RESIDENTIAL
WASTEWATER DISPOSAL SYSTEM
DESIGN MANUAL

GREENSTONE COUNTRY
COMMUNITY SERVICES DISTRICT

REVISION 3

JANUARY 2001

Prepared for the Greenstone Country Community Services District by:

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PREFACE

The Greenstone Country Subdivision lies within a portion of the Sierra Nevada Foothills region where soil and rock conditions sometimes limit conventional wastewater disposal system usage. The Greenstone Country Community Services District was formed to oversee and regulate disposal system planning, design, construction and long-term use at the Greenstone Country subdivision, its purpose being to minimize the potential for costly repairs or adverse environmental impacts which could result from improper septic system design, installation, and operation. The District works in conjunction with the El Dorado County Environmental Management Department to insure long-term safe and sanitary wastewater disposal in this area.

The Community Services District prepared this Design Manual to set forth guidelines and regulations which would govern disposal system design and usage. The design specifications and the criteria for system selection are based on current technology concerning alternative wastewater disposal systems, and is revised to comply with the latest changes in the El Dorado County private sewage disposal ordinances (Ordinance #4542). as effective 1/1/2000.

The District has tested and monitored various waste treatment/disposal systems over the past years to evaluate the long term operation of these sewage disposal systems under various site conditions at Greenstone Country. With this experience, and experience from other close-by disposal management agencies, the most practical and effective means of handling wastewater disposal in this area have been explored in this manual.

There are many significant changes in this manual since it was originally developed in 1981, and revised in 1986. This third revision of the design manual will be appended as necessary to incorporate modifications in system design as a result of further experience with wastewater disposal system operations at Greenstone Country, and in the Sierra foothills area.

Joseph Borgerding P.E.
District Engineer

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SECTION 1 – PERMIT REGULATIONS

1.1 Application for Permit

A written permit must be obtained from the District before beginning construction of a wastewater disposal system. This permit shall be required in addition to any building or wastewater disposal permits required by El Dorado County.

The District application form must be used, accurately completed, and accompanied with a check for the amount required by the type of system. Copies of the application are available at the District office. The application must be accompanied with a wastewater system design. The design must be in accordance with the District Design Manual and El Dorado County code.

The wastewater disposal system design must be performed and stamped by a Registered Civil Engineer, Registered Geologist, Professional Soil Scientist, or Registered Environmental Health Specialist licensed to practice in the State of California.

The design shall include, at a minimum, a site plan, percolation test data, soil data, design calculations, tank and trench layout, trench dimensions, pump sizing and installation information, and other data pertinent to the proper construction and operation of the proposed system. The site plan information percolation test and soil data submittal must comply with the format in the El Dorado County Code. The design criteria and data must comply with this design manual.

1.2 Issuance of Permit

Approval of the system application constitutes a construction permit. The approved permit will be mailed to the applicant. It is the applicants responsibility to complete the construction permit approval process through El Dorado County. The District permit must accompany the building plans submitted to El Dorado County.

1.3 Construction

The permittee must notify the District when construction of the disposal system is to commence. Each type of disposal system has inspections listed on the permit. It is the owners and contractors to notify the District at least 24 hours prior to inspection. **IF A SYSTEM IS BUILT, AND INSPECTIONS ARE NOT REQUESTED, THAT SYSTEM WILL BE FAILED AND BE REQUIRED TO BE UNEARTHED TO PROVIDE THE REQUIRED INSPECTIONS.**

1.4 Final Approval

Final approval of the constructed system will be given after construction is complete, all finish grading is complete, and an "as-built" plan prepared by the system designer submitted to the District. The final approval must be obtained before a certificate of occupancy can be issued by the County.

SECTION 2. - TESTING FOR SITE EVALUATION

2. 1 Unsuitable Slopes

Sites, which have land surface slopes of 20 percent or less are preferred. Sites with land surface slopes greater than 30 percent shall not be considered for wastewater disposal. Slope will dictate disposal trench spacing for trench systems. Special slope criteria for mound systems are set forth in Section 3.4.

2.2 Minimum Distances

No septic tank, leaching field or replacement area shall be located within the distances shown in Table 1.

TABLE I - MINIMUM SEPARATION DISTANCES

Items Requiring Separation	Separation from Disposal Field and/or Replacement Area	Separation from Septic Tank
Flowing stream, lake, pond, marsh or wetland	100'	50'
Well or spring	100'	100'
Seasonal wet area	50'	50'
Ephemeral stream or drainage course	50'	25'
Lake or pond used as drinking water source	200'	100'
Property boundaries, driveways or buildings	10'	5'
Domestic water service line	5'	5'
Cuts or fills	4x height, 50' max	10'
Swimming pools	4x max depth below grade, 25' max	10'

2.3 Unsuitable Areas

No leaching field or replacement area shall be located within any of the following areas:

- Any area within any easement that is dedicated for surface or subsurface improvement.
- Any paved area
- Any area not owned or controlled by the property owner unless said area is dedicated for waste disposal purposes or the property owner has a right to use the disposal area.
- Any area occupied or to be occupied by buildings.
- Any area that does not meet minimum criteria set forth in this manual

2.4 Depth to Groundwater and Impermeable Material

The proposed disposal area shall not be located in a topographically low area where seasonal groundwater may surface or where the disposal field may be in the path of seasonal surface water drainage channels.

The proposed disposal area may not show any evidence of perched high groundwater or spring activity.

An inspection pit shall be excavated in the proposed disposal area to insure that seasonally high groundwater levels and depth to impermeable material meet the criteria in Section 3.

The inspection pit depth depends upon the type of disposal system considered.

2. 5 Percolation Test Procedures

A.Soil Test Pits

The soil test pit must be located within the bounds of the proposed disposal trench area. Even if percolation tests have been performed on a lot in the past, a new percolation test must be performed if the location of the proposed trenches is not at the previous test pit site.

The purpose of the pit is for visual inspection only. Where the depth exceeds safe conditions for the type of soil, or 5 feet maximum, the pit shall not be entered. Excavation and inspection of the pit shall be coordinated with the District Engineer so it is not left open overnight, and shall be back-filled immediately following inspection. See Table 2 for test pit depths.

Table 2

Type of System	Inspection Pit Depth
Trench System	4 ft + trench depth
"At Grade" System	4 ft + trench depth
Mound System	4 ft
Sand Filter	4 ft + trench depth
Combination ETI System	11 ft

The pit depth shall be at least 4 feet below the bottom of the proposed disposal trench. Any groundwater found in the pit must be at least 4 feet below the bottom of the proposed disposal trench. If adverse soil conditions (shallow soil or groundwater) are found, additional pits shall be dug to determine the best location for disposal trenches.

The following characteristics identify unsuitable soil conditions for disposal trenches:

- Munsell value indicating minerals in their reduced state
- Clean fractured rock with no weathering or fines, including serpentine
- Massive crystalline rock structure (fractures >4" apart)
- Clay layers or other impervious layers within the proposed absorptive area.

B. Percolation Test Procedures

The test pits should be located in the area of the proposed disposal trenches. Excavate a 5-foot deep stepped percolation test pit in the proposed disposal area. Locate four steps approximately 2 feet by 3 feet at I- to 5-foot depths. Dig a 6-inch diameter hole with a hand auger to a depth of approximately I foot at the backside of each step in the test pit. Keep the auger hole sidewalls as straight as possible to maintain a uniform diameter.

Carefully scratch the bottom and sides of the auger hole with a sharp instrument to remove smeared soil particles. Remove all loose soil material and add 2 inches of pea-gravel to the bottom of the auger hole.

Presoak the test holes by filling with water and allowing it to soak overnight. Conduct the percolation test on the day following the overnight presoak.

If water remains in the test hole after the overnight soaking period, adjust the depth to 6 inches over the gravel. From a fixed reference point, measure the drop in water level at 30- minute intervals until the rate stabilizes (at least 3 hours).

If no water remains in the hole after the overnight soaking period, add fresh water to a depth of approximately 6 inches over the gravel. From a fixed reference point, measure the drop in water level at 30-minute intervals for 4 hours, refilling the hole to a depth of 6 inches over the gravel as necessary.

In sandy soils (or other soils in which the first 6 inches of water seeps away in less than 30 minutes after the soaking period) the time interval between measurements shall be taken as 10 minutes and the test run for one hour.

if soils in the proposed disposal area exhibit an average percolation rate slower than 240 minutes per inch, the proposed area is not usable and a new area should be selected.

The stepped percolation test pit shall be back-filled immediately following the testing or the pit may be further excavated to the depth required for a groundwater and impermeable material inspection pit, as set forth in Section 2.4.

Section 2.6 Presentation of Data

The data developed during the soil logging and percolation test should be presented in the format prescribed in Diagram 1 of the El Dorado County Code, Ordinance 4542, at a minimum. Soil logging should identify horizons, Munsell values, soil classification, moisture content, groundwater, roots, plasticity, and texture. Percolation test data may be presented graphically, or in tabular form in a manner which is legible, and easily read and interpreted.

SECTION 3. – CRITERIA FOR SELECTION OF APPROPRIATE WASTEWATER DISPOSAL SYSTEM

3.1 Systems Allowed:

Seven alternative wastewater disposal systems may be considered for use. All of the systems are to be used in conjunction with conventional concrete septic tanks. These systems are:

a) Standard Trench disposal system
b) Special Design Trench disposal system
c) Capped, Elevated, or At Grade disposal system
d) Mound disposal system
e) Sand Filter disposal system
f) Combination Trench/Evapo-Transpiration system
g) Alternative systems

3.2 Standard Trench Disposal System

On sites where the native soil has an average percolation rate between the 2 and 3 feet test depths of 60 minutes per inch or faster, but slower than 5 mpi, standard disposal trenches of 3 feet wide and 3 feet deep are to be used. These systems must have a minimum depth of 4 feet between the bottom of the trench and groundwater level or an impermeable layer (rock or clay).

If the site does not have sufficient depth of soil to seasonally high groundwater or an impermeable layer (> 480 mpi), then a capped fill, a mound, or a sand filter system should be considered.

3.3 Special Design Trench Disposal System

Special design systems are used where soil conditions do not meet the criteria for a standard system, yet there is at least 4 feet distance from the trench bottom to a limiting layer. This type of system allows flexibility in trench depth and width, especially where percolation rates are greater than 60 minutes per inch, or less than 5 minutes per inch. These systems require a minimum depth of 4 feet above seasonally high groundwater levels or impermeable layers from the bottom of the trench. These systems may be fed by gravity distribution, pumping to a gravity distribution field, or pressure distribution in trenches or beds.

On sites where the average soil percolation rate is between 120 mpi and 180 mpi, pressure distribution of effluent to and inside the disposal trenches shall be used. Pressure distribution may be accomplished by siphon dosing or pumping. Laterals inside the trench shall be of PVC piping, spaced and sized according to the design.

If the site does not have sufficient depth of soil to seasonally high groundwater or an impermeable layer (> 480 mpi), then a capped fill, a mound, or a sand filter system should be considered.

3.4 Capped Fill Disposal System

On sites where there is insufficient depth of soil between the bottom of a proposed trench and an impermeable layer or seasonal groundwater layer, and the average percolation rate at 12 inches depth and 24 inches depth (see section 2) is between 5 and 60 minutes per inch, a capped fill trench disposal system may be used. A capped fill system may not have disposal trenches which extend more than 30 inches below the original soil surface. The top of the trench fill rock or media is at the soil surface, and is covered with 12 inches screened loam or sandy loam. Diversion of surface runoff is required to protect the disposal field.

3.4 Mound System

On sites where there is insufficient soil to provide the necessary clearance between the bottom of a proposed disposal trench and an impermeable layer and/or groundwater, a mound system may be appropriate. The crests of slopes or convex contoured slopes are the most desirable locations for mound systems. Mound systems shall not be placed in concave slopes or at the base of a large drainage.

Exposure of the mound to sun and wind is also desirable. The site location shall be selected in an area as open as possible. The maximum slope for a mound is 12%

3.5 Sand Filter Systems

On sites where there is insufficient soil depth or quality to provide treatment for septic tank effluent, an intermittent sand filter may be appropriate. Sand filter effluent can be disposed in fractured rock and shallow soils. Pressure distribution to of sand filter effluent to shallow trenches is a characteristic of this system.

3.6 Combined Special Design Trench-Evapotranspiration System (ETI)

ETI systems can be used in situations where poor soil conditions or siting constraints do not allow the use of any of the systems described above. This system requires a minimum depth of 12 feet to seasonally high groundwater levels and impermeable material (7 feet of permeable material for trench plus 5 feet minimum height above high groundwater from the bottom of the trench. Since the treatment and disposal process id largely evapo-transpiration, exposure of the ETI system to the sun and wind through proper siting is mandatory.

3.7 Alternative Designs

Any proposed treatment and disposal system which differs from the alternatives described herein shall require special review and approval by the District Engineer and the County of El Dorado.

SECTION 4 – DESIGN PARAMETERS

Design parameters and other design factors are included in this section for sewage flow rates, standard disposal trenches, special design trenches, elevated trenches, sand filters, mounds, and evapo-transpiration/infiltration systems. Design parameters for alternative systems must be approved by the District Engineer prior to use.

4.0 Sewage Flow Rates:

# of Bedrooms	Standard/Spec Design Trench	Mound/Sand Filter/ETI
1 bedroom	350 gal/day	150 gal/day/bedroom
2 bedroom	500 gal/day	"
3 bedroom	650 gal/day	"
4 bedroom	800 gal/day	"
5 bedroom	950 gal/day	"
6 bedroom	1100 gal/day	"

Additional bedrooms – 150 gallons per bedroom per day.

The District has no design parameters for commercial or multi-family. If this type of development is proposed, El Dorado County standards would govern

Type of System	Septic Tank Effluent Application Rate
Standard Trench	$5/(T)^{\wedge 0.5}$
Special Design Trench	$5/(T)^{\wedge 0.5}$
Mound (bed)	1.0 gpd/ft^2
Sand Filter (bed)	1.2 gpd/ft^2
ETI system	see section 4.6

Note: T = the percolation rate in minutes/inch

4.1 Standard Trench Disposal System Requirements

Each disposal trench shall be 3 feet wide and 3 feet deep with a length as required. A schematic is shown in Figure 4.1 An inspection riser pipe shall be located in the middle of each trench.

