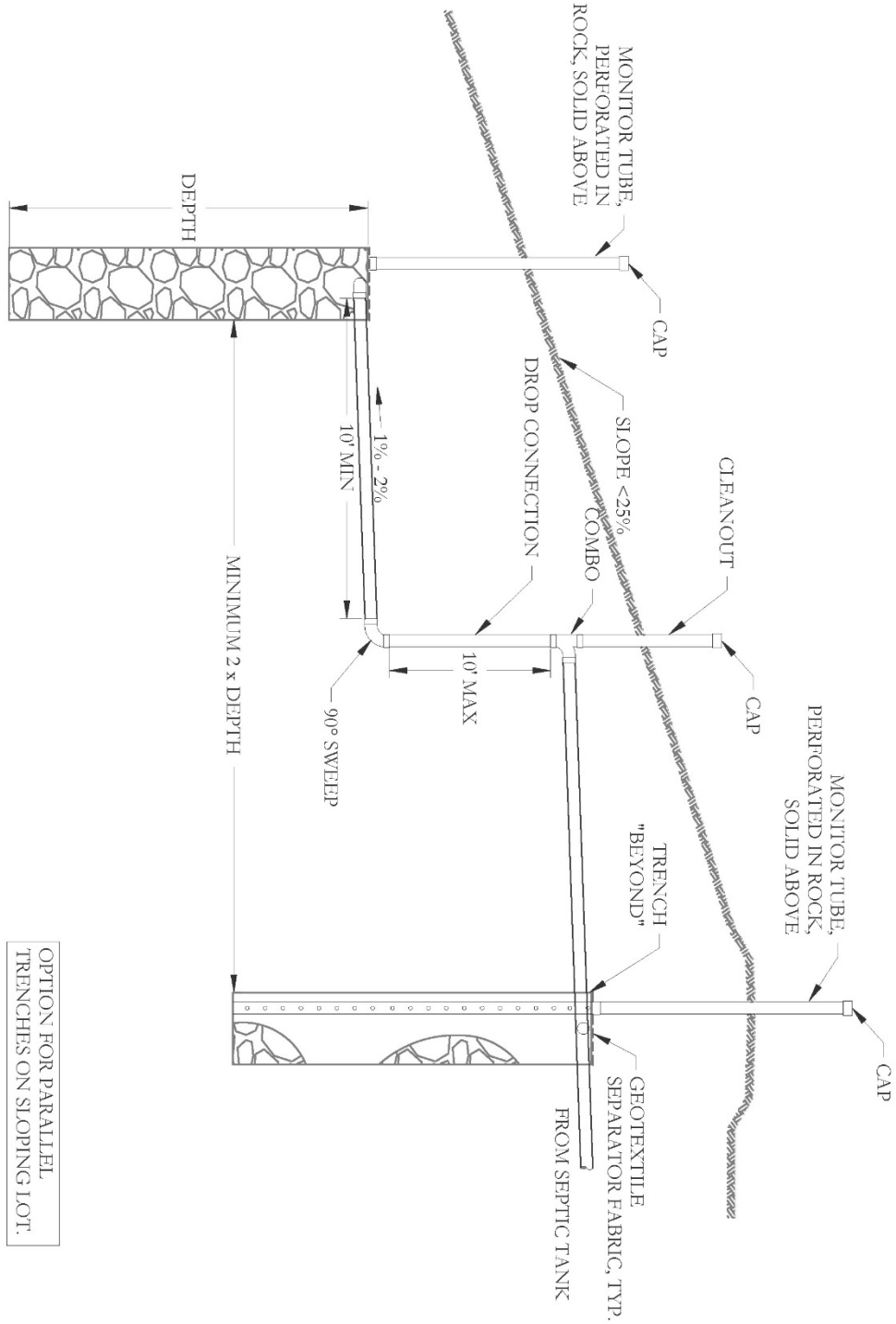
DEEP TRENCH PROFILE VIEW



	DEEP TRENCH ALTERNATIVE SCENERIO 1	SECTION #:	40.01
		DETAIL #:	01-03
		SCALE:	NTS
		REVISED:	09/15



PARALLEL DEEP TRENCH - PLAN ALTERNATIVE SCENERIO 2	SECTION #:	40.01
	DETAIL #:	01-04
	SCALE:	NTS
	REVISED:	09/15



SECTION A-A

PARALLEL DEEP TRENCH - PROFILE ALTERNATIVE SCENARIO 2

SECTION #:	40.01
DETAIL #:	01-05
SCALE:	NTS
REVISED:	09/15

SECTION 40.02 BED TYPE SYSTEM

Article 2.1 Designing and Sizing a Bed Type System

Perform the following calculations to determine the absorption area dimensions for an example bed type system for a 3 bedroom home. This is only an example. Apply site specific data for each project design.

A. Step 1

An 11 foot deep test hole dug within 25 feet of the proposed bed type system revealed SM (silty sand) soils with a groundwater table at 10 feet. An engineer performed a percolation test at 4 ½ feet and determined the percolation rate to be 10 minutes per inch. The application rate shown in Division 20 for these soils is 190 square feet per bedroom. Therefore, the total required absorption area will be 190 square feet per bedroom multiplied by 3 bedrooms as follows:

190 square feet per bedroom × 3 bedrooms = 570 square feet total absorption area required

To be conservative, 600 square feet of total absorption area will be used.

B. Step 2

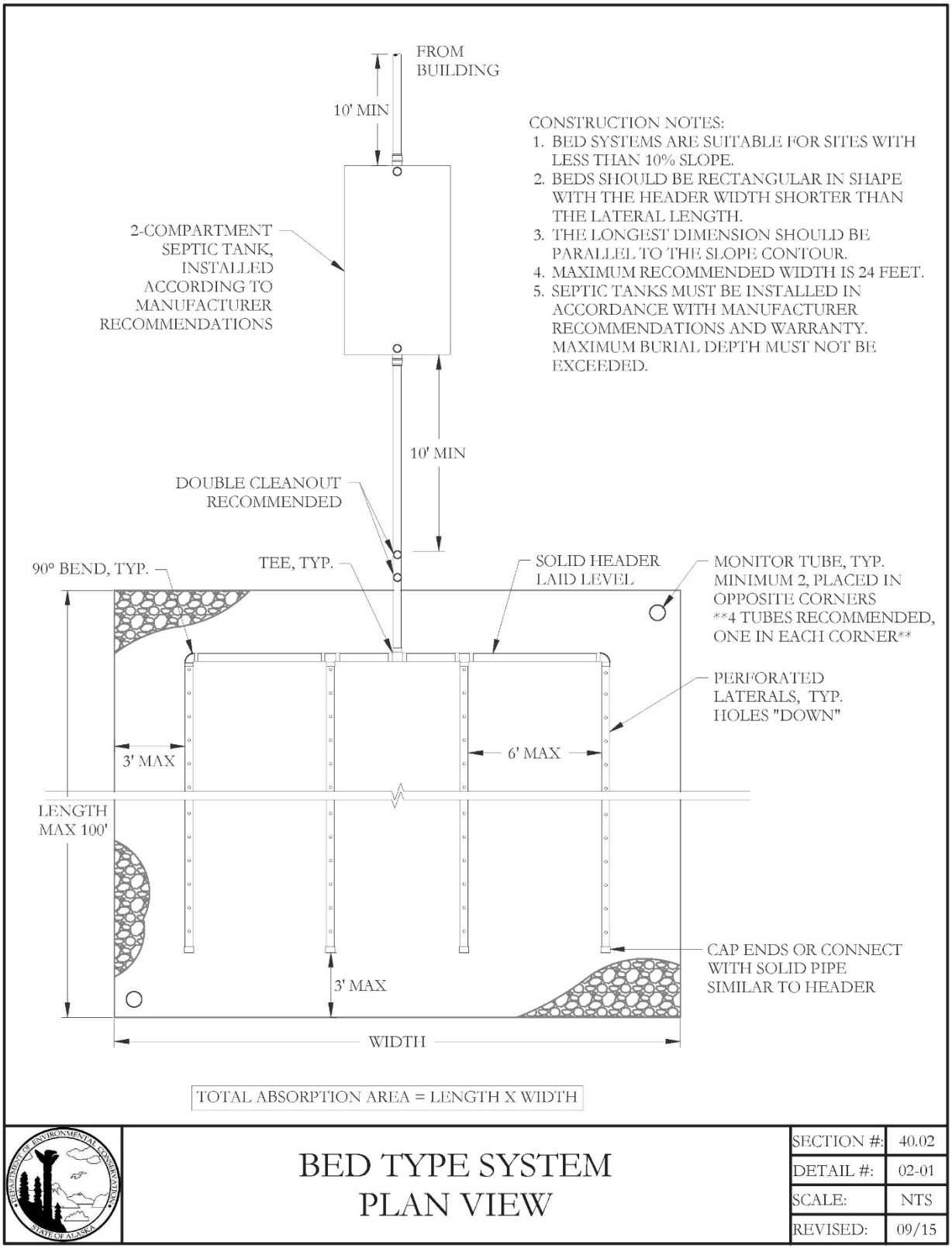
A bed width of 18 feet is decided on after examining the site. To determine the required length of the bed system, divide the required absorption area determined in Step 1 by the proposed width of 18 feet as follows:

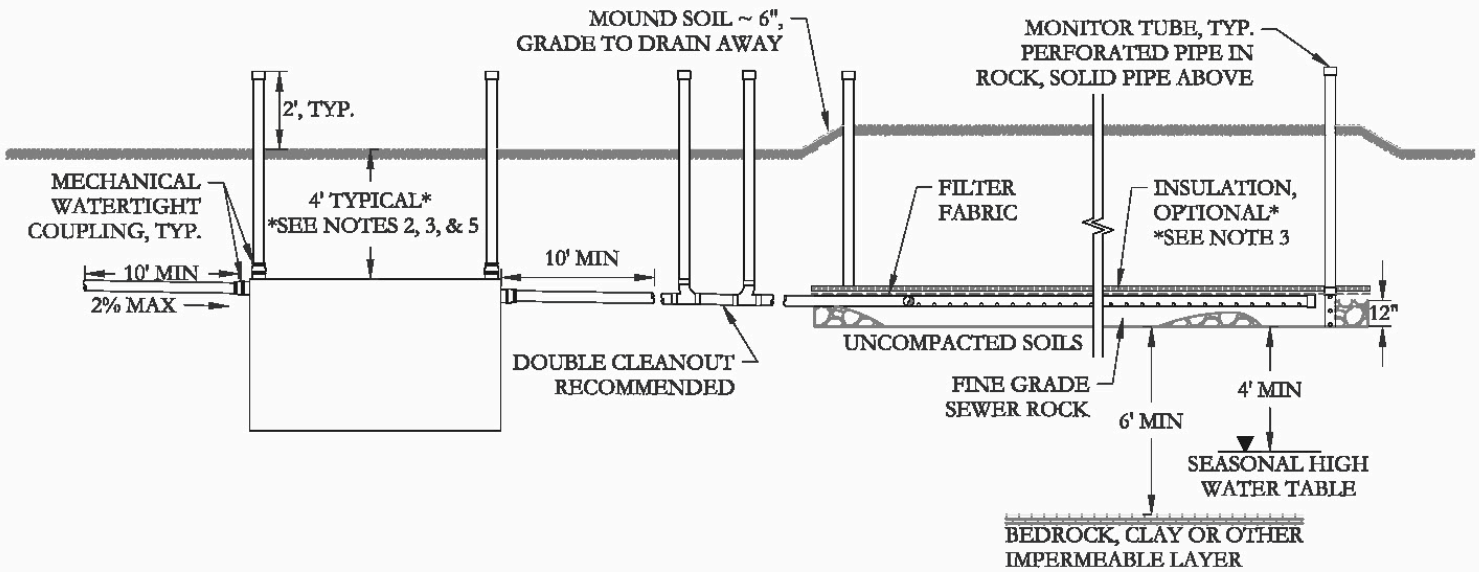
600 square feet (step 1) ÷ 18 foot proposed width of bed = 34 foot long bed

Always round up the bed length to be safe.

Therefore, in this example the design for the bed system is 18 feet wide by 34 feet long and a minimum of 4 feet of soil cover. Since the sewer rock in a bed type system is 1 foot deep, the required depth to ground water is 9 feet and the required depth to an impermeable layer is 11 feet. The test hole must be a minimum of 11 feet deep to meet the minimum required depth of the test hole and the groundwater no deeper than 9 feet.

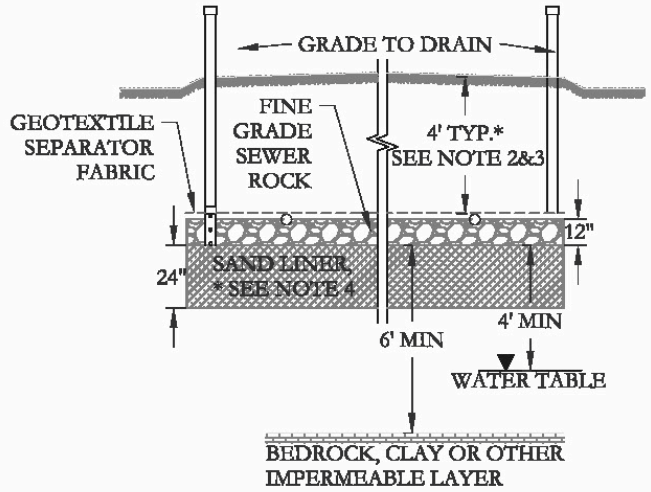
Article 2.2 Standard Drawings for Bed Type Systems





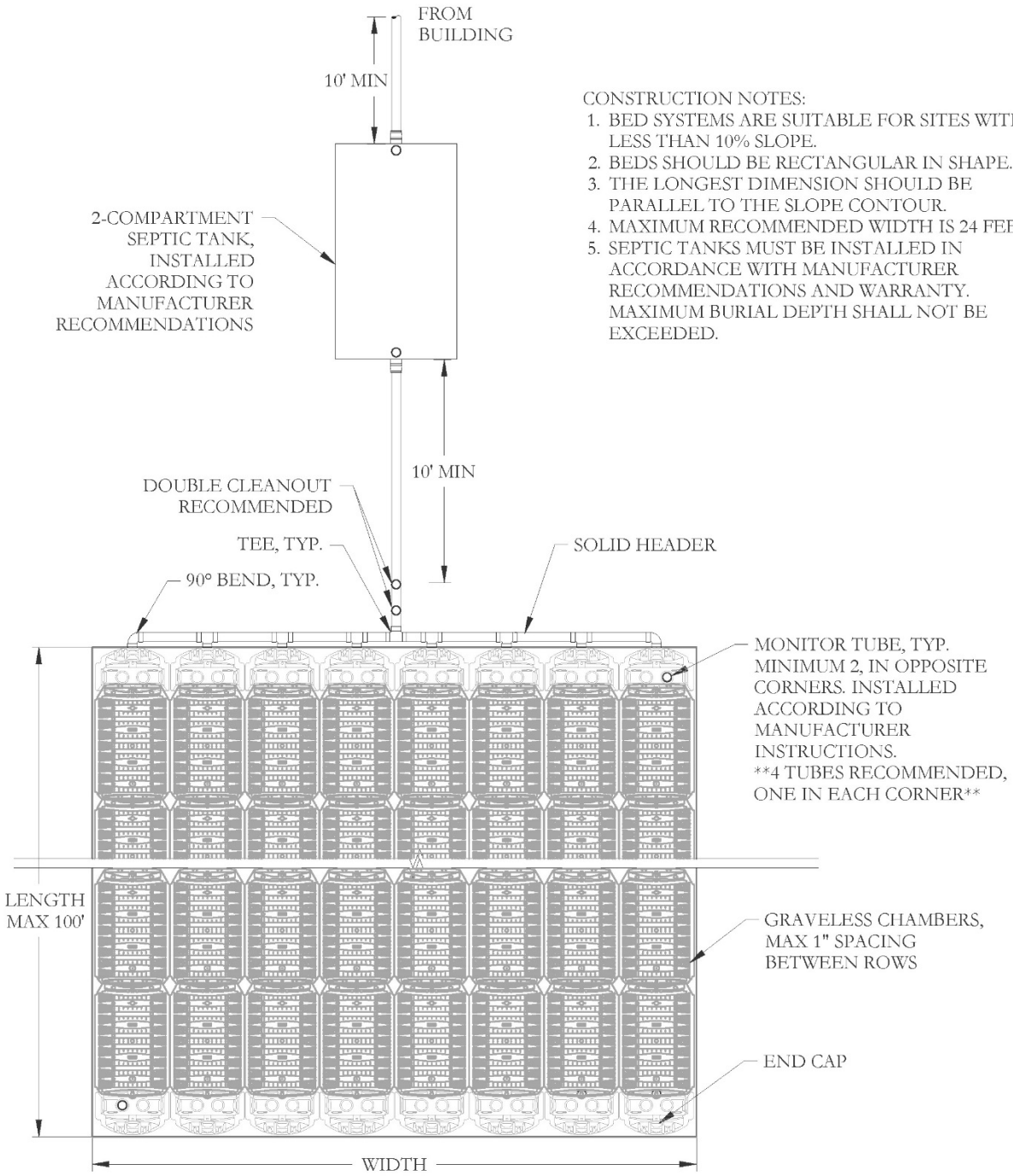
CONSTRUCTION NOTES:

1. ALL LEACH FIELD PIPING (SOLID AND PERFORATED) SHALL BE LAID LEVEL AND BEDDED IN ROCK TO THE SPRINGLINE (CENTER LINE OF PIPE). MINIMUM 12 INCHES OF ROCK MUST BE PLACED BELOW SPRINGLINE.
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGIONS. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN TWO (2) FEET.
4. SAND LINER, MEETING THE GRADATION SPECIFICATION IN ARTICLE 3.18, REQUIRED IF GRAVEL SOILS PERCOLATE FASTER THAN 1 MIN/INCH.
5. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH MUST NOT BE EXCEEDED.



SECTION #:	40.02
DETAIL #:	02-02
SCALE:	NTS
REVISED:	09/15

BED TYPE SYSTEM PROFILE VIEW



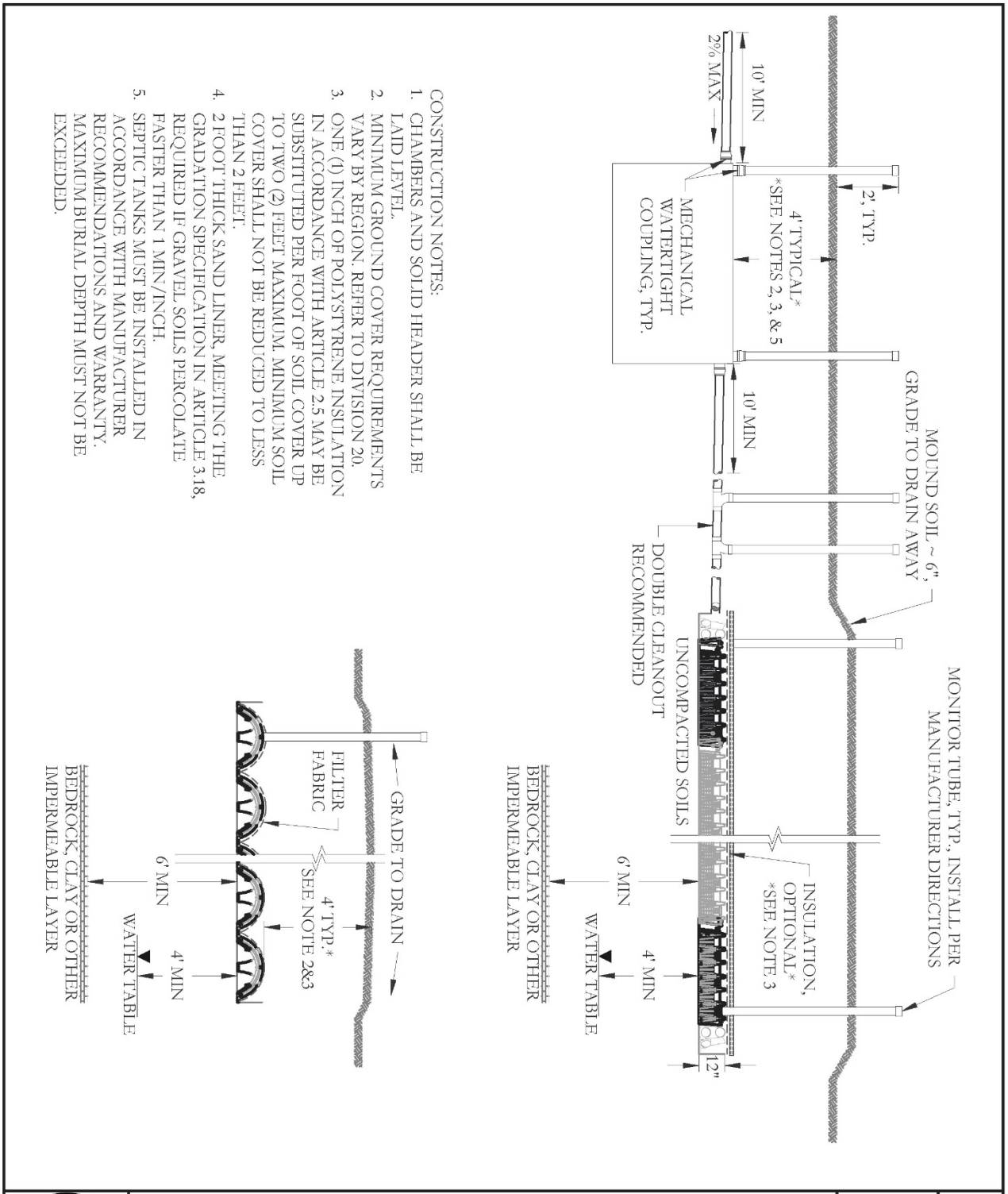
CONSTRUCTION NOTES:

1. BED SYSTEMS ARE SUITABLE FOR SITES WITH LESS THAN 10% SLOPE.
2. BEDS SHOULD BE RECTANGULAR IN SHAPE.
3. THE LONGEST DIMENSION SHOULD BE PARALLEL TO THE SLOPE CONTOUR.
4. MAXIMUM RECOMMENDED WIDTH IS 24 FEET.
5. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH SHALL NOT BE EXCEEDED.

TOTAL ABSORPTION AREA = LENGTH X WIDTH

BED WITH GRAVELESS CHAMBERS PLAN VIEW

SECTION #:	40.02
DETAIL #:	02-03
SCALE:	NTS
REVISED:	09/15



CONSTRUCTION NOTES:

1. CHAMBERS AND SOLID HEADER SHALL BE LAID LEVEL.
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGION. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION IN ACCORDANCE WITH ARTICLE 2.5 MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN 2 FEET.
4. 2 FOOT THICK SAND LINER, MEETING THE GRADATION SPECIFICATION IN ARTICLE 3.18, REQUIRED IF GRAVEL SOILS PERCOLATE FASTER THAN 1 MIN/INCH.
5. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH MUST NOT BE EXCEEDED.

BED WITH GRAVELESS CHAMBERS PROFILE VIEW

SECTION #:	40.02
DETAIL #:	02-04
SCALE:	NTS
REVISED:	09/15

SECTION 40.03 SEEPAGE PIT

Article 3.1 Designing and Sizing a Seepage Pit Type System

Perform the following steps and calculations to determine the absorption area dimensions for a theoretical seepage pit type system for a 3 bedroom home. This is only an example. Apply site specific data for each project design.

A. Step 1

A 16 foot deep test hole dug within 25 feet of the proposed bed type system revealed GM (silty gravel) soils with no groundwater table encountered in the test hole. An engineer performed a percolation test at 7 ½ feet and determined the percolation rate to be 28 minutes per inch. The application rate shown in Division 20 for these soils is 250 square feet per bedroom. Therefore, the total required absorption area will be 250 square feet per bedroom multiplied by 3 bedrooms as follows:

250 square feet per bedroom × 3 bedrooms = 750 square feet total absorption area required

B. Step 2

Divide the chosen depth of the sewer rock in the seepage pit (use 5 feet for this example) by the total required absorption area determined in step 1 (750 square feet) to get the total perimeter of the seepage pit. The seepage pit type system uses 4 sidewalls for absorption. The total perimeter of all four sidewalls in this example is:

750 square feet (step 1) ÷ 5 feet of sewer rock = 150 foot perimeter of seepage pit.

