Prince Edward Island
CANADA
Environment,
Labour and Justice
Inspection Services

On-site Sewage Disposal Systems

in Prince Edward Island

Construction Standards Handbook

May 2013

Preface

This document has been prepared to assist private sector licensed contractors, licensed site assessor's, engineering consultants and staff of the Prince Edward Island Department of Environment, Labour & Justice, in the assessment, selection, design and installation of on-site sewage disposal systems.

The document is divided into three discrete parts. **Part I** Describes the basic components and principles of operation of on-site sewage disposal systems typically constructed on PEI, as well as guidance on the proper assessment of sites to determine the most appropriate system design. **Part II** describes the enforceable, regulatory standards and procedures for this installation of on-site sewage disposal systems in Prince Edward Island. **Part III** comprises of the appendices which are referenced in this document.

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Part One

A Guide to Septic Systems
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Part One, a guide to septic systems and site assessment, outlines the general components of a sewage disposal system and their functions as they pertain to the efficient storage, treatment and disposal of wastewater. As well, guidance is provided on acceptable procedures for conducting site suitability assessments, a critical part of the selection process for the type of septic system best suited to local lot conditions, and a key factor in the successful long-term operation of an on-site sewage disposal field. Here the licensed Site Assessor will use the required tests and procedures to assess and select an acceptable area for the construction of the sewage disposal system.

Section 1 Introduction

On-site sewage disposal systems provide the most common means of sanitary wastewater treatment disposal in most rural areas, and generally can be counted on to provide a good level of treatment and reliable performance for a significant period of time, provided they are designed to accommodate the anticipated volume and nature of waste and with due consideration of the site specific soil characteristics in the area of installation, and are installed and maintained in an appropriate manner.

The successful design of an on-site sewage disposal system depends first and foremost on a thorough understanding of the various components of the system and their function, limitations and alternatives that best suit the local site conditions and waste stream characteristics.

Section 2 provides a brief, generalized description of the main components of an on-site sewage disposal system and their function. Specific regulatory requirements for the specifications or standards for these components are contained in Part II, Section 4 of this document.

The reader will note that among the components listed in Section 2 are the soils in which systems are installed. Soils play an extremely important role in the overall function and treatment performance of on-site sewage disposal systems, and must be considered as an integral part of system design and function. Indeed, in many cases, site specific soil characteristics will be the dominant factor in the selection of the most appropriate system design for a particular application.

Section 3 provides information on some of the most important soil properties affecting the performance of on-site sewage disposal systems, as well as recommended site assessment procedures for properly evaluating and categorizing soil characteristics. The systematic approach outlined in Section 3 is intended to ensure those involved in conducting site assessments follow a comprehensive process that captures the key factors affecting system performance, and can consistently record and communicate this information to others. The information from these “site suitability assessments” is important not just for the selection and design of current system, but also provides a valuable reference for future investigations in the area.

Section 2 Components of an On-Site Sewage Disposal System

2.1 Introduction

The purpose of an on-site sewage disposal system is to treat wastewater "sewage" that is produced in a residence or business and return the liquid into the ground in a safe and efficient manner that does not negatively impact public health, groundwater or surface water. This passive system consists of a septic tank and a disposal field. The septic tank treats raw sewage to a primary level with the effluent then being displaced to the disposal field for final treatment and disposal in the surrounding soils. The exact size of the system components depends upon the site conditions and the daily sewage flow and strength of the sewage from the development. A third component of the sewage disposal system is the soil. The purpose of the soil is to accept all the effluent generated, and provide a high level of treatment by filtration and biological action before it reaches the groundwater, and to prevent the premature discharge of effluent to the surface.

A cross section of a typical sewage disposal system is shown in **Figure 2.1 Example - On-Site Sewage Disposal System** and indicates the role of different components. The following provides a summary of some different components of a system with sizing and separation requirements listed in **Section 4** of this document.

2.2 System Components

2.2.1 Septic Tank

A **septic tank** is a settling tank that holds the sewage long enough (usually 48 hours) to allow for settling and floating solids, fats and greases to be removed. This prevents these materials from clogging the disposal field and the surrounding soil. The tank also provides storage for sewage solids, and allows them to partially decompose. The tank will hold about a 3-5 year accumulation of solids in normal use, after which the tank should be pumped. Septic tanks must be watertight to prevent sewage from escaping, and to prevent ground water from entering and occupying space intended for the treatment of sewage. All tanks must also contain a **riser** section to the ground surface to provide access for maintenance and repair without entering the septic tank.

The **building sewer line** is the pipe that carries sewage from a household to a septic tank.

Septic tank **effluent filter** is used to assist with the treatment of wastewater. These filters consist of a fine screen that assists with keeping solids in the septic tank instead of allowing them to flow out into the disposal field. By preventing solids from leaving the septic tank you can prolong the life of the disposal field.

A **sewage lift pump** located in the pumping chamber of the septic tank may be required when flow to the distribution system cannot be achieved by gravity flow.

Septic tank effluent (sewage leaving the tank) will contain reduced concentrations of floatable solids, but it will still be contaminated by fecal bacteria and fine organic solids.

An **effluent line** is the pipe that connects the septic tank to a disposal field. In some cases it may be necessary to pump effluent to the large disposal fields or to overcome elevation differences.

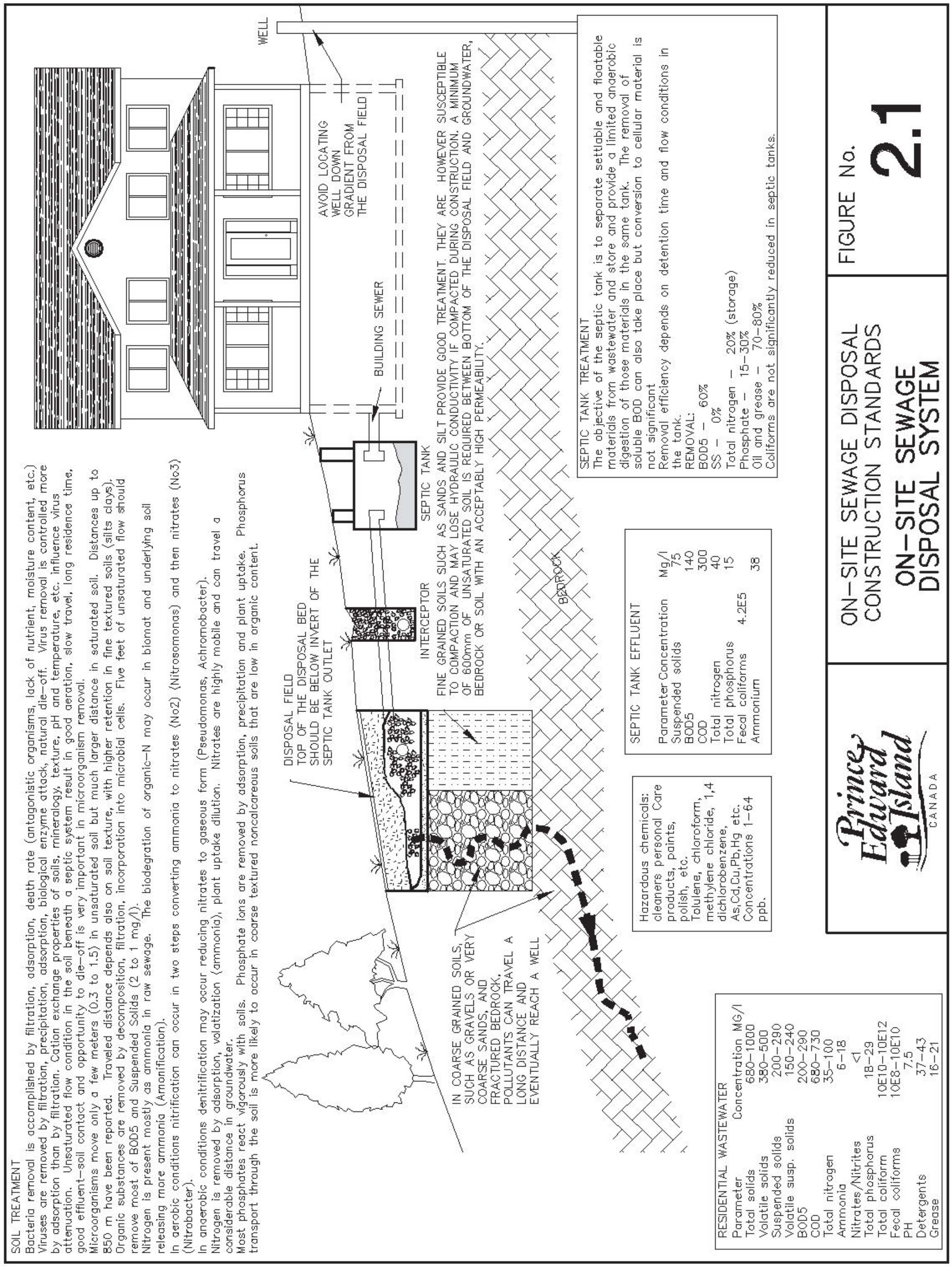


Figure 2.1 Example - On-Site Sewage Disposal System

2.2.2 Disposal Field

The function of the disposal field is to distribute the effluent over a wide area so it can be absorbed by the surrounding (or down slope) soil. There are various sizes and layouts of disposal fields and these will be addressed later in this document in Section 4. The basics of the fields are the same and the typical installation on Prince Edward Island is a pipe and gravel trench type disposal system. Perforated pipe and gravel distribute the effluent from the septic tank over the disposal area. The gravel supports the pipe, provides storage for peak effluent flow, dissipates the energy the incoming fluid may have which could erode the infiltration surface, and insulates the pipe from freezing and also root penetration.

The following are components are considered to be a part of the disposal field (refer to **Figure 2.2**):

Sod cover over a disposal system is essential because it provides frost protection, protects against erosion, sheds surface water, and stores water that does soak in to the soil until it evaporates or is returned to the atmosphere by plants.

Final cover material supports the sod. It also provides frost protection, storage for surface water until it **evaporates**, and allows oxygen and other gases to pass into and out of the disposal field.

A synthetic **barrier material** prevents clean local backfill material from migrating into the gravel void spaces and clogging the disposal field.

Most systems use **gravity distribution pipe**, with a slope and hole spacing intended to evenly distribute the effluent throughout the distribution system. For longer systems or systems that cannot be gravity fed, **pumps or dosing chambers and pressure distribution piping** will be necessary.

Chambers may be used in some disposal fields where the total land available may be limited. Chambers are an alternative to a pipe and gravel system.

Gravel surrounds the distribution pipe and distributes effluent from the septic tank over the disposal area. It provides support and protection for the distribution pipe and storage and distribution of the effluent.

Filter sand beneath the gravel provides a location for the formation of the clogging mat, which will form after several months of system operation. The **clogging mat** is a layer of solids, consisting of solids from the septic tank effluent microbiological organisms and their by-products. The micro organisms digest the organic materials in the effluent. The clogging mat has a very low permeability, and, at periods of high flow, effluent will pond within the distribution field (i.e. the gravel layer) in order to generate enough pressure to force the effluent through the clogging mat and into the surrounding soil.

Good Quality Fill (GQF) means a reasonably uniform sand or sandy gravel containing a small proportion of silt but no more that 30% of the material shall be retained on a 10 mm (3/8 inch) sieve and a minimum of 2.5% and a maximum of 15% must pass the 0.075 mm sieve (#200 US std.).

The **infiltrative surface** is the top of the natural soil beneath the field. Care must be taken during construction to prevent damage to this surface (ie: compaction or smearing), which could block soil pores and prevent effluent from entering the soil.

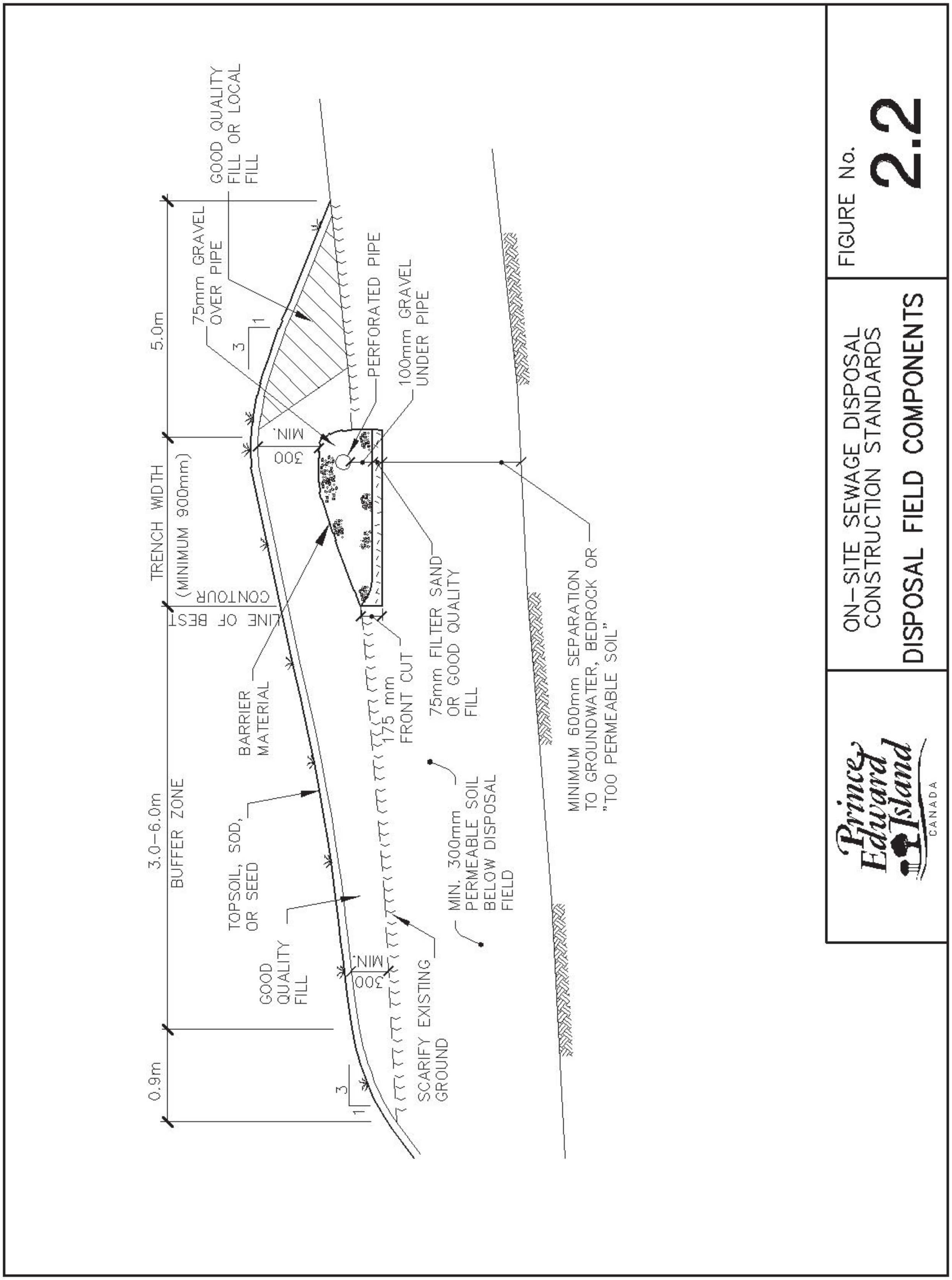


Figure 2.2 Disposal Field Components

2.2.3 Soil

Definition: *Permeable soil means soil having a hydraulic conductivity in the range of 8.0 x 10-3 cm/s to 8.0 x 10-5 cm/s (3.1 x 10-8 in/s to 3.1 x 10-5 in/s).*

The **soil** beneath the disposal field plays an important role in determining the design and the size of on-site fields. The soil removes harmful pathogens before the effluent reaches ground water, which may supply a well or re-appear in a stream or lake. As effluent from a disposal field passes through a silty soil, particulate matter is physically filtered out in a relatively short distance. Most bacteria, viruses or other potentially disease-causing organisms (pathogens) are not able to pass through long distances of unsaturated soil. They are retained within the first few feet of soil, where their numbers are greatly reduced in a hostile environment. In saturated soils the organisms may travel much greater distances. When effluent enters a coarse gravel with little or no fine material (silt and clay particles), it will pass through the voids so quickly that pathogens can be transported hundreds of feet.

For all systems, a minimum soil thickness is maintained between the bottom of the disposal field and ground water or bedrock, which may contain fractures or openings that can carry effluent into the ground water. If the natural soil is too coarse to provide this protection, a built-up disposal system must be designed to include an additional sand layer (**Good Quality Fill**) over the coarse soil. In situations where the natural soil is so tight that effluent will travel horizontally before it can slowly enter the soil, selection/design of the system focuses on provision of an adequate distribution area.

Surface water and roof drainage must be directed away from a disposal field. Surface and ground water entering a disposal system can cause the hydraulic capacity of the field to be exceeded. For this reason some locations should be avoided for sighting of a disposal field. In many locations an **interceptor trench system** (see **Figure 4.7**) may be required to divert surface water and/or lower a water table.

2.3 Alternative Treatment Devices

In some cases where a conventional on-site sewage disposal system (septic tanks and disposal field) can not be installed due to limited space or restrictive soils there may be other alternatives available. Options for servicing difficult lots may be the installation of an **Alternative Treatment Device** followed by the installation of a disposal field. There are many different types of treatment systems available to treat wastewater from residential homes. These units treat wastewater prior to the effluent entering the ground. Once treated, the wastewater is more easily disposed of on small lots and difficult soils. These treatment systems should meet BNQ (Bureau de normalization du Quebec) standards and/or certification by an equivalent standards development body. Alternative treatment systems require an engineer to assess, design and oversee the installation of the system.

Section 3 Site Assessment

3.1 Introduction

This section will provide soil and other information to the Site Assessor, needed to carry out an assessment of the site. Included in the section is a method for describing and evaluating soils for their suitability to support on-site sewage disposal systems, using referenced soil information that is relevant to Prince Edward Island.

The information focuses on the methods for describing mineral soils that can support sewage disposal systems, and on describing soil properties that influence the movement of water through soil, and hence the treatment of the waste from the sewage disposal system. The information will assist in the determination of lot sizes as well as the size and type of sewage disposal system which will best work in the identified soil, based on the site assessment.

Traditionally, soil investigations have been performed for soil genesis and classification for mapping or agricultural purposes and these investigations are usually limited to a depth of about 1.2 metres (4 feet). When evaluating soils for sewage disposal systems, test pits are usually prepared to a depth of 1.85 metres (6 feet) and the focus is on evaluating soil properties such as texture, density, structure and internal drainage characteristics which most directly affect the ability of water to pass through soil.

3.2 Site Information

When performing a site assessment, it is important to maintain an accurate and complete record of all site information for reference purposes. The physical characteristics of a parcel of land need to be thoroughly evaluated to determine if the site is suitable for the proper operation of an on-site sewage disposal system. Upon completion of the evaluation of the information gathered, the submission forms located in **Appendix H** must be completed and registered with the authority having jurisdiction, prior to the construction of an on-site sewage disposal system.

From the site visit, information such as soil permeability, depth to bedrock, depth to water table, slope, landscape position, location of wells and watercourses should be identified and compared to the findings on available soils maps. The end result of the site assessment should provide the assessor with the information required to determine a lot category and select a proper sewage disposal system for that site.

It is important to note that Departmental policy will not allow a site to be re-assessed unless the work is carried out by an Engineer or qualified departmental staff from the Department of Environment, Labour & Justice.

The site information should be recorded using **Form A (Test Pit Record**) found in **Appendix H**. The following provides a description of the types of information that should be recorded:

- **Site Information -** Proponent's name and contractor's name, phone numbers, case number, property number, test pit number (if more than one test pit is completed), date excavated, the inspector's name, and site location.

- **Site Observations/Comments -** Identify the geographic location of the property, PID (Property Identification Number) including the highway, road or rural route number. If a GPS is available, record the geographic coordinates for the location; provide photos of the site for future reference; provide a description of surrounding land use; provide a description of the site characteristics, including percent slope, slope position of the proposed sewage disposal system, observations of ponded water on the soil surface (indicating poor surface drainage), type of vegetation, etc. Lot boundaries, wells, watercourses and drainage ditches within 30 m of proposed system should also be recorded. Further explanation of this information can be found in the remainder of this section. **Table F2** in **Appendix F** provides minimum setback distances that must be maintained, as per the Subdivision Development Regulations & Sewage Disposal Systems Regulations.

- **Site Plan** – use this section to provide a sketch of the site (**Appendix H**) including the following information: a North arrow; contours; the location of all existing or proposed structures; locations of existing and/or proposed site access (driveways/laneways); any physical features such as out buildings, trees, surface water (streams, ponds, etc.) and existing or proposed well locations. Identify where the test pit(s) and proposed sewage disposal system will be located; measure and record all distances from the proposed sewage disposal system to the above site features (see Planning Act, Subdivision Development Regulations and the Environmental Protection Act, Sewage Disposal Systems Regulations for reference). Care should be taken to evaluate the position of existing adjacent wells and sewage disposal systems.

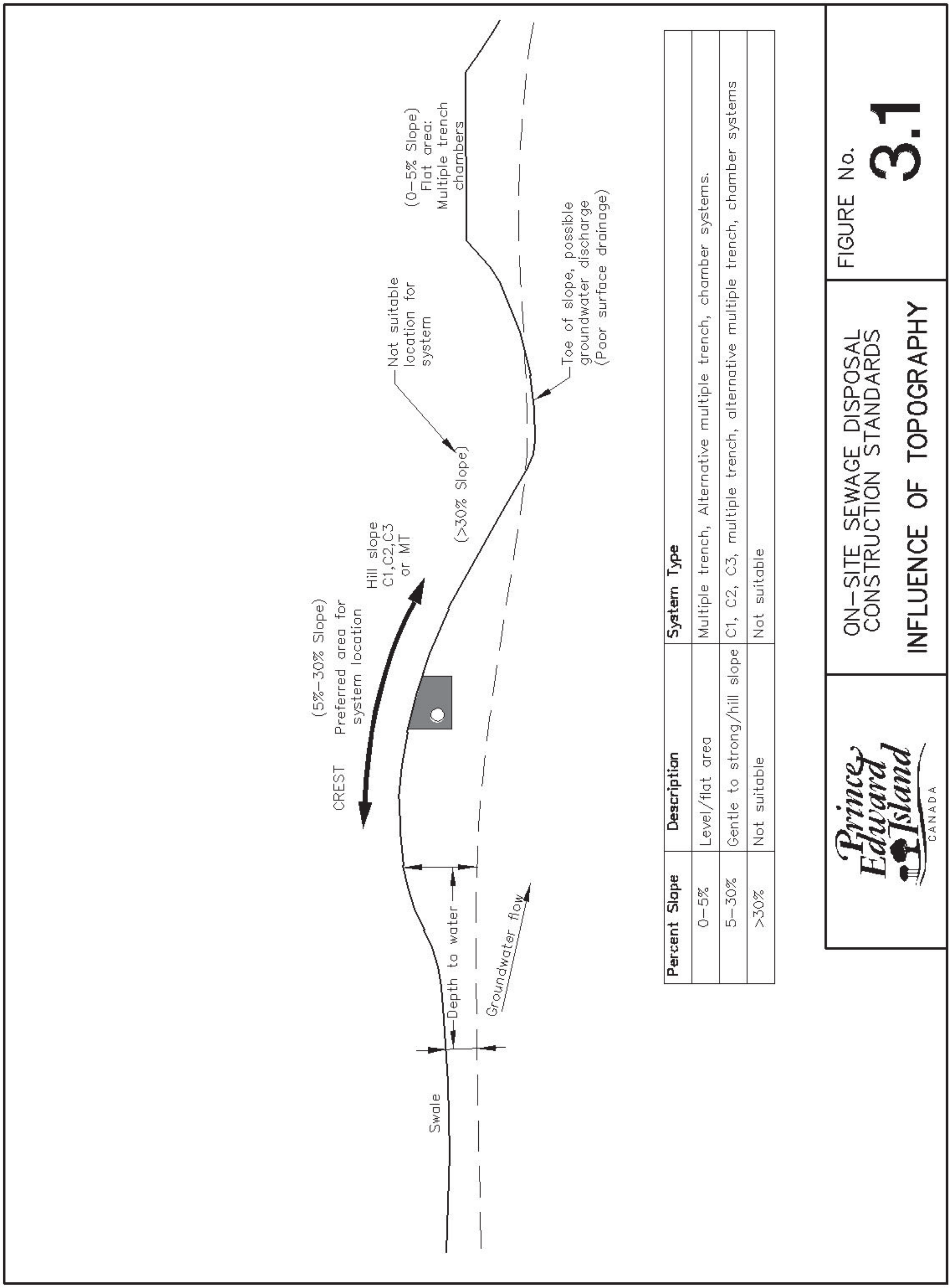
- **Surface Drainage** – Surface drainage refers to the loss of water from an area by flow over the surface. It depends on many factors, acting independently or in combination, such as the amount and intensity of rainfall or snow melt, the soil water state at the beginning of the rainfall event, the type of vegetation or land use, etc. An estimate of surface drainage characteristics can be made by visually inspecting the site for areas of standing water, wet or saturated soil, etc. Surface drainage can range from very rapid through rapid, moderate, slow, very slow and ponded. On-site sewage disposal systems should be located in areas where the surface drainage is moderate to very rapid.

- **Slope** – The design and operation of the on-site sewage systems will often be determined by its actual position in the landscape. For this reason, it is important to measure the slope where the proposed system is to be situated topographically**. Figure 3.1** shows the influence of topography on system selection. Percent slope can be estimated or it may be measured more precisely with a clinometer or Abney Level. The following table provides a summary of the typical system types that can be used on sloped lands.

Table 3.1 Percentage Slope and Acceptable Systems

Percent Slope	Description	System Type
0 – 5%	Level/flat area	Multiple trench, alternative multiple trench, chamber systems
5 – 30%	Gentle to strong/hill slope	C1, C2, C3, multiple trench, alternative multiple trench, chamber systems
>30%	Steep slope	Not suitable

- **Soil Conditions –** Once the general site information has been recorded, the site soils must be evaluated. Since soil properties may exhibit significant spatial variability (i.e., both laterally and with depth), **it is important the test pit is completed in the area where the sewage disposal field will actually be located. It is also important that a soils map for the site be obtained before conducting a site assessment.** The soil map should give a general idea of expected soil conditions, however, the results of the test pit evaluation and permeability tests will be the factors used to determine depth of permeable soils. Please note if the soils map indicates different classes of soils on the site, each class must be evaluated. *The soils map can be obtained from two different locations prior to the submission of the documents. The soil mapping series is available on line at www.gov.pe.ca/maps/ then click on GeoLinc Plus or on PEI LandOnline. Passwords are required for both of these sites. (When you register as a user for either program, you will be provided a password). If the soils map does not accompany the registered documents it can be purchased at the time of submission.*



Percent Slope	Description	System Type
0–5%	Level/flat area	Multiple trench, Alternative multiple trench, chamber systems.
5–30%	Gentle to strong/hill slope	C1, C2, C3, multiple trench, alternative multiple trench, chamber systems
>30%	Not suitable	Not suitable

Figure 3.1 Influence of Topography

3.3 Soils Information

3.3.1 Site Investigation

Following is a summary of information relevant to performing a site investigation.