The correct disposal trench size is based on total sewage flow and allowable application rate. A sample calculation for a 4-bedroom home on a site with 30 minutes per inch percolation rate follows:

Total Sewage Flow = 800 gal/day

Application Rate = $5/(T)^{\wedge 0.5}$ T = percolation rate, min/inch

= 0.91 gal/sq ft/day

Required Trench Absorption Area = 800 gal/day/0.91 gal/sq ft/day = 967 sq ft

Lineal Feet of Trench Required = 967 sq ft/3 sq ft/lineal ft = 322 lineal ft

Individual lateral lines shall not be over 100 feet long.

Minimum distance between parallel trenches shall be 10 feet.Trench spacing shall depend on field slope as follows:

0 to 10% slope	minimum centerline spacing	10 ft
11 to 20% slope	minimum centerline spacing	12 ft
20 to 30% slope	minimum centerline spacing	14 ft
greater than 30%	trenches are not allowed	

Location of standard leach field on the parcel must allow for a 100 percent replacement or alternate system area.

4.2 Special Design Trench Disposal System

Special design trenches may be narrower, deeper, or shallower than standard trenches, designed to meet specific site conditions for disposal of septic tank effluent. A schematic is shown in Figure 4.2. The minimum size trench allowed is 18 inches wide and 30 inches deep. The maximum trench depth would be governed by safety considerations and depth to impervious layers.

A sample calculation for sizing a trench in soils with an average perc rate of 55 mpi serving a 4 bedroom home is presented below:

Total Sewage Flow = 800 gal/day

Application Rate = $5/(T)^{\wedge 0.5}$ T = percolation rate, min/inch

= 0.674 gal/sq ft/day

Required Absorption Area = 800 gal/day / 0.39 gal/sq ft/ day = 1187 sq ft

Assume trench depth below distribution pipe = 2.5 ft

Trench length = 1187 sq ft / 5 sq ft/ft = 237 lineal ft of trench

Individual lateral lines shall not be over 100 feet long, and an inspection pipe shall be located at the ends of each trench.

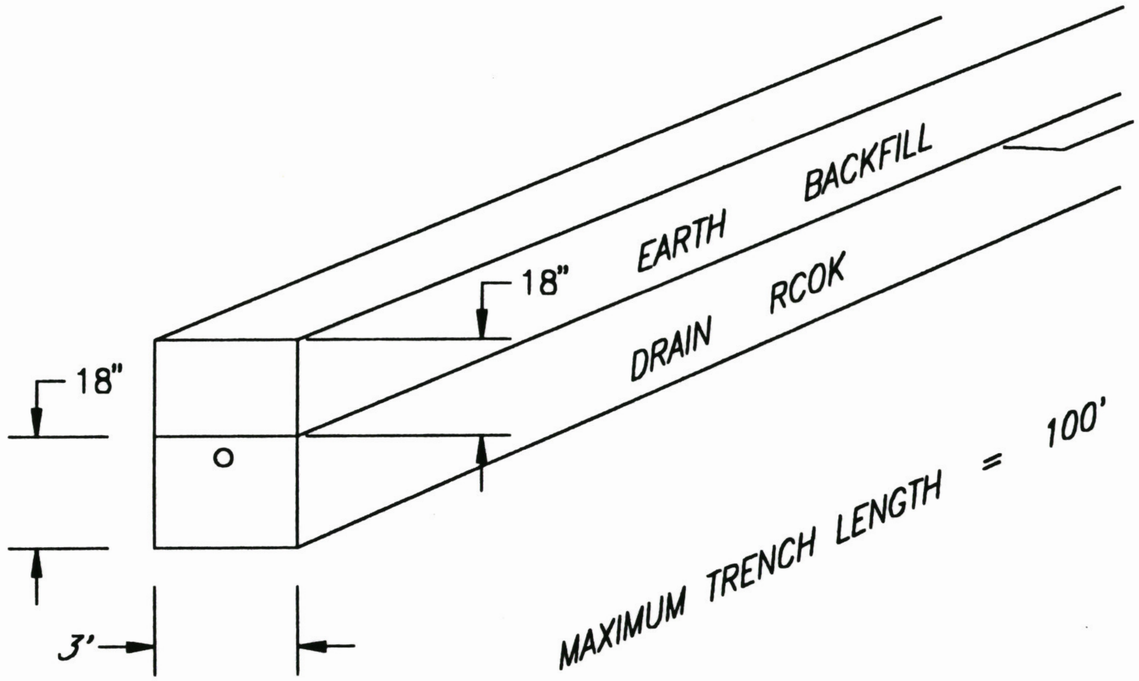
Location of standard leach field on the parcel must allow for a 100 percent replacement or alternate system area.

The minimum distance between parallel trenches shall be 10 feet. Trench spacing shall depend on field slope as follows:

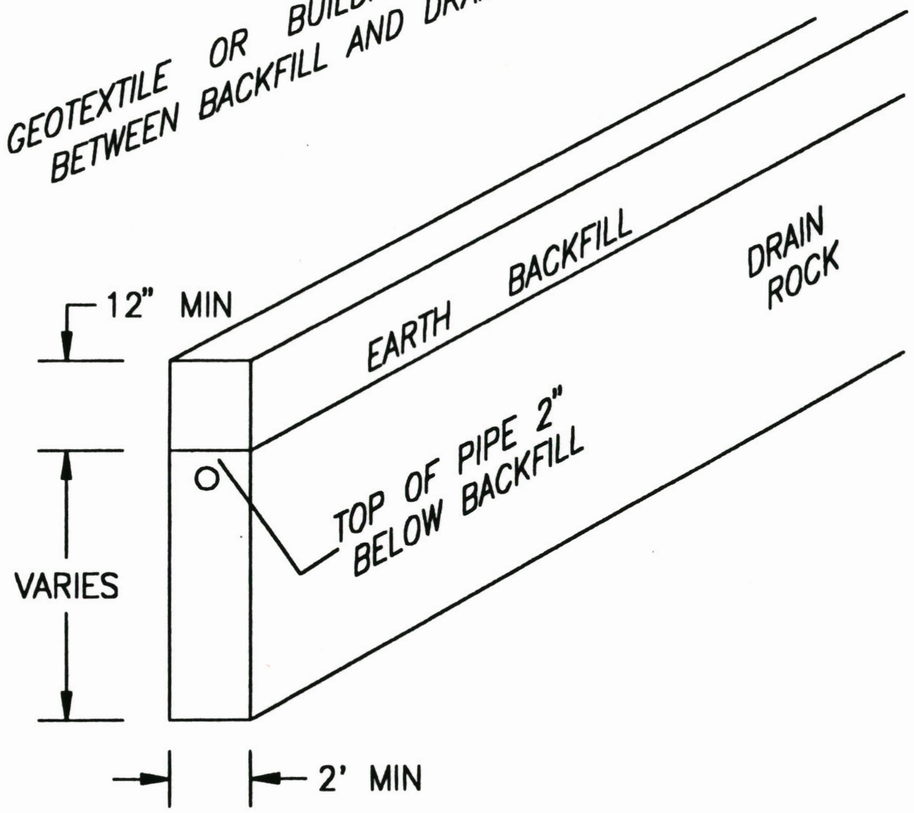
0 to 10% slope	minimum centerline spacing	10 ft
11 to 20% slope	minimum centerline spacing	12 ft
20 to 30% slope	minimum centerline spacing	14 ft
> 30%	minimum centerline spacing	by special design

Location of deep trench leach field on the parcel must allow for a 100 percent replacement or alternate system area.

FIGURE 4.1 STANDARD TRENCH

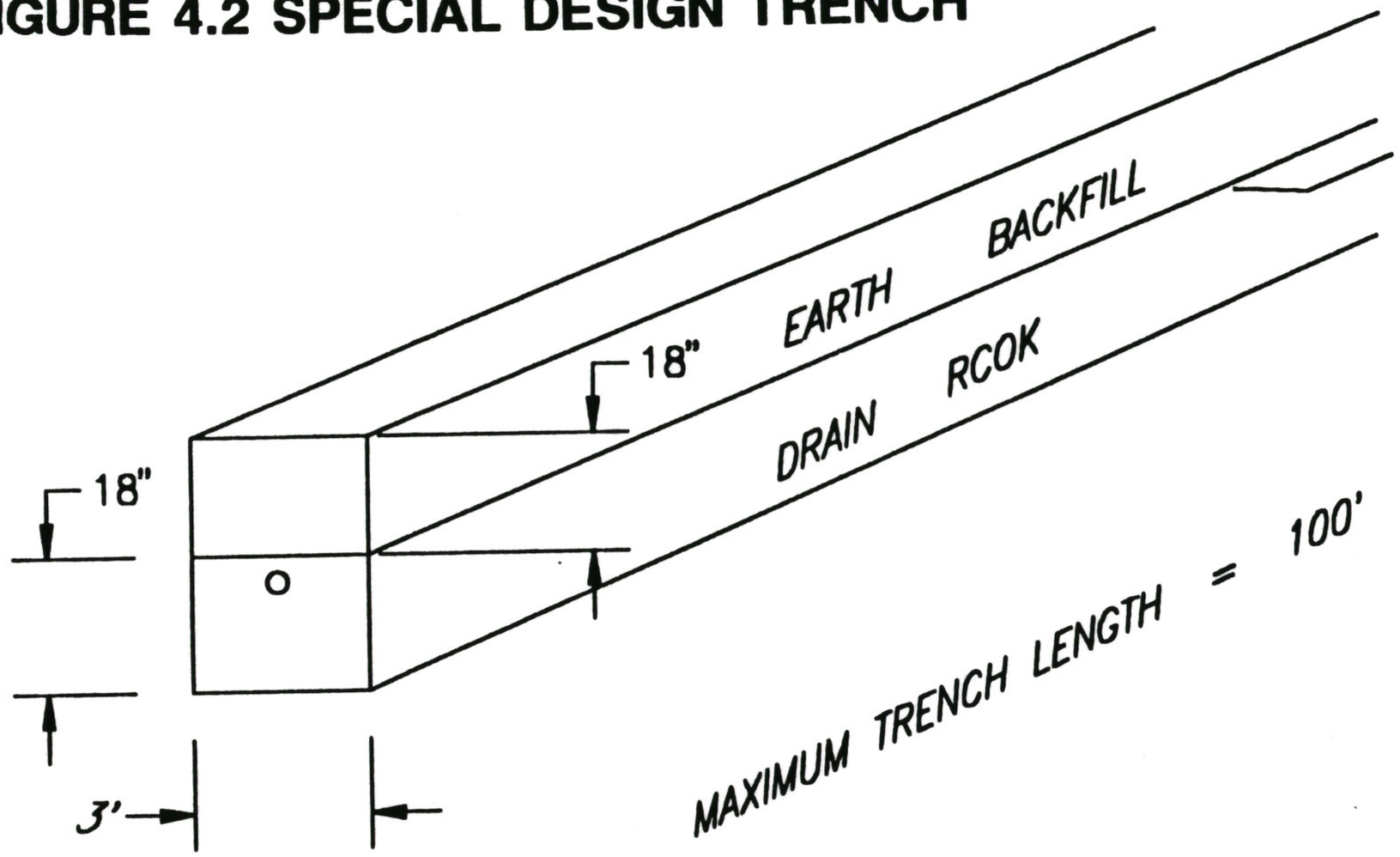


STANDARD TRENCH

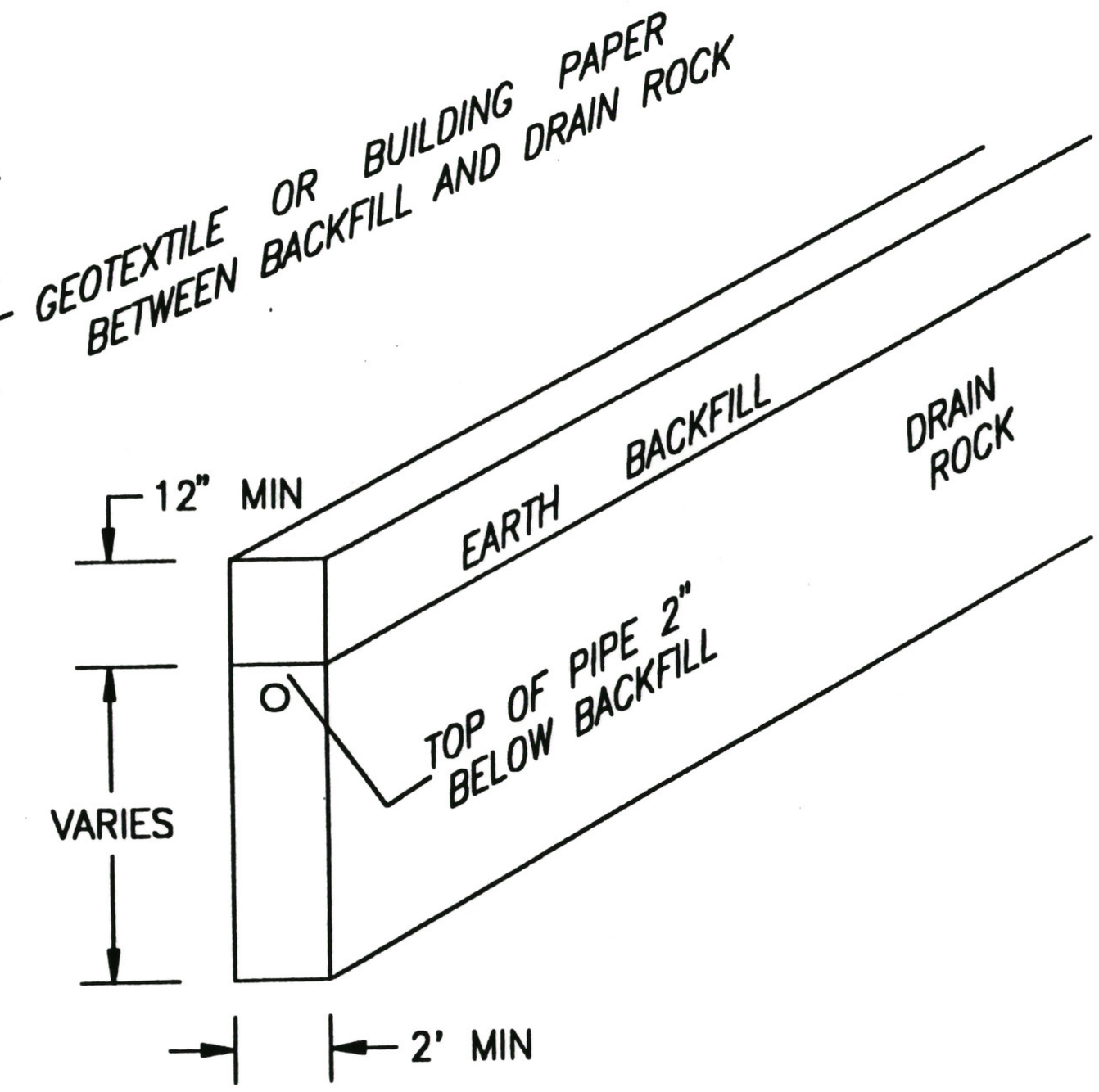


SPECIAL DESIGN TRENCH

FIGURE 4.2 SPECIAL DESIGN TRENCH



STANDARD TRENCH



SPECIAL DESIGN TRENCH

4.3 Capped Fill Trench Systems

Elevated trench systems are those special design systems which have shallow trenches with the top of the trench at the ground surface. The trenches are then covered with a minimum of one foot of loamy soil. The purpose of elevated trenches is to keep the septic tank effluent in a good soil layer above a limiting layer of poor soil or groundwater.