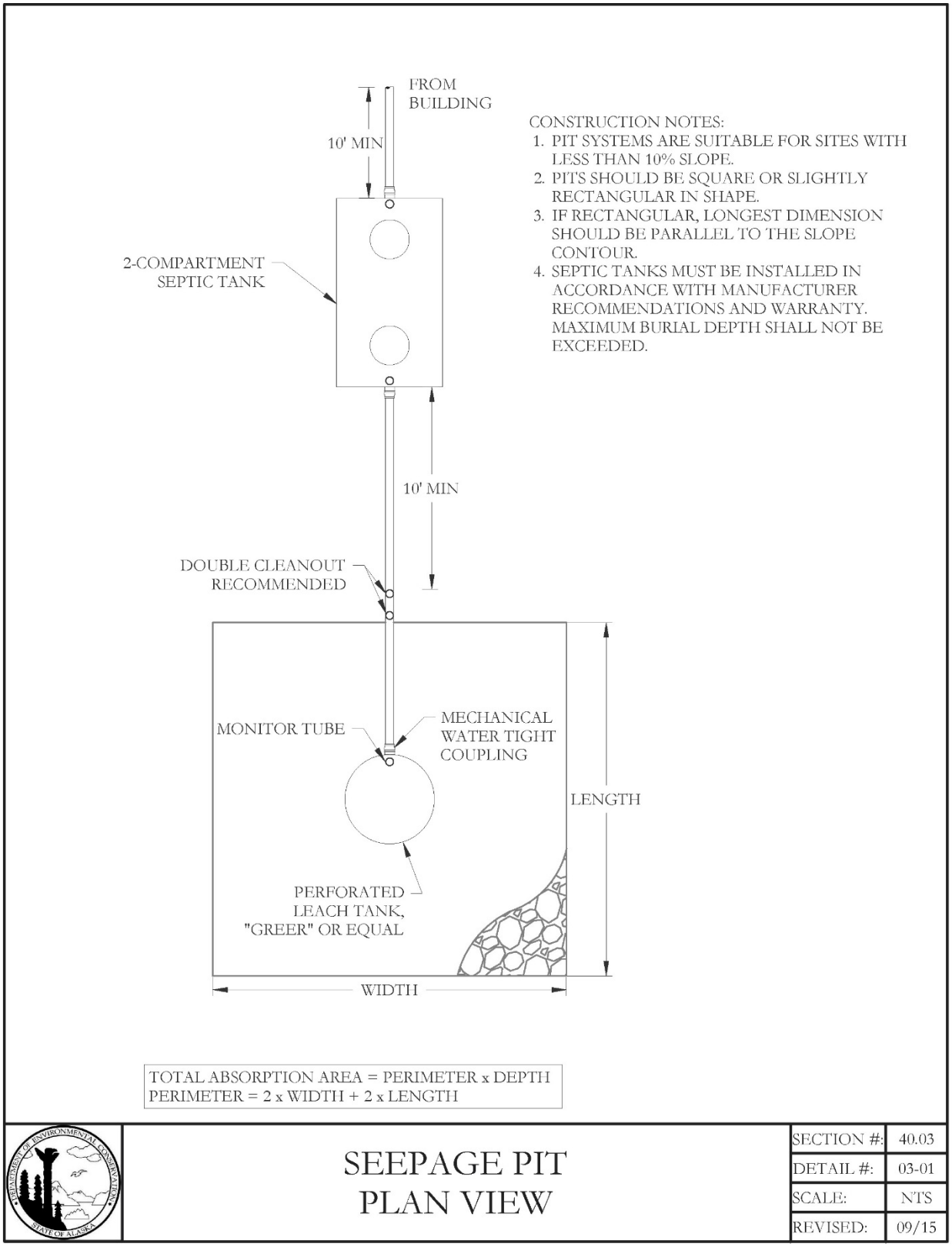
C. Step 3

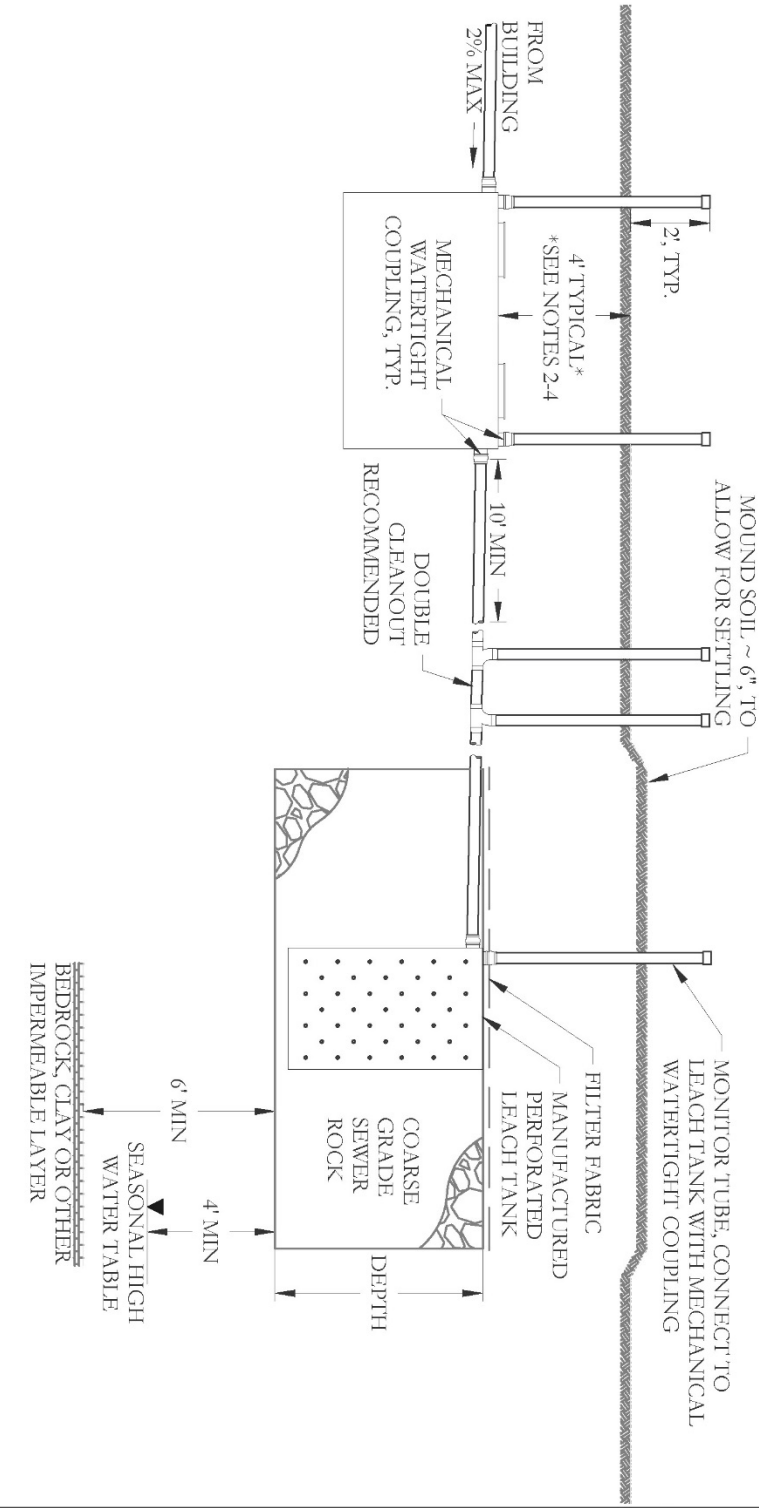
Determine the dimensions of the 4 sidewalls of the rectangular seepage pit by dividing the total perimeter (150 feet) determined in Step 2 by 4 (the 4 sidewalls of the seepage pit). The total length of each side of the rectangular seepage pit is:

150 foot perimeter of seepage pit (step 2) ÷ 4 sidewalls = 38 feet per side of seepage pit.

In this example the design for the seepage pit system is for a rectangular pit with 38 foot sides, with a 5 foot depth of sewer rock and a minimum of 5 feet of soil cover. Therefore the required depth to ground water is 14 feet and the required depth to an impermeable layer is 16 feet. The test hole depth must be a minimum of 16 feet to meet the minimum required depth of the test hole.

Article 3.2 Standard Drawings for a Seepage Pit Type System





CONSTRUCTION NOTES:

1. DEPTH MAY NOT EXCEED 8 FEET.
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGION. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN TWO (2) FEET.
4. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH SHALL NOT BE EXCEEDED.