1. Obtain a soils map for the property before going to the site, showing property lines and PID number.
2. Contact the proponent and/or contractor to confirm your arrival time and exact location of the property.
3. Upon arrival, review where the proposed septic field will be located with the proponent/contractor and locate test pit.
4. Excavate the test pit to a depth of 1.2 metres (4 feet).
5. Before entering the test pit, visually inspect the soil conditions for stability. Both very dry, granular soils (such as coarse sands) and very wet, fine textured soils (i.e. those containing significant silt and clay content) may become unstable and collapse during the inspection, causing injury. Do not enter a test pit that has been left unattended unless protective measures (i.e. shoring, etc.) have been installed to the standards established by the PEI Occupational Health and Safety Act.
6. After entering the test pit, complete a preliminary estimate of the depth of permeable soil. This will assist in determining the depth at which to complete the permeability testing.
7. Prepare the soil profile for inspection by selecting a representative vertical column of soil. Use a knife, spatula or mason hammer to scarify the pit face for the full depth of the test pit. This removes any smearing caused by the excavation equipment and allows you to see the soil horizon boundaries and their physical characteristics more clearly. Record results of visual inspection on **Form A**.
8. Exit the test pit and complete the permeability testing as outlined in the Pask In-situ Permeameter Operating Instructions (**Section 3.3.3**). Record results of visual inspection on **Form A** and **Submission Form**.
9. Have the contractor excavate an additional 0.6 metres (2 feet) so that the test pit is a total of at least 1.85 metres (6 feet) in depth. Without re-entering the test pit, inspect the pit for evidence of a visible water table and the presence of bedrock.
10. Have the contractor fill in the test pit. Do not leave test pits open and unattended.

3.3.2 Collection of Soils Information

When collecting site information, use Form A – Test Pit Record (**See Form A in Appendix H**) and record the following information:

1. Record the depth of the root mat (surface vegetation and organic matter) from the surface to the start of the first mineral soil horizon. For example, record the layer as "0 - 5 cm". The top layer of the mineral soil will then be the starting point for your evaluation.
2. Starting at the top of the first mineral soil layer (i.e. below the root mat) identify the total depth of any visible roots and rootlets that are present. Deep penetration of roots may indicate a well-drained soil.
3. Identify and mark distinct horizon boundaries and, using a measuring tape, record the thickness (depth) of each horizon.
4. Refer to **(Figure 3.3)** and identify soil layers that have different texture, density and colour.
5. For each layer identified, record the following on Form A: texture **(Figure 3.4**), structure **(Table 3.2** and **Figure 3.5)**, colour **(Section 3.3.6)**, density (**Table 3.3**), and permeability.

6. Site Observations: look for evidence of dense or confining layers that may impede drainage and record depth if present. This may be assessed using the rebar techniques described in **Table 3.3**. Complete Form A (**Appendix H**) and using the data recorded in Steps 1 to 9, categorize the soils in accordance with The Planning Act, Subdivision Development Regulations, Section 23(1), **(see Table F1)**.

3.3.3 Pask In-situ Permeameter Operating Instructions

The following procedure shall be used when operating a Pask In-situ Permeameter (**See Appendix B**):

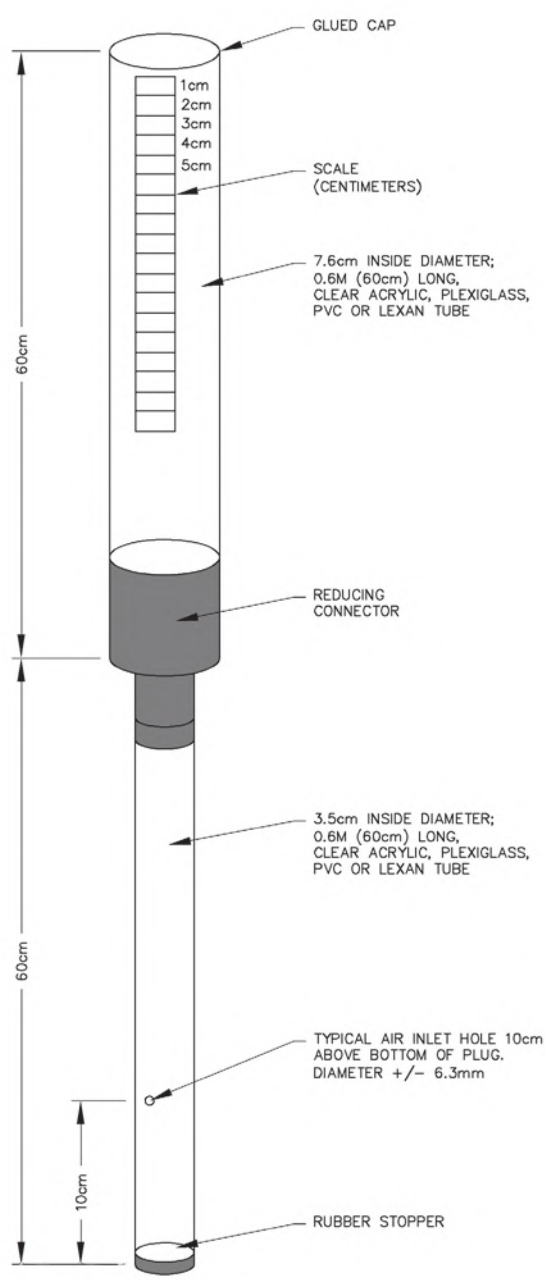


Figure 3.2 Pask In-situ Permeameter

1. Using an auger which will give a hole diameter of 70 mm 7(cm), auger hole(s) in the area of the proposed disposal field. If the soil is uniform make the hole depth 450-500 mm. The test determines the soil permeability of only the bottom 100 mm in the hole. If you wish to test a soil located deeper than 500 mm, the top layer of soil should be removed before you auger the hole. Care should be taken to locate the hole(s) in locations that will most closely represent permeability of the area in question. Attention should be paid to any soil condition that may cause a misrepresentation of the soils permeability, such as the presence of excessive worm or rodent activity, roots, clay or gravel lenses or soil cracks.
2. The auger may smear the sides of the hole particularly if the soil is fine grained and damp. The smear layer can be removed from the sides of the hole with a brush (wire, pipe cleaning brush with at least 60 mm diameter bristles will do).
3. Stand the device upside down, fill with water to the air inlet hole and place rubber stopper back on device.
4. Invert the permeameter and quickly insert it into the hole, resting the rubber stopper on the bottom.
5. Water will initially flow very rapidly out of the permeameter reservoir until the head of water in the hole reaches the level of the air inlet hole. Allow the flow out of the permeameter to “equilibrate” (approach a constant flow rate), which usually requires 5-30 minutes depending on soil type and soil structure. Monitor the rate of fall of the reservoir water level at a set timing interval until the rate becomes constant for at least three consecutive readings.
6. Record the value for the rate of fall in the reservoir on the Field Permeability Data Sheet (**Figure B-4**).
7. Using the reference table for Soil Permeability (**Table B-2**) determine the field saturated hydraulic conductivity (K_{fs} (cm/sec)) for the identified soil type. Record the value on the Form –A Test Pit Record (**Appendix H**) for submission with the registered documents.

Note: Due to the potential variability in test results, carry out a minimum of two tests. If the recorded constant rate of drop is not close, carry out additional tests until the measured rate is representative.

Due to potential variability from cooler temperatures, the permeameter should not be operated in temperatures below 5 degrees celcius.

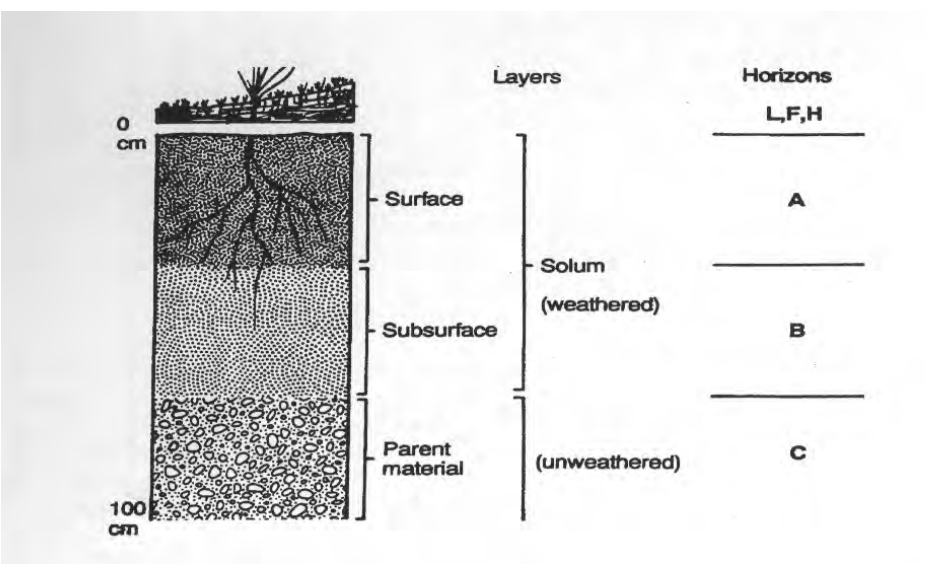


Figure 3.3 Major Soil Designations Table

3.3.4 Determination of Soil Texture – Method Description

Soil texture is the relative amount of sand, silt and clay particles in a soil. Following are various test methods to determine soil texture:

Feel Tests

Graininess Test **-** Soil is rubbed between the thumb and fingers to assess the percent sand. Sand will feel gritty, while silt feels "silky" and clay feels like flour and is often sticky if moist.

Dry Feel Test **-** For soils with greater than 50% sand content. Soil is rubbed in the palm of the hand to dry it and to separate and estimate the size of the individual sand particles. The sand particles are then allowed to fall out of the hand and the finer material (silt and clay content) remaining is noted. Usually, the higher the clay content, the more soil that will remain due to its stickiness.

Stickiness **-** Soil is wetted slightly and compressed between the thumb and forefinger. The degree of stickiness is determined by noting how strongly it adheres to the thumb and finger upon release of pressure.

Moist Cast Test

Compress some moist soil by clenching it in your hand. If the soil holds together (i.e. forms a cast), test its strength by tossing it from hand to hand. The more durable it is, the more clay that is present.

Ribbon Test

Moist soil is rolled into a cigarette shape and then squeezed out between the thumb and forefinger in an upward direction to form the longest and thinnest ribbon possible. Soils with high silt content will form flakes or peel-like thumb imprints rather than ribbons. Clays will form ribbons more easily**.**

Shine Test

A small amount of moderately dry soil is rolled into a ball and rubbed once or twice against a hard, smooth object such as a knife or mason hammer. A shine on the soil indicates the presence of clay in the soil.

The following **Soil Sample Texturing by Hand – Flow Chart (Figure 3.4)** will be used to determine soil texture. It is a flow chart for the determination of texture by hand. **Figure 3.6** gives some textural classes of soils based on the percentage of sand and clay particles present in the sample.

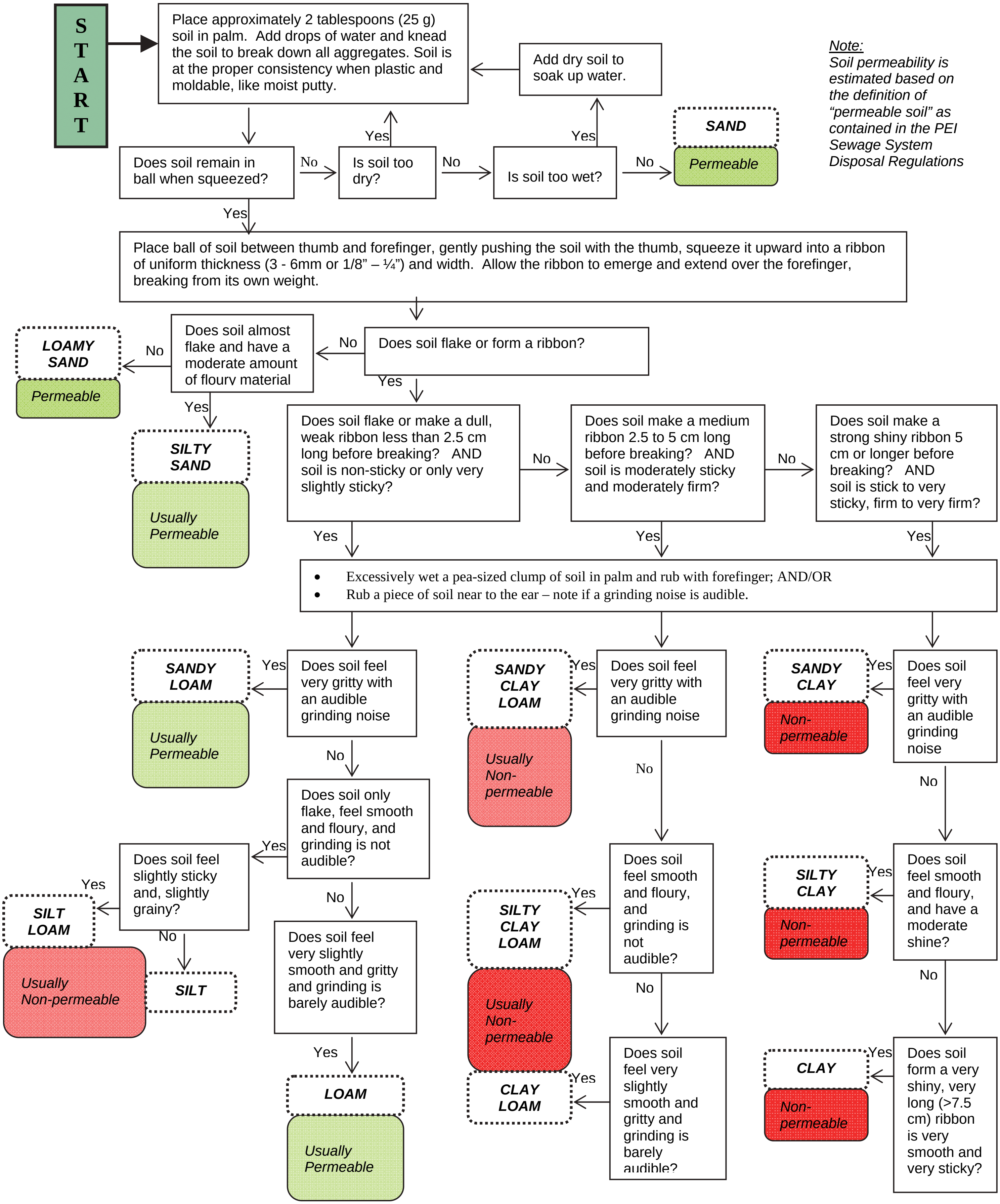


Figure 3.4 Soil Sample Texturing by Hand - Flow Chart

3.3.5 Soil Structure

Soil structure is defined as the arrangement of primary soil particles (sand, silt and clay) into secondary particles (aggregates). Aggregated soils are considered to be better suited for on-site sewage disposal systems because they generally have lower bulk densities, good porosity and thus exhibit permeability's that are neither "too fast" nor "too slow" to allow for proper treatment of the sewage to occur. For example, coarse sands may allow water to move through the soil profile at too high a rate, whereas fine textured soils such as clays will restrict movement.

Table 3.2 Soil Structure

Type	Description	Comments
Single Grain	No observable aggregation or joining together of individual soil particles.	Single grain (loose sands).
Granular	Particles are joined into relatively small units approximately spherical in shape with curved or irregular faces.	Units look like cookie crumbs
Columnar	**Structure is arranged in a vertical plane.**	Aggregates formed in vertical arrangement. Often good secondary permeability.
Blocky	Soils joined together to form larger units arranged with flat or round surfaces.	Observable sharp or rounded surfaces on aggregates.
Massive	Solid structure.	Appears as solid mass.
Platy	Structure is layered on a horizontal plane.	Horizontal layering appearing as plates. Usually associated with soils high in clay content.

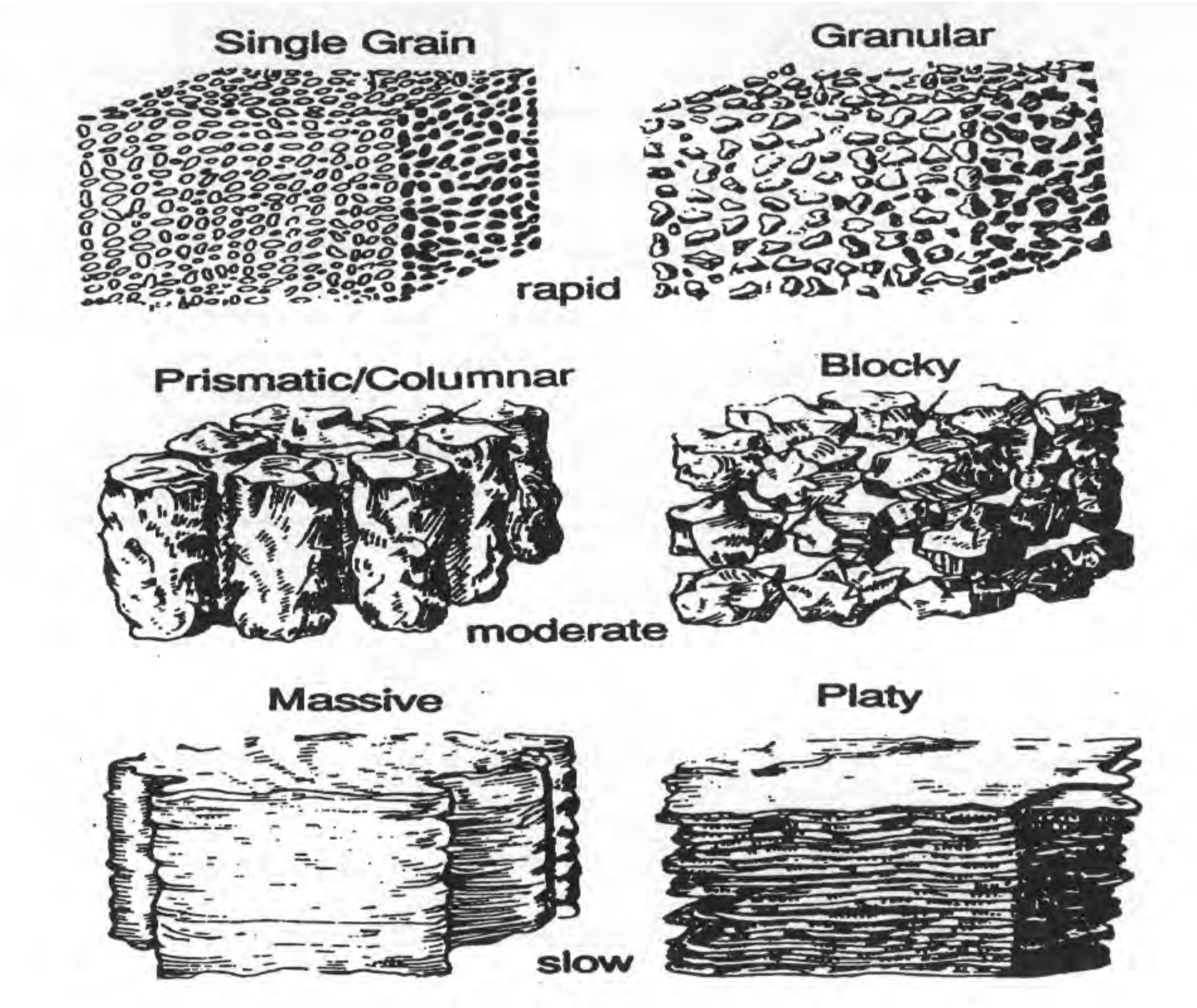


Figure 3.5 Soil Structure Figure

3.3.6 Soil Colour

Soil colour is a property that is useful in soil assessment. Colour and colour patterns provide clues towards estimating the ability of a soil to allow water to pass through it. There are complex colour charts for soil colour determination, which are beyond the scope of these Standards. Much of our soil colour is due to the presence of iron. When there is no air in the soil, iron exists in a state that is greyish. When air is abundant in the soil and the soil is well drained iron is in a state which is yellowish or reddish. If over a long period of time a soil has been alternately wet and dry, it may show defined spots or blotches of different colour, possibly with a grey or dark predominant colour, this is known as mottling. This would indicate that at times (usually spring and fall) this soil is saturated, (i.e. poorly drained). On the other hand, a well drained soil would be a relatively bright colour (often reddish yellow) and be free of mottling to at least 1.2 metres in depth.

Mottles are spots or blotches of different colour or shade of colour interspersed with the dominant colour of a horizon. Usually mottles are seen as greying or dulling of colour due to poor aeration, which is in turn caused by the soil horizon being wet or saturated most of the time due to poor drainage, a perched water table or a seasonally high water table. In PEI, the dominant red colour of soil often masks the presence of mottles. In poorly and very poorly drained soils, mottling may be more evident. In other soils, mottles may be difficult to identify.

3.3.7 Soil Density

For the purposes of assessing the site for suitability for on-site sewage disposal, the inspector can estimate soil density by two methods: resistance to penetration using a soil probe (i.e. a re-bar), and evaluating the consistency of soil aggregates by hand.

Step 1

Prepare a soil probe made from a minimum 1.25 cm diameter (0.5 inch) re-bar. Use the re-bar to probe each horizon independently to assess the density of the soil. Make sure that an equal amount of pressure is applied each time. Observe the penetration depth of the re-bar for all horizons and record in Form A. Note the depths of any confining layers in the comments section of Form A.

Step 2

Assess the nature and consistency of the soil aggregates by collecting an aggregate from each horizon. Soils that are permeable will range from a loose, granular texture to aggregates that are easily broken up in your hand (i.e. friable). Soils with increasing silt and clay content will become less friable and, depending on the moisture control, may be sticky to the touch. In addition, if the clay content is significant, the aggregate may be plastic or slightly plastic (i.e. the aggregate will not break easily and can be moulded in the hand like putty). These soils will have a lower permeability and are less suited for on-site sewage disposal systems.

Table 3.3 Soil Density Classification

Code (FORM A)	Typical Penetration Depth (cm)	Description
1	> 10 Re-bar penetrates easily	**Very loose,** granular (coarse to medium textured sands, rapid permeability)
2	5-10 Re-bar penetrates easily Easily excavated using shovel	**Loose,** aggregated soil, friable, non-sticky, non-plastic (coarse to medium textured soils, non-compacted with good permeability)
3	2.5-5 Can excavate with effort	**Compact,** aggregated soil, slightly sticky but non-plastic (medium textured soils, slightly more dense with good to moderate permeability for on-site disposal systems)
4	1.0-2.5 Difficult to excavate with shovel	**Dense**, aggregated soil, friable, sticky and slightly plastic (slightly compacted soil horizon, predominantly fine textured (silt and clay) with slower permeability, unsuited to on-site sewage disposal)
5	< 1.0 Very difficult to excavate with shovel	**Very dense**, compacted layer, non-friable, sticky, plastic (compacted silts and clays with poor permeability, unsuited to on-site sewage disposal)

3.3.8 Soil Texture Classification

Following in **Figure 3.6** is the Soil Texture Classification Triangle.
To use this triangle:

1. Apply the percentage of **Sand** provided from a soil analysis and draw a vertical line up through the triangle.
2. Apply the percentage of **Clay** provided from a soil analysis and draw a horizontal line across the table.

Where the two lines cross this indicates a Soil Texture Classification that will assist in determining the permeability of the soil and also establish a lot category for the suitability of an on-site sewage disposal system.

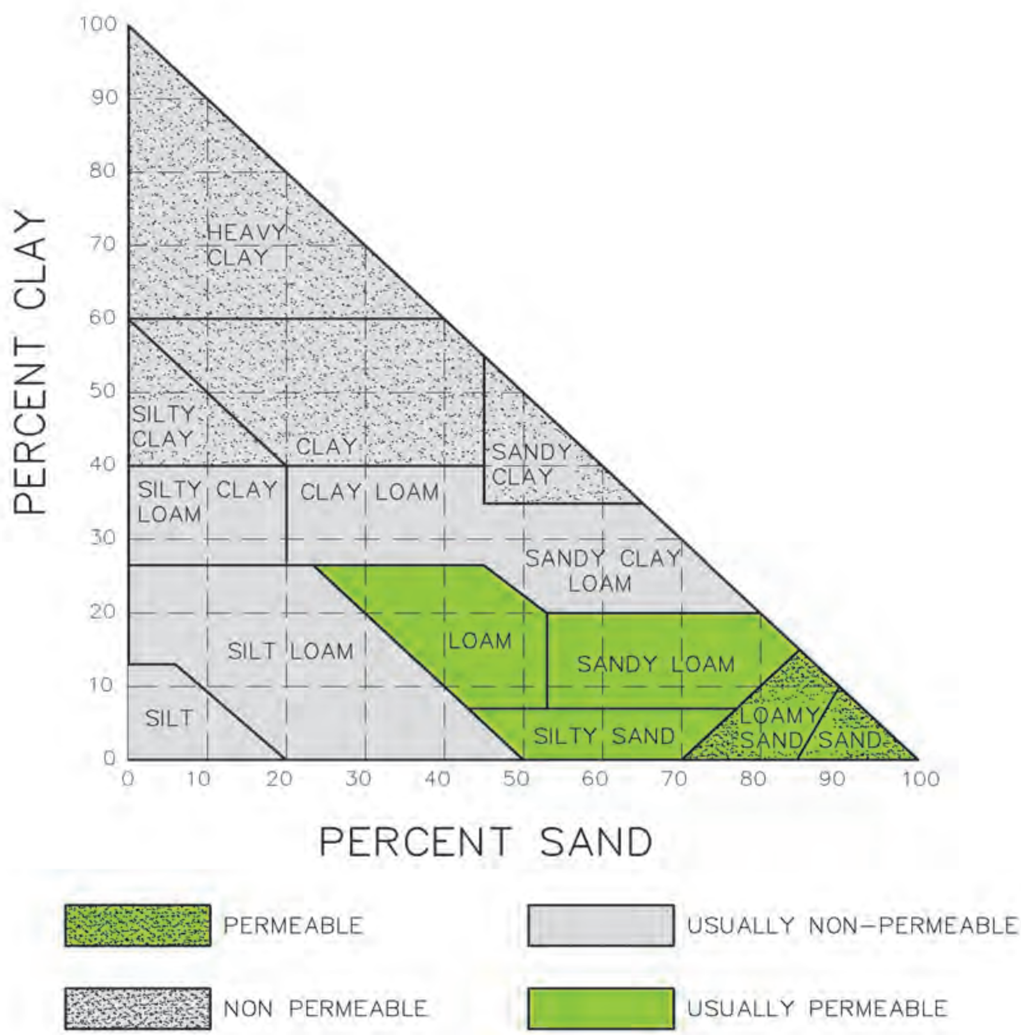


Figure 3.6 Soil Texture Classification Triangle

3.3.9 Soil Drainage Class

When considering the suitability of soil for on-site sewage disposal systems, one of the key elements to consider is the internal drainage characteristics of the soil. Soil drainage is partially controlled by the soil texture and also by the structure and density of the soil. Evaluations of the soil test pit should be performed at different horizons and at appropriate depths to determine structure and density.

Prior to any site visit the Soils of PEI handbook (PEI Soil Survey) should be referenced for some background information on the soils classification within the proposed site.