A typical elevated trench plan and section is shown below in figure 4.3.

The design requirements for elevated trenches are as stated for special design systems in Sections 4.2. Special care must be taken in covering the trenches to avoid a situation where the fill over the trenches does not create ponding at the uphill side of the trench.

The entire area must be provided with runoff diversion (see Section 4.6).

4.4 Mound System

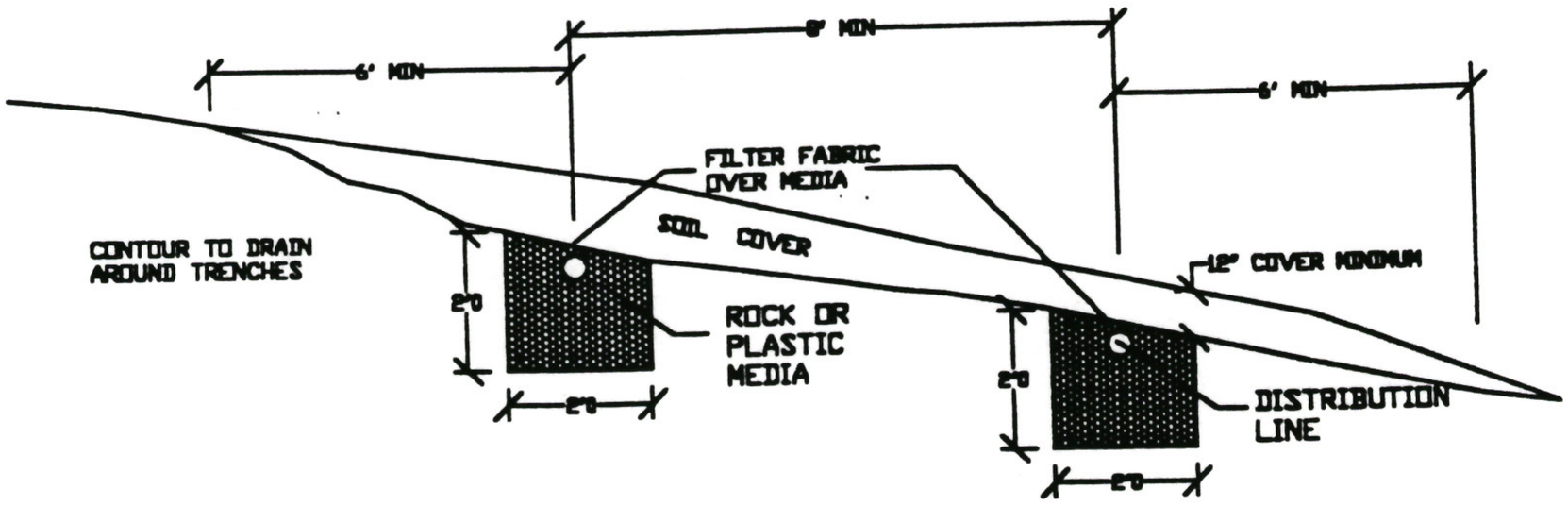
The mound system shown in Figure 4.4 consists of a wide, shallow, rock distribution bed over a sand fill treatment bed. The rock bed contains 2 or more perforated plastic pipes that spray the septic tank effluent over the rock distribution beds. The sand bed provides the treatment volume, spreading the wastewater over a large absorption area. This system is used typically in areas with shallow, yet permeable soils. The piping in the mound is fed from a pump or dosing siphon in a pump tank.

The location of the mound system on the parcel must allow for a 100 percent replacement or alternate system area.

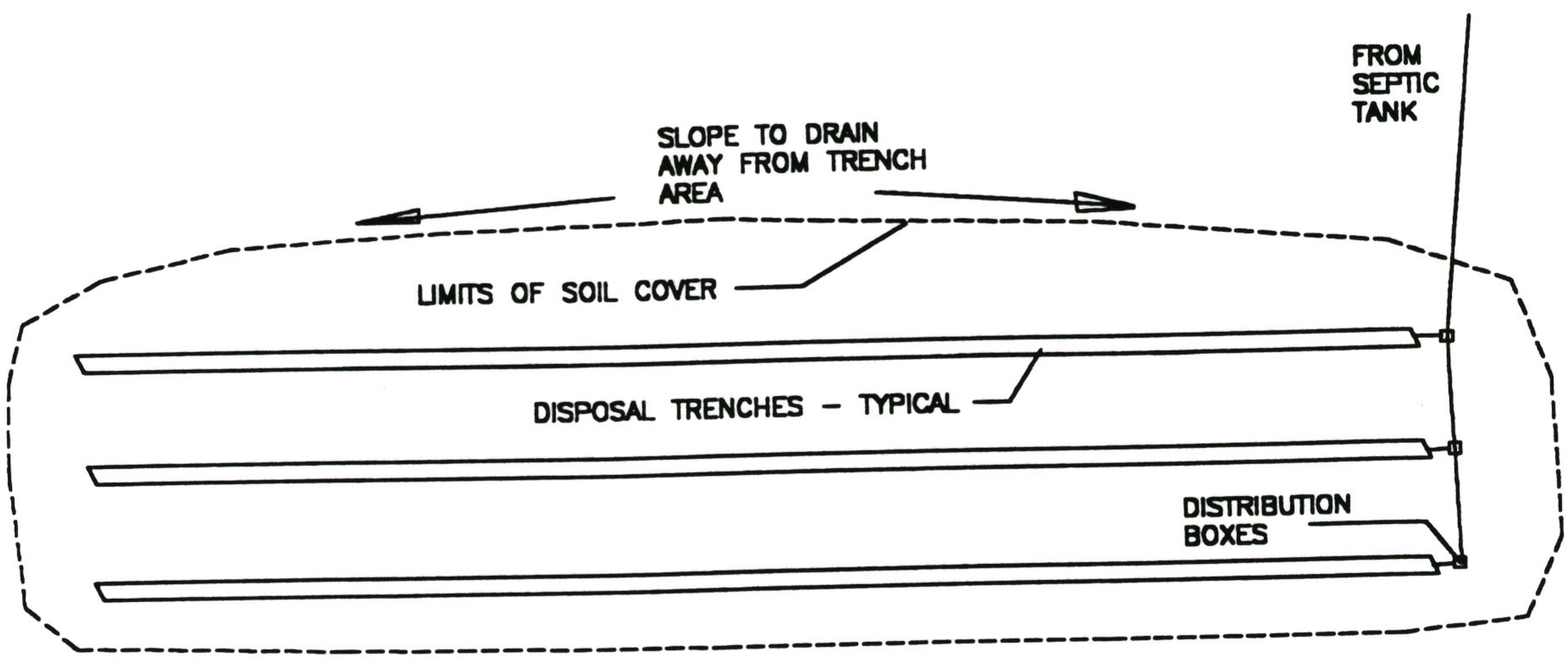
Mound system materials specifications and construction must follow the guidelines set forth in sections 5.6. There are several design parameters which the mound designer must consider in sizing the mound. These are:

- Linear loading rate that dictates the minimum length;
- Base area that is determined by percolation area
- Distribution bed area, which is determined by effluent loading and length
- Dosing frequency
- Depth to groundwater or impermeable layer, which determines sand depth
- Linear loading rate is the daily volume of sewage applied divided by the proposed mound length. It establishes the minimum length of the mound. The design value is between 5 to 8 gpd/ft.
- Base area is established dividing the daily sewage load by the soil percolation
- Distribution bed area is the daily sewage load divided by the bed-loading rate This establishes the area of gravel distribution beds required.
- Dosing frequency is used to calculate the volume of each dose, the pump sizing,
  distribution pipe sizing, and pipe perforation spacing and sizing.
- Depth to groundwater or impermeable layer establishes the depth of sand bed fill.

FIGURE 4.3 CAPPED FILL TRENCH

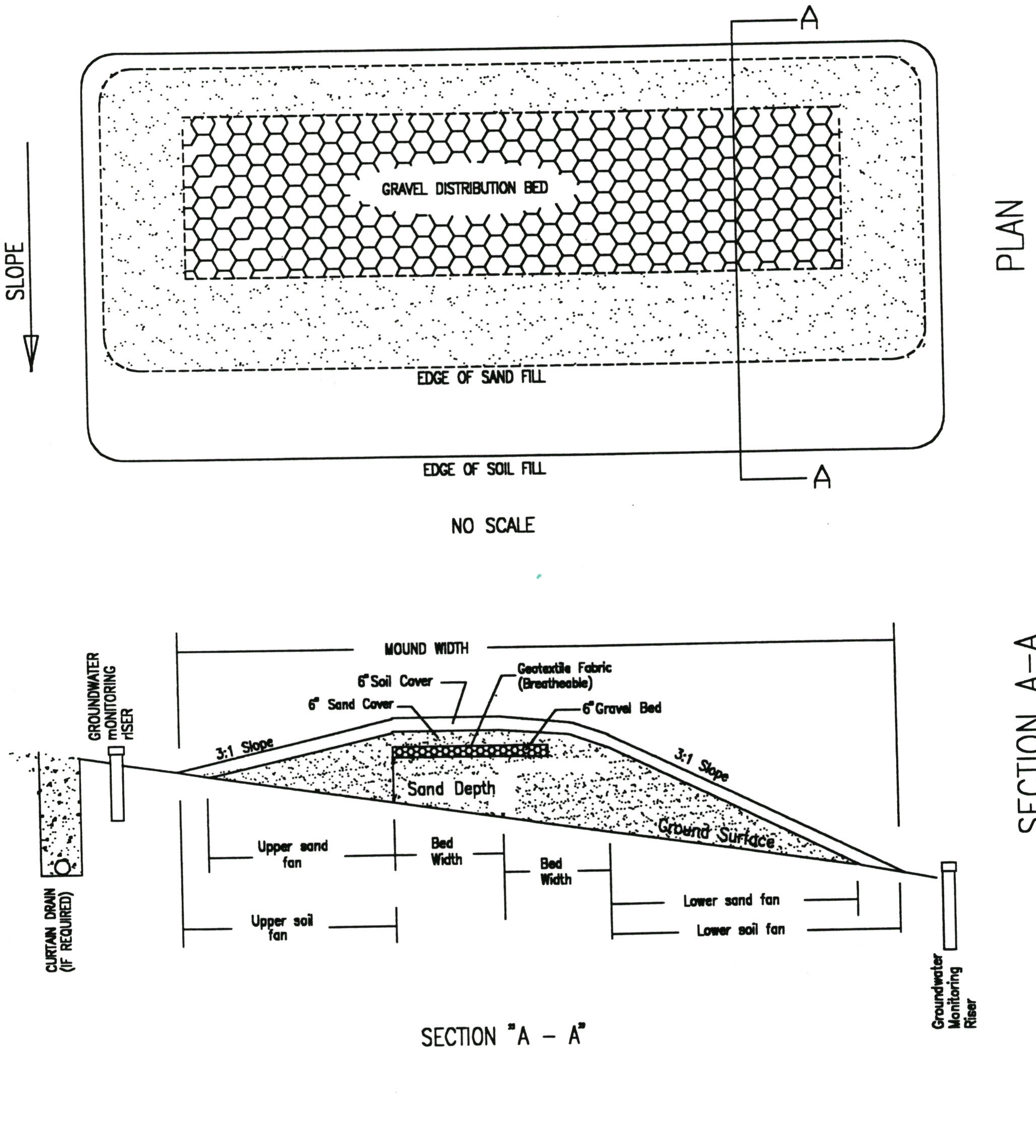


ELEVATED TRENCH SECTION – TYPICAL



PLAN VIEW ELEVATED TRENCH – TYPICAL

FIGURE 4.4 MOUND DISPOSAL



Typically, a mound is designed by first establishing the required distribution bed area. This is calculated dividing the daily wastewater flow by the allowable loading rate (1.0 gpd/sq ft maximum). Next, the minimum bed length is calculated. This is calculated dividing the daily wastewater load by the linear loading rate. Next, the bed width is calculated dividing the bed area by the bed length. Once the bed dimensions are calculated, and the sand depth established, (determined by soil depth to impermeable layer), the dimensions of the upper and lower sand and soil fans are calculated using the formulae shown in figure 4.5. These calculations establish the geometry of the mound. A typical mound, shown in section and plan is shown in Figure 4.4.