SEEPAGE PIT PROFILE VIEW

SECTION #:	40.03
DETAIL #:	03-02
SCALE:	NTS
REVISED:	09/15

SECTION 40.04 SHALLOW TRENCH TYPE SYSTEM

Article 4.1 Designing and Sizing a Shallow Trench Type System

Perform the following steps and calculations to determine the absorption area dimensions for a theoretical shallow trench system for a 3 bedroom home. This is only an example. Apply site specific data for each project design.

A. Step 1

An 11 foot deep test hole dug within 25 feet of the proposed shallow trench type system revealed GP (poorly graded gravel) soils with a groundwater table at 10 feet. An engineer performed a percolation test at 4 ½ feet and determined the percolation rate to be faster than 1 minutes per inch. These soils will therefore require a sand liner. The application rate shown in Division 20 for these soils with a sand liner is 150 square feet per bedroom. Therefore, the total required absorption area will be 150 square feet per bedroom multiplied by 3 bedrooms as follows:

150 square feet per bedroom × 3 bedrooms = 450 square feet total absorption area required.

B. Step 2

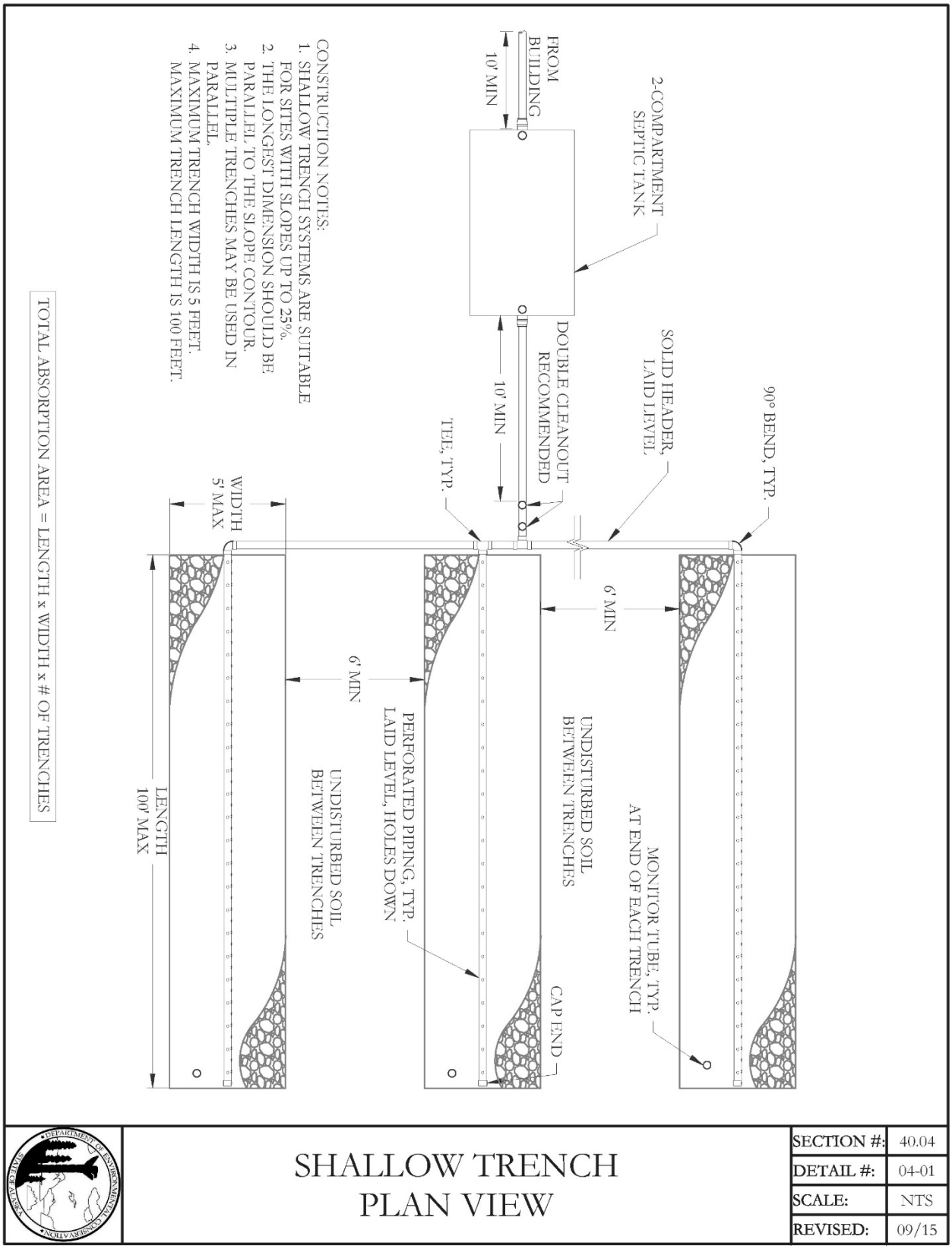
A shallow trench width of 5 feet is decided on after examining the site. To determine the required length of the shallow trench system, divide the required absorption area determined in Step 1 by the proposed width of 5 feet as follows:

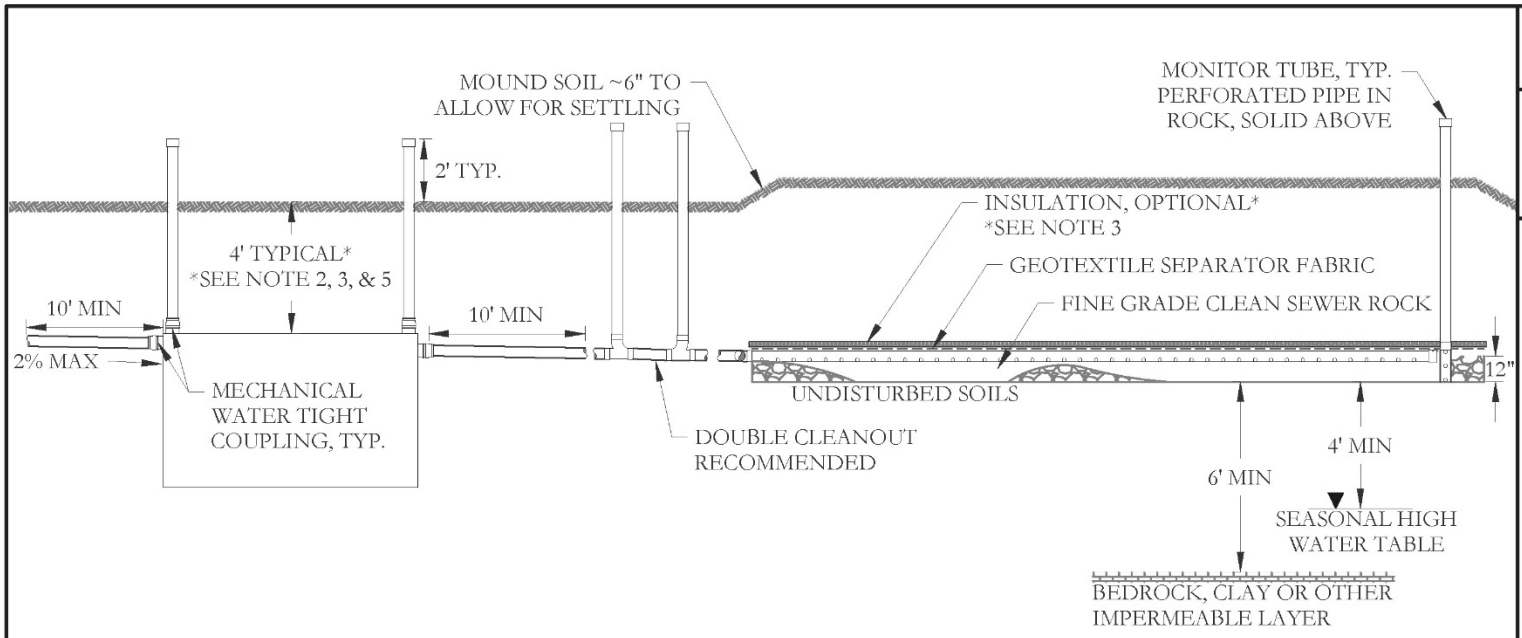
450 square feet (step 1) ÷ 5 foot proposed width = 90 foot long shallow trench

Say 100 linear feet (Always round up the length to be safe).