Part Two

Minimum Regulatory Requirements for the Selection & Construction of On-Site Sewage Disposal Systems on Prince Edward Island

Part Two of this document describes the minimum regulatory requirements for the selection and design of on-site sewage disposal systems **(Section 4)**, and the acceptable construction procedures for their installation **(Section 5)**, and is intended to be used in conjunction with the *Environmental Protection Act* Sewage Disposal Systems Regulations.

Section 4 - describes the minimum specifications and design considerations for on-site sewage disposal systems on Prince Edward Island. It describes the regulatory standards for individual system components, as well as the acceptable system designs, as dictated by local site suitability (soils) conditions. These requirements are intended to ensure that appropriate system components are incorporated into specific system designs, and that the overall system design is compatible with local soil conditions.

Section 5 - describes the approved procedures for the installation of on-site sewage systems including system layout, required testing procedures and acceptable construction practices to ensure that the system, once installed, functions as intended.

Note: It should be noted that references to appendices, tables & figures in Part Two may differ from those appendices, tables & figures referenced in 'Appendix A' in the Sewage Disposal Systems Regulations. For enforcement purposes the regulations are law.

Section 4 Standards for Selection of On-Site Sewage Disposal Systems

4.1 Introduction

The following section is intended to be used by Private Site Assessors, Environment Officers (Safety Standards Officers and Qualified Staff) and Licensed Septic Contractors for the sizing and sighting requirements for the selection and installation of on-site sewage disposal systems. The Licensed Septic Contractor/Assessor and the Private Site Assessors are permitted to assess and select sewage disposal systems, up to a system size of 6,810 L/day (1,500 Igal/day) that have Category I, II, III (bedrock) & IV. The selection of systems up to five bedrooms (2,270 L/day) residential units can be selected from **Table 4.1** and selection tables in **Appendix G (Disposal Field Length Selection Table)** once the soils of the area have been categorized. Septic tank and disposal field sizing requirements from 2,271 L/day up to 6,810L/day can be determined using the **Design Flow Table (Appendix D)** and the **Disposal Field Length Selection Table (Appendix G).** Systems greater than 6,810 L/day (1,500 Igal/day) ***shall be assessed and designed*** by a consulting engineer licensed to practice on Prince Edward Island. A qualified engineer can then complete an assessment and design any sized system as desired by the property owner.

A Licensed Septic Contractor, not licensed as a site assessor, and utilizing the permit process must also follow these standards. Under the permit process, licensed contractors are required to make application for a permit, receive a closing time and have an inspection carrier out, prior to covering the sewage disposal system.

4.1.1 Definitions

alternative multiple trench disposal field - means a multiple trench disposal field oriented across the slope of a property with lateral spacing of no less than 4 metres (13 ft) between the lines.

barrier material - means a light weight (50 g/m2 or more) nonwoven (i.e. felted, needle punched or heat bonded fibre) fabric or proprietary geotextile with a permeability greater than 0.001 m/s (0.04 in/sec) and an opening size of less than 700 μm (0.028 in).

capacity - means the liquid capacity of a septic tank between the waterline and the floor of the tank

contour trench disposal field - means a relatively narrow and shallow disposal bed constructed in a trench of constant depth, with both the trench bottom and the lip of the trench wall at the ground surface horizontal throughout the entire length (*see Construction Standards, Part II,* ***Sections 4.10.6 – 4.10.8***).

disposal field - means that part of an on-site sewage disposal system designed and installed in accordance with these regulations for the subsurface distribution of septic tank effluent into the soil

drainage pipe - means the certified, perforated, rigid, straight, sewer pipe used in a disposal field

duplex – means a building that is divided into two dwelling units

effluent - means sewage after it has passed through a septic tank or some other type of treatment;

effluent line - means a pipe that transports effluent from a septic tank to a disposal field;

existing parcel - means any parcel in existence prior to June 12, 1993;

filter sand - means clean, washed, screened or natural sand having less than 10% by weight retained on a 10 mm (3/8 in) sieve and less than 2% by weight passing a 0.075 mm (#200 US std.) sieve and the permeability of the sand must be not less than 0.0004 m/s (0.0013 ft/s);

good quality fill - means a reasonably uniform sand or sandy gravel containing a small proportion of silt/clay but no more than 30 % of the material shall be retained on a 10 mm (3/8 in) sieve and a minimum of 2.5 % and a maximum of 15% passing the 0.075 mm sieve (#200 US std.);

gravel - means clean, washed or screened small pieces of rock or crushed rock of a consistency or hardness which is not conducive to premature deterioration, and of which 98% by weight shall pass a 40 mm (1½ in) screen and 98% by weight shall be retained on a 12.5 mm (½ in) screen;

grease interceptor tank - means a tank installed in front of the septic tank to remove grease, oil and fats from sewage;

header - means pipe used to connect the ends of lines of drainage pipe or leaching chambers;

leaching chamber - means a prefabricated device approved by the authority having jurisdiction for use in a disposal field as an alternative to gravel and drainage pipe

leaching chamber disposal field - means a system of leaching chambers arranged in a multiple trench configuration (*see Construction Standards, Part II, **Section 4.10.5***).

liquid depth - means the maximum vertical depth of liquid which a septic tank can contain before the liquid discharges through the septic tank outlet;

multiple family dwelling - means a building containing three or more dwelling units;

multiple trench disposal field - means a system of drainage pipes and gravel arranged in the form of narrow, parallel trenches connected to a header (*see Construction Standards, Part II, **Section 4.10.3***).

permeable soil (natural) - means soil having a hydraulic conductivity in the range of 8.0 x 10-3 cm/s to 8.0 x 10-5 cm/s (3.1 x 10-8 in/s to 3.1 x 10-5 in/s).

pressure distribution system - means a distribution system designed such that a pump or siphon supplies septic tank effluent to non-perforated pipe that is drilled with holes of such diameter and spacing that the top header, full length of all interconnecting pipes, and the bottom header are under a positive pressure;

septic tank – means a watertight receptacle that receives sewage which is designed and installed to permit settling of settleable solids from the sewage, retention of the solids and scum, partial digestion of the organic matter, and discharge of the liquid portion into a disposal field;

sewage holding tank - means a closed, water-tight receptacle designed and used to receive and store sewage or septic tank effluent which does not discharge waste water;

sewer line - means a pipe that transports sewage from a building to a septic tank or a sewer collection main

standard disposal field - means

(i) a multiple trench or alternative multiple trench disposal field.

top header - means the first header of each disposal field to receive effluent from the septic tank (*see Construction Standards, Part II, **Figure 4.9**).*

waterline - means the maximum elevation of the liquid in a septic tank;

water table - means the level at which water stands in a shallow well open along its depth and penetrating the surficial deposits just deeply enough to encounter standing water in the bottom (level of water in saturated soil where hydraulic pressure is equal to zero).

4.2 Building Sewers

A building sewer for a single unit dwelling, is defined as the part of the building drainage system carrying sewage that extends from the septic tank or public sewer to a point 900 mm to 1500 mm out from the foundation wall. The building sewer shall be installed with the following conditions:

1. Minimum 100 mm diameter pipe, non-perforated, rigid, smooth bore, watertight joints with gaskets, DR35 CSA certified piping.
2. Laid straight on a grade not less than two percent.
3. If a change in direction is needed the fittings shall consist of certified, long sweep fittings. The use of these fittings should be limited.
4. Located a minimum 0.5 metres from any potable water service line.
5. Located a minimum of 3.0 metres from a domestic water well.
6. Cleanouts extended to the ground surface shall be provided at intervals of not more than 30 m, if the length of the building sewer exceeds 60 m or any direction change greater than 90 degrees.
7. Install pipe & fittings according to manufacturer's recommendations.

4.3 Septic Tanks & Effluent Lines

The following requirements shall apply to any tank that is selected or designed for use as a septic tank, with respect to construction standards, selection criteria and setback requirements:

1. The septic tank shall be designed to carry a minimum of 600 mm of earth cover.
2. All materials shall be installed according to the manufacturer's recommendations. These recommendations shall be submitted to the department by the manufacturer.
3. The manufacturer of a prefabricated tank shall provide to the installer instructions for assembly and installation of the tank. These instructions shall detail the entire installation process to ensure that the tank is watertight. These instructions shall include, but not limited to, the preparation of excavation, installation of tank, backfilling of tank, connection detail of inlet/outlet piping, etc.
4. The instructions shall have been submitted for review by the department, to assure that they address the requirements of these Standards.
5. Septic tanks must conform to the latest standard as stated in Canadian Standards Association (CSA). Grease tanks and dosing chambers are not permitted for use as a septic tank, pump or siphon chamber. Acceptable materials are reinforced concrete that conforms to CSA standards and fiberglass and polyethylene tanks which are CSA approved.
6. All septic tanks shall be watertight (see **Section 5.5.1).**
7. All septic tanks shall have risers installed as outlined in the appropriate sections. As a minimum an access riser shall be installed over the outlet and in each chamber, if the tank has multiple chambers.
8. Where a tank is installed in an area where high groundwater levels may occur, the manufacturer shall include instructions to prevent flotation of the tank.
9. A sectional pre-fabricated tank may be assembled on site, provided that the manufacturer's instructions are followed to produce a watertight tank.
10. Where a tank is manufactured from concrete; the bung hole must be sealed in a watertight manner.
11. The tank shall be tested for water tightness on site after assembly.(see **Section 5.5.1** *for a recommended testing procedure*)

12. All septic tanks shall be installed in accordance with the separation distances outlined in **Appendix F, Table F2**.
13. All septic tanks shall be equipped with a tamper resistant lid labeled “DANGER – DO NOT ENTER”.
14. All septic tanks shall be equipped with an effluent filter meeting NSF Standard 46.
15. A septic tank manufactured on-site shall be designed by a professional engineer licensed to practice in Prince Edward Island and conform to applicable CSA Standards.

4.3.1 Septic Tank Sizing

Any septic tank is required to meet the following sizing requirements: (**Figure 4.1** - Septic Tank)

1. Septic tanks for dwellings must have a capacity not less than that stated in **Table 4.1**.
2. For larger systems the minimum capacity shall be calculated as follows:

   For peak average daily flows up to 6810 l/day:

   Tank Volume(TV) = 2 x Q

   Where: Q – peak average daily flow in litres (L/day)
   TV– liquid volume of septic tank in litres (L)

   The minimum required septic tank size is 3400 L. Septic tank sizes larger than the required minimum may reduce problems and extend the life of an on-site system. See **Appendix I** for calculation examples.

3. Septic tank capacity shall be increased by 25 percent where a garbage grinder is used.
4. Access to a tank shall be provided over the inlet and outlet for easier service. The dimension of any opening shall meet latest CSA standards.
5. All septic tanks shall be fitted with a riser located at the outlet of the septic tank. Riser requirements shall be as outlined in section (section riser).
6. All outlets of septic tanks should be equipped with an effluent filter sized to manufacturer’s recommendations.
7. The septic tank shall be installed according to the manufacture’s recommendations.
8. Two compartment tanks are required when the daily flow exceeds 4100 L to reduce solids carry-over to the disposal field. Each compartment shall have an access riser for purpose of maintenance that extends to the ground surface as outlined in the riser section.
9. The interconnecting port in the divider should be located approximately one-half way in the liquid depth.
10. The final compartment should be approximately one-third of the total volume.

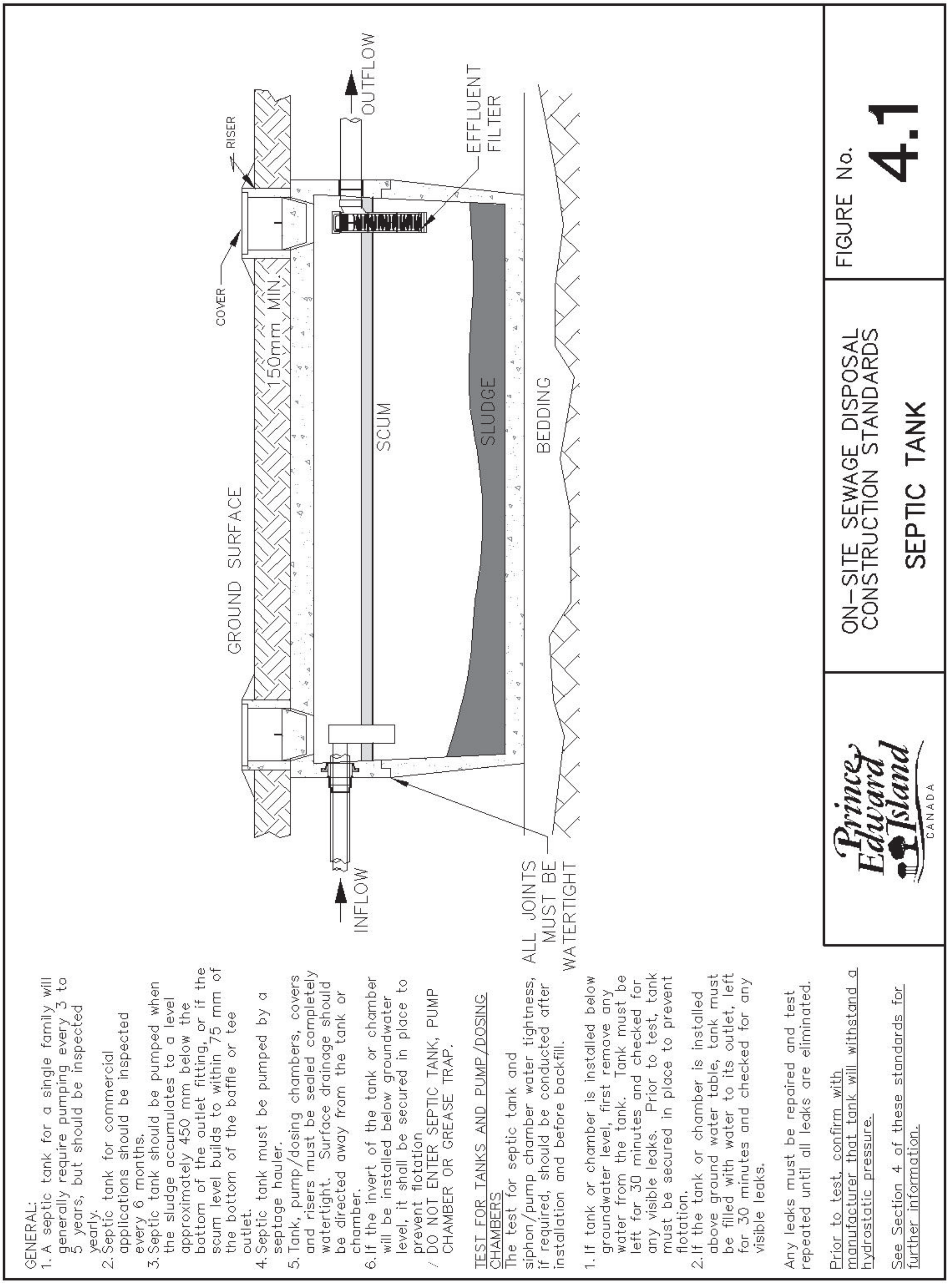


Figure 4.1 Septic Tank

Table 4.1 Minimum Capacity of Septic Tanks for Dwellings

Number of Bedrooms	Minimum Liquid Capacity (litres)
Up to 3	3,400
4	4,090
5	4,500

When selecting a tank, the depth of bury must be considered. If it is greater than 600 mm, the tank should be stamped to indicate that it has been designed to withstand burial to the required depth.

4.3.2 Effluent Line

The effluent line, which is the pipe that allows effluent to move from the septic tank to the distribution field can be fed by a gravity distribution system or a pressure distribution system.

The following are the requirements of each:

4.3.3 Gravity Effluent Line Requirements

1. A gravity line shall be a 100 mm diameter pipe, non-perforated, rigid, smooth bore and watertight and certified to CSA standards (as for Building Sewer, **Section 4.2**).
2. A gravity line shall have watertight joints.
3. A gravity line shall have a grade not less than one percent.

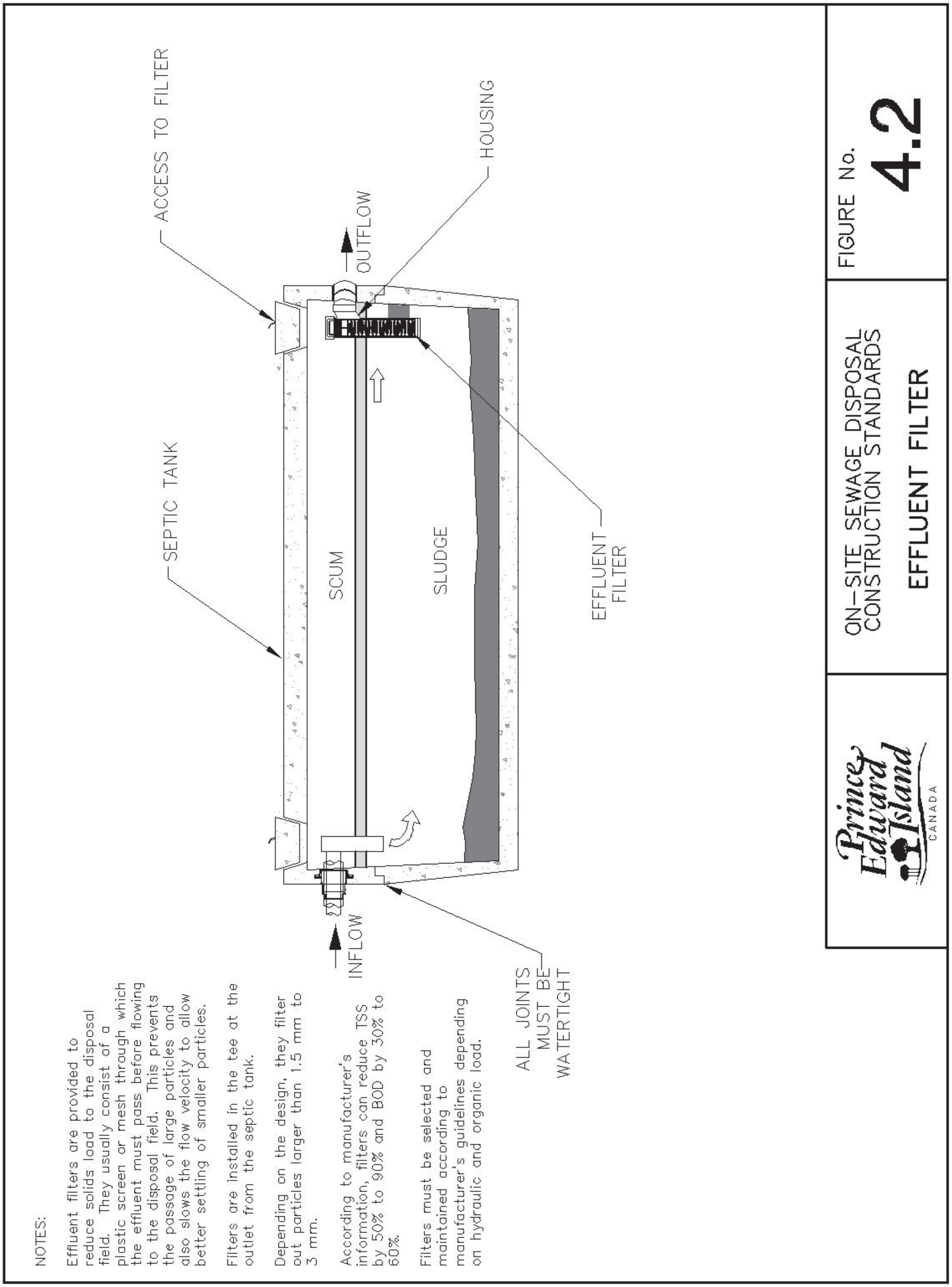


Figure 4.2 Effluent Filter

4.3.4 Pressure Effluent Line Requirements

1. Pressure line shall be a 38 mm min. (1.5 inch) diameter pipe, non-perforated, rigid, smooth bore, watertight and shall be SDR 26 certified piping or equivalent and conform to the most recent CSA specification.
2. The joints of the pressure pipe shall be watertight and installed according to the manufacturer's recommendations.
3. Provide appropriate freezing protection methods such as adequate depth of cover, insulation and/or draining of effluent lines after each pump cycle stops.
4. Pressure line to the tank (if necessary) shall be a minimum of 3 metres from a domestic water well.

4.3.5 Pressurized System Pipe Requirements

A pressurized system is more effective than a gravity system as it provides both uniform distribution and periodic dosing of the disposal field. The disadvantage of a pressurized system is the higher capital cost and the extra maintenance requirements associated with the pump or dosing chamber. Pressurizing using a pump or dosing chamber is required:

- where an end fed disposal line is longer than 30.5 linear metres
- where the one disposal bed exceeds 152.4 linear metres
- where the natural ground slope is not uniform and a gravity system might concentrate effluent at one on more weak spots in the field
- for any system where the disposal field is at a higher elevation than the septic tank

Where a pump or dosing chamber is required, the solid pipe from the pump or dosing chamber to the disposal field must have a minimum diameter as specified by the pump or siphon manufacturer but shall not be less than 38 mm. Piping within the dosing chamber and extending 1 metre from chamber shall be schedule 40 (in accordance with the most recent CSA standard). All pumped systems shall be connected to the disposal field using a "siphon breaker" as shown in Figure 4.3.

For any system selected to serve a single family home using a pump or dosing chamber, the perforated pipe in the distribution field can be similar to gravity distribution pipe **(Subsection 4.3.4)** only a 13 mm hole drilled in the top of the pipe 100 mm from the end cap(s). **In addition the distribution piping must be placed such that there is no slope on the piping in the disposal trench.**

For systems serving more than 6810 l/day (designed by a Professional Engineer), the pipe diameter, and hole spacing must be calculated, based on the system hydraulics, in an effort to provide uniform distribution throughout the disposal field. Maintain a minimum 600 mm of head at the most distant orifice. In a designed system the minimum acceptable pipe diameter is 38 mm. The design shall allow for distribution pipe to drain after the completion of each dose.

4.4 Pump and Dosing Chambers

The pump or dosing chamber discharge capacity must be sized to distribute effluent over the entire disposal field during each dose. This allows utilization of the entire field and minimizes the possibility of breakout of effluent in a localized area. Periodic dosing also allows the infiltrative surface to drain between doses. These cycles of alternate dosing and resting may maintain higher infiltration rates in the clogging mat and thus extend the life of the system.

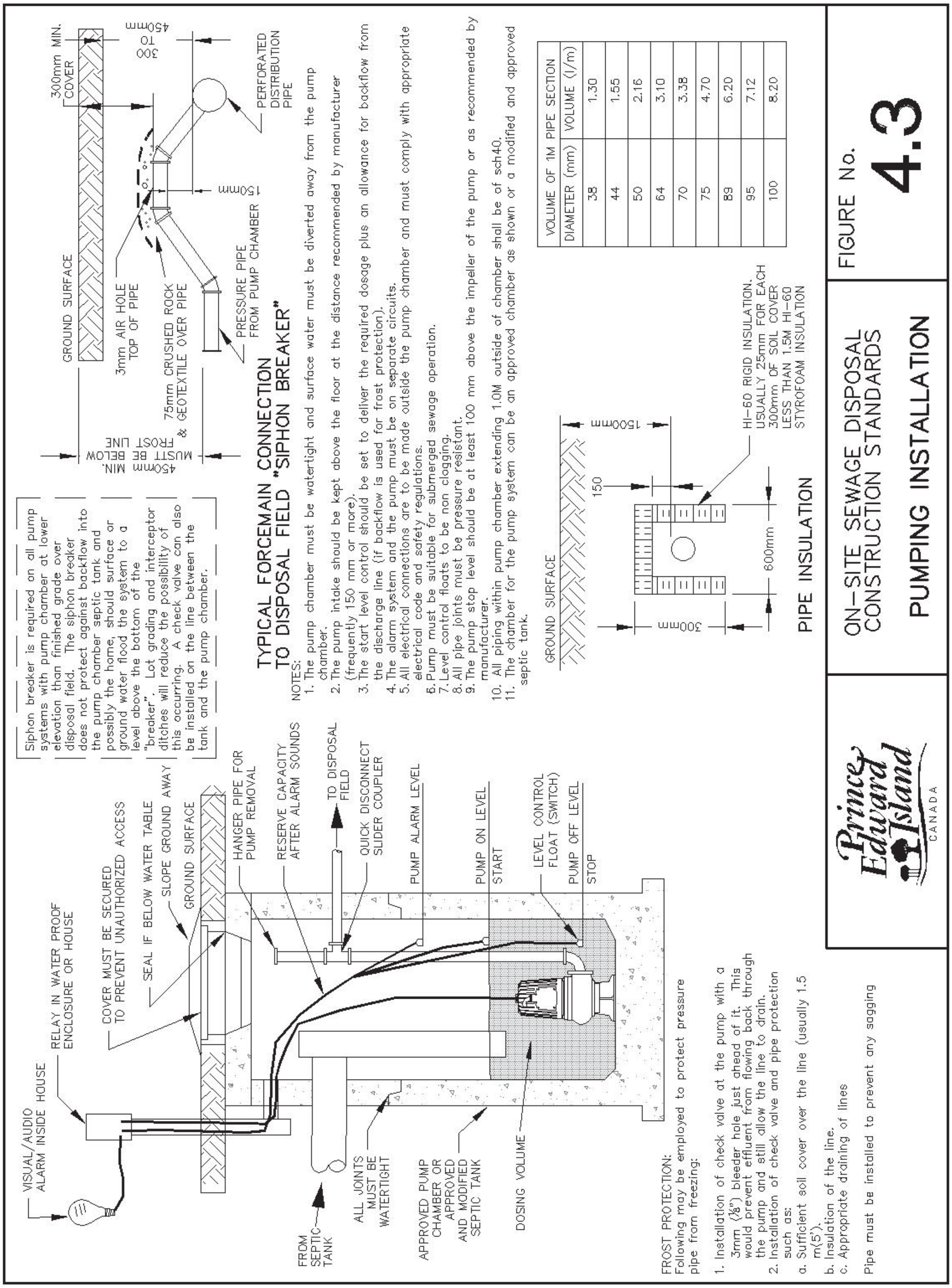


Figure 4.3 Pumping Installation

Where a dosing system is used the minimum dosing frequency is at least two times per day. When a large system is designed, other dosing frequencies may be necessary. The discharge volume must be large enough to flood the entire distribution pipe. Unless the Site Assessor or Engineer specifically selects the pump to be used, it is the installer's responsibility to ensure that the pump has the proper capacity of achieving equal distribution throughout the field.

4.4.1 Dosing Systems

There are two types of dosing systems:

High Pressure Systems provide a calculated residual head (squirt height) throughout the entire distribution network within the disposal field. The piping network continues through out the entire disposal field and is typically 50 mm in diameter depending upon system type, hydraulics and manufacturer's recommendations. This pipe can be laid on the gravel bed or adequately suspended in a chamber system. These systems shall be designed by a Professional Engineer licensed to practice on PEI.

Low Pressure Systems provides pressure typically through a 50 mm force main (SDR 26 or equivalent) to a point whereby the pipe diameter size is increased to 100 mm. At this point the flow from the pump converts to gravity flow. Typically, the method to convert the high pressure flow to low pressure flow is at the entrance to the disposal header of the system. The 50 mm pressure line is connected to the header at the centre of the header. At this point the diameter of the line changes to 100 mm. This type of pressure installation is more common in residential and smaller commercial installations. When used in conjunction with a chamber system, an energy dissipation device, such as a patio stone should be used at the entrance to each disposal line. Care is required when selecting the pump system to ensure that there is adequate total hydraulic head to over come the system head (vertical distance between the lowest liquid elevation in the pump tank and the highest point within the system and any friction losses of the pipe, fittings, valves etc.)