The pressure distribution piping is sized using standard pressure manifold hydraulics. The hydraulics must provide at least 6 feet of "squirt" when testing. The maximum orifice size is 1/4", and the minimum size is 1/8". The number of laterals and orifice spacing must be so that effluent is spread evenly over the entire distribution bed. laterals and orifices should be spaced about 18 to 30". The pump is sized to provide at least 8 doses per day at about 25 gpm/dose.

The distribution system shall consist of a 2-inch PVC pipeline from the distribution pump (3" with a siphon), a 2-inch PVC manifold system, and 1" to 1-1/4" PVC perforated laterals, as shown in Figure 4.6 The maxim mum length of the distribution laterals shall be determined by head loss in the lateral. There shall be no more than 5% pressure drop from the beginning of the lateral to the end.

The system shall be designed with "blow-offs" at each lateral end to facilitate periodic cleaning. The pump or siphon must be protected with an effluent filter that has maximum 1/8" screen size. The pump must meet the requirements of Section 5. In addition to the requirements in this manual, all El Dorado county Health Department design criteria for mounds must be met.

4.5 Sand Filters

Design elements in a sand filter are calculation of a sand bed size, depth, associated distribution piping and collection networks, feed and discharge pump sizing, and disposal trench sizing. Sand filters are used where the disposal soil is largely sand with very high percolation rates, in fractured rock with little soil for treatment, or in soils with very slow percolation rates. A section and plan of a typical sand filter is shown in Figure 4.7

Design criteria are:

Maximum hydraulic loading rate – 1.2 gal/day/sq ft
Minimum sand depth – 2 feet
Septic tank effluent dose rate – minimum of 8 times daily hydraulic load
Minimum pressure at distribution lateral orifice – 4 psi
Maximum orifice and distribution lateral spacing – 2 feet
Minimum septic tank effluent pump dose rate – 25 gpm
Sand filter effluent pump well size – ¼ daily hydraulic load
Sand specification – see section 5.6

The size of the sand bed is calculated dividing the prescribed flow (Section 3) by the hydraulic loading. This results in an area of sand required. The dimensions of the bed may be rectangular, square, or even circular. Rectangular or square shapes allow simpler distribution hydraulic calculations. The minimum depth of sand is 2 feet. More may be used, but research has shown that most treatment occurs in the top 2 feet of sand.

Septic tank effluent is distributed over the sand bed through a network of small diameter PVC pipes. The size of pipe and spacing of the pipe is based on hydraulic calculations which allow even distribution of effluent. Hydraulic calculations should be provided as part of the design. Typically, on an 18' x 20' sand bed, distribution pipes and orifices should be sized so that there is maximum 2 foot spacing between each orifice, less spacing is better The minimum orifice size is 1/8", the maximum is 5/32".

The filter must be fed with a pump or dosing siphon. Either must be adjusted so the filter is fed numerous times per day. A minimum of 8 doses per day is the standard. Electric controls may be installed which program a given dose time per hour. The pump or dosing siphon must provide at least 10 ft of head at the orifice, and be verifiable by squirt testing. Pump specifications should be provided as part of the design. The septic tank effluent must be protected with a basket or screen which screens down to 1/8" maximum particles.

The ends of each distribution lateral should have a flush valve in a valve box to allow lateral flushing. All bends should be long radius to allow flushing with a high-pressure nozzle.

The sand filter effluent is collected at the bottom of the filter with slotted or perforated pipe that drains to a wet well. The bottom of the filter must be sloped to the well to allow this. The minimum slope is 1%.

The wet well must be sized to hold at least ¼ of the daily flow without flooding the filter collection pipes.

The effluent disposal pump must be sized to dose at least ¼ of the daily design flow, with sufficient design pressure to provide at least 6 feet of head at the effluent disposal lateral orifice as evidenced by a squirt test.

The final disposal of sand filter effluent is to disposal trenches or beds. The disposal trench sizing is based on the percolation rate and the calculations as stated in Section 4.2.

4.6 Combination Evapotranspiration/Infiltration (ETI) System

The combination system provides for effluent disposal by both evapotranspiration and infiltration. The system consists of an ET sand bed overlying a deep trench, as shown in Figure 4.8. When the system is in use, wastewater will flow into and fill the distribution trough located in the sand bed. Water from the trough is pulled upward through the sand by capillary action. Disposal of the water to the atmosphere occurs by evaporation and transpiration through the grasses planted on top of the system. If wastewater cannot be disposed of by evapotranspiration as fast as it flows into the system, the excess effluent will flow over the sides of the distribution trough and will filter down through the sand to the deep infiltration trench.

The surface of the ET bed shall be covered by a 4-inch layer of rock-free topsoil and shall be crowned so there will be about 3 percent slope (after initial settling) from the centerline of the bed toward the sides. This will help reduce the amount of inflow of rainwater through the ET bed surface.

A cover of phreatophyte grasses shall be planted on the surface of the ET bed. These grasses will help dispose of wastewater via evapotranspiration and will help control erosion. The roots of these grasses will penetrate the soil cover layer; yet will not be so large that they damage the effluent distribution pipe. Vegetation types are specified in Section 6.

The ET beds shall be constructed over the 5-foot deep trenches on a 6-foot to 8-foot wide "terrace" cut along the slope contours.

The sand fill material shall be a clean, fine, uniform sand having a D50 size of 0.25 =n (50 percent by weight smaller than 0.25 mm).

The ETI system length is based on the design flow, ET rates for the area, and precipitation. The design flow used for this system is 150 gal/bedroom/day.

Sample Calculations for a 4-bedroom home follow:

Design Flow = 150 gal/bdrm/day x 4 bedrooms = 600 gal/day

Monthly Volume = 600 gpd x 30 days = 18,000 gal/month = 2,410 cu ft/month

ET Bed Surface Area Required = effluent volume/ assimiliation capacity
{assimilation capacity = (ET - P + 1)}
= 2,410 cu ft/month/1.00 ft/month = 2,410 sq ft

ET Bed Length = 2,410 sq ft / 6 ft (ET top bed width) = 402 ft

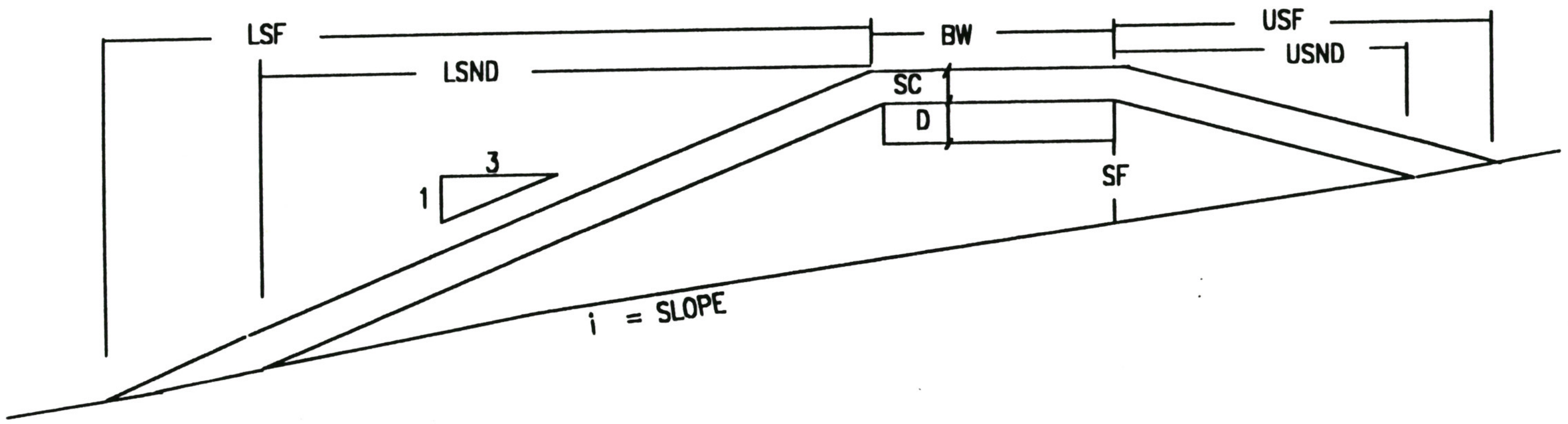
Therefore, the overall dimensions of the combination ETI system are as follows: Use four 100-foot long ETI trenches. Each ET bed is approximately 6 feet wide by 2.5 feet deep along the centerline. Each trench (which underlies the ET bed) is 1.5 feet wide by 5 feet deep. Trenches must be located a minimum of 10 feet apart.

Location of the ETI system on the parcel must allow for a 100 percent replacement or alternate system area.

The ET bed trench laterals shall be connected in serial or parallel distribution. The wastewater distribution system consists of standard 4-inch ABS plastic drain pipes placed in a ¾ inch to 1-inch gravel base fill material within a plastic-lined distribution trough. The trough consists of 24-inch diameter, half-round, corrugated metal pipe (CMP) or District Engineer's approved equal. The 100-foot long trough is made by placing ten, 10-foot sections, of the half-round pipe in the trench with each section overlapping the next by about 6 inches. The laps must be watertight.

FIGURE 4.6 MOUND FORMULAE

MOUND GEOMETRY CALCULATIONS



UPSLOPE:

USND = (3)(SF+D)[1−3/(3+1/i)]
USF = (3)(SF+D+SC)[1−3/(3+1/i)]

DOWNSLOPE:

LSND = (3)(SF+D+D*i)+([G*(SF+D+D*i)(i)/(1−3*i)]
LSF = (3)(SF+D+D*i+SC)+[9*(SF+D+DI+SC)/(1−3*i)]

SIDES (AT MIDPOINT)

SSND = (3)[SF+(BW/2*i)+D)
SSF = (3)[SF+(BW/2*i)+D+SC]

4.7 Water Diversion

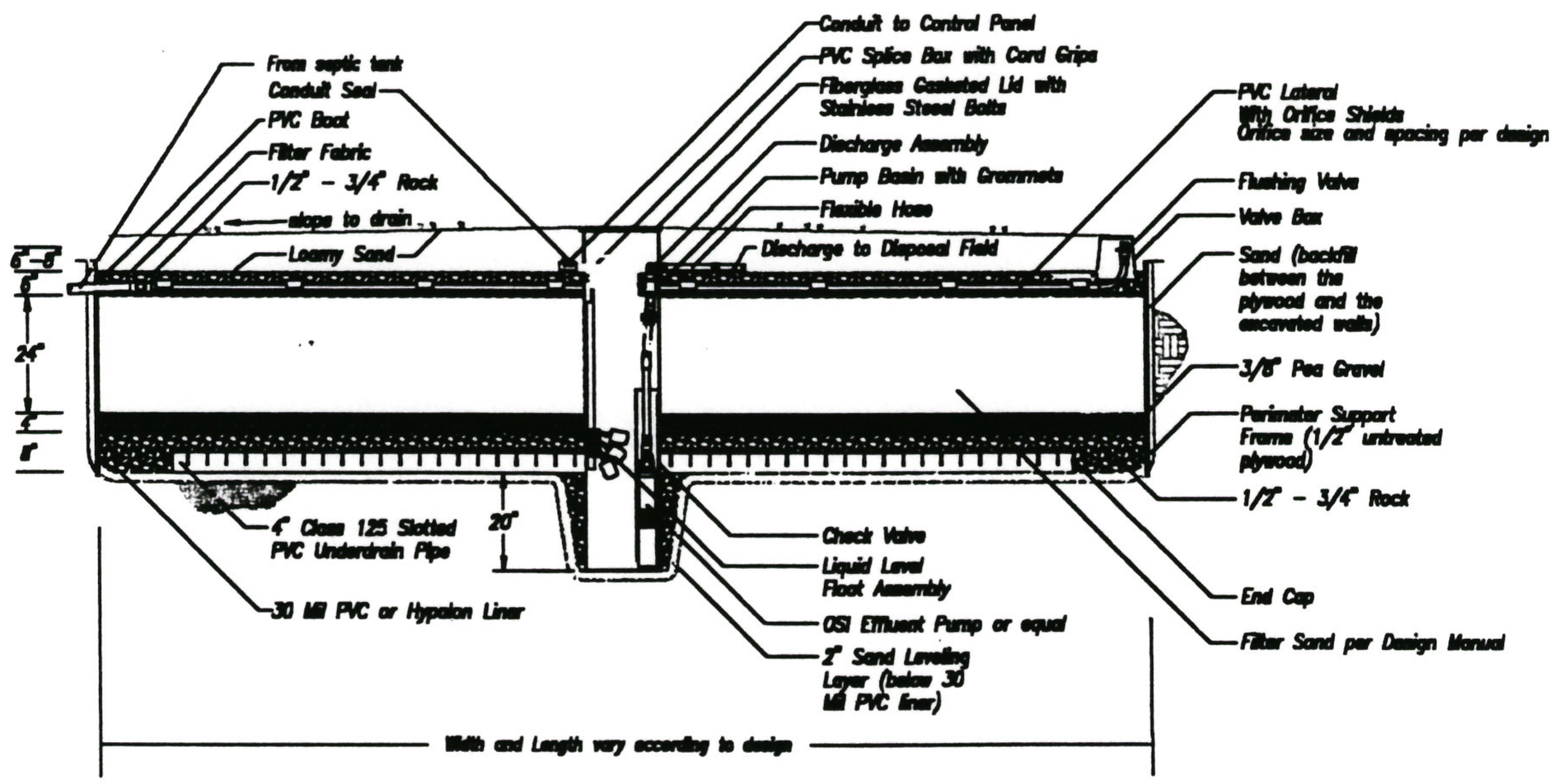
If the disposal system lies in an area, which may be subject to surface or shallow subsurface drainage, a diversion trench shall be constructed on the upslope side of the system.

The diversion trench shall be designed to intercept surface and shallow subsurface drainage and divert it around the ends of the disposal system.