Therefore, in this example the design for the shallow trench system is 5 feet wide by 100 feet long with a 2 foot thick sand liner under the sewer rock and a minimum of 4 feet of soil cover. Since the sewer rock in a shallow trench type system is 1 foot deep, the required depth to ground water is 9 feet (4 feet below the bottom of sewer rock) and the required depth to an impermeable layer is 11 feet. The test hole must be a minimum of 11 feet deep to meet the minimum required depth of the test hole and the groundwater no deeper than 9 feet.

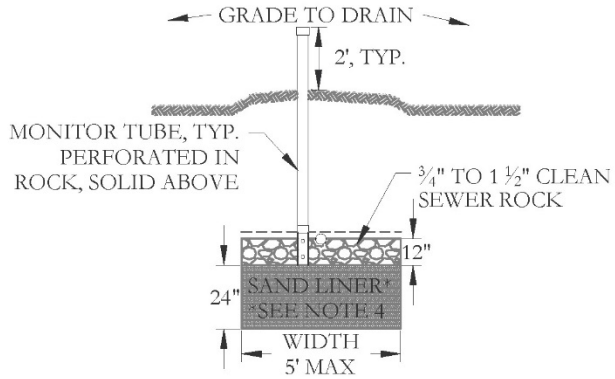
Article 4.2 Standard Drawings for a Shallow Trench Type System





CONSTRUCTION NOTES:

1. ALL LEACH FIELD PIPING (SOLID AND PERFORATED) SHALL BE LAID LEVEL. LEACH FIELD PIPING SHALL BE BEDDED IN ROCK TO SPRINGLINE (CENTERLINE OF PIPE). ROCK MUST EXTEND MINIMUM OF 12 INCHES BELOW SPRINGLINE.
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGION. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN TWO (2) FEET.
4. SAND LINER REQUIRED IF GRAVEL SOILS PERCOLATE FASTER THAN 1 MIN/INCH.
5. SEPTIC TANKS MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND WARRANTY. MAXIMUM BURIAL DEPTH MUST NOT BE EXCEEDED.



SECTION #:	40.04
DETAIL #:	04-01
SCALE:	NTS
REVISED:	09/15

SHALLOW TRENCH PROFILE VIEW

SECTION 40.05 FIVE WIDE TYPE SYSTEM

Article 5.1 Designing and Sizing a Five Wide Type System

Perform the following steps and calculations to determine the absorption area dimensions for a theoretical 5-wide system for a 3 bedroom home. This is only an example. Apply site specific data for each project design

5-Wide Drainfield Length Sizing Factor	
Depth of Sewer Rock Below Perforated Pipe	**System Sizing Factor**
18 inches (1½ feet)	0.78
24 inches (2 feet)	0.70
30 inches (2½ feet)	0.64
36 inches (3 feet)	0.58
42 inches (3½ feet)	0.54
48 inches (4 feet)	0.50

A. Step 1

A 13 foot deep test hole dug within 25 feet of the proposed 5-wide type system revealed SP (poorly graded sand) soils with no groundwater found. The application rate from in Division 20 is 150 square feet per bedroom, therefore 150 square feet per bedroom multiplied by 3 bedrooms is:

150 square feet per bedroom × 3 bedrooms = 450 square feet total absorption area required.

B. Step 2

A 5-wide type system with a depth of 3 feet of sewer rock is decided on for this location after examining the site. To determine the required length of the 5-wide system, first divide the required absorption area determined in Step 1 by 5 feet (for the 5-wide system) as follows:

450 square feet (step 1) ÷ 5 foot width = 90 feet

Always round up the length to be safe.