4.4.2 Pumping Chamber Requirements & Sizing

A typical pump chamber is shown in **Figure 4.3** and shall be certified to the latest applicable CSA or ASTM specification.

Requirements for a pump chamber include the following:

1. The chamber shall be equipped with an audible and visible high level alarm, level controls, and other accessories required to assure effective and reliable operation.
2. A riser access shall be installed over the pump(s) for maintenance purposes.
3. The dimension of any opening shall meet CSA requirements and allow easy repair of pumping system.
4. All pumps shall be accessible and set to permit maintenance of pumping system without entering the pumping station.
5. The pump system shall accommodate the automatic start, stop and alarming of system based on the water level of the pump tank.
6. The pump system shall alternate pumps in a multiple pump system.
7. The elevation of the tank shall be such that any horizontal seam is located above the highest seasonal groundwater table or as recommended by the manufacturer.

8. The high water alarm level must be below the level of the horizontal seam. It is recommended that the ***pump chamber should be tested on site after assembly, for water tightness, proper operation and dosing quantities (s***ee ***Section 5.5.1)*** for a recommended testing procedure.

The actual design of a pressure distribution system is based upon hydraulic principles and is beyond the scope of these Guidelines. In an attempt to simplify selection and standardize equipment requirements for single family homes, the required dosing capacity for siphons and pumps is as shown in **Table 4.2**.

Table 4.2 Dosing Chambers and Pumps - Capacity

Flow	Dosing Amount per Discharge Event in Litres	Minimum Pump Chamber Capacity*
1000 L	500 L	1000 L
1350 L	675 L	1350 L
1500 L	750 L	1500 L

* below any horizontal seam

When pumping a considerable distance, the dosing amount and chamber size may have to be increased to compensate for effluent in the pump line returning to the pump chamber after the pump shuts off.

4.4.3 Siphon Breaker

This section specifically addresses pressurized systems for delivery of septic tank effluent to a distribution system in a disposal field. When pumping down slope, the connection is to be made directly into the distribution pipe. If pumping upslope, a siphon breaker is required. The siphon breaker should be located where the pipe from the tank enters the distribution pipe. As well, one 13 mm hole should be placed 150 mm in from each end of the distribution pipe on the top of the pipe (**Figure 4.5**).

4.4.4 Mechanical-Electrical System

The complete electrical and mechanical system—including pumps, controls, and switches—must be capable of functioning effectively, reliably, and for many years, in a corrosive environment. These systems shall be installed according to the Canadian Electrical Code Requirements.

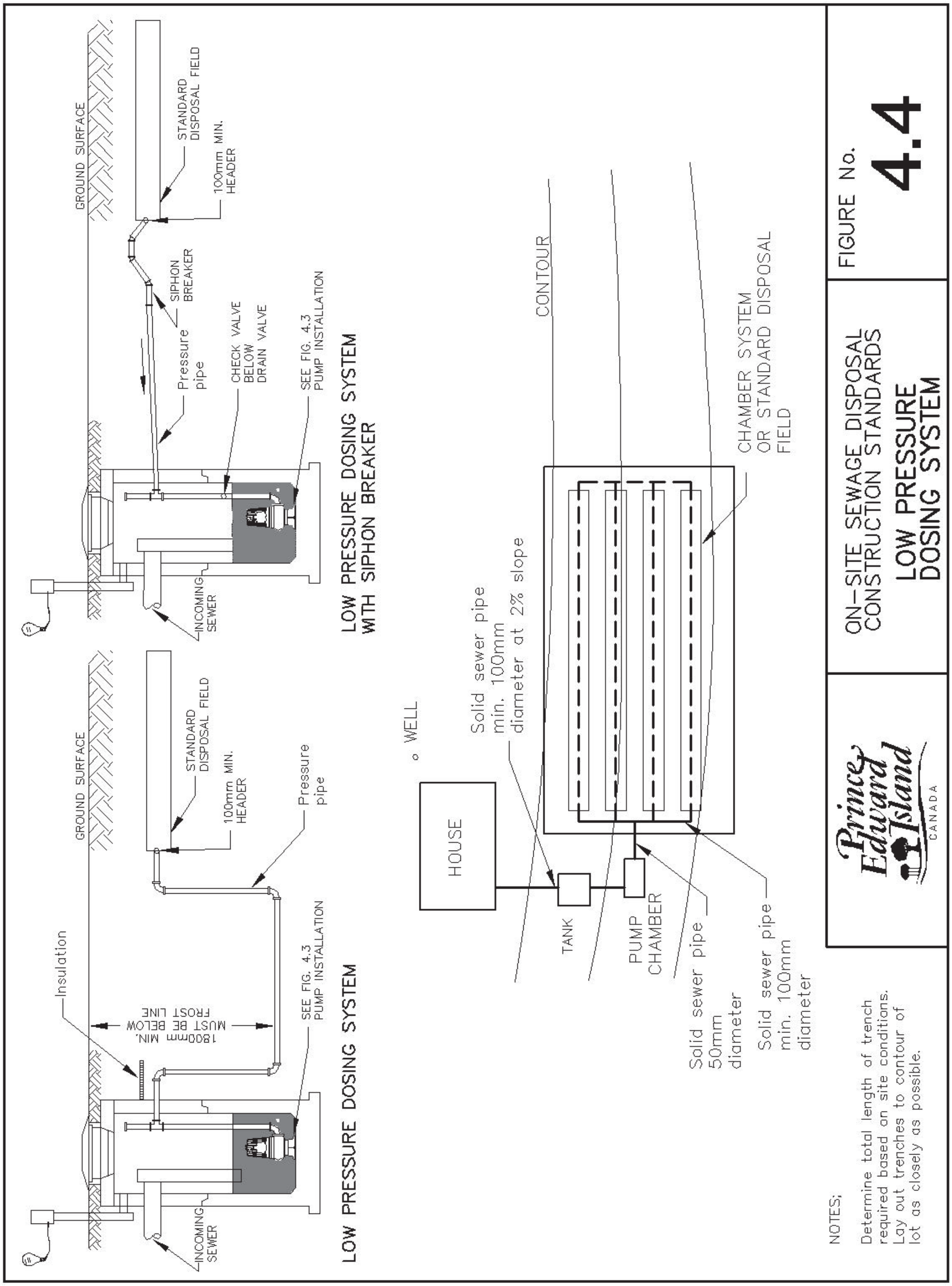


Figure 4.4 Low Pressure Dosing System

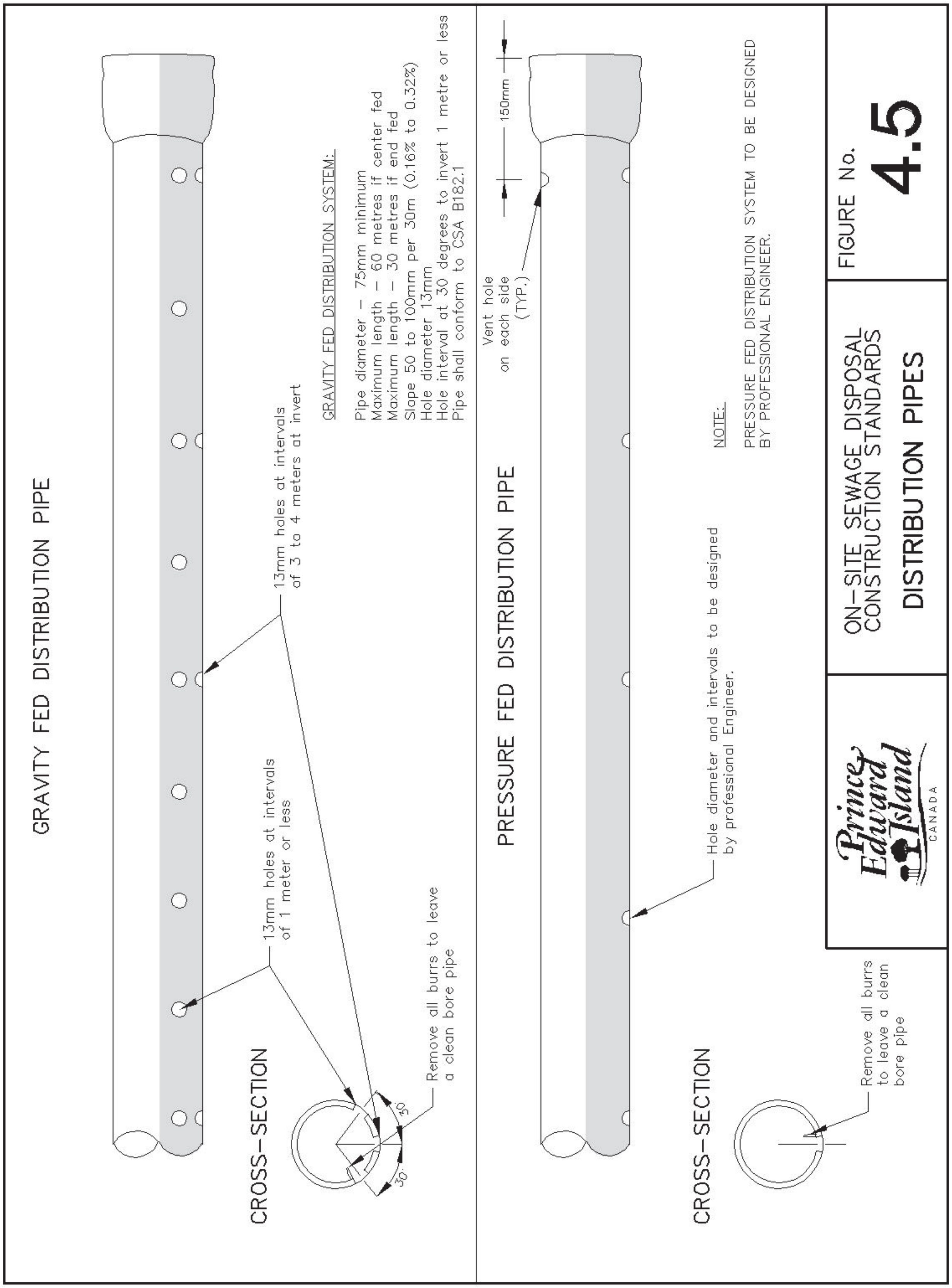


Figure 4.5 Distribution Pipes

4.5 Holding Tanks

Holding tanks (**Figure 4.6**) are not considered an on-site sewage disposal system. **Once the tank is full the material must be pumped out of the holding tank(s) by a Licensed Pumper and transported to a Wastewater Treatment Plant for final treatment.** Typically, the frequency of the pump out is 5 to 7 days. The operating costs for this type of system can be expensive depending on water use. Water usage can be reduced with the installation of low flow fixtures such as six (6) litre toilets and low flow shower heads. This option should be carefully reviewed prior to installation so that the owner is fully aware of the on going operating cost.

Although the design and installation of a holding tank is similar to that of a septic tank, several additional considerations do exist and are outlined in **Table 4.3**.

Table 4.3 Holding Tank Considerations

Holding Tank	Considerations
Minimum Size (Residential)	**4,540 litres (1000 Igal)**
Minimum Size (Commercial)	6,810 L or 2 days storage, whichever is greater
Discharge	No surface discharge allowed
Alarm System	Positioned to allow for ½ day storage after activation
Accessibility	Must be readily accessible to pumping vehicle
Location	Surface water diverted from tank area
Water Use	Water use should be reduced.

The incremental costs of a large tank are minor compared to the cost of pumping over a long period of time. A small sized tank will require more frequent pumping and higher costs whereas a larger tank will require less pumping trips resulting in a lower cost in the long term. Maintenance and operating costs are substantially higher than operation of a regular sewage disposal system. The homeowner must understand that these costs are very high and that such costs may not be sustainable. Therefore, due to the costs, the use of a holding tank is only recommended as a last resort for on-site sewage treatment.

The installation of a holding tank is an option for servicing given that one of the following conditions exists:

a. in the opinion of the department, no practical alternative for the construction of a disposal field exists;
b. the sewage holding tank is to be installed for commercial use and, in the opinion of the department there is no practical alternative for the installation of a disposal field.

A licensed septic contractor shall install a holding tank that complies with the manufacturer's recommendations and these Standards.

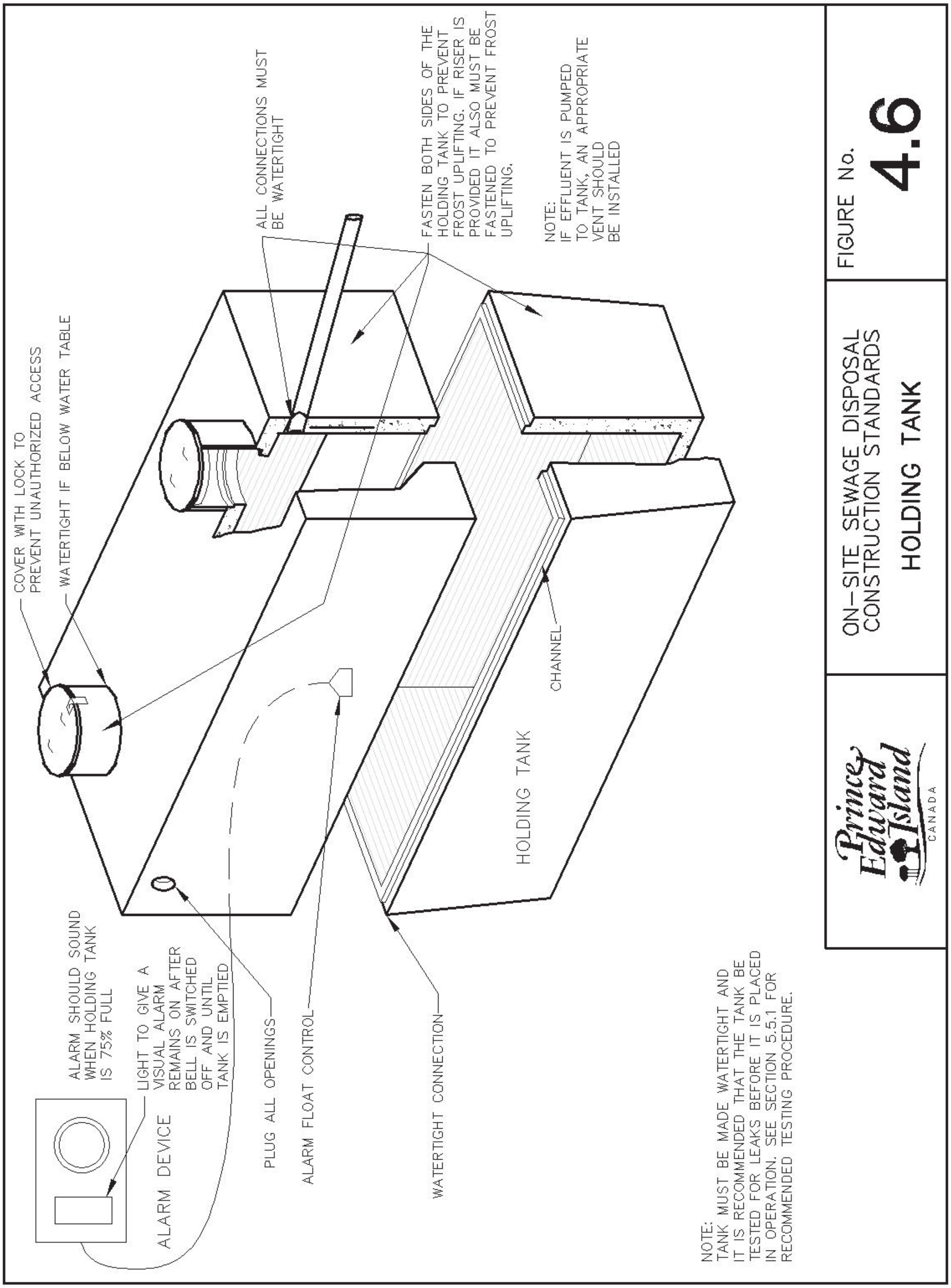


Figure 4.6 Holding Tank

4.5.1 Requirements for a Holding Tank

1. The requirements of a holding tank (**Figure 4.6**) are as follows:
   a. Volume is calculated as having twice the maximum expected daily flow as calculated in **Appendix D**
   b. Minimum capacity of 4540 L for residential use and 6810 L for commercial use.
   c. Equipped with an audible and visible high level positioned so that it alarms at ¾ mark of the liquid capacity of the holding tank.
   d. Be readily accessible to a pumping truck
   e. Be equipped with a riser over the inlet of the holding tank
   f. Where a tank is installed in an area where high groundwater levels may occur, the manufacturer shall include instructions to prevent flotation of the tank.
2. The holding tank shall be installed according to the manufacture's recommendations.
3. The proposal of a holding tank should include estimated yearly pump out costs from a Licensed Pumper.
4. A below ground tank shall be constructed of a non-metallic material.
5. A holding tank may be utilized for **above ground** services for an industrial/commercial operation, with the following requirements:
   a. the tank is constructed of non-corrodible material
   b. secondary containment is supplied (dykes, berms, etc)
   c. adequate weatherproofing is provided to prevent freezing in the tank or lines
   d. the tank is supplied with adequate hold down and support systems
   e. the inlet shall be on the top of the tank and the inlet line shall be self-draining
   f. drain valves are locked when not in service or security in the form of a fence is provided
   g. the tank vent is equipped with an odor control device or is extended sufficiently above grade to eliminate odors at ground level
   h. tank to be installed according to existing departmental policies, regulations and operational bulletins
6. Holding tank shall be tested on site after assembly, for water tightness**.** (**See Section 5.5.1** *for a recommended testing procedure*).

4.5.2 Riser and Lid

1. A single compartment septic, holding or pump tank shall have a riser section that
   a. is installed over the outlet opening of the top of the septic tank
   b. has a watertight seal where it joins the tank
   c. raises the outlet opening sufficiently to prevent flooding by surface water
   d. is equipped with a secure tamper resistant locking mechanism with lid
   e. lid to the riser provides watertight connection
   f. is labeled clearly of dangers, **"DANGER – DO NOT ENTER"**
2. A multiple compartment septic, holding or pump tank shall maintain the above requirements and shall have a minimum of one riser section located over each compartment.
3. Refer to **Figure 4.6** for construction details
4. All riser and lid sections shall be installed according to the manufacturer's recommendations.
5. Riser installation procedures shall be submitted by the manufacturer of the septic, holding or pump tanks.

4.6 Interceptors

Interceptors are installed to intercept and divert surface water and groundwater upslope of a disposal field. An interceptor may be a trench filled with gravel, and containing a perforated pipe, or a swale (shallow trench) at the ground surface (**Figure 4.7**). Situations in which interceptors are required, and their locations relative to the ground surface, are defined in this Section. The construction of interceptors is described in **Section 5.6** of this document.

4.6.1 Interceptor Trench

An interceptor trench may be required or considered in order to address the following situations:

(1) intercept and divert perched groundwater over a layer of impermeable soil
(2) lower a seasonally high groundwater table upslope of a system that is located at lower end of a long slope
(3) intercept and divert surface water.

In situation (1) the base of the trench should be set at least 150 mm into any impermeable layer.

In situation (2) the depth of the trench should be a minimum of 150 mm below the bottom of the distribution field. In some cases this could result in an interceptor depth of up to 2 meters or more.

In situation (3) a trench intended to intercept groundwater may also intercept surface water, or a trench (french drain) may be intended specifically to intercept and divert surface water. In the latter case the trench should be at least 300 mm deep.

The interceptor trench should be 0.3 to 0.6 m in width and be filled with gravel. It may contain a perforated pipe with a slope. The trench must be sloped and sod placed where it is practical.

Any interceptor trench must be long enough to divert the intercepted water to a point where it will not enter the disposal system and to where it will freely discharge to the surface, well down slope of the disposal field. It is recommended that the discharge point for the interceptor extend a minimum of 6 metres down slope of the disposal field or buffer. It is recommended that interceptors be located 5 to 10 metres upslope of the distribution field and that they pass no closer than within 5 metres of the end of the disposal field. If these separation distances cannot be achieved, it may be necessary to use impervious fill, such as compacted clay or bentonite, to ensure that surface/ground water does not enter the disposal field or have sewage enter the interceptor.

If the trench is to intercept surface water either the gravel should be carried to within 50 mm of the surface (with no final cover material or sod) to allow surface water to enter the trench, or a swale should be included at the surface. The option of no final cover material may not be practical if there is a danger that sediment from upslope sources may clog the surface of the gravel.

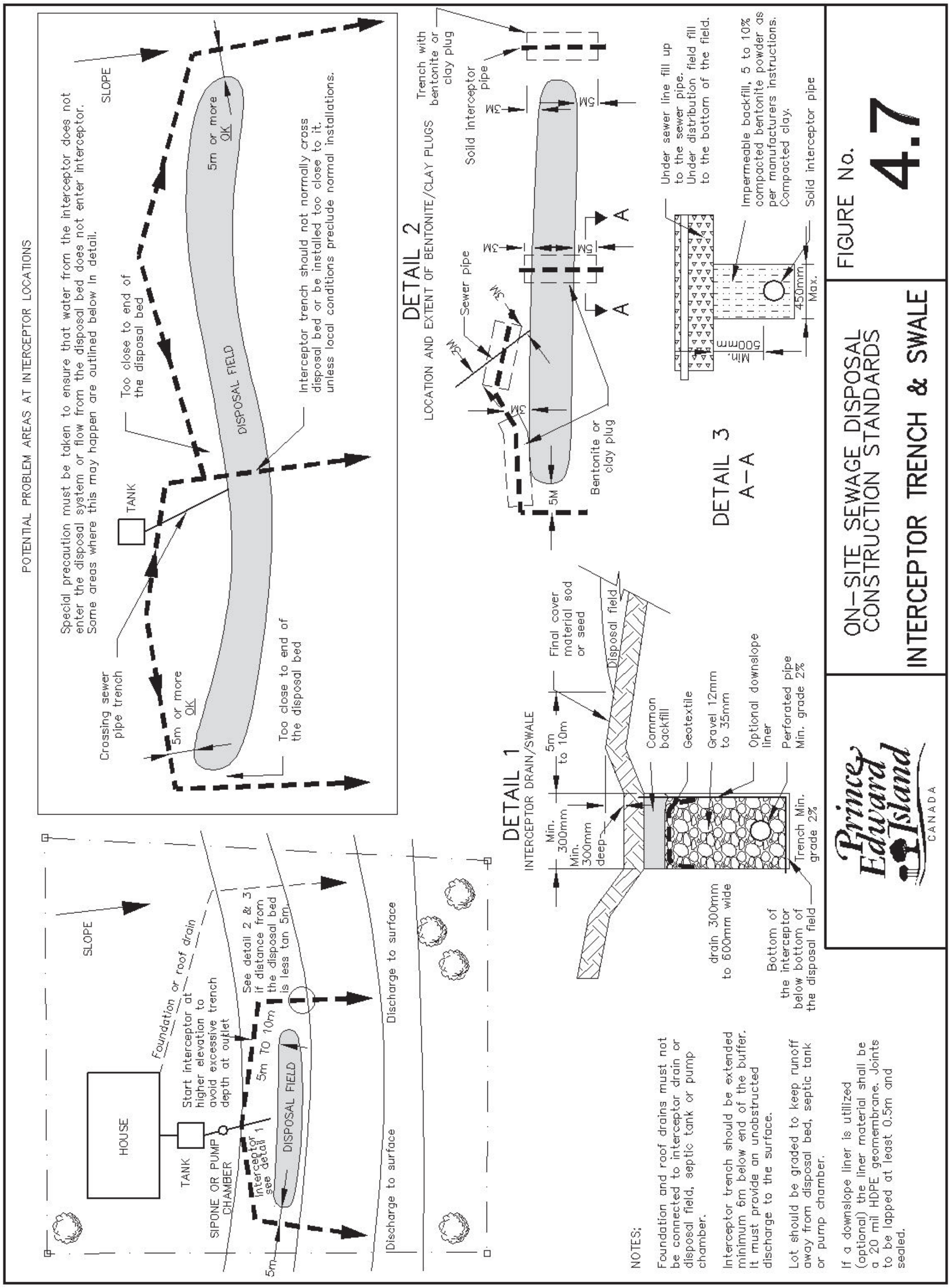


Figure 4.7 Interceptor Trench and Swale

Normally, the interceptor will drain past either or both ends of the disposal pipe, but for very long contour systems, an interceptor trench may be required to cross the disposal system at intervals. Where this crossing occurs the trench shall be constructed of solid pipe and should be laid a minimum of 500 mm below the bottom of the distribution trench (**Figure 4.7**). This drain line must be sealed with impermeable fill such as compacted clay or bentonite, for a minimum of 3 metres upslope and 5 metres down slope of the distribution field. Roof water must not be connected to the perforated pipe in an interceptor trench, but may be carried in a solid pipe in the same trench.

In some cases such as highly permeable soils or high surface water flow, it may be advisable to place a liner on the down slope and bottom of the interceptor trench. If a liner is utilized, it must be placed along the bottom of the interceptor trench and up the vertical face of the down slope side of the trench; it must not to be placed on the upslope side of the trench (**Figure 4.7**). The liner shall be a 20 mil HDPE geomembrane with all seams over lapped a minimum of 0.5 metres with an appropriate sealant between the overlap.

4.6.2 Interceptor Swale

A swale is intended to intercept surface water. It may be constructed alone, or at the surface of an interceptor trench.

A swale should be at least 0.3 m deep and 0.6 m wide, and sodded with sloping sides to permit mowing.

The length of any swale must be enough to divert the intercepted water to a point where it will not enter the disposal system and sloped down and beyond the system.

4.7 Grease Chambers

Grease chambers, usually, are not necessary on kitchen waste lines from residential development. However, in some commercial/institutional applications such as restaurants, school cafeterias and kitchens at summer camps, grease chambers **are required**. For the purpose of these Standards, a grease chamber is a chamber where grease floats to the surface while the cleaner water underneath is discharged to the septic tank. If this grease is not removed prior to entering the septic tank, large quantities may accumulate in the sewer and may block the building sewer or the effluent line to the disposal field, or the disposal field itself.

The small grease traps found on some commercial/institutional kitchen drains are not considered adequate to protect the disposal system. The liquid volume of the grease chamber must be large enough to permit the water to cool allowing the grease to separate and rise to the top of the grease tank.

The volume of a grease chamber shall be calculated from the following equation:
For Restaurants:

$\mathbf{V_{grease}} = \mathbf{D * (HR/2) * GL * ST * LF}$

Where: D - number of seats in dining area
HR - number of hours open per day
GL - gallons of wastewater per meal (2 or more)
ST - Storage capacity (normally 2)
LF - Loading factor depending on restaurant location
1.25 - central locations
1.0 - recreation areas
0.5 to 0.8 - other locations

For Cafeterias or Institutional kitchens:

$\mathbf{V_{grease} = M * GL * ST * LF}$

Where: M - Total number of meals served per day
GL - Gallons of wastewater per meal (2 or more)
ST - Storage capacity (normally 2)
LF - Loading factor
1.0 with dishwasher
0.5 without dishwasher

For all but large establishments, a converted 2,725 litre septic tank would have adequate capacity to serve as a grease chamber and may be the most economical solution even if it has more than the minimum required capacity. To convert a septic tank to a grease chamber, a tee can be installed on the outlet and extended to be 300 mm above the tank bottom (**Figure 4.8**). Calculation examples are provided in **Appendix I**.