The diversion trench shall consist of an 18-inch wide gravel-filled trench with a perforated pipe laid in the bottom. An impervious layer of plastic or PVC may be required on the downslope side of the trench to prevent ponded water from percolating to the field below. A 4-inch thick layer of topsoil shall cover the trench. The design depth of the trench will depend upon local conditions. The trench must have a minimum grade of 0.5 percent from the high point to the end to insure effective runoff. A typical diversion trench is shown in figure 4.9

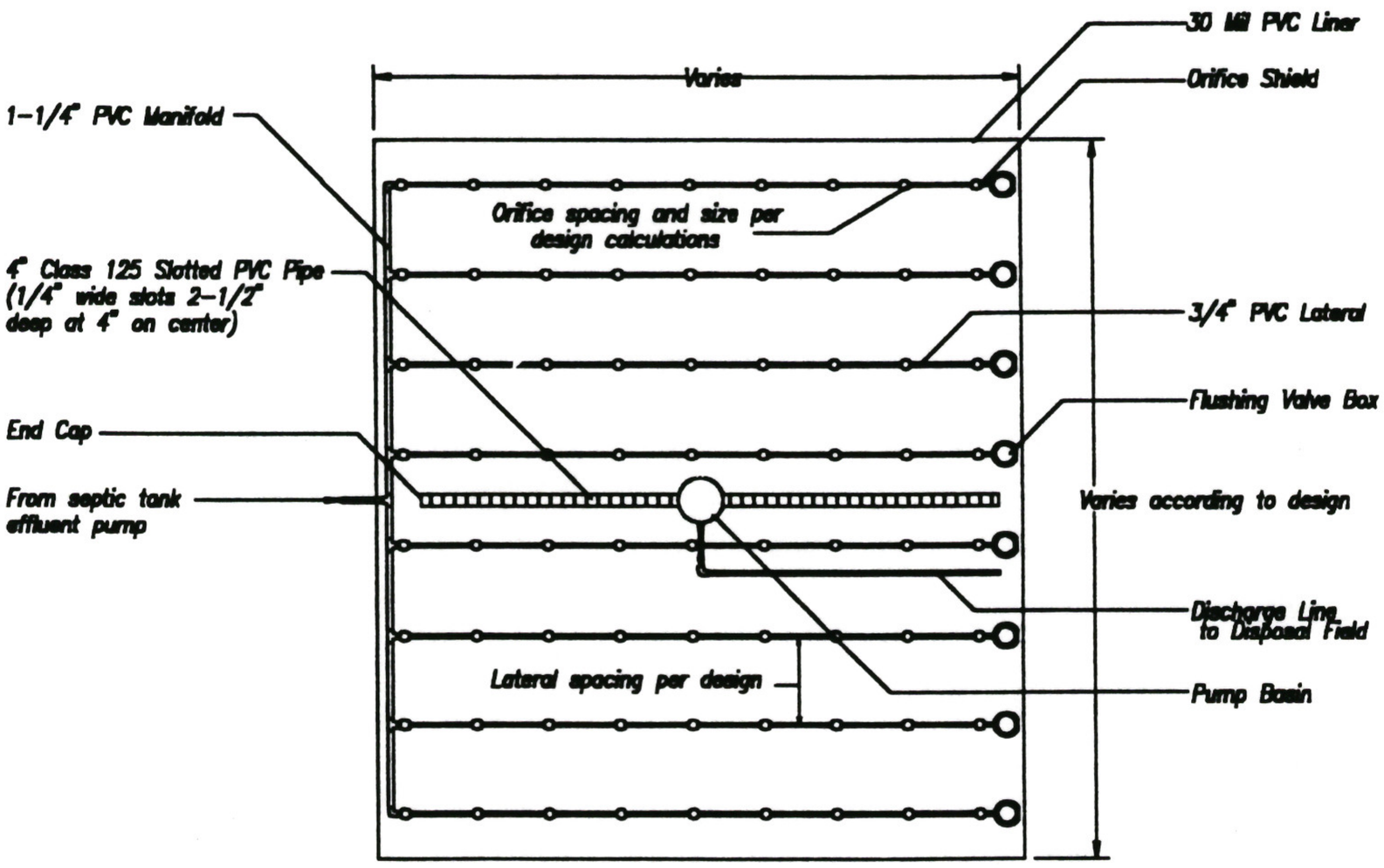
Runoff from roof drains and paved areas shall be directed away from the sewage disposal area. The outlet from the diversion trench must be at least 25 feet from the lowest disposal trench or bed.

FIGURE 4.7



SECTION VIEW - SAND FILTER WITH PUMP DISCHARGE

NO SCALE, SCHEMATIC ONLY



TOP VIEW - TYPICAL PUMP DISCHARGE SAND FILTER

NO SCALE - SCHEMATIC ONLY

FIGURE 4.8 ETI DISPOSAL

EVAPO-TRANSPIRATION/INFILTRATION SYSTEM SECTION

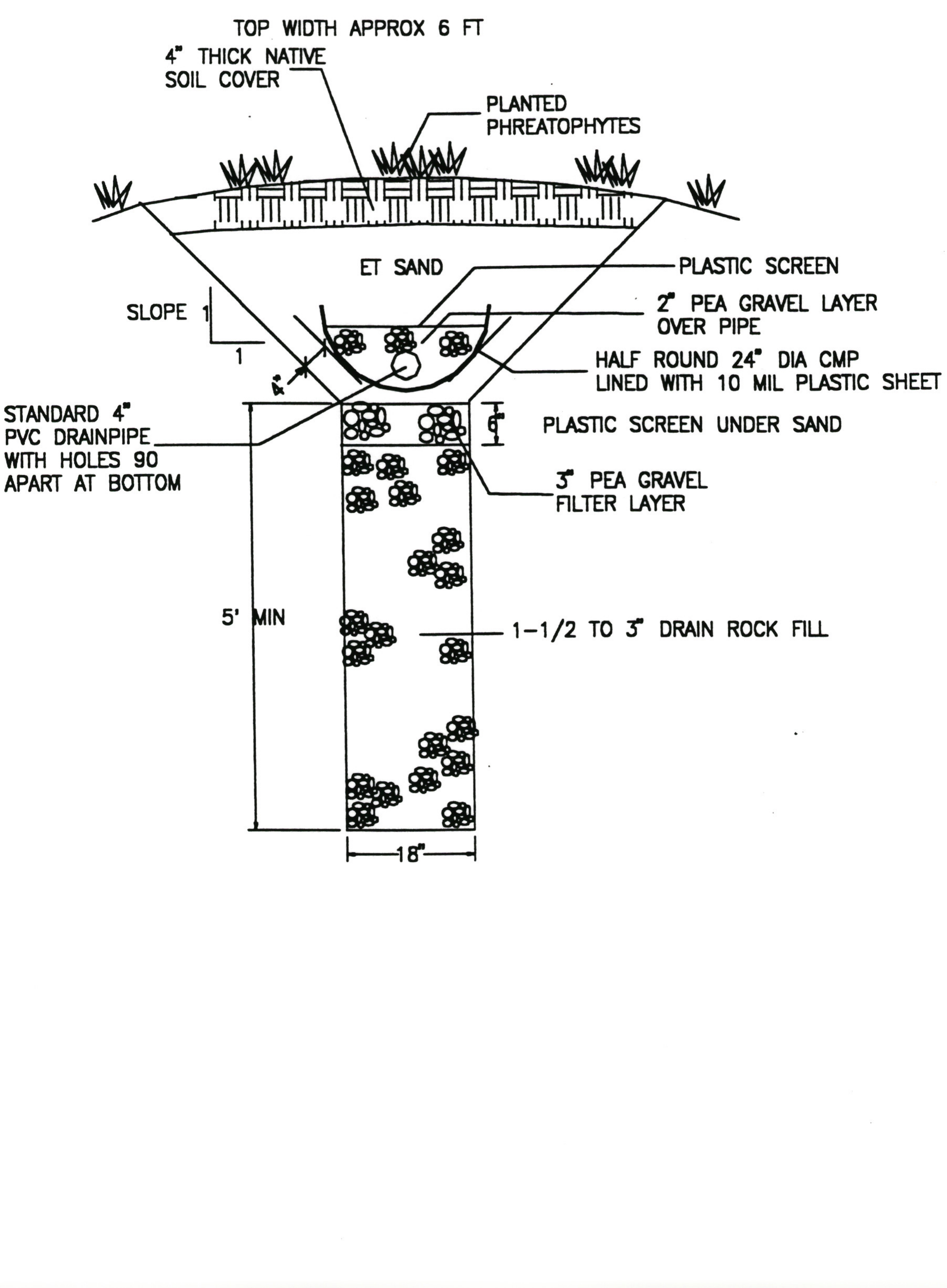
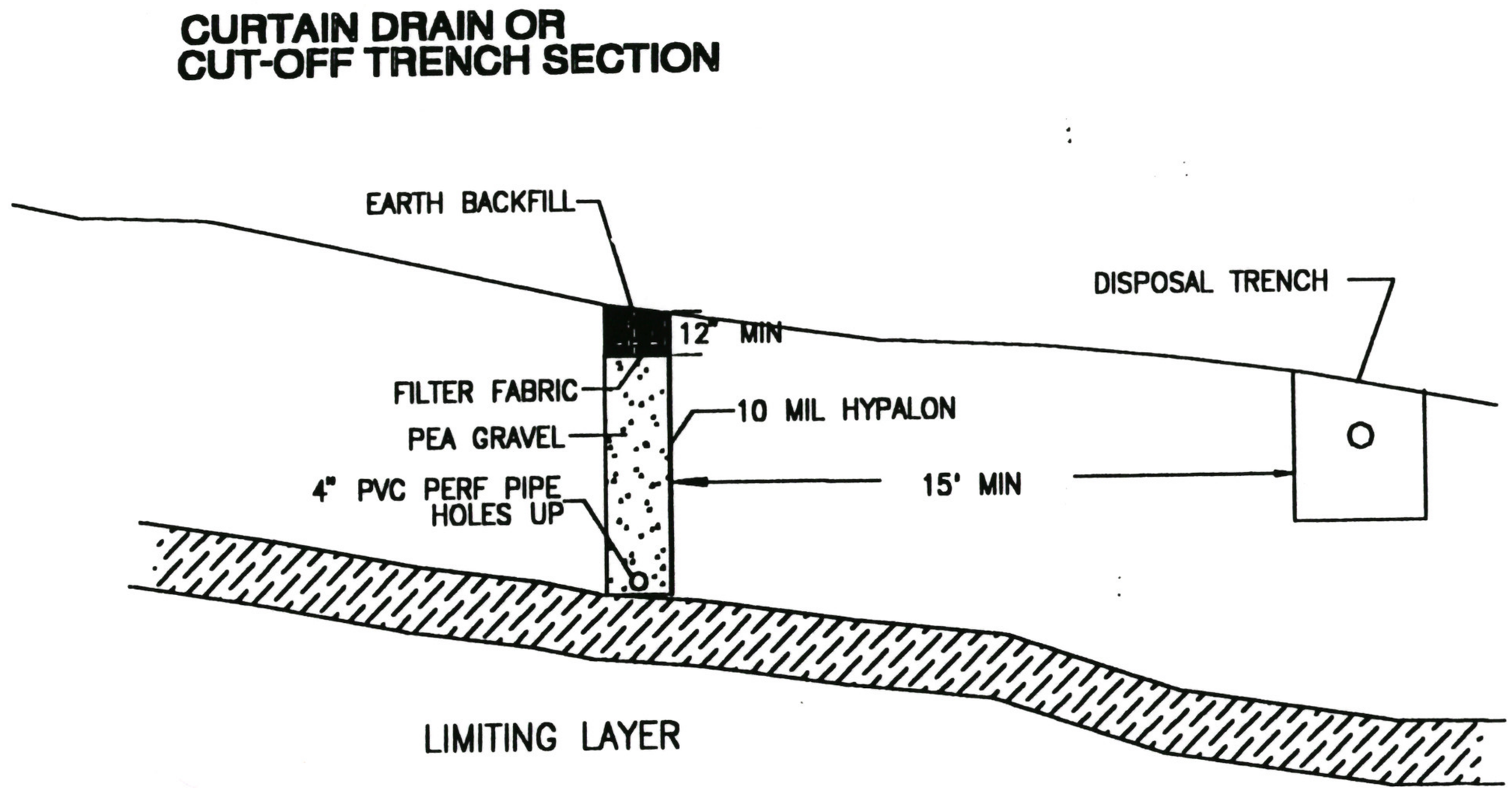


FIGURE 4.9 DIVERSION TRENCH



SECTION 5. - CONSTRUCTION MATERIALS AND PROCEDURES

This section covers the required materials and procedures used in design and installation of wastewater disposal systems.

5.1 Septic Tanks

Standard precast monolithic waterproof concrete septic tanks are to be used with each of the disposal system alternatives. Fiberglass, plastic, steel, and wood tanks are not allowed.
The septic tank requirements are as follows:

The liquid capacity of all septic tanks shall conform to the requirements found in Section 4.

Septic tanks shall be bedded level on at least 4 inches of sand or similar approved material. The bottom of the tank excavation must be level and free of protruding rocks, roots, or humps. There shall no standing groundwater in the tank excavation.

Septic tank installers shall be required to fill the tank with water above the lid joint level to prove water tightness before the tank is back-filled.

Septic tanks installed under concrete or black top paving shall have the required manholes, accessible by either extending the manhole openings to grade in a manner acceptable to the District Engineer or by providing a removable concrete or other approved section, not less than 24 inches in the least dimension, in such concrete or black top paving which is located directly over the required septic tank manholes. This includes sludge level inspection risers.

Both the inlet and outlet tees or baffles shall extend 4 inches above and at least 12 inches below the water surface. The invert of the inlet pipe shall be at least 2 inches above the invert of the outlet pipe.

Inlet and outlet pipe fittings or baffles and compartment partitions shall have a free vent area equal to the required cross sectional area of the house sewer or private sewer discharging therein to provide free ventilation above the water surface from the disposal field through the septic tank, house sewer and stack to the outer air.