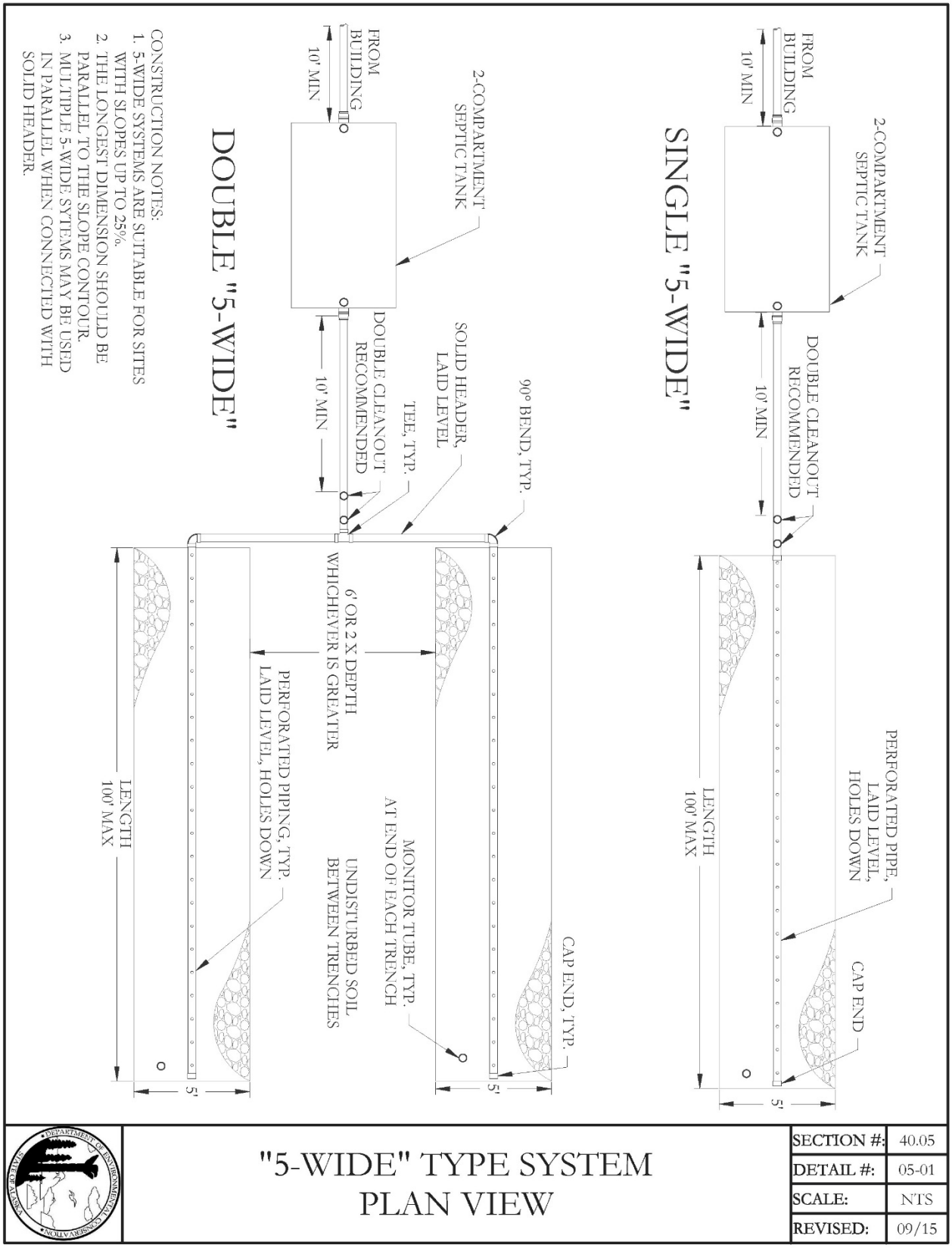
C. Step 3

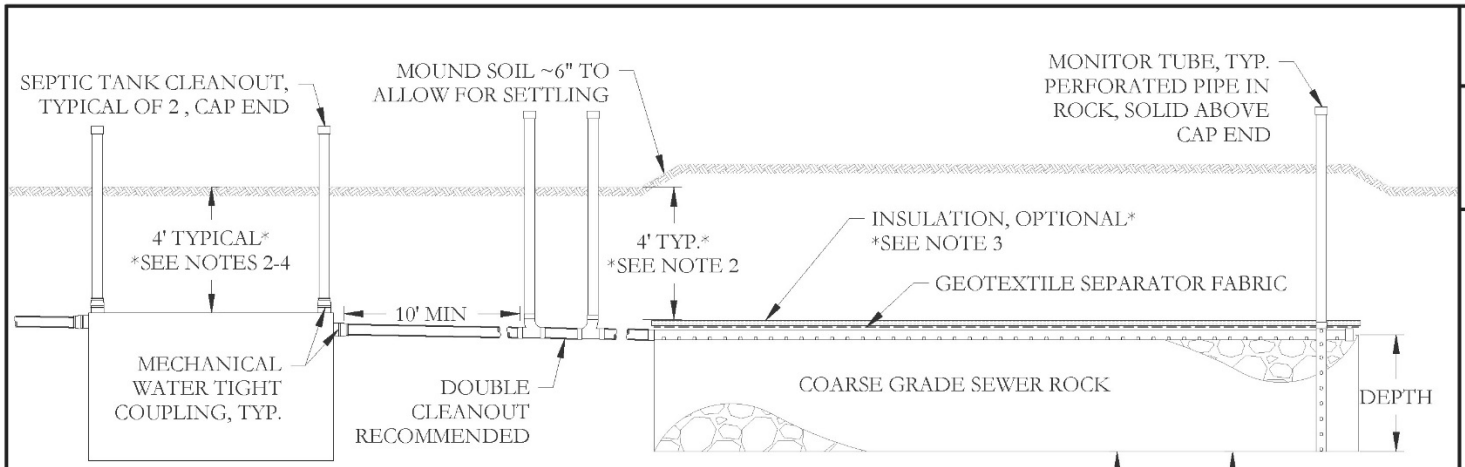
Determine the length of the 5-wide type system for this example by multiplying the result of the calculation in Step 2 by 0.58 (the system sizing factor found above for a sewer rock depth of 3 feet) as follows:

90feet (Step 2) × 0.58 (system sizing factor, above) = 53 linear feet total 5-wide length required

Therefore, in this example the design for the 5-wide system with 3 feet of sewer rock 53 linear feet and a minimum of 4 feet of soil cover. Since the sewer rock is 3 foot deep, the required minimum depth to ground water is 11 feet (4 feet below the bottom of sewer rock) and the required depth to an impermeable layer is 13 feet. The test hole must be a minimum of 13 feet deep to meet the minimum required depth. **NOTE: Do not use 5-wide systems with a sand liner.**

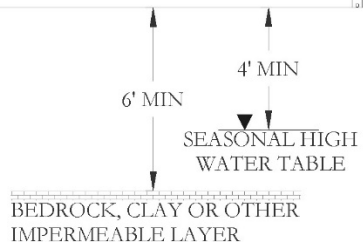
Article 5.2 Standard Drawings for a Five Wide Type System





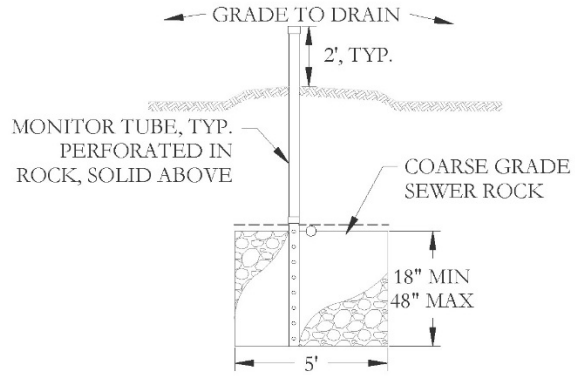
CONSTRUCTION NOTES:

1. ALL LEACH FIELD PIPING AND SOLID HEADERS SHALL BE LAID LEVEL. LEACH FIELD PIPING SHALL BE BEDDED TO THE SPRINGLINE (CENTER LINE OF PIPE) IN ROCK.
2. MINIMUM GROUND COVER REQUIREMENTS VARY BY REGION. REFER TO DIVISION 20.
3. ONE (1) INCH OF POLYSTYRENE INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN TWO (2) FEET.
4. SMEARED SIDEWALLS AND BOTTOM MUST BE RAKED OR SCARAFIED PRIOR TO GRAVEL PLACEMENT.



5-WIDE DRAINFIELD LENGTH REDUCTION FACTOR (RF)

DEPTH OF GRAVEL BELOW PIPE (INCHES)	LENGTH REDUCTION FACTOR
18	0.78
24	0.70
30	0.64
36	0.58
42	0.54
48	0.50



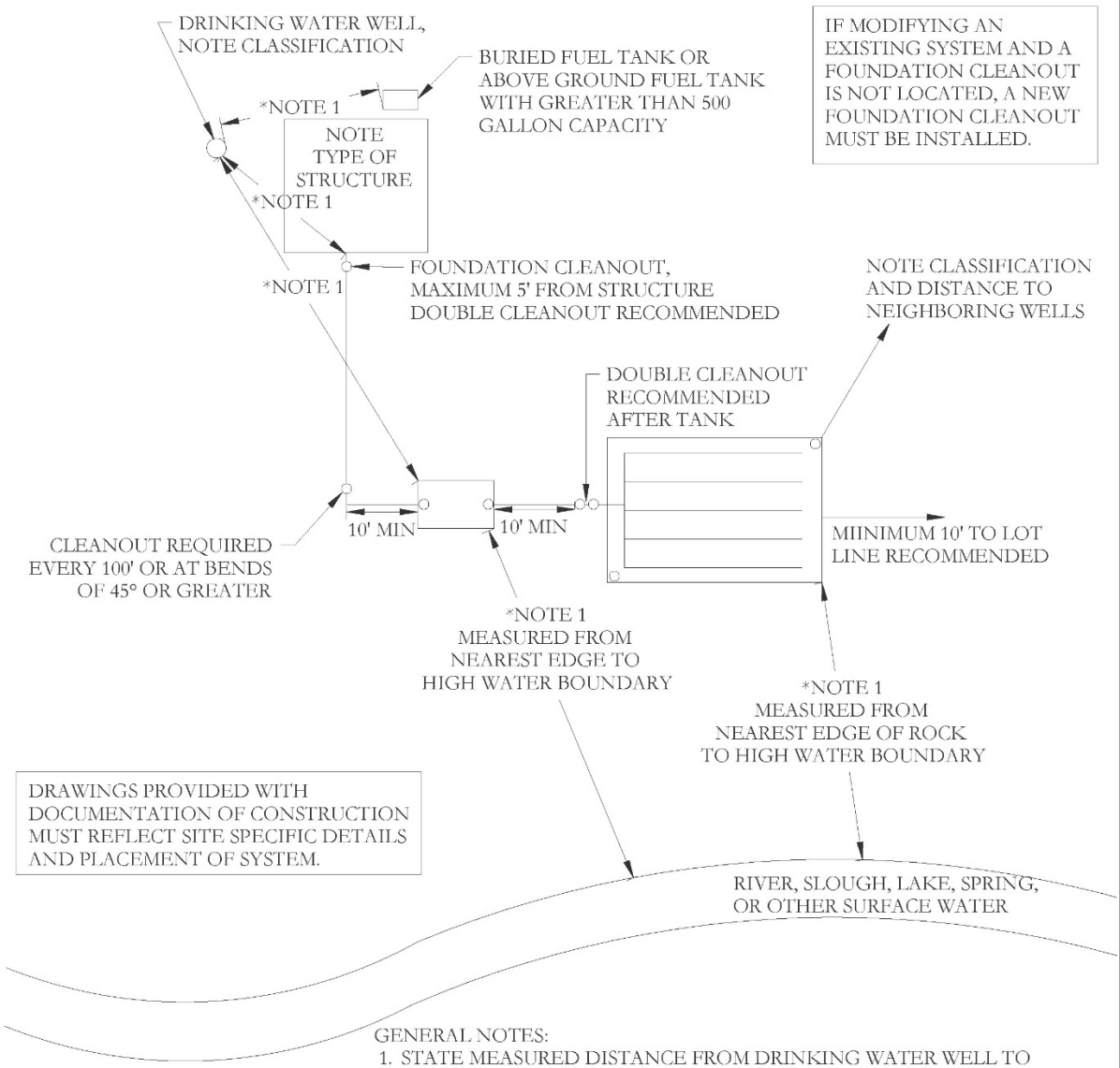
LENGTH = AREA REQUIRED/5' (WIDTH) x RF (TABLE ABOVE)

EXAMPLE: FOR 450 SQ FT ABSORPTION AREA USING 36" OF ROCK:
LENGTH = 450 FT^2 ÷ 5' x 0.58 = 53' (ALWAYS ROUND UP TO NEAREST FOOT)