To allow for proper maintenance, clean out covers shall be extended to finished grade. The cover shall be watertight and secured to prevent unauthorized entry. To minimize problems with grease solidifying in the sewer line the chamber should be located close to the building but not closer than 1.5 m, no more than 10 m from the fixture being served, and on undisturbed earth or compacted fill material..

4.8 Final Cover Material

The complete on-site sewage disposal system shall be covered with a layer of soils that will promote the growth of vegetation over the system.

The material used to cover on-site sewage disposal systems is referred to as final cover material and will consist of: “Imported, manufactured or site prepared material consisting of friable sandy silt or silty sand with a 4 to 25% organic matter content. The material must be free of debris, vegetation, and roots, with no stones greater than 25 mm in size. The material shall be capable of supporting grass or similar vegetation.

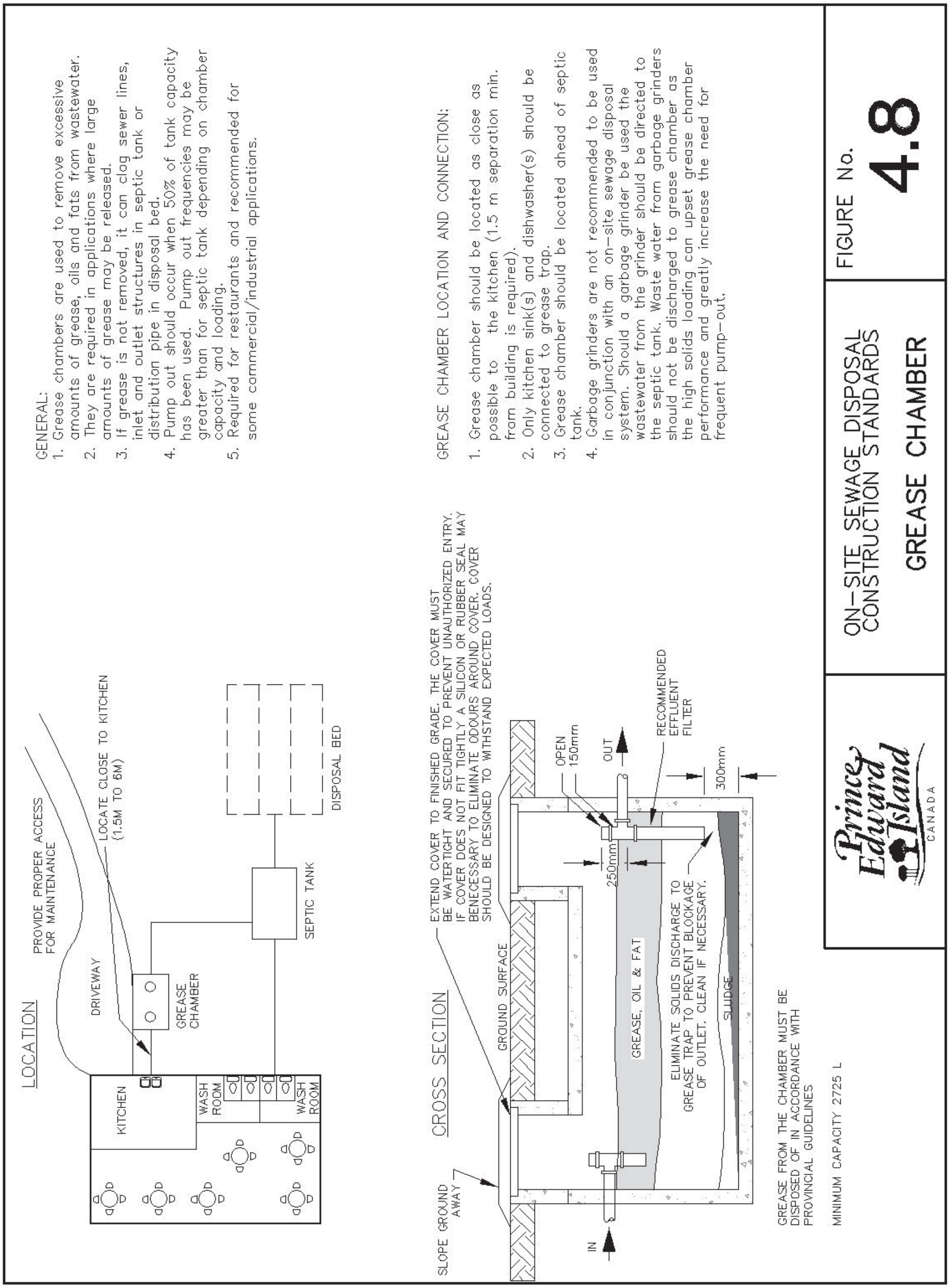


Figure 4.8 Grease Chamber

4.9 Approved Products

Under the ***Sewage Disposal Systems Regulations***, products for use in on-site sewage disposal systems shall be CSA approved. The use of products/materials other than what has been described in these Standards may be considered. In these cases, the use of such a product or material must be done in accordance with the Minister's approval, recognizing it as a product for use in an on-site sewage disposal system.

4.10 Disposal Fields Selection & Layout

4.10.1 Introduction

Most or all septic tank effluent will eventually reach the ground water table, directly or by travel in bedrock or very permeable soils. If the effluent is not adequately treated, drinking water and surface water may become contaminated. It is therefore required that there is well draining soil underneath the disposal field to ensure effluent is treated prior to recharging ground water. The roles of the disposal fields are to uniformly distribute the effluent into the soil profile below the system ensuring that the hydraulic capacity of the soil is not exceeded, and to provide treatment of the effluent leaving the system. This treatment will ensure the protection of groundwater and surface water resulting in the protection of public health and environment. For the usual circumstances when a system is to be installed on a Category I, II or III lot the Regulations require a minimum of 600 mm of separation between the bottom of the trench and bedrock, maximum water table or soil with unacceptably high permeability. ***Please note:*** *For systems installed on a Category IV lot, the reader is referred to the depths prescribed in* ***Appendix G, (Category IV)*** *and not those shown in this section or some of the sketches in the document.* The separation distance under the system can be achieved with the addition of Good Quality Fill where suitable permeable soils are not present. All on-site sewage disposal systems shall meet the required minimum setbacks provided in **Appendix F**.

The on-site disposal fields discussed in this section which can be selected by a Site Assessor, a Licensed Septic Contractor/Assessor and a Professional Engineer are:

- Multiple Trench
- Alternative Multiple Trench
- Gravelless Disposal Systems
- Contour Trench C1, Raised C1, C2 & C3

The on-site disposal field shall not be located:

- where, at any time, the maximum water table is less than 0.6 m (2 ft) below the ground surface
- in soil which does not meet the definition of permeable soil;
- in any area which may be subject to flooding either by a natural body of water or by surface water runoff;
- under a roadway;
- under a paved area;
- under an area used by motor vehicles;
- under an area used intensively by livestock;
- less than 6.1 m (20 ft) from a foundation;
- less than 3.0 m (10 ft) from a parcel boundary or an embankment;
- less than 15.2 m (50 ft) from any well; or
- Less than 15.2 m (50 ft) from a natural boundary of a body of water.

See **Appendix F**, **Table F2** for more details.

4.10.2 Disposal Field Sizing

Disposal field sizing not listed in the tables outlined in **Appendix G** shall be determined using the following formula and calculations:

*The formula shown here is in metric units. For the imperial version and examples of calculations, please refer to **Appendix J**.*

$$\textbf{Drainage pipe length (m)} = \frac{Q\ (L/d) \times SLR\ (m^2/1000L/d)\ /\ 1000}{CA\ (m^2/m)}$$

1) Calculate the wastewater flow **(Q)**
2) Calculate septic tank volume (size)
3) Calculate the length of the disposal field system according to the following:

    1) Choose the soil loading rate **(SLR)**
        i) For Category I & Category III (permeable soil 2-4 feet) conditions choose:
            - 36 m^2/1000L/day for multiple trench disposal field
            - 36 m^2/1000L/day for leaching chamber disposal field
            - 31 m^2/1000L/day for contour trench disposal field
        ii) For Category II, Category III (permeable soil 1-2 feet) & Category IV conditions choose:
            - 41 m^2/1000L/day for multiple trench disposal field
            - 41 m^2/1000L/day for leaching chamber disposal field
            - 36 m^2/1000L/day for contour trench disposal field
    2) Choose the contact area / linear foot of trench **(CA)**
        i) For multiple trench system the CA is 0.6 (m^2/m)
        ii) For a leaching chamber system the CA is 1.2 (m^2/m)
        iii) For a contour trench disposal field the CA is
            - for a 0.9 m wide trench is 1.1 (m^2/m)
            - for a 1.2 m wide trench is 1.4 (m^2/m)
            - for a 1.5 m wide trench is 1.7 (m^2/m)
            - for a 1.8 m wide trench is 2.0 (m^2/m)

Where:

Flow (Q) is the design flow referenced from **Appendix D** or as determined by actual measured readings.

Soil Loading Rate (SLR) is the disposal area required for each one thousand litres per day of wastewater generated and is expressed as square metres per 1000 litres per day (m^2/1000L/day).

Contact Area (CA) is the minimum square metres per linear metre of gravel/soil interface on the bottom of the trenches in the disposal field. The contact area is expressed as square metres per linear metre (m^2/m).

4.10.3 Multiple Trench

A multiple trench system has been the conventional method of treating and disposing of effluent. It consists of a series of disposal trenches oriented along the contour connected by a level solid header pipe and footer pipe. In **Figure 4.9**, a solid header and a perforated (optional) footer pipe are joined by a number of perforated laterals. The trenches should be oriented with the greatest dimension across the slope of the lot. The header pipe and footer pipes are laid level in an attempt to ensure equal flow distribution to the laterals.

The width of the trench is a minimum of 600 mm. Wider trenches can be used where required. Lateral trenches shall be installed 2.0 metres apart centre to centre, where site conditions allow. Trenches can be closer together if special care is taken to ensure excavated material from one trench does not fall into the next trench. A minimum 1.5 metre separation distance, centre to centre is required for all disposal fields, however, at all times a minimum of 900 mm is maintained between the trench walls..

Selection of a Multiple Trench

Once it has been determined that conditions allow the installation of a multiple trench type system, the minimum total length of trench can be selected from the table in **Appendix G**.

The dimensions of a multiple trench system may be selected as follows:

1. Determine the average daily flow in L/day from the tables in **Appendix D**.
2. From the test pit information determine soil type, depth of permeable soil and total soil depth to bedrock or water table.
3. From the tables found in **Appendix G**, determine if soil depths allow the selection of a trench type field and if so determine the depth of trench allowed.
4. If conditions allow the selection of a trench type system, select the length of trenches for the soil type from the tables in **Appendix G**.
5. Refer to **Section 5** for system construction details. Refer to **Figure 4.9** for typical layout of a multiple trench system.

Layout of a Multiple Trench

To use a multiple trench type disposal field the following conditions must be met:

1. There is at least 600 mm permeable soil on the lot for a Category I disposal field size (**Appendix G**).
2. There is at least 300 mm permeable soil on the lot for a Category II disposal field size (**Appendix G**).
3. There is at least 300 mm permeable soil on the lot for a Category III shallow bedrock disposal field size (**Appendix G**).
4. There is at least 1200 mm of Good Quality Fill (GQF) on a lot for Category IV disposal field size, where there is less than 300mm permeable soil **(Appendix G)**. Also, a 3 meter buffer must be maintained around the perimeter of the field bed.
5. There is at least 300 mm permeable soil under the disposal trench.
6. There is at least 600 mm separation between the bottom of the trench and the maximum water table elevation, bedrock or soil with unacceptably high permeability.

Where these conditions cannot be met, the selection of another type of disposal field may be required.

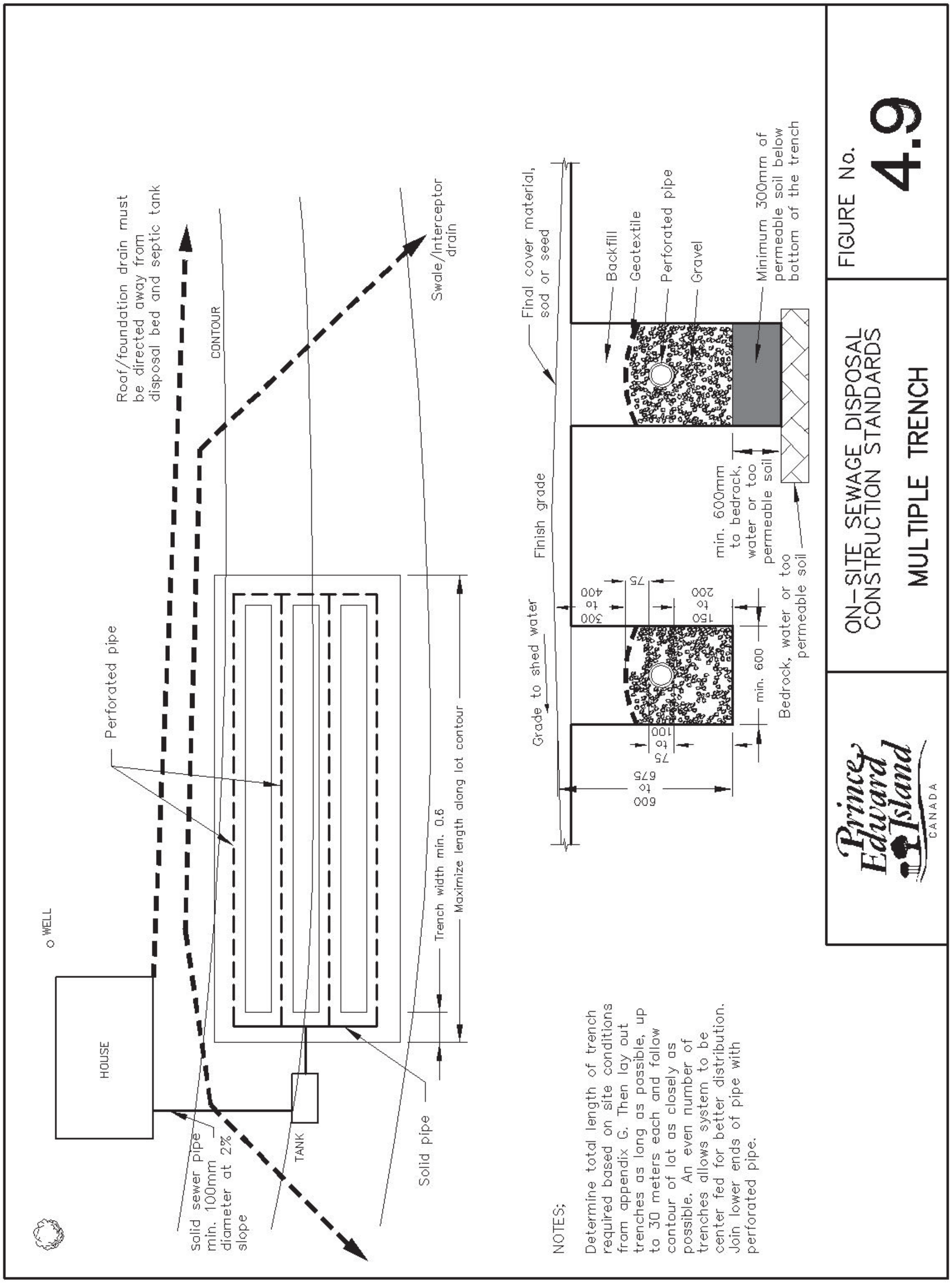


Figure 4.9 Multiple Trench

4.10.4 Alternative Multiple Trench

An alternative multiple trench consists of a series of disposal trenches oriented perpendicular to the contour of the land connected by a level solid header pipe and footer pipe in **Figure 4.11**. A solid header and a perforated footer pipe (optional) are joined by a number of perforated laterals. The minimum width of the trenches will be 600 mm. Laterals to be installed a minimum of 4 m apart where pipe conditions allow.

Selection of an Alternative Multiple Trench

To use an alternative multiple trench type disposal field, the following conditions must be met:

1. Determine the average daily flow in L/day from the tables in **Appendix D**.
2. From the test pit information determine soil type, depth of permeable soil and total soil depth to bedrock or water table.
3. From the tables found in **Appendix G**, determine if soil depths allow the selection of a trench type field and if so determine the depth of trench allowed.
4. If conditions allow the selection of a trench type system, select the length of trenches for the soil type from the tables in **Appendix G**.
5. Refer to **Section 5** for system construction details. Refer to **Figure 4.11** for typical layout of an alternative multiple trench system.

Layout of an Alternative Multiple Trench

To use an alternative multiple trench type disposal field the following conditions must be met:

1. There is at least 600 mm permeable soil on the lot for a Category I disposal field size (**Appendix G**).
2. There is at least 300 mm permeable soil on the lot for a Category II disposal field size (**Appendix G**).
3. There is at least 300 mm permeable soil on the lot for a Category III shallow bedrock disposal field size (**Appendix G**).
4. There is at least 1200 mm of Good Quality Fill (GQF) on a lot for Category IV disposal field size, where there is less than 300mm permeable soil **(Appendix G)**. Also, a 3 meter buffer must be maintained around the perimeter of the field bed.
5. There is at least 300 mm permeable soil under the disposal trench.
6. There is at least 600 mm separation between the bottom of the trench and the maximum water table elevation, bedrock or soil with unacceptably high permeability.

4.10.5 Gravelless Disposal Systems

Gravelless disposal systems offer alternatives to traditional pipe and gravel distribution systems. The use of gravelless systems technology can be advantageous in areas where gravel is difficult to place or may not be readily available. Systems such as chambers and other synthetic aggregate systems must meet appropriate standards for sewage disposal systems distribution and must meet specifications outlined in '**Appendix A'** of the **Sewage Disposal Systems Regulations**. Gravelless systems may consist of open-bottomed chambers, fabric-wrapped pipe, and pipe wrapped in synthetic materials such as expanded polystyrene (EPS) foam chips. A number of proprietary gravelless systems have been approved for use in specific jurisdictions throughout North America, including Prince Edward Island.

Gravelless technologies, like the leaching chamber system, shall be selected and laid out according to these standards and the manufacturer's installation recommendations for that technology. The manufacturer's installation recommendations must be approved for distribution by the Minister. Where applicable, system sizing for these systems has been adjusted and approved by the Minister, allowing for increased contact area in these systems. In the leaching chambers systems up to 50% reduction is permitted. With the EZ *flow* system a reduction of up to 33% is permitted. The EZ *flow* system is only permitted for use in a multiple trench design unless otherwise approved by the Minister.

A typical design layout of a gravelless system like the leaching chamber system have been approved for use in PEI since 1996 and two options for installation approved by the department include a Shallow In-ground System and an At-grade System (see **Figure 4.11**).

The **in-ground** system is used when the following conditions can be maintained:

1. System can be placed within 600 mm of surface;
2. Depth of permeable soil below the system is minimum 300 mm;
3. 600 mm separation to groundwater, bedrock, or "too permeable" soil.
4. **Appendix G** provides the lengths required for the various lot categories.

The **at-grade** system is used when the conditions required for the in-ground system cannot be met. The at-grade system is required to be backfilled with Good Quality Fill (GQF).

The **at-grade** system is used when the following conditions can be maintained:

1. System is placed at grade;
2. Depth of permeable soil below the system is minimum 300 mm;
3. Soil under the system is scarified;
4. 600 mm separation to groundwater, bedrock, or "too permeable" soil.
5. **Appendix G** provides the lengths required for the various lot categories.

Layout of Chamber System (Multiple Trench)

The trenches are to be excavated parallel to the ground contour. The lines of the chambers are to be of equal length. A minimum depth of 300 mm of permeable soil below the bottom of any trench of the disposal field is required. The minimum distance of the walls of adjacent trenches shall be 900 mm and the minimum spacing between the chambers shall be 1800 mm centre to centre. The bottom of each trench shall be level and of equal elevation. Each line of chambers shall be fed from a header via tees and the downstream end of each line shall be connected to a bottom header.

For gravity fed systems, the inlet pipe shall extend through the end plate and terminate on an adequate splash plate (concrete patio stone) or an energy dissipation device. This is required for both high and low pressure distribution systems.

Where the total length of leaching chambers in a multiple trench configuration exceeds 150 m, they shall be constructed in two or more separate disposal fields connected to the septic tank by using, a) a sewage pumping station or b) a siphon chamber.

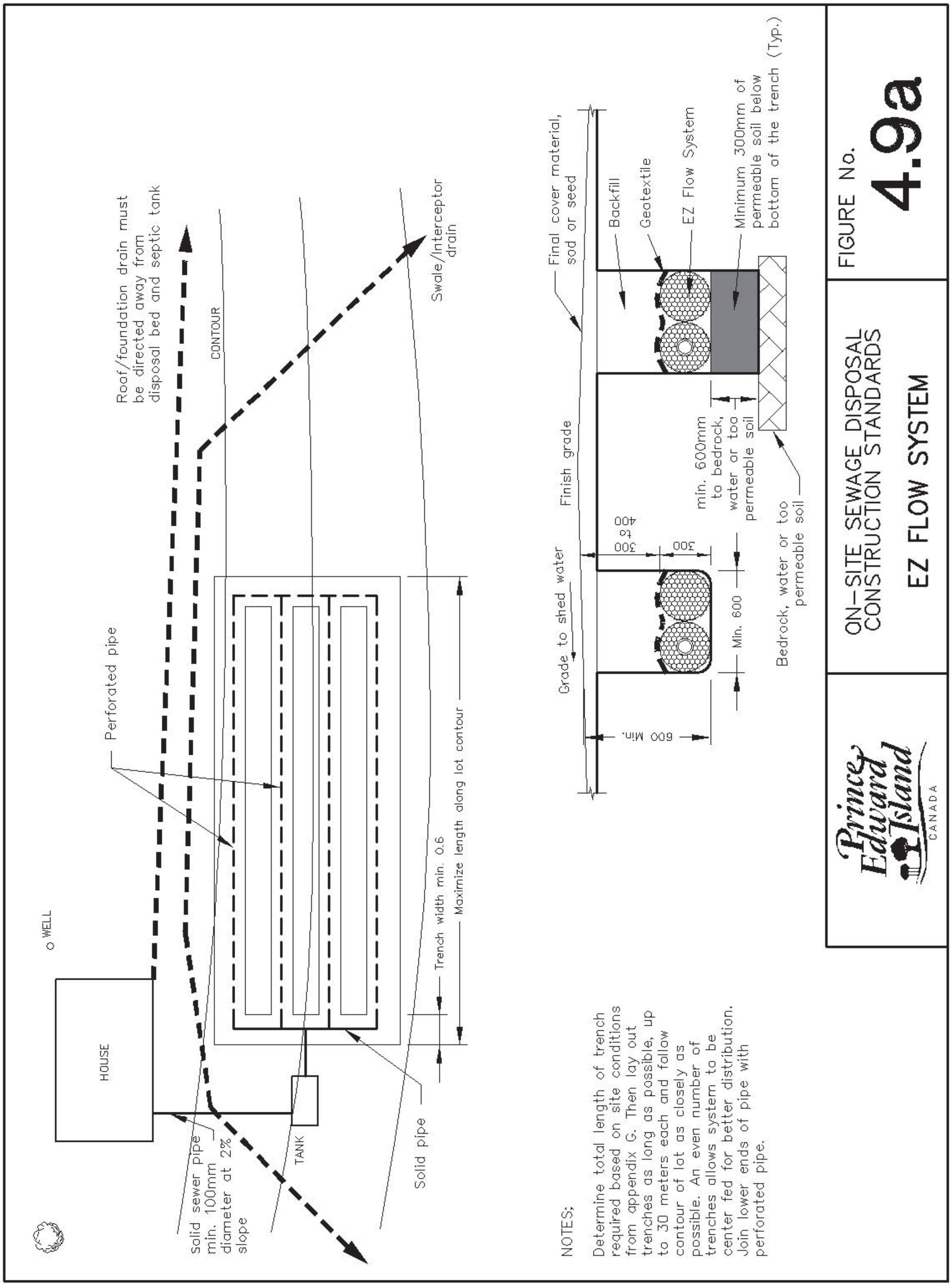


Figure 4.10a EZ *flow* System

Layout of EZ Flow System (Multiple Trench)

For use in raised bed applications, the EZ*flow* 1202 is a bundle of 2 pieces each of 300mm in diameter by 3.0 meters long. The EZf*low* 1202 is designed for use in trench applications.

Installation Instructions

The instructions for installation of EZ*flow* products are given below. In cases where linear footage required is not in multiples of 10, installer may (a) reduce the product to needed length and refasten netting to the pipe or, (b) use an additional 10 feet of product to exceed the required trench length.

Disposal Fields Use

The EZ*flow* 1202H, systems can be used in disposal fields as follows:

1. The EZ*flow*1202H system is to be installed side by side, in a 600 mm wide trench, one cylindrical bundle shall be of solid aggregate fill (without pipe) and the other cylindrical bundle (with pipe) shall be of aggregate and drainage tile.
2. Disposal field trenches shall follow the ground surface contours so that variations in trench depth will be minimized.
3. The minimum clearance distances required shall be met. Determine the permitted location and excavate the trenches.
4. Construction of trenches shall comply with the Construction Standards. Trench wall and bottom are to be raked or scarified to loosen soil.
5. Remove plastic EZ*flow* stretch wrap prior to placing bundles in the trench(s). Remove any stretch wrap in the trench before system is covered.
6. Place first EZ*flow* bundle(s) in the trench. The next bundle(s) with pipe are joined end to end with approved internal pipe couplings. Connect and place additional EPS bundles with pipe in trenches until the required linear footage has been obtained and cap the ends with approved caps.
7. If installing an EZ*flow* product that does not contain a pre-inserted geotextile, then a geotextile barrier cover shall be placed over the top of these products prior to backfilling. The barrier material must meet the requirements of the On- Site Sewage Disposal Systems Construction Standards.
8. These products shall be covered with a minimum of 300 - 400 mm of backfill.
9. The trench top shall be shaped or mounded to ensure surface water runoff.