The total inside depth of the tank shall not be less than 9 inches greater than liquid depth. The cover of the septic tank shall be at least 2 inches above the top of the back vent openings.

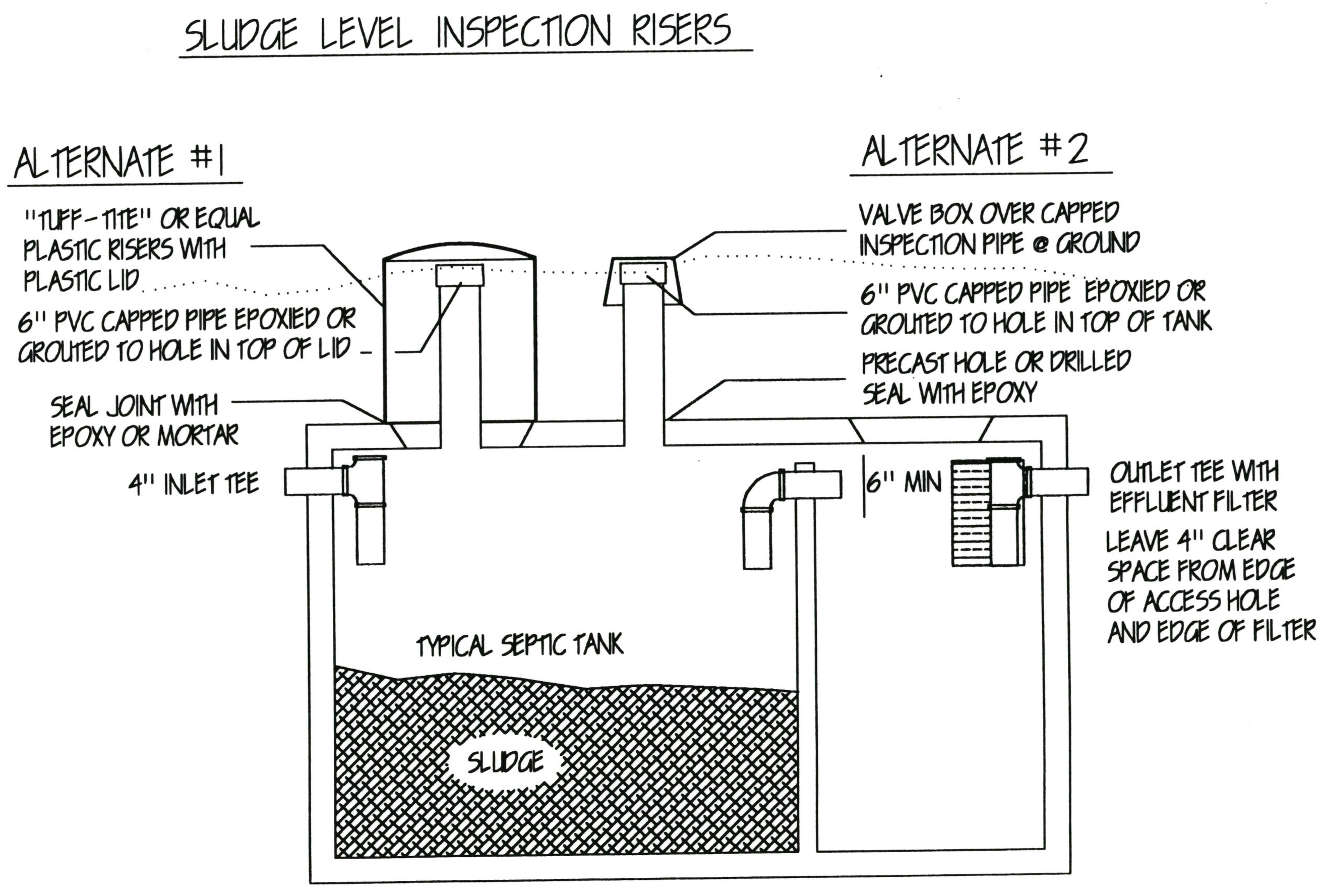
Partitions or baffles between compartments shall be concrete and shall extend at least 4 inches above the liquid level. An inverted fitting equivalent in size to the tank inlet, but in no case less than 4 inches in size, shall be installed in the inlet compartment side of the baffle with the bottom of the fitting placed midway in the depth of the liquid.

Septic tanks shall have a minimum soil cover of 12 inches with inspection access risers as shown in figure 5.1.

Minimum allowable offset distances for locating septic tanks and disposal systems are found in Section 2.2

Tanks larger than 2,000 gallons, or of special design, shall be approved by the District prior to installation. This includes any pumping unit used in conjunction with effluent disposal.

FIGURE 5.1


SLUDGE LEVEL INSPECTION RISERS
ALTERNATE #1
"TUFF-TITE" OR EQUAL PLASTIC RISERS WITH PLASTIC LID
6" PVC CAPPED PIPE EPOXIED OR GROUTED TO HOLE IN TOP OF LID
SEAL JOINT WITH EPOXY OR MORTAR
4" INLET TEE
ALTERNATE #2
VALVE BOX OVER CAPPED INSPECTION PIPE @ GROUND
6" PVC CAPPED PIPE EPOXIED OR GROUTED TO HOLE IN TOP OF TANK
PRECAST HOLE OR DRILLED SEAL WITH EPOXY
6" MIN
OUTLET TEE WITH EFFLUENT FILTER
LEAVE 4" CLEAR SPACE FROM EDGE OF ACCESS HOLE AND EDGE OF FILTER
TYPICAL SEPTIC TANK
SLUDGE

5.2 Septic System Pump Wells and Pumps

Drainage from septic tanks located below the level of the disposal field shall discharge into an approved watertight septic system pump well. The minimum size pump well is 500 gallons. The septic system pump well shall receive septic tank effluent by gravity only, using 4" PVC pipe..

The minimum size of any pump discharge piping shall not be less than 1.5 inches in diameter. This discharge piping shall be provided with an accessible check valve and gate valve. All electrical connections for the pump and floats necessary for the pumping operation shall be located where they will be readily and easily accessible for inspection and repair at all times, and shall be enclosed in a watertight pit fitted with an adequately sized removable cover.

Check valves, gate valves, pumps, motors, switches, and electric control devices shall be designed and manufactured to operate in septic tank effluent or sewage.

Septic system pump wells shall be watertight and shall be constructed of concrete and constructed in accordance with specifications for septic tanks. Pump wells shall have access manholes and shall be equipped with risers extending to the ground surface. The drainage and venting systems, in connection with the septic system pump well, shall be installed under the same requirements as for gravity systems.

The lids to the pump well risers shall be gasketed and bolted to the pump well tank risers

All electrical controls, panels, and alarms shall be mounted, in a weatherproof enclosure, on an external house or garage wall, immediately next to the pump tank, and be easily available for inspection and testing. A typical system is shown in figure 5.2.

Sewage Pump specification and their installation shall be as follows:

-All pumps installed shall have a written guarantee for sewage service, capable of passing ¾" solids. Copies of this guarantee shall be provided at the time of inspection.

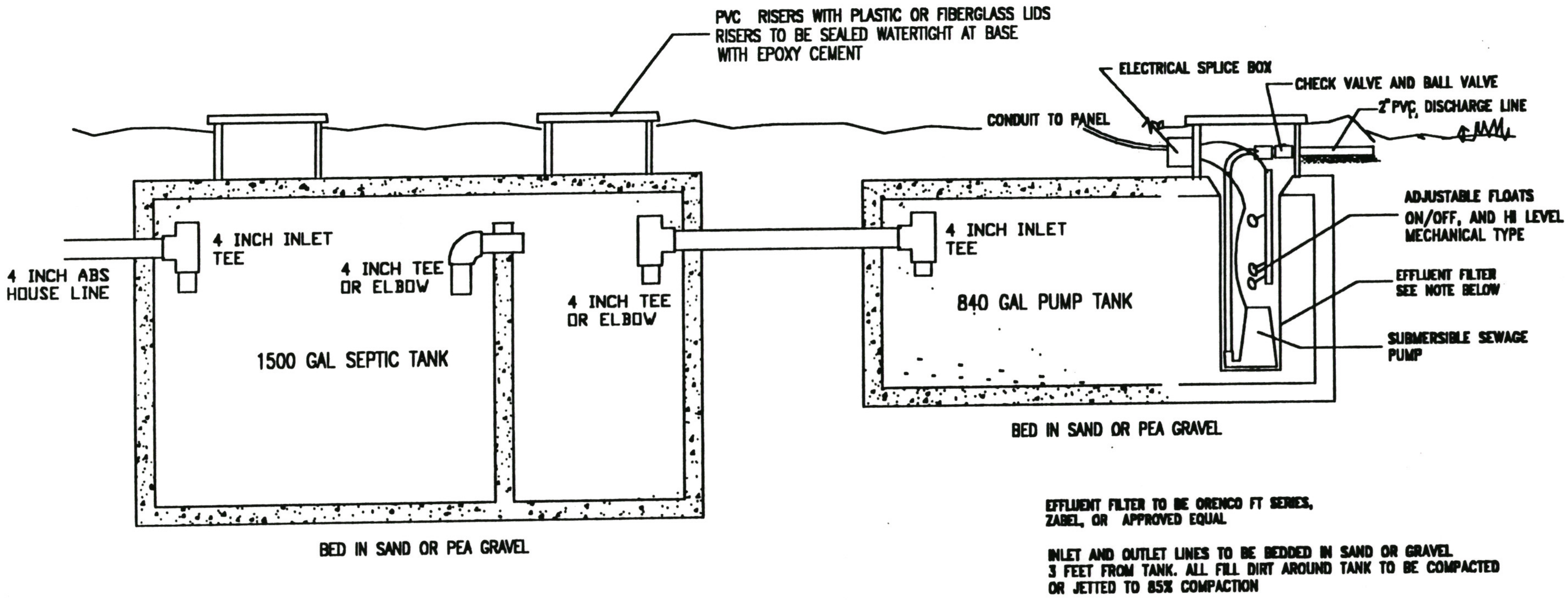
- All control switches shall be adjustable; mechanical or mercury float controls are recommended. Diaphragm controls are not acceptable.
- The pump control panel shall be weather proof (NEMA Type 4) with padlocking latch, shall include Off-Manual-Automatic modes for normal and maintenance purposes, and shall be equipped with an audio-visual alarm system.
- Separate circuit breakers shall be provided for the pump and the alarm systems. The pump's internal overload switch or current limiting circuit breaker shall not activate the alarm system.

-The pump shall be capable of discharging the specified gallons/minute at design discharge head. The pump motor shall be single phase, 120 or 230 volt with built-in load and automatic reset. There shall be an approved check valve located within the immediate vicinity of the pump discharge line. (see figure 5.3)

-There shall be an approved gate valve located downstream from the check valve to facilitate isolating that same check valve. (see figure 5.3)

- The pump shall be installed in such a manner as to facilitate easy access for routine service (i.e. a pull rope and quick disconnect coupling in the discharge line).
- Pump tanks shall be water tight. The tank manhole shall be fitted with a waterproof riser to finish grade.
- The discharge piping shall be 2" PVC Schedule 40 solvent weld per ASTM D1785 or equal. Install pipe per ASTM D2855 and as recommended by pipe manufacturer.
- An operational inspection, by the District, is required prior to final approval.
- Effluent pumps shall be installed inside a pump screen similar to Orenco Systems Inc Model SV1548 or equal.

FIGURE 5.2



EFFLUENT FILTER TO BE ORENCO FT SERIES,
ZABEL, OR APPROVED EQUAL

INLET AND OUTLET LINES TO BE BEDDED IN SAND OR GRAVEL
3 FEET FROM TANK. ALL FILL DIRT AROUND TANK TO BE COMPACTED
OR JETTED TO 85% COMPACTION

SEPTIC/PUMP TANK X-SECTION

5. 3 Distribution System

Connections between a septic tank and a distribution box, or between a distribution box and leach field, shall be made of PVC or ABS tightline, laid with approved watertight joints on compacted fill.

Minimum depth of earth cover over lines shall be 12 inches. Minimum grade of lines shall be 3 inches per 100 feet. Maximum grade of lines shall be 6 inches per 100 feet.

Drain lines shall be constructed of perforated plastic according to the specifications set forth in Sections 5.4 and 5.5. All bends used in the disposal field shall be made with appropriate fittings. The mitering of drain pipe is not acceptable

Where two or more drain lines are installed, a distribution box of sufficient size to receive lateral lines shall be constructed at the head of each disposal field. The inverts of all outlets shall be level and the invert of the inlet shall be at least one inch above the outlets. Suitable baffles shall be provided to insure equal flow. Distribution boxes shall be built on a level concrete slab, installed in natural or compacted soil.