SECTION #:	40.05
DETAIL #:	05-02
SCALE:	NTS
REVISED:	09/15

"5-WIDE" TYPE SYSTEM PROFILE VIEW

SECTION 40.06 TYPICAL SITE PLAN

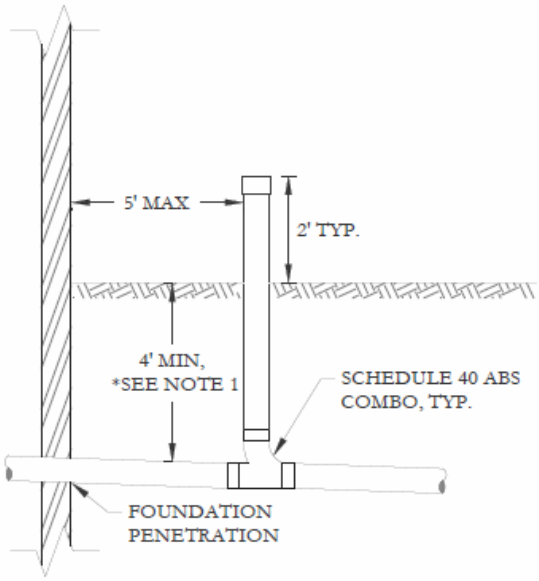


GENERAL NOTES:

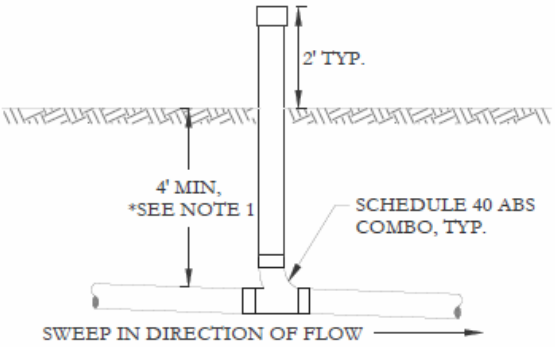
1. STATE MEASURED DISTANCE FROM DRINKING WATER WELL TO POTENTIAL SOURCES OF CONTAMINATION. REFER TO DIVISION 20 FOR MINIMUM SEPARATION DISTANCE REQUIREMENTS.
2. NO COMPONENT OF THE WASTEWATER DISPOSAL SYSTEM SHALL BE INSTALLED IN ROAD RIGHT-OF-WAYS OR UTILITY EASEMENTS.
3. NO COMPONENT OF THE WASTEWATER SYSTEM SHALL BE INSTALLED ON A SEPARATE LOT THAN THE FACILITY SERVED, REGARDLESS OF OWNERSHIP, UNLESS A PERMANENT EASEMENT IS RECORDED. A COPY OF THE EASEMENT SHALL BE PROVIDED WITH THE DOCUMENTATION OF CONSTRUCTION.
4. VERIFICATION OF SEPARATION DISTANCE TO NEIGHBORING WELLS REQUIRED. VERIFY CLASSIFICATION OF THE WELL WITH OWNER.

TYPICAL SITE PLAN	SECTION #:	40.06
	DETAIL #:	06-01
	SCALE:	NTS
	REVISED:	09/15

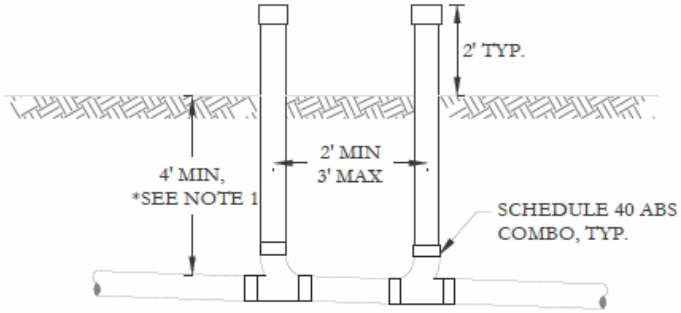
SECTION 40.07 TYPICAL CLEAN OUT



FOUNDATION CLEANOUT



SINGLE CLEANOUT



DOUBLE CLEANOUT

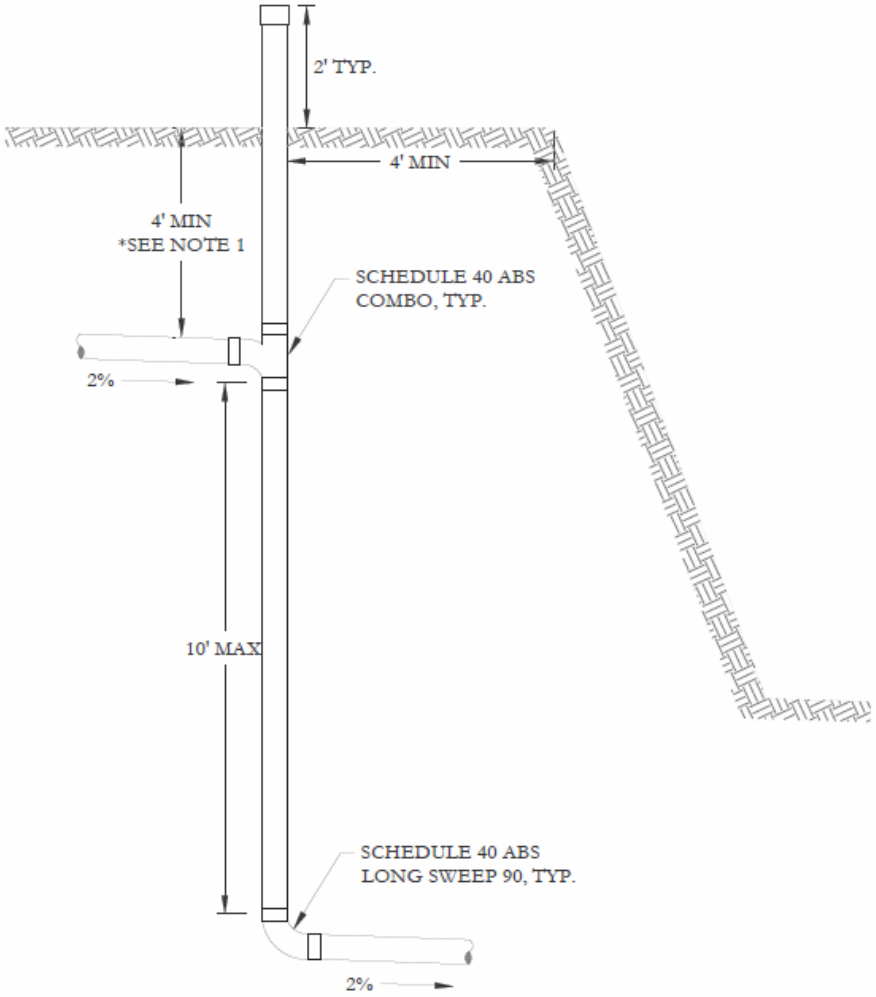
CONSTRUCTION NOTES:

1. ONE (1) INCH OF INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL COVER UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN 2 FEET.
2. SWEEP TYPICALLY IS IN DIRECTION OF FLOW.
3. CLEANOUTS REQUIRED EVERY 100 FEET AT A MINIMUM AND AT CHANGE IN DIRECTION OF 45° OR GREATER.
4. EASILY ACCESSIBLE FOUNDATION CLEANOUT IS REQUIRED.
5. DO NOT CUT OFF PIPING OR BURY BELOW GRADE. RECOMMEND MARKING LOCATION SO CLEANOUTS IN ORDER TO LOCATED WHEN NEEDED.

CLEANOUT DETAILS

SECTION #:	40.07
DETAIL #:	07-01
SCALE:	NTS
REVISED:	04/14

SECTION 40.08 TYPICAL DROP CONNECTION



GENERAL NOTES:

1. ONE (1) INCH INSULATION MAY BE SUBSTITUTED PER FOOT OF SOIL UP TO TWO (2) FEET MAXIMUM. MINIMUM SOIL COVER SHALL NOT BE REDUCED TO LESS THAN TWO (2) FEET.

	DROP CLEANOUT	SECTION #:	40.08
		DETAIL #:	08-01
		SCALE:	NTS
		REVISED:	04/14