Where the total length of the field bed in a multiple trench configuration exceeds 150 m, the field bed shall be constructed in two or more separate disposal fields connected to the septic tank by using, a) a sewage pumping station or b) a siphon chamber. The design layout of an EZ*flow* system is similar to a standard multiple trench system as shown in **Figure 4.9a.**

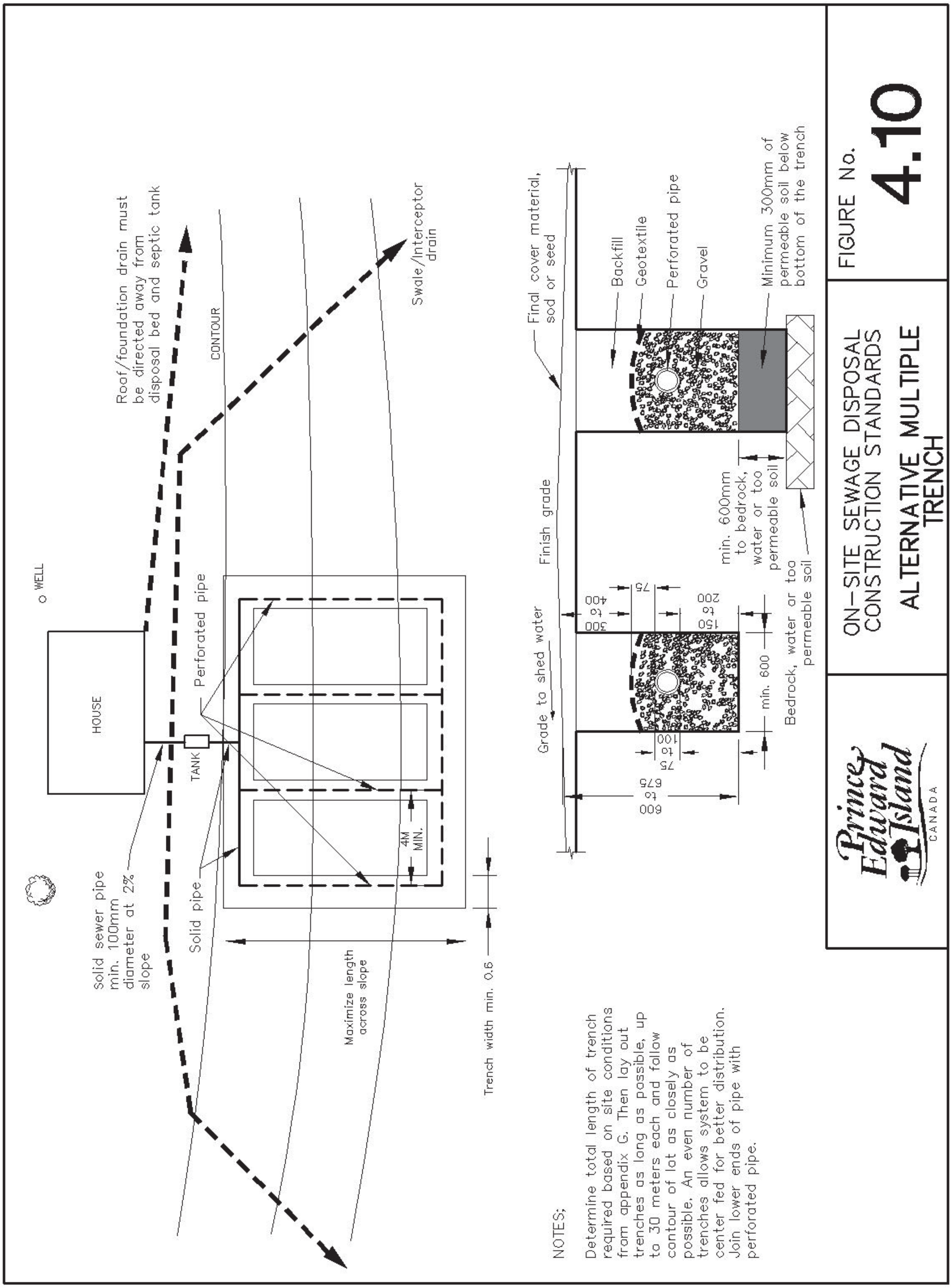


Figure 4.11 Alternative Multiple Trench

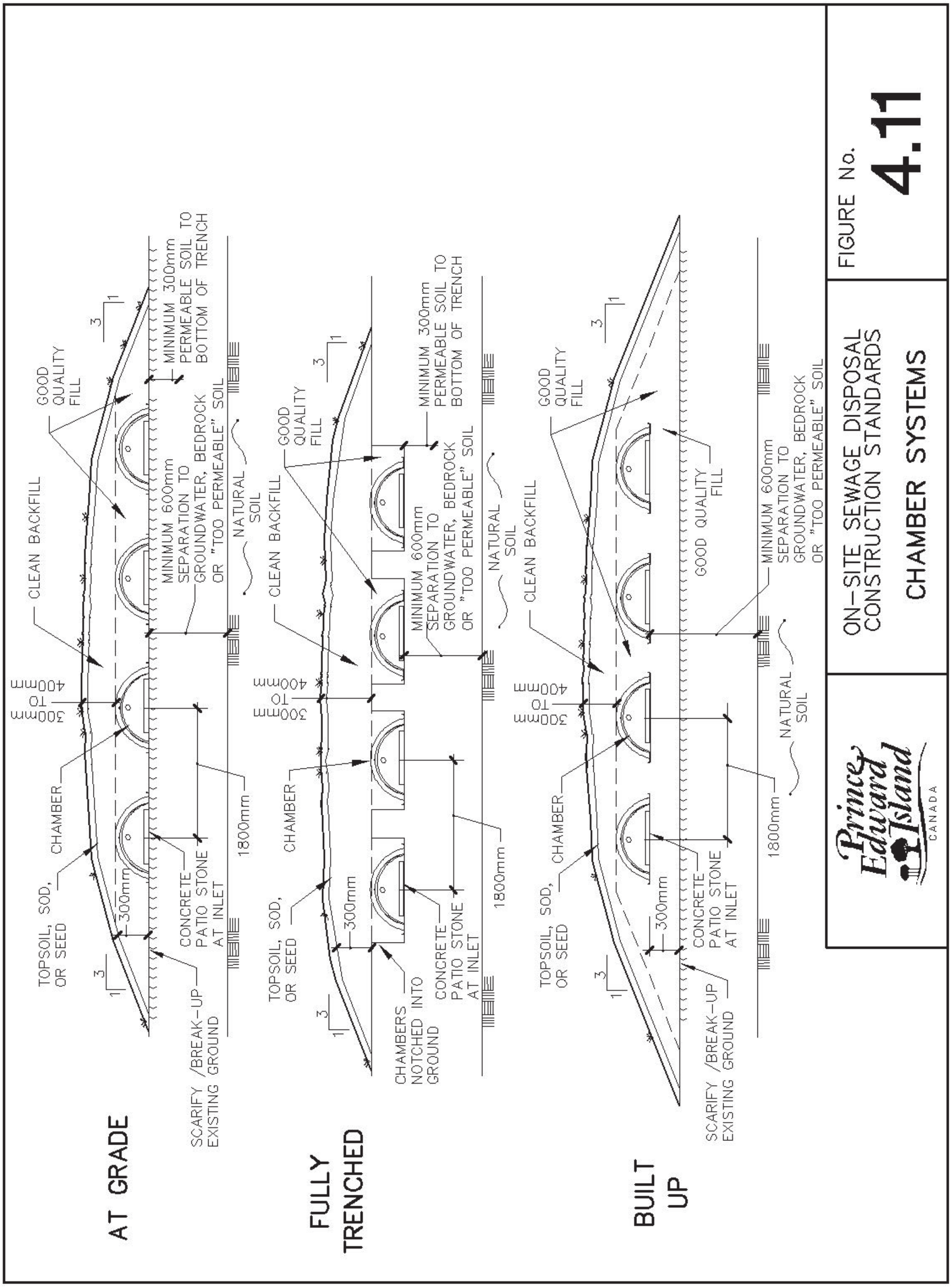


Figure 4.12 Chamber Systems

4.10.6 Contour Trench C1 and Raised C1

A contour trench is a conventional disposal field constructed along the contour line. Details of a C1 contour trench are shown in **Figure 4.13.**

A C1 trench may be selected:

- where the surface slope at the location of the trench is at least 5 percent
- where the width of the lot will allow for the length of the selected C1 trench

A C1 trench is fed by a gravity distribution system, except where a pressure system is required where the distribution field is at a higher elevation than the septic tank.

An interceptor trench or swale may be necessary, to intercept and divert surface or ground water if a perched water table exists, or if the system is located at the lower end of a long slope.

Refer to **Section 4.6** and **Section 5.6** for more information on interceptor trench or swale.

Depth Limitations for a C1 Contour Trench

Figures 4.12 and **4.13** illustrate two possible C1 contour installations.
It is important that the C1 trench excavation does not penetrate the soils with unacceptably low permeability and that there is a <u>minimum</u> of 300 mm of permeable soil under the disposal field. It should also be noted that the draining of a perched water table may allow for the increase of an effective soil depth.

As illustrated in the raised C1 cross section (**Figure 4.14**), clearance to water table, bedrock and soils with unacceptably high permeability can be increased if the trench is raised by not more than 300 mm. This trench will require an earth cover as illustrated and an interceptor trench and/or swale.

Selecting a C1 Contour Trench

The length of a C1 trench is determined using the table in **Appendix G**. The table used will depend on the average daily flow leaving the dwelling and the depth of permeable soil. Other factors include the amount of room for a contour system on the property and the total depth of soil above water table, bedrock, or soil with high permeability.

The length of a C1 trench will range between 30 m and 60 m. If a C1 system cannot be selected due to limiting soil conditions, then a C2 or C3 system may be considered with the addition of Good Quality Fill (GQF).

A C1 system can be selected as follows:

a) Determine the number of bedrooms and low flow fixture option.
b) Determine the surface slope at the proposed location of the disposal field. <u>If the slope is less than 5 percent or greater than 30 percent, a C1 cannot be considered for selection</u>.

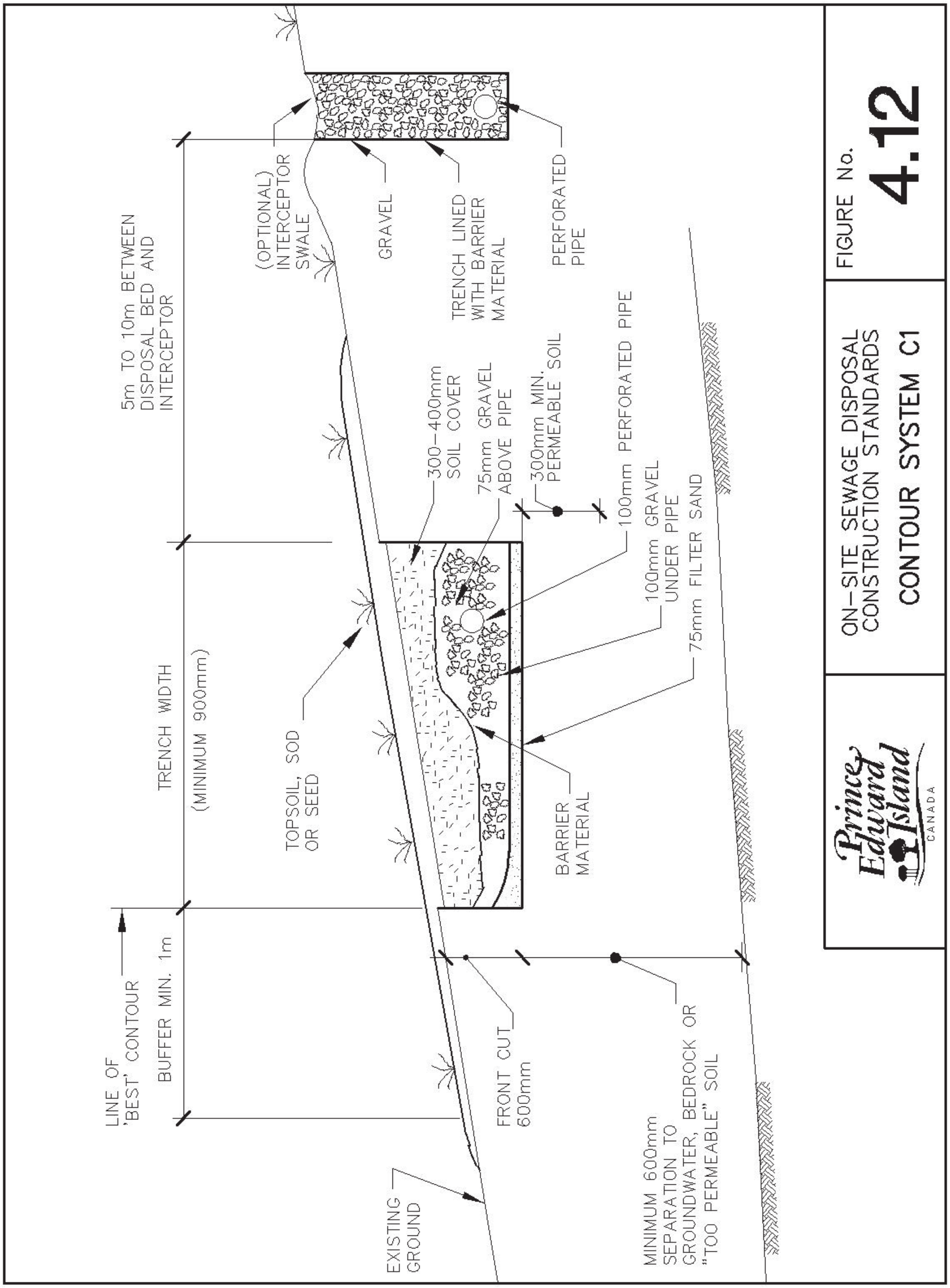


Figure 4.13 Contour System C1

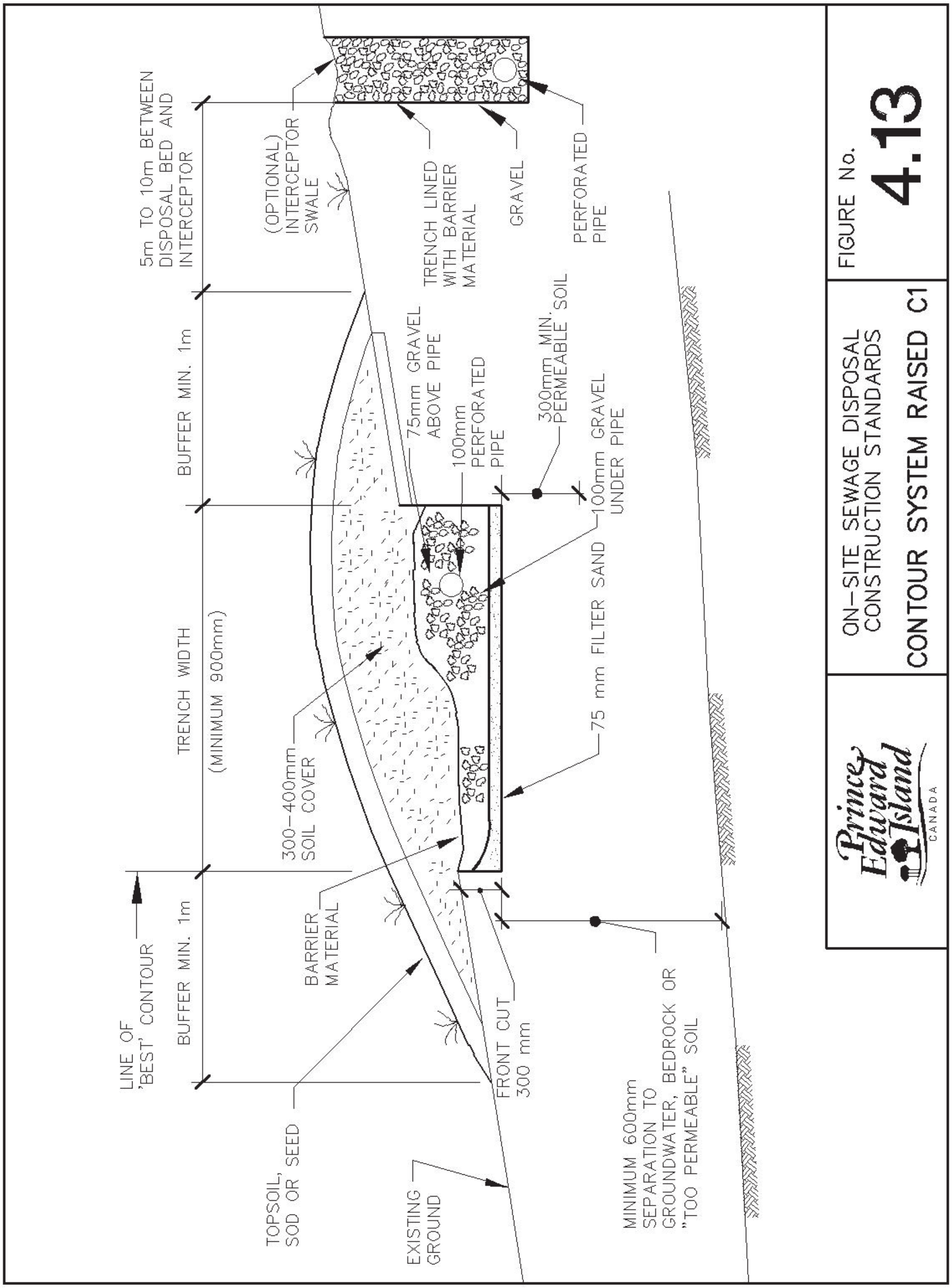


Figure 4.14 Contour System Raised C1

c) Determine the category of the soils in the area of proposed disposal field. If the total depth of permeable soil is less than 600 mm a C1 cannot be considered for selection.
d) Determine the maximum depth to water table, bedrock, soil with unacceptably high permeability. If this value is less than 1.2 m, then a C1 cannot be considered for selection.
e) Determine the lot category.
f) Once the lot category, number of bedrooms and system type are determined, refer to **Appendix G** to determine the trench length and width.
g) The cross section dimensions of the disposal field will be shown in **Figures 4.12 and 4.13**

Layout of a C1 Trench
Figures 4.12 and 4.13 illustrated the layouts of fully trenched C1 and raised C1 trenches.

A trench is excavated along the contour to the required width and depth. The trench bottom is perfectly level throughout its length and width. The bottom of the trench and the down slope side walls are then raked. After raking, filter sand is deposited in the bottom of the trench to a depth of 75 mm, with excess filter sand raked to the down slope side of the trench. The sand is placed as shown in **Figure 4.12 & 4.13**. Once the sand is in place a minimum of 100 mm of gravel will be placed. The amount of crushed rock at the tee will exceed 100 mm because the pipe will be sloped toward(s) the end(s) of the system. (for more details on layout see **Section 5.5.3**).

4.10.7 Contour Trench C2

A C2 contour trench may provide an alternative in situations where a C1 trench cannot be used. **Figure 4.15** illustrates the layout of a standard C2.

A C2 trench is similar to a C1 trench in that effluent leaving the trench is expected to move laterally in the soil below the organic surface layer. In a standard C2 a layer of Good Quality Fill, above the ground surface, enables saturation of the existing soil to the natural ground surface preventing possible breakout.

Use of C2 systems is limited to locations where the surface slope at the location of the trench is at least 5 percent. If the slope is less than 5 percent, a multiple trench or chamber system should be considered. The exact selection is dependent on the site.

A modified C3 trench, constructed according to **Figure 4.17**, should be used instead of a C2 trench where uneven surfaced lots or boulder fields are encountered.

A C2 trench is fed by a gravity distribution system, except that a pressure system is required where:

- the length from the tee feeding the system, to the end of the distribution pipe, exceeds 23 m
- the natural slope is not constant and a gravity system may tend to concentrate effluent in one part of the system
- The distribution pipe is at a higher elevation than the septic tank.

Where groundwater, bedrock, or soil with unacceptably high permeability occurs under a C2 trench, a 600-mm vertical separation must be maintained between the bottom of the disposal field trench and the above conditions. This may require the use of a C3, rather than a standard C2, to ensure that this 600 mm separation is met.

Selection of a C2 Trench

The length of a C2 trench is determined using the table in **Appendix G**. The table used will depend on the average daily flow leaving the dwelling and the depth of permeable soil. The amount of area for a contour system on the property, and the total depth of soil above water table, bedrock, or soil of unacceptably high permeability must be taken into consideration in your selection from the table.

The length of a C2 trench will range between 30 m and 60 m. If a C2 system cannot be selected due to limiting soil conditions, then a C3 system may be considered.

A C2 system can be selected as follows:

a. Determine the number of bedrooms and low flow fixture option.
b. Determine the surface slope at the proposed location of the disposal field. <u>If the slope is less than 5 percent or greater than 30 percent, a C2 cannot be considered for selection</u>.
c. Determine the depth(s) of permeable soil. If the total depth of permeable soil is less than 300 mm a C2 cannot be considered for selection.
d. Determine the depth to water table, bedrock, soil with unacceptably high permeability. If this value is less than 1.2 m, then a C2 cannot be considered for selection.
e. Determine the category of lot.
f. Once the lot category, number of bedrooms and system type are determined, refer to **Appendix G** to determine the trench width and length.

The cross section dimensions of the disposal field will be as shown in **Figure 4.15**.

Layout of Standard C2 Trench

Figure 4.15 illustrates the layout of a standard C2 trench. The toe of the trench is excavated along the contour to a depth of 175 mm into the permeable soil.

The trench is then excavated to the necessary width while keeping the bottom of the trench perfectly level throughout its length and width. The trench bottom and down slope side walls are raked. The depth of the trench from the upslope side will be greater than the depth at the toe.

A 75 mm layer of filter sand, is deposited in the bottom of the trench and excess filter sand is raked to the down slope side of the trench.

A minimum 125 mm depth of crushed rock is placed on top of the filter sand. This will ensure that the distribution pipe is raised so that its invert is at or above the ground elevation at the down slope lip of the trench. The amount of crushed rock at the tee will exceed 125 mm because the pipe will be sloped toward(s) the end(s) of the trench.

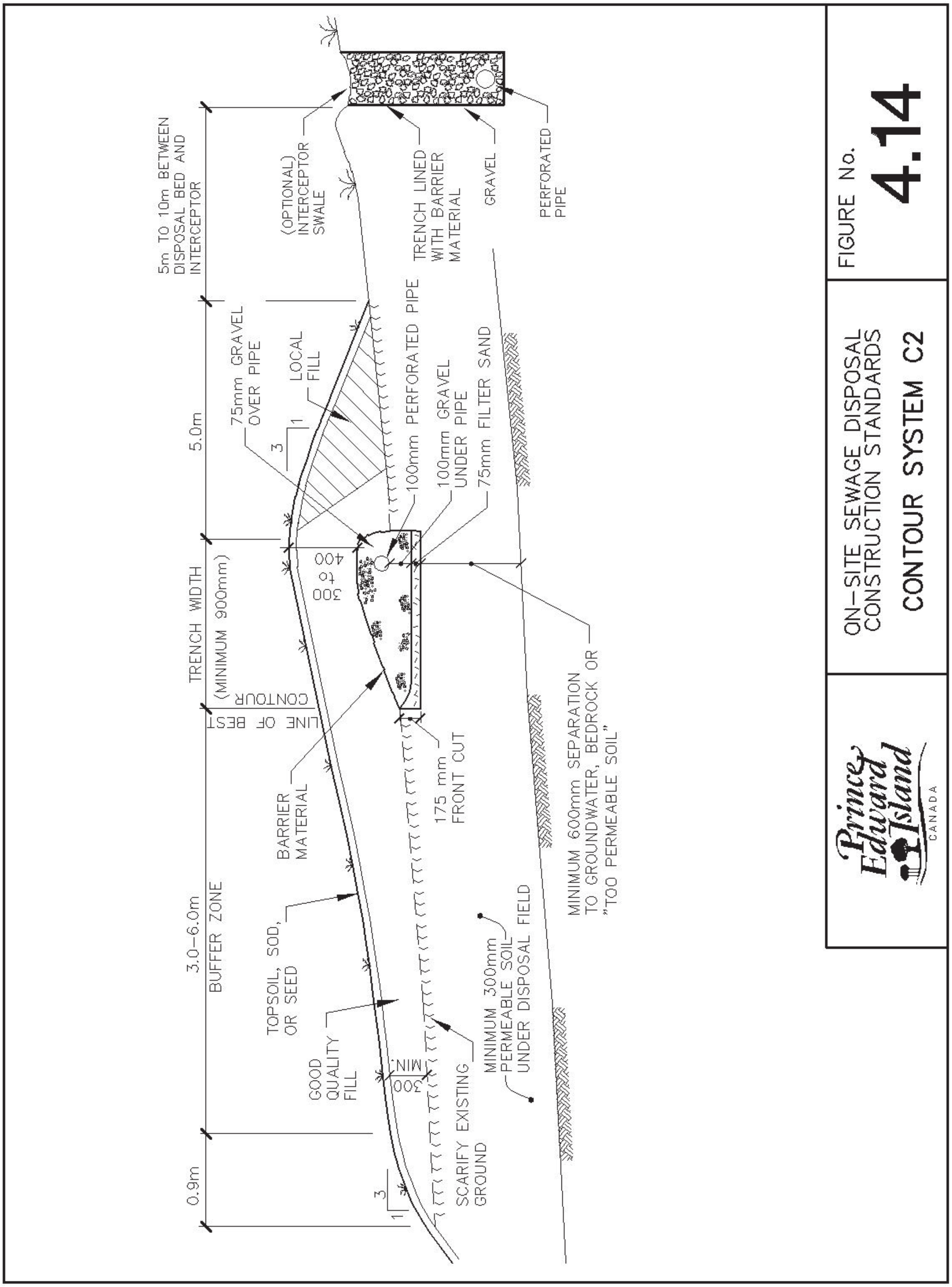


Figure 4.15 Contour System C2

4.10.8 Contour Trench C3

A C3 trench is shown in **Figure 4.16**. This trench consists of a distribution pipe and rock filled trench constructed entirely in good quality fill. The Good Quality Fill (GQF) and trench must follow the site contour.

- additional depth of good quality fill is required to protect groundwater
- site conditions—uneven sites including boulder fields, or undulating wooded areas—require a modified C3 system, **Figure 4.17**, instead of a C2 trench
- the surface slope is at least 5%

Effluent leaving the trench in a C3 is expected to move vertically through the Good Quality Fill (GQF) until it reaches the natural soil under the fill. Effluent will then move vertically into the natural soil if the permeability allows, or down slope through the good quality fill where the permeability of the natural material is inadequate to allow the effluent to enter the soil.

Selection of a C3 Trench

Where ground water, rock or soil with unacceptably high permeability occur under the C3 trench, the depth of good quality fill must be enough to provide a 600 mm vertical separation between the bottom of the distribution trench and the ground water, rock or soil with unacceptably high permeability. Under these conditions, select a C3 as shown in **Figure 4.16** with a depth of good quality fill adequate to give the 600 mm separation, but not less than 600 mm.

The dimensions of a C3 system can be selected as follows:

a. Determine the number of bedrooms and low flow fixture option.
b. Determine the ground surface slope at the location of the trench and confirm that is greater than 5% and less than 30%.
c. Based on the flow determined in (a) and the slope determined in (b), the length of the C3 and the type of good quality fill required is selected from **Appendix G**.
d. If the distance from the bottom of the trench to ground water, bedrock, or soil with unacceptably high permeability is a factor, select the depth of good quality fill required to give the minimum 1 m separation. Where separation to ground water, bedrock, or soil with unacceptably high permeability is not a concern select a depth of 600 mm good quality fill under the trench.
e. Select other dimensions of the system from **Figures 4.15 and 4.16**.

Where a C3 type system is installed on a lot with very little permeable soil over solid bedrock or soil with unacceptably low permeability and effluent is expected to be obvious at the down slope toe of the sand buffer it is recommended that a 150 mm layer of sand plus final cover material and sod be extended beyond the buffer. The down slope width of this extra buffer is determined on a site by site basis but should extend at least 7 m or to the point where there is adequate permeable soil or root zone to absorb the effluent.

Layout of a C3 Trench

The required dimensions of the buffers for a C3 trench are shown on **Figures 4.15 and 4.16**. Fill used for the buffer upslope of the trench may be Good Quality Fill or clean fill material. Good Quality Fill is required for down slope and end buffers. The down slope edge of the rock trench in the C3 is laid out to follow the contour of the site.