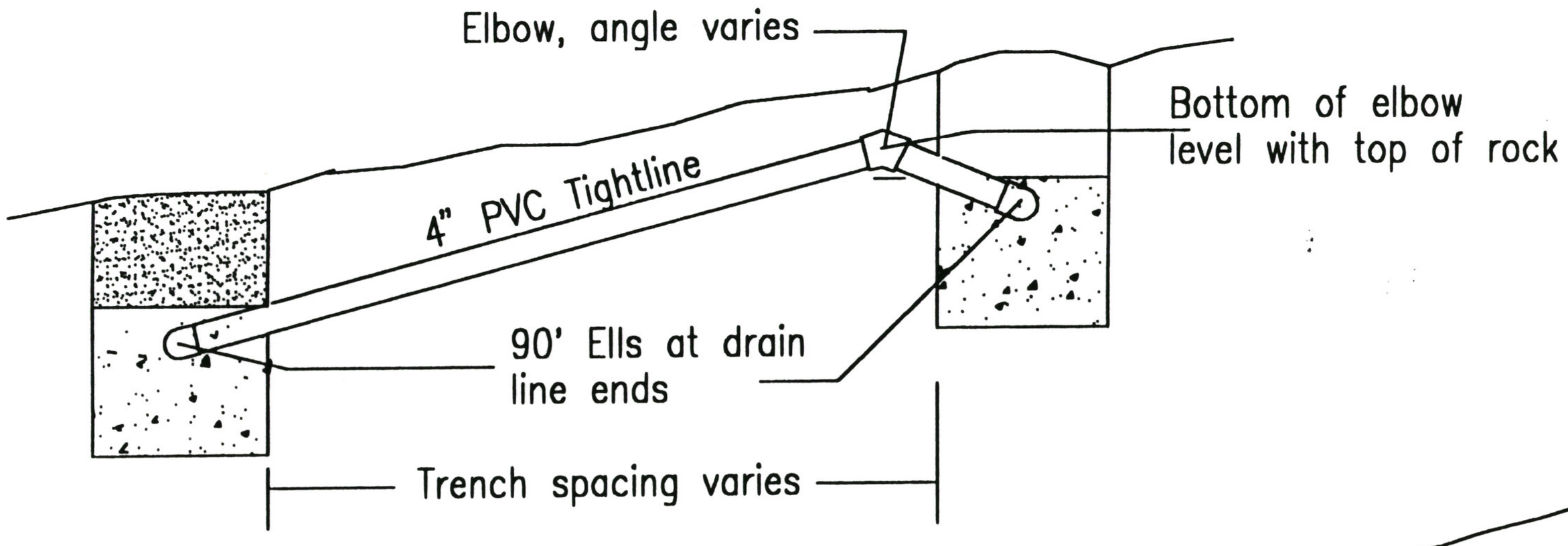
All laterals from a distribution box to the disposal field shall have ABS or PVC tightline pipe with watertight joints. Multiple disposal field laterals, wherever practicable, shall be of uniform length

On sloping ground, trenches shall be stepped. The lines between each horizontal section shall be made with watertight joints.

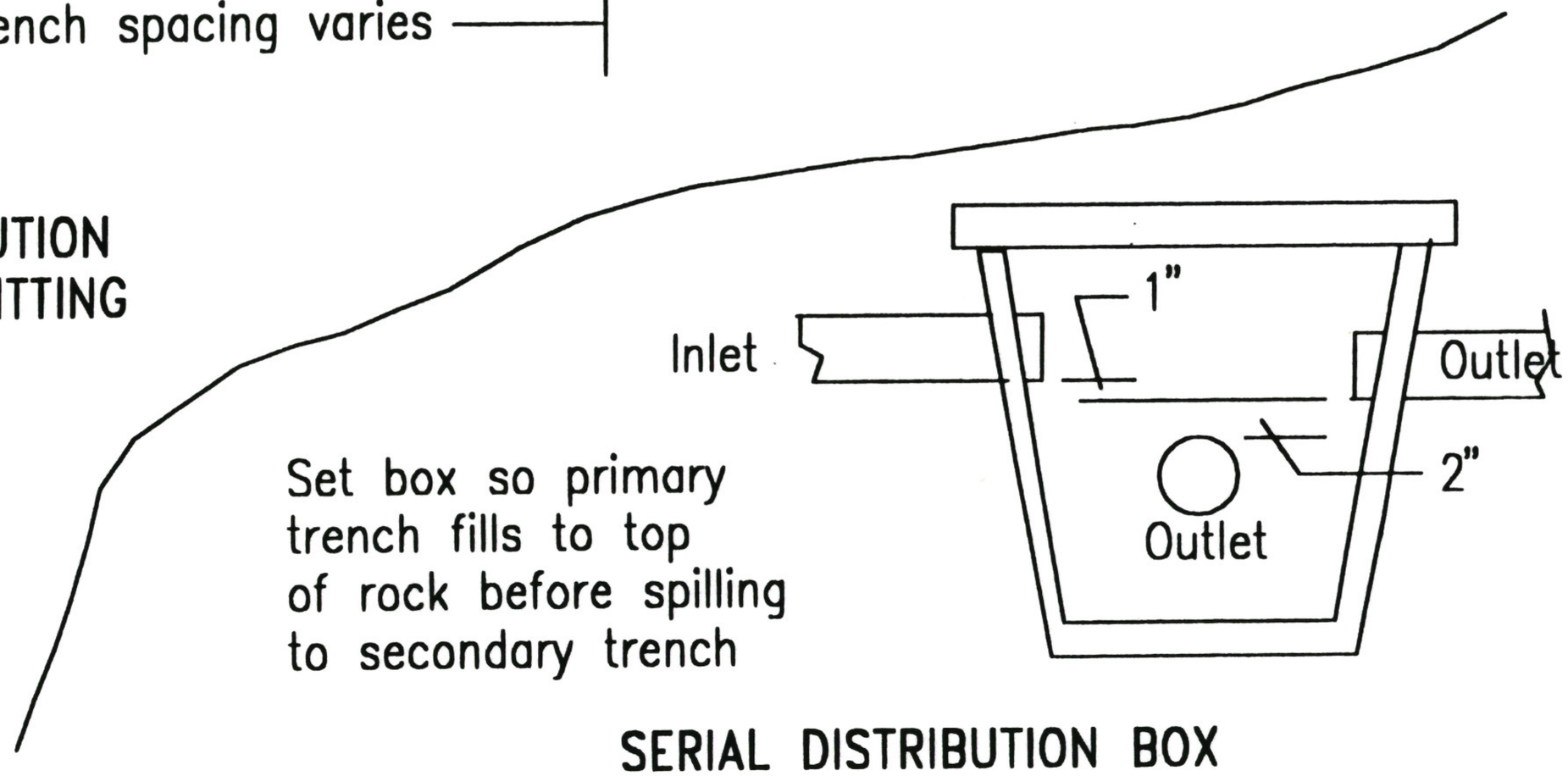
Before placing rock or plastic filter material in a prepared excavation, all smeared or compacted surfaces shall be removed from trenches by raking to a depth of one inch and the loose material removed.

Filter material specified in Sections 5 4 and 5.5 shall be placed in the trench to the depth and grade required by this manual. Perforated drainpipe shall be placed in the trench to the depth and grade required by this manual, or to the designers specifications. Perforated drainpipe shall be laid level and the end of the line capped. The drain lines shall then be covered with filter material to the minimum depth required by this manual and covered with untreated building paper, filter fabric or similar porous material to prevent clogging of voids with earth backfill.

FIGURE 5.3



SERIAL DISTRIBUTION BY PIPE FITTING



SERIAL DISTRIBUTION BOX

Section 5. 4 Conventional Trench Disposal System

Conventional trench leach fields shall be constructed as follows:

(a) Minimum number of drains lines per field 1
(b) Maximum length of each line ....100 feet
(c) Minimum bottom width of trench ..... 36 inches
(d) Minimum spacing of lines, center to center .....10 feet
(e) Filter Material ..... ¾" to 1-1/2" inch drain rock or plastic chambers
(f) Minimum filter material under drain lines ..... 18 inches
(g) Minimum filter material over drain lines ..... 2 inches
(h) Soil Barrier - untreated building paper,straw, or geotextile fabric
(i) Earth Backfill – clay loam to sandy loam topsoil
(j) Trench distribution piping • 4-inch ABS, or PVC perforated laterals
(j) Monitoring risers 4-inch PVC perforated inspection pipe
(k) 4-inch PVC pipeline from septic tank to and between distribution boxes
(l) Distribution boxes required at each trench.

Special Design Trench Disposal Systems

Special Design Trench Disposal Systems shall be constructed according to the design criteria set forth in Section 4.2. Construction material specifications are as follows:

(a) Filter Material in Trench – ¾" to 1-1/2" drain rock, no plastic chamber.
(b) Soil Barrier - untreated building paper, straw, or geotextile
(c) Earth Backfill – screened uncompacted topsoil
(d) Trench distribution piping - 4-inch ABS or PVC perforated laterals
(e) Monitoring risers 4-inch PVC perforated inspection pipe
(f) 4-inch PVC pipeline from septic tank to and between distribution boxes
(g) Distribution boxes required at each trench

See figure 5.3 for typical distribution box layout

5. 6 Mound System

Mound systems shall be designed according to the criteria set forth in Section 4.3. Construction material specifications and procedures are as follows:

I. Material Specifications

Sand fill used in all mound systems in GCCSD will meet the sand criteria below. Contractors/builders will be required to provide sand delivery tickets and should be prepared to provide a grading analysis. The criteria is as follows:

- A granular mineral material, other than limestone.
- Total acid soluble matter shall be less than 3%.
- The uniformity coefficient shall be 4.0 or less.
- The min. effective size shall be at least .3 mm and not more than 1.0 mm (max.).

SIEVE SIZE	PERCENT PASSING
3/8	100
4	95 to 100
8	82 to 90
16	50 to 62
30	25 to 36
50	10 to 16
100	2 to 6
200	None

Distribution Bed Fill - granitic 1" inch washed rock or gravel (no limestone or serpentine))
Soil Barrier/Bed Cover - untreated building paper or geotextile fabric
Soil Cover - rock-free topsoil, preferably a sandy loam
Distribution System – 1" or 1– ¼" PVC laterals with drilled orifices, min size 5/32"
Manifold - 2 inch PVC
Minimum 2" inch PVC pipeline from effluent distribution pump
Pumping System - The pumping system shall meet the design criteria set forth in Section 4.3, and installation requirements of Section 5.3

II. Mound Construction Procedures:

Stake out the location of the designed mound such that its distribution laterals will be generally parallel to the elevation contours of the site. Grass, shrubs and trees are to be scraped from the site. Do not remove topsoil. The mound site shall be adequately cordoned off to preclude vehicular and equipment traffic or any other activity that might result in damage to the soils.

Measure the natural soil elevation under the future mound beds and note the highest soil elevation. Note this on a remote benchmark for controlling bed bottom elevation with the mound fill.

Trench and place the transmission line from the pump tank to the mound site. This line should be placed at least 14 inches below grade. The entrance to the mound should be on the upslope side whenever possible to avoid any disturbance of the down slope area.

Plowing the site is the first critical construction task. The plowing should be done with a moldboard or chisel plow, and only when the soil moisture content is sufficiently low. The soil shall not be disked or ripped (tractor rippers or backhoe teeth are unacceptable) as the operation can break the soil into fine particles leading to a restriction in the soils surface percolation capacity. If the soil at 6 inches or more under the surface can be rolled into a rope or can be easily molded, the soil is too wet.

If after plowing the soil becomes wet, construction should be postponed and replowing will be required. Plowing shall be parallel with the elevation contours. The soil shall be plowed to a depth

of 7 or 8 inches and the soil shall be thrown upslope. A plow as wide as possible should be used to minimize site compaction.

Extend the inlet pipe to a height above the higher bed and approximately centered according to the design.

Stockpile the fill sand around the perimeter of the plowed area taking care to keep the truck wheels ff the plowed surface. *See the last page of document for sand criteria.

Placement of the sand should be such as not to rut up or compact the tilled area and all work should be done from the upslope side so as not to compact the down slope area. Use a crawler tractor (rubber tired equipment is NOT acceptable) with a blade and a minimum of 6 inches of sand under the tracks to minimize compaction to distribute the sand over the mound. The sand is placed to an elevation above the tops of the gravel distribution beds. The sides of the mound are shaped to proper slope (3 horizontal to 1 vertical is the steepest allowable).

The blade of the crawler tractor may be used to grade the bed bottoms to the proper elevation within the mound body fill. The distribution bed bottoms must be level. This will require careful handwork.

Place the gravel in the excavated bed without disturbing the sand. Gravel must be clean and sound and of approved size. Limestone and serpentine gravel are NOT acceptable. Fill it from the upper side of the mound. The distribution bed is filled to the top with 6" of gravel.

Within the distribution bed, place a 3-inch deep furrow with a shovel for the distribution laterals. Cover the lines with 2 inches of gravel taking care that the laterals are level.

Install blow-off assemblies (see diagram) and bed monitoring risers at the end of each lateral for ease of future service.

A geotextile synthetic fabric such as Dupont Typar (4-6-oz./sq. yd.) is placed over the distribution bed to prevent the migration of fines of sand or cover soil into the beds.

Place a minimum of 6 inches of sand above the top of the beds and then place a 6-12 inch layer of suitable topsoil over the entire mound making sure not to exceed a 3:1 slope. * Total cover over the upper bed shall be 18 inches at the center tapering to 12 inches over the sloped sides (figure 5.4).

Final grade the mound area with light weight equipment so surface water moves away from the mound and does not pond on the upslope toe of the mound. A diversion ditch or curtain drain will be installed on the upslope side of the mound.

Landscape the mound with grasses (section 7) and the down slope periphery with shrubs or other approved vegetation.

Install two 4-inch diameter PVC (or equivalent) observation wells as shown on the plot plan. Well No. 1 shall be located upslope of the mound body, while well No. 2 shall be located down slope from the mound extending 6 inches above the ground surface to a depth of 42 inches below grade. All wells shall be fitted with a removable cap and shall be sealed at the soil surface to prevent infiltration of surface water. The wells shall be perforated beginning at a depth of 18 inches below ground.

5.7 Sand Filter Systems

These specifications describe the most current, commonly available, sand filter construction materials from local suppliers. Sand filter construction materials (except for the sand and gravel) can be purchased as kits from local suppliers. A sand filter, like a mound, can be built from basic materials. This specification does not endorse any particular suppliers products, but recognizes that sand filter construction can be made simpler using pre-packaged materials.

I. Material Specifications

pumps – same specifications as for mounds (sec 5.6)
pipe – all PVC, glue joints
earth/gravel geotextile fabric barrier
filter sidewall – plywood, ¾" CDX
filter liner – 30 mil PVC or hypalon. Multiple layers of visqueen or polyethylene are NOT allowed
pump floats – same specifications as for mounds (sec 5.6)
sand – same specification as for mounds (sec 5.6)
gravel – ¼" to 3/8" granitic pea gravel, washed, no fines

II. Construction Procedures

Construct a 3' deep hole, flat on the bottom, to slightly more than the size of the filter, with a depression as shown in Figure 1 where the pump basin will be located. Any over-excavation should be filled and well compacted. Place a 2-inch cushion of sand in the bottom of the hole to protect the basin liner from penetration by sharp objects.