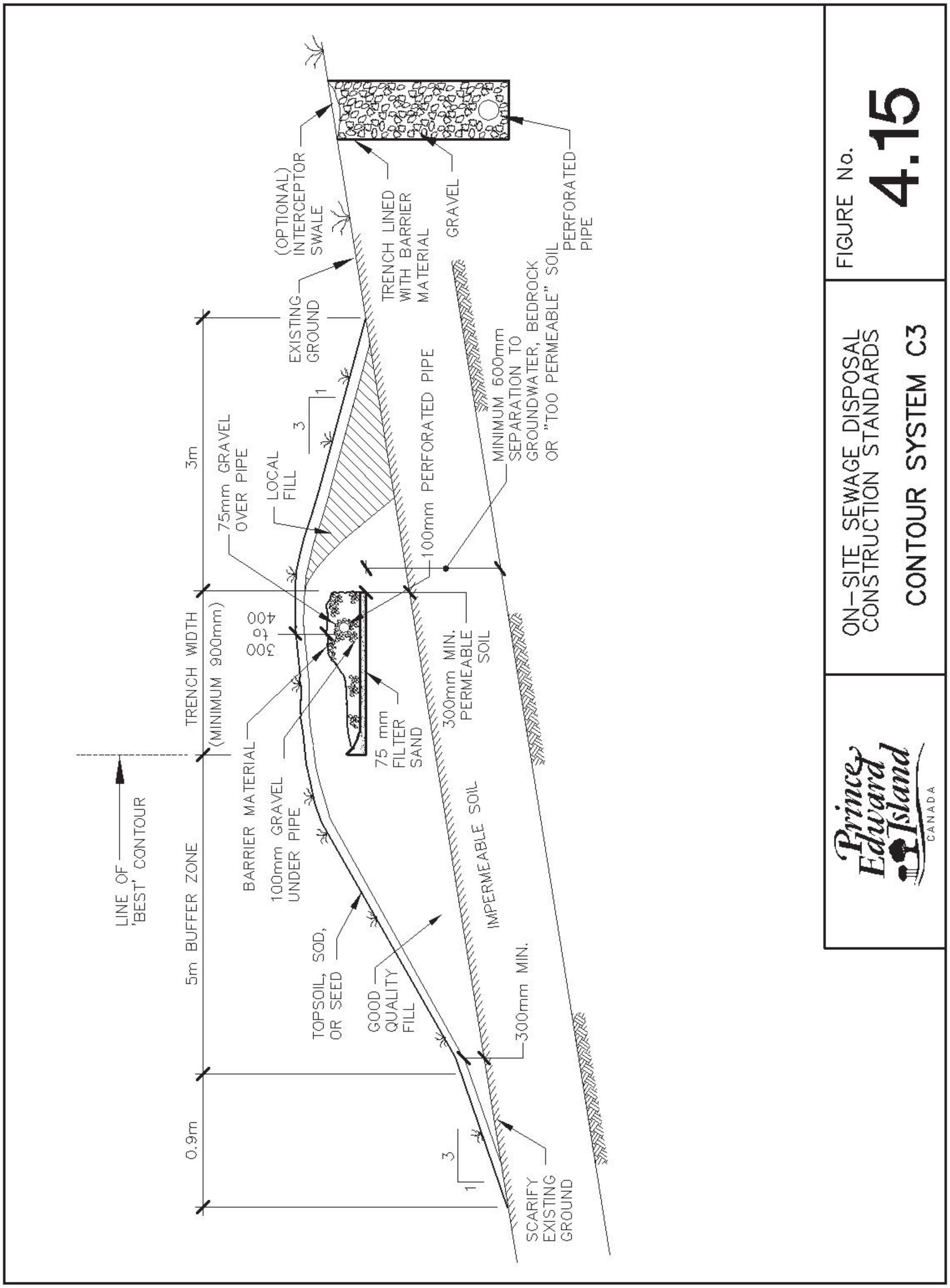


Figure 4.16 Contour System C3

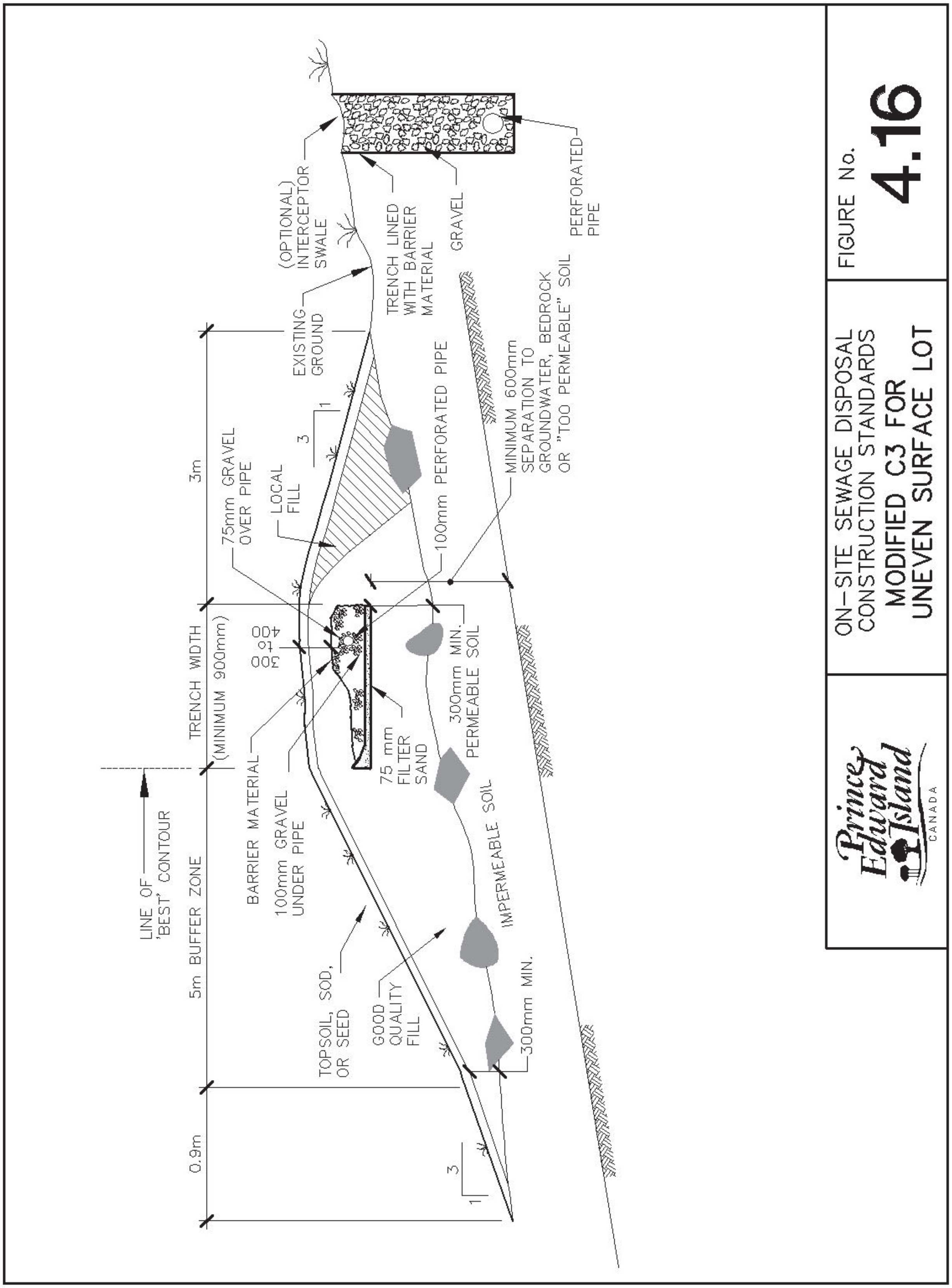


Figure 4.17 Modified C3 for Uneven Surface Lot

4.11 Gravelless Disposal System

Gravelless disposal systems offer alternatives to traditional pipe and gravel distribution systems and the Province of Prince Edward Island will consider the approval of alternate gravelless technology if proponents submit the following information:

- Soil effluent loading and hydraulic loading rates;
- Equivalent void space (to crushed rock);
- Capability of the system to withstand pressure of backfill and extraneous loads;
- Manufacturer’s installation instructions;
- Documentation of approval in other jurisdictions;
- Applicability to Prince Edward Island;
- Benefits to Prince Edward Island.

4.12 Requirements for Good Quality Fill (GQF)

4.12.1 Site Preparation

Prior to the installation of an on-site sewage disposal system (septic), a site suitability assessment has to be completed to verify the site conditions. This assessment should take place in the proposed area of the disposal field or at least within a 75 foot radius of the proposed location of the disposal field. The assessment will provide details with respect to the depth to bedrock, water table, and the depth of permeable soil as outlined. Once this assessment has been completed, as per **Section 3** of this document, the disposal field can be selected to suit the lot and development.

A critical piece of information during the selection of the disposal field is to determine if and how much fill material may be added to the disposal field area in order to accommodate the design of the system. As the system is only as good as the natural soil on-site and the fill added, it is very important not only to perform an assessment of the natural soils but also the fill material that is to be added to the disposal field area. This material is called Good Quality Fill (GQF).

4.12.2 Specifications

Typically, in PEI the GQF added to the site is a reasonably uniform sand or sandy gravel with a small portion of silt/clay. The recommended sieve specifications for suitable sand are given in T**able 4.4** and should be used for all systems that require fill material under and around the disposal field and in the buffer areas of the disposal field.

The placement of fill material for built up disposal fields is very expensive. Therefore, it is recommended that the contractors take care to ensure that the material that is in place meets the specifications. As well, it is important that the site is prepared properly to receive the GQF.

The recommended Good Quality Fill Specifications are listed in **Table 4.4**. Contractors should strive to meet or exceed these recommendations. However, sieve analysis results can vary due to sampling. For this reason, the department will accept up to 15% silt & clay passing at the No. 200 sieve.

Table 4.4 – Good Quality Fill (GQF)

Sieve	Effective Particle Size (mm)	Percent Passing by weight (%)
1 in	25	95 to100
3/8 in	9.5	70 to 100
No. 200	0.075	2.5 to10

4.12.3 Contractors Responsibility

The Licensed Septic Contractor has the ultimate obligation to ensure that the disposal field is installed in material that is suitable and meets the requirements of these standards even though the material may be purchased and installed by another Fill Contractor. It is recommended that the Licensed Septic Contractor inform the Fill Contractor clearly of their fill requirements. As well, the Fill Contractor may want to hire a qualified individual to collect and arrange to have analyzed the fill material it meets GQF specifications. At a minimum, the Fill Contractor should perform the following:

1) select an area of the pit that is likely to meet the specifications for good quality fill,
2 excavate, crush and stock pile material for septic systems,
3) collect 3 samples each of 10 kg that is representative of the overall material. *(It is important to remember that, when testing a pit, material may vary. Even a stockpile of material from a pit can contain different material of varying permeability. It may be necessary to perform many tests on pit material as it is being removed to assure the material consistently meets the specification. Ultimately the fill material landed on-site has to meet the minimum GQF specifications).*
4) have the samples taken to a soils lab for sieve analysis.

4.13 Buffers

The down slope side of the contour trench may need to be extended due to limited permeable soils on site. If desired, a 150 mm layer of Good Quality Fill (GQF) could be extended 5 meter down slope of the standard 5.9 meter buffer.

5.1 Introduction

Despite an excellent job being done of assessing the site and designing the disposal system, improper construction of a system can result in the premature failure of the system. Proper installation is one key to long term satisfactory performance. Failing systems cause many problems including: health and aesthetic concerns, wasted private and public funds, neighbourhood disputes, and the servicing of areas with central collection and treatment systems where this should not be a priority. This section will outline areas of construction that, if not carried out properly, may be cause for failure.

5.2 Elevations

The elevation of the disposal field pipe in relation to grade of the natural soil at the site will be given in the system details based on the conditions for the particular site. This pipe level will determine the elevation of the septic tank and the elevation at which the building sewer can leave the basement. This is critical on level sites and is often not considered by builders and homeowners when planning basement levels and elevations of plumbing fixtures. Before the basement elevation or building sewer elevations are set, elevations of the system, the tank and the point at which the pipe leaves the basement wall need to be calculated. A decision can then be made whether to:

1. set the basement floor above this level
2. have no plumbing in the basement
3. pump sewage to the septic tank from the basement or
4. pump all tank effluent to the disposal field.

It is possible at times of snow melt or high rainfall, some soils in Prince Edward Island will be saturated to near ground surface or to ground surface. If the tank outlet is below this level, water could back up into the tank. Depending on the grade of the line from the house to the tank, sewage may back up into the house or, at the very least, the plumbing will be slow draining. To prevent this from happening, the elevation of the bottom of the outlet from the septic tank shall be above the elevation of natural soil at the disposal field. This is shown in **Figure 2.1**.

The finished grade on top and around the field must be sloped to divert surface water away from the field. Most soils will handle the effluent if this surface water is removed from the area. It is very important to sod or seed the area over and around the disposal field. The sod will prevent erosion and the established root zone will have a greater permeability than the soil below. This root zone can play an important part in preventing effluent from reaching the ground surface before receiving adequate treatment.

5.3 Soil Damage during Construction

Avoiding construction damage to the soil is an important consideration. The installer must be aware that this is a potential problem regardless of the type of system being installed. The objectives are to install the system, as designed, without reducing the permeability of the natural soils surrounding the field. Smearing and/or compaction of the soil interface is the most common and destructive damage that occurs during construction. Care must be taken to limit this problem.

To maintain the permeability of the natural soil, the voids between individual soil particles and clusters of particles must not be destroyed. Preventing the smearing and compaction of the soil interface is essential, i.e. the trench bottom and sidewalls of the natural soil in the excavation. Smearing will increase with higher clay content and higher moisture content in the soil. It occurs when machinery such as dozer blade or backhoe bucket slides over this soil interface. The moisture acts like a lubricant allowing the clay particles to slide over each other sealing off the voids. Compaction from the wheels or tracks of machinery or footsteps increases the density of the soil and reduces the number and size of voids. Both compaction and smearing will reduce the soil permeability even if they take place in only a thin layer on the interface. Smearing can be reduced by working only when the soil moisture content is low. Unfortunately, this means that at certain times of the year, such as in spring, conditions may not be suitable for the installation of disposal systems, and construction should be delayed until conditions improve.

The type of machinery will also influence the amount of damage that will take place during installation. Excavation with a dozer tends to smear the interface more than the use of a backhoe bucket. The use of a dozer also causes more compaction of the soil interface because the machine is passing back and forth over it. The heavier the machinery the greater the pressure from the tracks, therefore expect more compaction. A light machine sitting to the side of the excavation will cause the least amount of damage. After the excavation is completed, the system should be finished as soon as possible. An exposed interface may be subject to compaction due to heavy rainfall, machinery, or people walking on it. To remove some damage due to smearing or compaction, it is recommended that the interface on all excavations be hand raked.

In most soils the effluent will move laterally away from the system in the down slope direction before it has time to go vertically into the subsoil. For this reason, it is important to keep machinery on the upslope side of the excavation. If machinery is allowed on the down slope, it may compact the soil through which the effluent should pass. This may result in effluent breaking to the surface before it is adequately treated.

5.4 Preparation of Disposal Field & Placement of Good Quality Fill

The following are the recommended minimum standards for the preparation of the Disposal Field and the placement of Good Quality Fill:

- Determine area and set elevations of septic tank, piping and disposal field. This planning would have been completed prior to the construction of the building but should be verified prior to fill placement.
- Clearly stake and rope off using fluorescent orange paint and ribbon tape the entire disposal field including and area 15 metres (50 ft) down slope to deter unauthorized vehicles from entering.
- Before placing GQF, the area should be cleared of stumps and roots.
- Remove topsoil to a maximum depth of 150 mm (0.5 ft)
- Scarify the existing ground parallel to the contours with a chisel plow, mold board plow or similar equipment. Tilling of material is not recommended.
- Place the GQF on site using light weight equipment (D4 tracked Dozer or Equivalent). The first lift of GQF shall be incorporated into the original soil. The lifts should be no greater the 300 mm (1.0 ft) and consolidated using the tracked equipment.
- Prior to the installation of the disposal field, the contractor should confirm the material meets the minimum specifications for GQF. This can be done by collecting representative sample(s), 10 kg per sample, from the prepared pad for a sieve analysis as outlined in **Table 4.4**.

Note:* - *except during the installation of the disposal field when a backhoe may be excavating disposal trenches, only light tracked equipment such as a D4 Tracked Dozer or lighter piece of equipment should be on or down slope of the disposal field area.

The recommended particle size distribution testing for Good Quality Fill (GQF) should range from the 25 mm size to the 0.075 mm size. Proper gradation testing will help to verify that the soil at the pit and in the prepared pad, meets the On-Site Sewage Disposal Systems Construction Standards.

5.5 Septic Tanks

Manufacturers' instructions must be followed for the installation of septic tanks.

Several types of commercially manufactured septic tanks are available. The most common is pre-cast concrete. These tanks are sturdy, less expensive than some types, and do not require extra care in backfilling. The disadvantage is the weight and the fact that most pre-cast tanks are made in two halves. Care must be taken to ensure that there is a good seal between the top and the bottom half of the septic tank, in order to control leakage into and out of the tank (**See Figure 4.1**). There have been reports of well contamination and sewage leaking into foundation drains resulting from leaking joints in tanks. If two piece tanks are used, care must be taken to assure the joints fit and are properly sealed. In installations where water table or bedrock is less than 1 m below the tank, or in gravel soil conditions, consideration should be given to the use of a one-piece tank. Installation procedures from the manufacturer must be followed at all times.

A full tank weighs several thousand kilograms. Therefore, it is important to place it on solid, well-compacted bedding material to avoid settlement. Tanks shall not be placed on fill unless the material has been compacted in lifts of not more than 150 mm with a vibratory roller and must follow manufacturer's bedding requirements.

Plastic or fibreglass tanks have the advantage of being totally water tight and are much lighter than pre-cast concrete tanks. The weight is a particular advantage when the tank must be installed in a confined area where reaching it with a boom truck is not possible. Backfilling plastic or fibreglass tanks require more care then concrete tanks. **The manufacturer's instructions for backfilling, which may include the use of pea gravel, must be followed.** Care must be taken while pumping out plastic or fibreglass tanks to prevent their collapse or floatation. Empty, reinforced plastic and fibreglass tanks have been known to pop out of the ground under high water table conditions. Therefore, these tanks must be anchored in position (usually with weights, or to a concrete slab) in accordance with the manufacturer's instructions.

The homeowner may be reluctant to have the tank pumped at the required frequency unless there is an easy access. Consequently, it is required that, a riser be placed over the outlet so that excavation is not required to reach the tank for servicing. A riser must be water tight to avoid infiltration into the tank. There are products available such as reinforced plastic risers and covers sealed to a gasket poured into the tank cover. This type of construction should eliminate problems due to leakage. To avoid a tragedy that could result from a child removing a cover, any covers light enough to be moved by a child should be locked shut. The cover shall be equipped with a sign labelled **"DANGER – DO NOT ENTER"**.

Shearing of the pipe at the tank inlet, outlet, or at the foundation is a common problem. These problems can be minimized with proper tank and pipe bedding and the use of SDR 35 or stronger pipe. Some contractors use flexible joints next to the foundation wall and the tank to avoid this problem. The foundation is always backfilled before the sewer line is connected because compacting the fill under the pipe is impossible once it is installed.

5.5.1 Water Tightness Testing for Septic Tanks, Holding Tanks and Siphon/Pump Chambers

When septic tanks, holding tanks and siphon/pump chambers are tested for water tightness, the following procedure must be followed:

1. Confirm with the tank/chamber manufacturer that the tank/chamber will withstand a hydrostatic pressure test
2. If the tank/chamber is installed below the groundwater level, first remove any water from the tank/chamber. The tank/chamber must be secured in place to prevent flotation. The tank/chamber is to remain in place for a minimum of 30 minutes and then checked for any visible leaks
3. If the tank/chamber is installed above the ground water level, the tank/chamber is to be filled to the invert of the outlet. The level may drop as much as 10 to 15 mm due to absorption into the concrete. To ensure water level has reached a constant, check for any visible leaks after a minimum of 30 minutes. Ensure the water level is still at the invert of the outlet
4. Any leaks must be repaired and the test repeated until the tank/chamber is watertight

5.6 Disposal Fields

The following procedures apply to systems installed on Category I, II & III lots. For systems installed on Category IV lots the minimum separation distance between the bottom of the trench and bedrock has been reduced (see **Appendix G, Category IV**).

5.6.1 Multiple Trench Systems

The following procedure shall be followed when constructing a multiple trench system:

1. Check grades from proposed pipe elevation in the disposal field back to the tank and check the elevation of the building sewer where it will exit the foundation. Be sure the slope on the pipe meets the minimum requirements.
2. Place stakes to locate the trenches. Note that the long dimension of any type of system should be along the contour of the site, following the contour as closely as possible.
3. Excavate the trenches to the depth and width shown on the drawing/sketch.
4. Hand rake the bottom and sides of the excavation to remove smearing or compaction.
5. Spread a minimum of 150 mm of gravel in the bottom of trench. The gravel should be graded as closely to the required pipe grade as possible. It may be necessary to add additional gravel in some areas in order to achieve the required slope on the distribution piping and still maintain the minimum 150 mm under the piping.
6. Place the pipe on the gravel. The header is a solid pipe, while the footer (which may also be solid) and connecting laterals between the header and footer are perforated pipe.
7. The slope from the header (level) to the laterals must meet the specified grade of between 50 and 100 mm per 30 metre, with the footer remaining level.

8. The lateral pipes shall be equally spaced as shown on the drawing/sketch with the minimum spacing being 2.0 metres between each lateral.
9. Cover the pipe with 75 mm of gravel.
10. Cover the gravel with geotextile (barrier material).
11. Carefully backfill the trench with excavated material or clean permeable local fill, providing it is not frozen and any rocks greater than 75 mm have been removed.
12. Cover the entire area with final cover material and sod or seed the area.

5.6.2 Alternative Multiple Trench Systems

The construction of alternative multiple trench (AMT) systems follow similar procedures as standard multiple trench systems. The difference is that in an AMT the laterals are perpendicular to the contour of the land.

The following procedure shall be followed when constructing an AMT:

1. Check grades from proposed pipe elevation in the disposal field back to the tank and check the elevation of the building sewer where it will exit the foundation. Be sure the slope on the pipe meets the minimum requirements.
2. Place stakes to locate the trenches. Note that the long dimension should be run perpendicular to the contour of the site.
3. Excavate the trenches to the depth and width shown on the drawing/sketch.
4. Hand rake the bottom and sides of the excavation to remove smearing or compaction.
5. Spread a minimum of 150 mm of gravel in the bottom of trench. The gravel should be graded as closely to the required pipe grade as possible. It may be necessary to add additional gravel in some areas in order to achieve the required slope on the distribution piping and still maintain the minimum 150 mm under the piping.
6. Place the pipe on the gravel. The header is a solid pipe, while the footer and connecting laterals are perforated pipe.
7. The slope from the header (level) to the laterals must meet the specified grade of between 50 and 100 mm per 30 metre, with the footer remaining level.
8. For AMT the distribution pipes shall be placed as shown on the drawing/sketch in a minimum trench width of 600 mm.
9. The lateral pipes shall be equally spaced as shown on the drawing/sketch with the minimum spacing being 4.0 metres between each lateral and be oriented so as to have greatest dimension perpendicular to the contours of the land.
10. Cover the pipe with 75 mm of gravel.
11. Cover the gravel with geotextile (barrier material).
12. Carefully backfill the trench with excavated material or clean permeable local fill, providing it is not frozen and any rocks greater than 75 mm have been removed.
13. Cover the entire area with final cover material and sod or seed the area with finished grade to shed water away from centre of system.

5.6.3 Gravelless Disposal Systems

Gravelless technologies, like the leaching chamber system and the EZ*flow* system, shall be constructed and laid out according to the manufacturer's installation recommendations for that specific technology. These manufacturer's installation recommendations must be approved for distribution by the Minister.

Shallow In-Ground System (leaching chambers)

The following construction methods are typically followed when constructing a shallow in-ground system. Installations are to be in accordance with the manufacturer's requirements.

1. Stake out the location of all trenches and lines.
2. Install sedimentation and erosion control measures, where required.
3. The bottom elevation of the trench should be within the upper 600 mm of the original ground surface.
4. Review the plans to determine trench excavation depth based on the offset distance to the limiting requirements (ie: depth of permeable soil).
5. Excavate the trench width to match the width of the chamber being installed.
6. Ensure that the trenches have the required centre to centre spacing.
7. Rake the soil under the chambers.
8. Rake the bottom and sides of the trench.
9. Remove large stones or other debris.
10. Do not use a backhoe bucket to rake the trench and be careful to minimize foot traffic within the trench.
11. Using appropriate instrumentation, ensure that the trench is level, or if applicable, has the required slope.
12. Confirm that the material to be used for backfill meets the Good Quality Fill (GQF) specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

At Grade System (leaching chambers)

The following construction methods are typically followed when constructing an at-grade system. Installations are to be in accordance with the manufacturer's requirements.

1. Stake out the location of all trenches and lines.
2. Install sedimentation and erosion control measures, where required.
3. The bottom elevation of the trench should be at or near the elevation of the original ground surface.
4. Review the plans to determine trench excavation depth based on the offset distance to the limiting requirements (i.e.: depth of permeable soil)
5. Cut trees flush to the ground (or remove if required), remove surface boulders, and remove vegetation over 150 mm long.
6. Plough/chisel plough the area parallel with the contour of the land.
7. Using appropriate instrumentation, ensure that the ploughed area is level, or if applicable, has the required slope.
8. Confirm that the material to be used for backfill meets the Good Quality Fill (GQF) specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

Built Up System (leaching chambers)

1. Stake out the location of all trenches and lines.

2. Install sedimentation and erosion control measures, where required.
3. Cut trees flush to the ground (or remove if required), remove surface boulders and remove vegetation over 150 mm long.
4. Plough/chisel plough existing ground perpendicular with the contour of the land.
5. The bottom elevation of the chambers should have minimum 300 mm Good Quality Fill (GQF) between chamber and existing ground.
6. Using appropriate instrumentation, ensure the Good Quality Fill (GQF) is level, or if applicable, has the required slope.
7. Chambers to be spaced 1.8 m apart (minimum on Category I site; Cat II site is larger) centre to centre and include a patio stone on top of Good Quality Fill (GQF) below inlet pipe.
8. Cover chambers with Good Quality Fill (GQF) to a minimum of 300 mm (max. 450 mm) at tops of chambers. Confirm that the material used for backfill meets the Good Quality Fill (GQF) specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

EZ*flow* Systems

Shallow In-Ground System (Multiple Trench)

The following construction methods are typically followed when constructing a shallow in-ground EZ *flow* system. Installations are to be in accordance with the manufacturer's requirements.