Place a perimeter support frame to hold the basin liner in place during construction. Plywood with 2×4 framing support is appropriate. Treated wood is unnecessary as once the system is backfilled and complete, it is supported by the earth and sand and the wood can decompose without harm. During construction of the sand filter (placement of the media), it is important that sand be placed between the excavated soil and the plywood framework. This keeps the framework and liner vertical during the course of construction and results in a sand cushion around the outside perimeter of the liner. All nails or staples used must have their sharp ends pointed away from the liner.

The 30-mil PVC liner is unfolded from the center of the excavation and draped over the top edges of the perimeter support frame. Care must be taken to ensure that the liner is in full contact with the bottom and sides and that no bridging occurs. Pleats or wrinkles in the liner are not a concern. Install PVC boots, after liner installation.

The PVC pump basin is installed in the depression located in the center of the sand filter. The pump basin must have a PVC or fiberglass bottom to prevent damage to the liner. It's important to verify all dimensions to ensure the pump basin is the correct height. The pump basin should have 4-inch grommets installed opposite one another to accommodate the 4-inch slotted PVC under drainpipe.

The 4-inch slotted PVC under drain pipe should be Class 125 (or higher) pressure rated. Slots are cut half way through the pipe, 1/4 inch wide, 4 inches on center. The pipe is laid flat with the slots pointed upward and capped with 4-inch end caps. The 4-inch underdrain pipe should penetrate the pump basin 1 to 2 inches.

Mound rock 1/2-inch to 3/4-inch in diameter at least two inches over the 4-inch slotted PVC drain pipe. Place a level course of 1/4-inch to 3/8-inch pea gravel, 6 inches deep, in the bottom of the sand filter.

Filter sand must be placed and compacted while it is damp. If the sand is not damp, it will not compact well and settlement may cause dislocation and breakage of the distribution laterals; wet the sand when necessary. The sand surface must be flat. The sieve analysis of the sand must conform to the material specifications.

Place three inches of 1/4-inch to 3/8-inch pea gravel on top of the compacted sand, disturbing the sand as little as possible. After the laterals are installed and pressure test performed, two more inches of pea gravel must be added.

Assemble PVC manifold (Class 200 minimum), 3/4-inch diameter Schedule 40 PVC laterals and flushing cleanouts as shown in figure 5.5. The 1/8-inch diameter orifices should be drilled with a drill press or drill guide using a new 1/8-inch drill bit and should not have any visible burrs. All PVC joints should be glued according to the manufacturer's instructions, e.g. primers shall be used if required.

Orifice shields are required to prevent the orifices from being blocked by rocks resting against the outside of the PVC pipe.

Place filter fabric over the final course of pea gravel.

Install floats on PVC stem. The floats should have a maximum tether length of two inches. The floats should be either mercury or mechanical and must be UL or CSA listed unless otherwise approved. The high-water alarm float must be connected to the pump control panel in such a manner that a high-water alarm in the sand filter will disable the pump in the dosing septic tank until the high-water alarm is canceled.

The electrical splice box must be UL or CSA listed and corrosion-proof, with the proper number of cord grips installed. Heat shrink must be used on the individual wire splices within the box. Sufficient length of wires must be provided in the box to allow for future repairs.

The conduit seal must be UL or CSA listed and must be installed using the proper conduit sealant as recommended by the manufacturer. Bubble gum or silicone is not allowed.

The electrical conduits must be UL or CSA listed for the purpose. Three-quarter inch diameter is most common. There are electrical code rules restricting the number of bends between panels and junction boxes. Refer to NEC 1993 section 347-14.

Install pump specified. The hose and valve discharge assembly should be easily removable and have the flexibility to be easily installed. It should be constructed of moisture and corrosion resistant materials. The pump basin lid should be fiberglass and should have durable, tamper-resistant mechanical fasteners.

The soil cover must be loamy-sand. Its purpose is to provide insulation against cold winter temperatures, to allow the free movement of air into the sand filter below, and to prevent odors from escaping the sand filter. Establishing a grass cover over the sand filter is very beneficial, but the pump cover must remain accessible.

5. 8 Combination Evapotranspiration/infiltration (ETI) System

ETI systems shall be constructed according to the design criteria set forth in Section 4.4. Construction material specifications and procedures are as follows:

(a) Filter Material in Trench - 3/4-inch to 2-inch drain rock
(b) Filter Layer at Top of Trench - pea gravel
(c) Plastic Screen - Typar Cloth or District Engineer's approved equal.
(d) Sand Fill – see Section 5.6 or 5.7
(e) Soil Cover - rock-free loamy topsoil
(f) Distribution Trough
- half-round 24-inch diameter CMP or District Engineer's approved equal
- 10 mil plastic sheet
- 3/4-inch to 2i-inch gravel fill
- 4-inch ABS perforated drain pipe
- pea gravel filter layer
- Plastic Screen - Typar Cloth or District .Engineer's approved equal

(g) Distribution System - 4 inch PVC pipeline from septic tank with distribution boxes as required

The construction sequence for the ETI system is described in detail as follows:

- After the deep infiltration trench has been filled with drain rock material and the pea gravel, and the plastic screen sand barrier have been placed in the trench; sand should be poured into the trench from the sides so as to leave an open v-shaped space along the trench centerline. At this point, 10-foot long, half-round CMP sections are placed in the trench slightly overlapping so as to form a continuous 100-foot long trough capped at each end. The top edges of the trough are aligned using a taut horizontal wire stretched between two stakes at the ends of the trench. The points of attachment of the wire on each of the stakes should be at the same elevation.

- After the trough edge is leveled out, the 10-mil plastic sheeting (6 ft x 100 ft) is rolled out along the trench and placed into and over the sides of the 100 ft trough to form a continuous watertight liner. The plastic is pulled up at the trough ends to the same elevation as the trough sides (Figure 8). Two inches of gravel is placed in the bottom of the distribution trough. The drainpipe is installed level on top of the 2-inch gravel bed. Gravel is then filled in around the drainpipe up to 2 inches over the top of the drainpipe. A plastic screen sand barrier covers the pea gravel and the top 4 inches of the distribution trough is filled with ET sand. The ET bed is then back-filled with sand, topped with 4 inches of rock-free topsoil, and seeded with vegetation specified in Section 6.

SECTION 6. - VEGETATION

6.1 Use of Vegetation

The use of vegetation is an important design factor in all disposal systems, especially Mound and Combination Evapotranspiration-Infiltration Disposal Systems. Proper vegetative cover will protect the soil from erosion and aid in water removal by evapotranspiration. Salt-tolerant plants with a high consumptive water use and ability to withstand fluctuating water levels shall be used.

6. 2 Grasses

Tall Fescue, Reed Canary Grass, and Perennial Rye Grass are deep-rooted perennial grasses, which are well suited for use on top of mound and ETI beds. A single variety should be chosen and seed applied at a rate of 12 to 15 pounds per acre. Fertilization with 16-20-0, or equivalent, at a rate of 300 to 500 pounds per acre shall follow seeding. Reed Canary Grass seedlings are available in flats and may be planted as an alternative to seeding. Peat or straw mulching is recommended in the initial stages to aid in grass establishment.

6. 3 Shrubs

Shrubs may be planted around the base and side slopes of the mound beds. Nandina, Oleander, and Atriplex (Quail Bush) are well suited for this use. Single Super Phosphate shall be applied at the time of planting to aid in establishment. Peat or straw mulching is recommended in the time of planting.

6. 4 Vegetation Maintenance

During the summer months irrigation will be necessary to supplement soil moisture available from the disposal systems. Grasses will require periodic mowing to stimulate growth and high water intake. Where Reed Canary Grass is used, care should be taken to not mow too short or crown damage may result. Annual fertilization of the grasses is recommended with application of 200 to 300 pounds per acre 16-20-0, or equivalent. Annual fertilization of the shrubs around the mound is recommended with application of Single Super Phosphate.

Section 7 – Disposal System Inspection

7.1 Annual Inspection

The District shall perform annual inspections of all the sewage disposal systems in the District. Scum and sludge levels in the septic tank will be measured, effluent levels in the disposal trenches will be measured, and a general observation of the disposal trench area and tank area will be made. If the system is pressure dosed or pumped, and the pump controls are accessible on the outside of the building, the pump operation will be checked. If the system is a mound, sand filter, or ETI system, additional checks will be made to determine if the system is functioning. Any malfunctions and required corrections will be noted, and the homeowner notified of the necessity for correction.

7.2 Septic Tank Inspection Ports

Septic tanks will be fitted with an 8-inch PVC capped riser in each tank compartment. Risers shall be brought to finish grade and enclosed by a valve cover box. See figure 7-1 for a schematic of the types allowed. The valve cover box must be large enough to allow access to the capped riser.

7.3 Disposal Trench Inspection Ports

A 4-inch diameter capped PVC trench riser shall be installed in each disposal trench, at the ends of each trench. The riser shall be enclosed by a 6-inch valve cover box in all landscaped areas. Figure 7-2 shows the construction of the riser.

Mound systems shall have a covered riser at the upper and lower side of the mound.

7.4 Sand Filter Inspection Ports

Sand filter systems shall be provided with access to the central pump well. The access hatch and port shall be similar to the septic tank inspection risers and lids shown in figure .

FIGURE 7.1

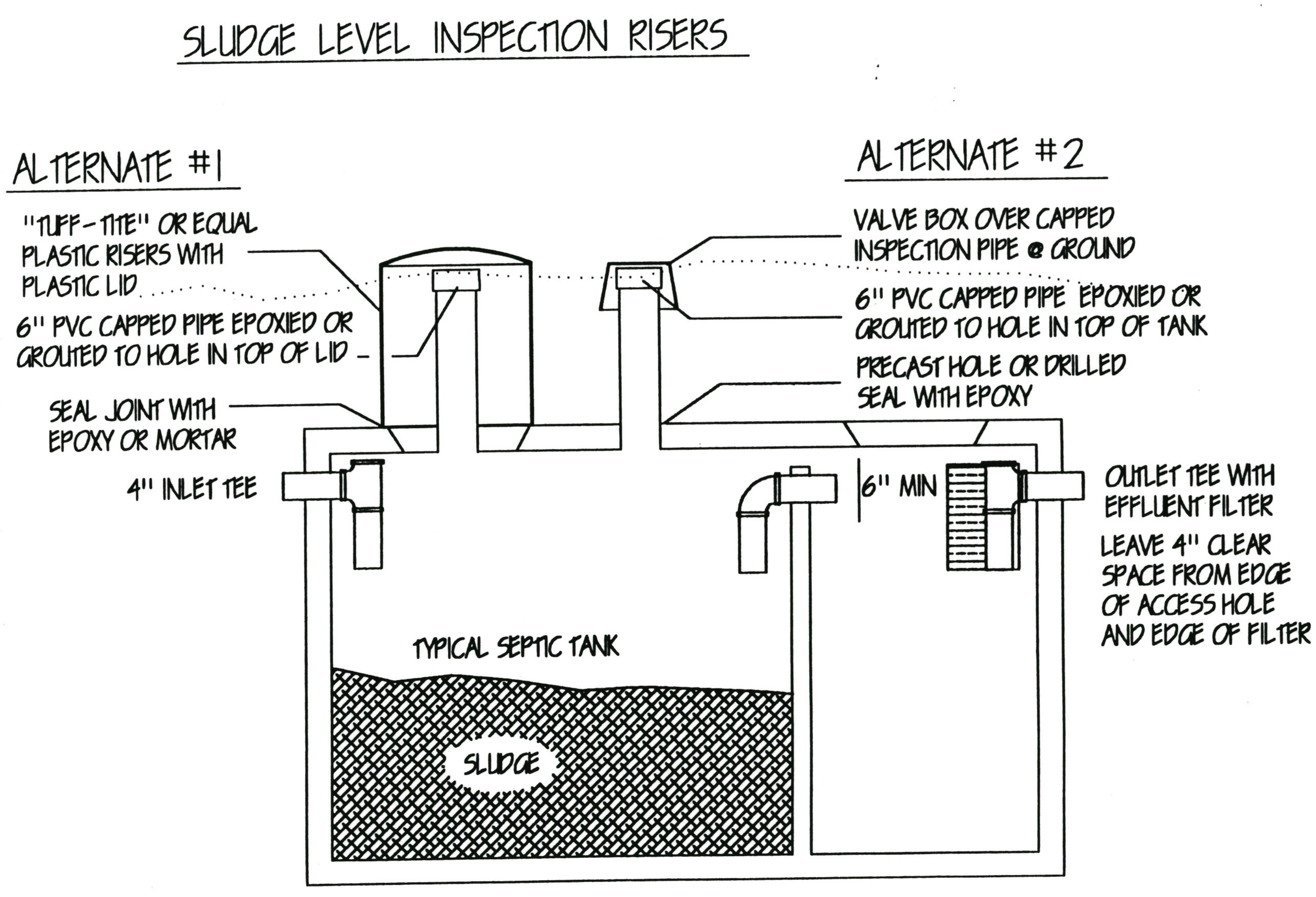

SLUDGE LEVEL INSPECTION RISERS
ALTERNATE #1
"TUFF-TITE" OR EQUAL PLASTIC RISERS WITH PLASTIC LID
6" PVC CAPPED PIPE EPOXIED OR GROUTED TO HOLE IN TOP OF LID
SEAL JOINT WITH EPOXY OR MORTAR
4" INLET TEE
ALTERNATE #2
VALVE BOX OVER CAPPED INSPECTION PIPE @ GROUND
6" PVC CAPPED PIPE EPOXIED OR GROUTED TO HOLE IN TOP OF TANK
PRECAST HOLE OR DRILLED SEAL WITH EPOXY
6" MIN
OUTLET TEE WITH EFFLUENT FILTER
LEAVE 4" CLEAR SPACE FROM EDGE OF ACCESS HOLE AND EDGE OF FILTER
TYPICAL SEPTIC TANK
SLUDGE

FIGURE 7.2

TRENCH MONITORING RISER INSTALLATION