1. Stake out the location of all trenches and lines.
2. Install sedimentation and erosion control measures.
3. The bottom elevation of the trench should be within the upper 600 mm of the original ground surface.
4. Review the plans to determine trench excavation depth based on the offset distance to the limiting requirements (ie: depth of permeable soil).
5. Excavate the trench width to match the width of the product being installed.
6. Ensure that the trenches have the required centre to centre spacing.
7. Rake the soil at the bottom and sides of the trench.
8. Remove large stones or other debris.
9. Do not use a backhoe bucket to rake the trench and be careful to minimize foot traffic within the trench.
10. Using appropriate instrumentation, ensure that the trench is level, or if applicable, has the required slope.
11. Confirm that the material to be used for backfill meets the Good Quality Fill (GQF) specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

At Grade System (EZ flow)

The following construction methods are typically followed when constructing an at-grade system. Installations are to be in accordance with the manufacturer's requirements.

1. Stake out the location of all trenches and lines.
2. Install sedimentation and erosion control measures, where required.
3. The bottom elevation of the trench should be at or near the elevation of the original ground surface.
4. Review the plans to determine trench excavation depth based on the offset distance to the limiting requirements (i.e.: depth of permeable soil)

5. Cut trees flush to the ground (or remove if required), remove surface boulders, and remove vegetation over 150 mm long.
6. Plough/chisel plough the area parallel with the contour of the land.
7. Using appropriate instrumentation, ensure that the ploughed area is level, or if applicable, has the required slope.
8. Confirm that the material to be used for backfill meets the Good Quality Fill specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

Built Up System (EZ flow)

1. Stake out the location of all trenches and lines.
2. Install sedimentation and erosion control measures, where required.
3. Cut trees flush to the ground (or remove if required), remove surface boulders and remove vegetation over 150 mm long.
4. Plough/chisel plough existing ground perpendicular with the contour of the land.
5. The bottom elevation of the trench should have minimum 300 mm Good Quality Fill (GQF) between the trench bottom and existing ground.
6. Using appropriate instrumentation, ensure the Good Quality Fill (GQF) is level, or if applicable, has the required slope.
7. Cover pipe with Good Quality Fill (GQF) to a minimum of 300 mm (max. 450 mm). Confirm that the material used for backfill meets the Good Quality Fill (GQF) specifications as outlined in the Regulations (refer to **Section 2.2.2** for specifications).

5.6.4 C1 and C2 Systems

Contour trench C1 & C2 systems cannot be installed on Category IV sites. This category requires the addition of 1.2 metres (4 feet) of Good Quality Fill (GQF) due to the limited amount of natural permeable soil (see ***Appendix G, Category IV****).*

When constructing these systems the following points shall be considered:

1. Effluent flows laterally down the slope away from the field.
2. A long narrow trench following the site contour is required.
3. Trench bottom and down slope lip are level.
4. Surface water and possibly perched water table must be diverted around the system.

The following procedure shall be followed when installing C1 or C2 systems:

1. Check grades from the proposed pipe elevation in the disposal field back to the tank and check the elevation of the building sewer where it will exit the foundation. Be sure the slope on the pipe meets the minimum requirements.
2. Using appropriate instrumentation, set stakes at 3 to 5 metre intervals along the contour elevation that will be the lower lip of the trench. The length of the trench will be specified with the system design.
3. If the area under the down slope buffers of a C2 is covered in a heavy sod, this area should be ploughed to help the passage of effluent into the natural soil. If the area contains trees, these should be cut at ground

level and any large stumps or roots removed before ploughing the area. The excavation is to be back filled with Good Quality Fill, especially down slope of the trench.

4. The contour trench is then excavated, following the stakes, to the depth and width specified on the design. The bottom of the trench will be level in both width and length. The depth at the toe of the trench will be of constant depth throughout the length of the contour.
5. Hand rake the bottom and sides of the trench to remove smearing or compaction.
6. Determine where the solid line from the tank will enter the perforated pipe. Centre feeding is required on all systems but systems less than 30 metres in length can be end fed (although this is not encouraged). A system greater then 30 metres shall be centre fed if it is not pressurized. If there is more than 60 metres of pipe, it must be pressurized.
7. Spread a layer of filter sand, to the depth required for the system (75 mm), over the entire length and width of the trench.
8. Spread a minimum of 100 mm of gravel on top of the sand. Note that the design of some systems may require more than the minimum of 100 mm. The gravel should be graded as closely to the required pipe slope as possible, which will increase the gravel depth toward the effluent tee.
9. Place the perforated pipe on the gravel and check to see that the slope on the pipe meets the specification of between 50 and 100 mm per 30 metres of length.
10. Cap the ends of the pipe.
11. Cover the pipe with 75 mm of gravel.
12. Cover the gravel with geotextile (barrier material).
13. Carefully backfill the trench with clean excavated material free of any rocks greater than 75 mm. The finished cover over the distribution pipe should be between 300 and 450 mm. If a C2 type system is installed, place good quality fill buffer to the depth and width as shown on the approval.
14. Cover the entire area with final cover material and sod or seed the area immediately to allow a sod and root zone to be established as quickly as possible.
15. All heavy equipment and excavated material should be kept on the up slope side of the trench to avoid compaction of soil down slope of the system.

5.6.5 C3 Systems

The following procedure shall be followed when installing C3 systems:

1. Some C3 disposal fields are pressurized to provide even distribution and the elevation of the tank and building sewers are not usually as critical as with gravity fed systems. However, the proposed location of tank and pump chamber need to be established to make sure all components of the system will fit together.
2. Use appropriate instrumentation to place stakes along the contour line where the toe of the disposal trench will be located. Stakes marking the toe can then be set at the proper distance from the trench stakes.
3. If the area under the fill material is covered in heavy sod, this area should be ploughed to help the passage of effluent into the natural soil. If the area contains trees, these should be cut at ground level and any large stumps or roots removed before ploughing the area.
4. Place the amount of Good Quality Fill required as per the design (refer to **Section 2.2.2** for specifications). A sieve analysis of the GQF may be required.

5. Excavate a trench into the good quality fill to the width and depth shown on the design. The trench bottom should be level along both its width and length.
6. Spread a layer of filter sand to the depth required for the system and not less than 75 mm, over the entire length and width of the trench. If the good quality fill meets the specification for filter sand, the filter sand layer is not required.
7. Spread a minimum of 100 mm of gravel on top of the sand. Note that the design of some systems may require more than the minimum of 100 mm.
8. Place the selected or designed pipe on the gravel and ensure it is level (no slope).
9. Cap the ends of the pipe. Drill 13 mm holes in the top of the pipe 150 mm back from the end caps to allow air to escape when the pump discharges.
10. Cover the pipe with 75 mm of gravel.
11. Cover the gravel with geotextile (barrier material).
12. Carefully cover the entire system with Good Quality Fill and a layer of final cover material suitable for establishing a healthy sod layer. The finished cover over the pipe should be between 300 and 450 mm.
13. Sod or seed the disturbed area as soon as possible after completion of the system.
14. All heavy equipment and excavated material shall be kept on the up slope side of the trench to avoid compaction of soil down slope of the system.

5.6.6 C3 Systems (Uneven Surface)

Where uneven surface lots, boulder fields or undulating wooded areas are encountered and conditions are such that a C2 would be normally used, the following criteria and techniques apply for construction of a modified C3 system:

1. Disturb the location of the field as little as possible (scarifying before good quality fill placement may be necessary in grassy field areas, but is unnecessary in wooded areas).
2. Place the good quality fill along the route of the contour filling hollows. Dress the good quality fill so that the surface follows a contour (some boulders may protrude through).
3. Spread a layer of filter sand to the depth required for the system and not less than 75 mm, over the entire length and width of the trench.
4. Spread a minimum of 100 mm of gravel on top of the sand. Note that the design of some systems may require more than the minimum of 100 mm.
5. Lay the distribution pipe level (the system will be pressurized).
6. Cover the pipe with 75 mm gravel.
7. Cover the gravel with geotextile (barrier material).
8. Cover with Good Quality Fill (refer to **Section 2.2.2** for specification.)
9. Landscape (final cover material and sod).

NOTE: For "uneven" ground such as old forest floor, caused by rotten trees and stumps, it may be possible to create a contour by levelling off some of the tops of the stumps and levelling it off with Good Quality Fill material and not natural material, while minimizing the disturbance to the area where the buffer will go.

5.7 Interceptors

When an interceptor is being installed, the following is required:

1. Interceptor locations are specified in **Section 4.6.**
2. An interceptor shall have a uniform bottom slope to allow flow of collected water.
3. Any excavation that passes between the disposal trench and the interceptor must be sealed with compacted clay material. (see **Figure 4.7**)
4. If the interceptor discharge must pass under the disposal system, this discharge pipe must be solid and the trench must be sealed by backfilling with compacted clay material (see **Section 4.6.1**).
5. Where an interceptor trench is filled with gravel, the top of the gravel should not be covered with topsoil or sod unless an interceptor swale is provided.
6. Roof water drainage shall not be discharged into an interceptor. A solid drainage pipe carrying roof water may be located in the interceptor trench if it discharges down slope of the disposal field.
7. Traffic must be restricted to the up slope side of the disposal area during construction of an interceptor trench
8. The bottom of an interceptor shall extend at least 150 mm below the bottom of the trench in the disposal field.

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Appendix B Measurement of Hydraulic Conductivity of Soils In-Situ

Saturated hydraulic conductivity, Ks, is a measure of the "ease" with which water flows through a saturated, permeable material such as soil. The higher the Ks value, the greater the water flow rate for a given hydraulic gradient. In-situ methods that infiltrate water into unsaturated soil do not measure Ks, but rather a reduced "field-saturated" hydraulic conductivity, $K_{fs,}$ because of air entrapment during the infiltration process (Reynolds, 1993). In the design of on-site sewage disposal fields, K_{fs} is preferred over Ks because drainage through the soil should be designed to occur at less than complete soil saturation.

In-situ measurement of K_{fs} can be achieved using the "Constant Head Well Permeameter" (CHWP) method (Reynolds, 1993; Elrick and Reynolds, 1986). The CHWP method is based on the observation that when a constant height or "head" of water is ponded in a borehole or "well" augured into unsaturated soil (Fig. B-1), a "bulb" of field-saturated soil is gradually established around the base of the well (see Fig. 3) in Elrick et al., 1989 and associated discussion). As this field-saturated bulb becomes established, the flow of water out of the well and into the soil approaches a constant rate. Once this steady flow rate is attained, the K_{fs} of the soil surrounding the well can be determined using the constant water flow rate, the radius of the well, and the head of ponded water in the well.

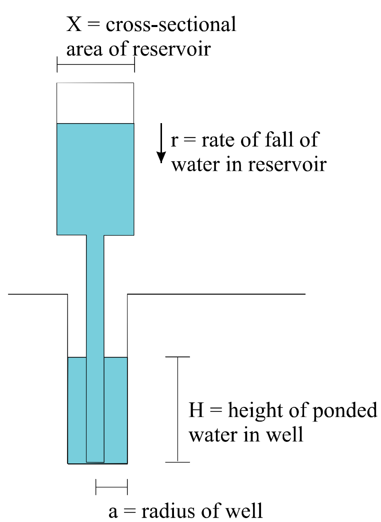

Figure B1. Constant Head Well Permeameter

The CHWP calculations presented here are based on the work of W.D. Reynolds (Agriculture and Agri-Food Canada) and D.E. Elrick (University of Guelph). As with any measurement method, the assumptions and procedures involved with the CHWP technique should be understood before it is used as a field assessment procedure. In-depth reviews and descriptions of the CHWP method can be found in Elrick and Reynolds (1986, 1992a,b); Reynolds et al. (1992); Reynolds (1993); Bagarello et al., (1999); and elsewhere.

A convenient and simple apparatus for ponding a constant head of water in a well and simultaneously measuring the flow into the soil is the well permeameter device shown in Fig. B3. An appropriately placed air-inlet hole in the permeameter outflow tube (Fig. B3) establishes and maintains the desired water ponding head (H) in the well. Measuring the rate of fall of the water level in the permeameter reservoir (r) and reservoir cross-sectional area (X) allows determination of water flow rate (Q) into the soil (i.e. Q = rX). The K_{fs} is then calculated using the equation (Reynolds, 1993):

$$K_{fs} = CQ / [2\pi H^2 + C\pi a^2 + (2\pi H/\alpha^*)] \qquad [1]$$

where C is a shape factor selected from Fig. B2 (or Fig. 56.3 in Reynolds, 1993), a is the well radius, and α* is a soil texture-structure parameter selected from the appropriate category in Table B1 (or Table 56.1 in Reynolds, 1993). An example calculation is given on page C-7. As noted in Reynolds (1993) and elsewhere, K_{fs} can be less than or equal to half of Ks due to partial blocking of soil pores by air bubbles entrapped by the infiltrating water. It should also be noted that, strictly speaking, the C-value curves in Fig. B2 and the α* values in Table B1 apply for soils that are at field capacity or dryer, and when the wetting front from the test hole does not appear on the soil surface (Elrick and Reynolds, 1986).

The recommended procedure for determining in-situ field-saturated hydraulic conductivity by a consultant or site inspector is: i) dig one or more test pits in the immediate area of the proposed disposal field to estimate soil texture and structure so that the appropriate α* value can be selected from Table B1; ii) make a number of permeameter measurements throughout the proposed disposal field so that a good estimate of the magnitude and variability of K_{fs} within the area can be established; iii) use equation [1] above (or one of its variants such as given in the example calculations) to determine K_{fs} at each measurement station; iv) examine both the mean K_{fs} and its variation throughout the proposed drain field to determine both the suitability of the site (Table 3.1of the Guidelines), and the value of K_{fs} to be used in the system design.

The temperature of the water moving through the soil can have a significant effect on the measured K_{fs} because of the different viscosities of water at different temperatures. Warm water will flow through soil easier than cold water. Therefore, depending on test and design operating temperatures, it may be necessary to adjust the measured K_{fs} to get permeability that is more representative of operating conditions. This adjusted value (Ka) can be calculated by multiplying K_{fs} by the viscosity of water at the temperature of water at which K_{fs} was measured divided by the viscosity of water at the system operating temperature.

$$Ka = K_{fs} \times V_K / Va$$

where: Ka = adjusted permeability for design temperature conditions
K_{fs} = the calculated permeability from the field test
V_K = the viscosity of water at the test conditions
Va = the viscosity of water at the adjusted design temperature

The temperature of the water in the permeameter should be close to air temperature when conducting the test. If not as the water temperature increases or decreases, the rate of water drop in the permeameter may vary and the rate will not become constant. If we were to assume that water and soil temperature down slope of the disposal field were approximately 4^{o} C in winter and the water temperature was 20^{o} C during the test, the value of Ka would be approximately 0.6 x $K_{fs.}$ Under normal design conditions this difference may be within the design or other inherent factors of safety however the designer must be aware of this temperature effect and be sure that the system has adequate capacity under all operating conditions.

Another important consideration in conducting permeability tests is the depth of the soil and the presence of any layering. As mentioned on page C-1, the test assumes water moves away from the hole in a bulb shape. If there were large variations in the soil profile such as a restrictive layer just below the hole or lenses of different soil textures throughout the hole, the test may not give a representative soil permeability. The examination of test pits in the area of the permeameter tests, plus the experience and judgement of the person conducting the test are critical to assure that test results are representation of the expected soil permeability.

There are many different constant head well permeameters. A list of some of the more common ones is included in Reynolds (1993, p. 600). Although all these designs are capable of measuring K_{fs}, they each have specific advantages and limitations which can affect their usefulness and suitability for a particular application. Only the "PASK" permeameter is described below. This permeameter has proven to be easy to use and appropriate for use intended in these guidelines. For details on the construction specifications of the Pask in-situ permeameter see Figure B.3.

Table B-1 Suggested α* values

α^* (cm^{-1})	Soil Structure and Texture
0.36	Coarse sands and highly structured soils
0.12	Most structured soils and medium sands
0.04	Unstructured fine textured soils and fine sands
0.001	Compacted clays (e.g. clay liners)

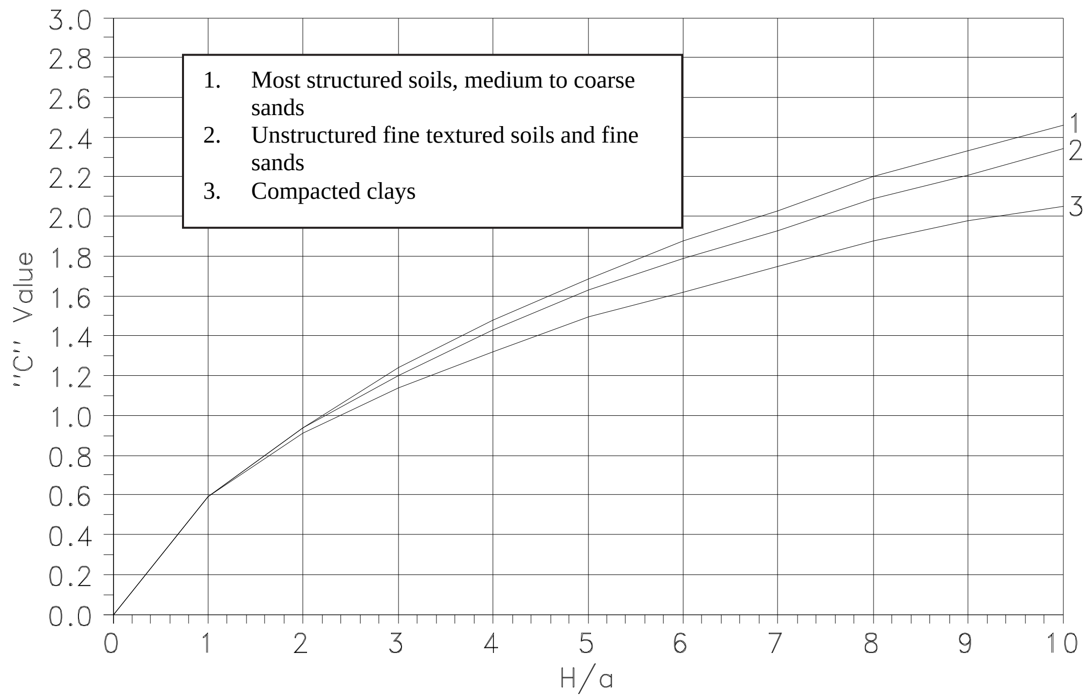

Figure B2. Determination of C values
(After Elrick and Reynolds, 1985)

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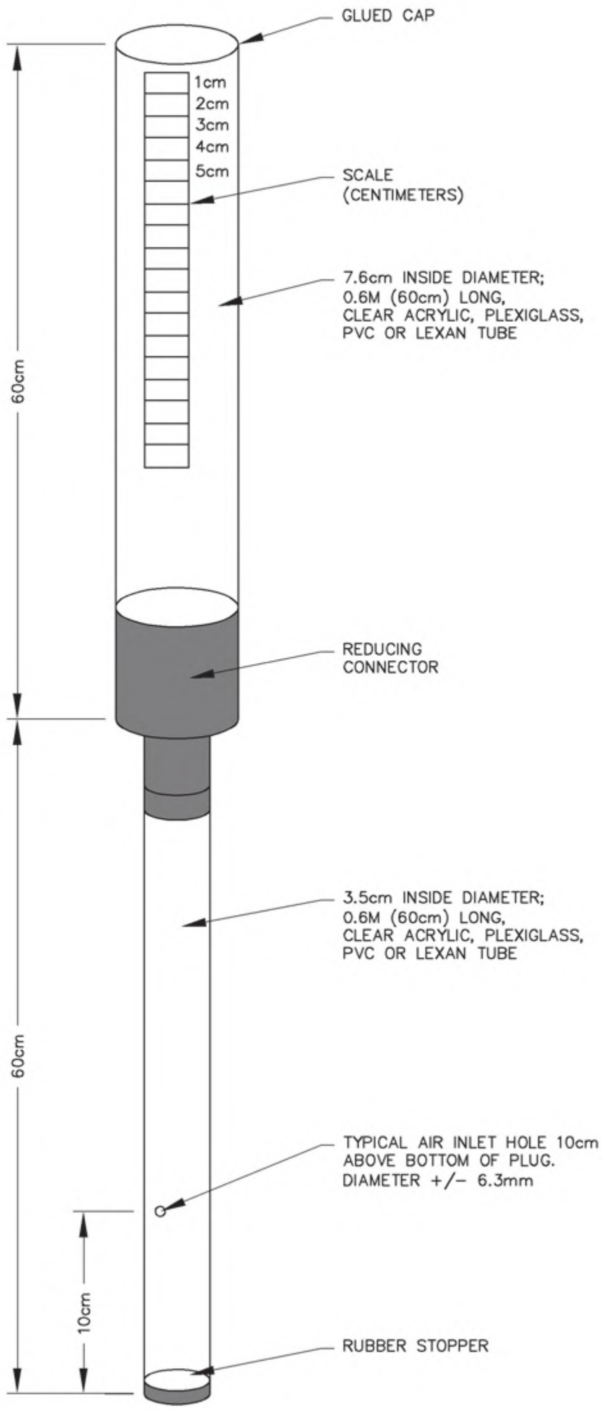


Figure B3 Pask In-situ Permeameter

PASK IN-SITU PERMEAMETER OPERATING INSTRUCTIONS

1. Using an auger which will give a hole diameter of 70 mm (7cm), auger hole(s) in the area of the proposed disposal field. If the soil is uniform make the hole depth 450-500 mm. If you wish to test a soil located deeper than 500 mm, the top layer of soil should be removed before you auger the hole. Care should be taken to locate the hole(s) in locations that will most closely represent the permeability of the area in question. Attention should be paid to any soil condition that may cause an unrepresentative of the permeability such as the presence of excessive worm or rodent activity, roots, clay or gravel lenses or soil cracks.

2. The auger may smear the sides of the hole particularly if the soil is fine grained and damp. The smear layer can be removed from the sides of the hole with a brush (a wire pipe cleaning brush at least 60 mm diameter bristles will do.)

3. Stand the device upside down, fill with water to the air inlet hole and place rubber stopper back on device.

4. Invert the permeameter and quickly insert it into the hole, resting the rubber stopper on the bottom of the hole.

5. Water will initially flow very rapidly out of the permeameter reservoir until the head of water in the well reaches the level of the air inlet hole. Allow the flow out of the permeameter to "equilibrate" (approach a constant flow rate), which usually requires 5-30 minutes depending on soil type and soil structure. Monitor the rate of fall of the reservoir water level at a set timing interval until the rate becomes constant for at least three consecutive readings.

6. Record the value for the constant rate of fall in the reservoir on the Field Permeability Data Sheet (**Figure B-4**).

7. Using the reference table for Soil Permeability (**Table B-2**) determine the field saturated hydraulic conductivity (K_{fs} (cm/sec)) for the identified soil type. Record the value on the Form –A Test Pit Record (**Appendix H**) for submission with the registered documents.

Note: Due to the potential variability in test results, carry out a minimum of two tests. If the recorded constant rate of drop is not close, carry out additional tests until the measured rate is representative.

Figure B4 – Field Permeability Data Sheet

PID # _____________ **Test Pit # ______**

Time	**Δt time (min)**	**Permeameter Water Level (cm)**	**Change in Water Level (cm)**	**Rate, r (cm/min)**
Equipment:				

CALCULATION SUMMARY FOR DETERMINING K_{fs}

For the purpose of determining lot category, K_{fs} does not need to be calculated. Soils can be classified as permeable or non-permeable based on the rate of fall of water and soil type. The following summary of the calculation K_{fs} is provided for information only and is intended to be used by Professional Engineers.

To calculate K_{fs} you will need:

a - test hole radius (cm)
H - height of air inlet hole from bottom of test hole (cm)
C - from C vs. H/a graph
α* - from table of soil types (cm^{-1})
X - cross-sectional area of permeameter reservoir (cm^2)
r - constant rate of fall of water in permeameter reservoir (cm/min)

Calculate the rate of discharge of water using Q=X r (cm^3/min)

Equation (1) is:

$$K_{fs} = CQ/[2\pi H^2 + \pi a^2 C + (2\pi H/\alpha^*)] \qquad \text{(Where } \pi = 3.14\text{)}$$

rewriting gives

$$K_{fs} = \frac{Q}{\left[\frac{2\pi H^2}{C} + \pi a^2 + \frac{2\pi H}{C\alpha^*}\right]}$$

$$A = \frac{2\pi H^2}{C} + \pi a^2, \quad B = \frac{2\pi H}{C}$$

To calculate the saturated field hydraulic conductivity:

Where $K_{fs} = \left(\frac{Q}{A + \frac{B}{\alpha^*}}\right)$ formula constants are grouped and named as *A* and *B*:

EXAMPLE PROBLEM FOR CALCULATION OF K_{fs}

Soil type (as determined from examination of a test pit) is structured loamy soil. Based on this assessment, from Table B-1 use:

$\alpha^* = 0.12\ cm^{-1}$

For the permeameter used:

$X = 45.3\ cm^2$ (inside diameter is 7.6 cm)
$H = 10$ cm (bottom of plug to air hole)
$a = 3.5$ cm

The air and water temperature at time of testing were 20° C

From the field permeameter test the constant rate of water drop was determined to be:

$r = 3.1$ cm/min

$H/a = 10/3.5 = 2.86$, therefore from Figure B-2:

$C = 1.17$ (for mostly structured soils - line #1)

$Q = X\ r = 45.3 \times 3.1 = 140.4\ cm^3/min$

$A = [(2\pi H^2)/C] + \pi a^2$
$A = [(2\pi 10^2)/1.17) + \pi 3.5^2 = 575.3$

$B = (2\pi H)/C$
$B = (2\pi 10)/1.17 = 53.68$

$K_{fs} = Q/[(A+(B/\alpha^*)]$
$K_{fs} = 140.4/(575.3+(53.68/0.12)$
$K_{fs} = 2.29 \times 10^{-3}$ cm/min $= 1.37\ x10^{-1}$ cm/sec

From **Table B-2** of the Guidelines this permeability is in the range given structured loams. From our test pit examination, we had described the soil as structured soil. Based on that assessment we had chosen α^* as 0.12 from **Table B-1** and used line #1 in **Figure B-2**. Our K_{fs} results are for a soil of similar texture as that assumed from the test pit. Therefore the use of α^* as 0.12 was appropriate.

If the measured K_{fs} was for a soil that was different from the texture described from the test pit examination something would have been wrong. If this were to happen more test pits should be examined and more permeability tests conducted until the observed texture (and corresponding values of α^* and line in **Figure B-2**) and the texture corresponding to the measured K_{fs} were similar.

If the system is to operate during the winter and the design winter soil/effluent temperature is chosen to be 4° C than the adjusted permeability would be:

$Ka = K_{fs} \times V_K / Va$

where: Ka = adjusted permeability for design temperature conditions
K_{fs} = the calculated permeability from the field test
V_K = the viscosity of water at the test conditions
Va = the viscosity of water at the adjusted design temperature

$Ka = 1.37 \times 10^{-1}$ cm/sec x 2/3.5
$= 7.5 \times 10^{-2}$ cm/sec (which is out of the range for structured loams from Table B-2)

ADDITIONAL COMMENTS

Many of the soils in which we will wish to use the permeameter in addition to test pit observations to assist in estimating soil class or permeabilities will be unstructured fine textured silts and sands. If this is the case, α^* will be 0.04. If we use a permeameter with dimensions as described in this Appendix, X will = 45.3 (the inside diameter of the reservoir is 7.6cm), H will = 10cm, a will = 3.5cm, H/a will = 2.8, and from Fig. B2, C will = 1.15 A will then = 584.6 and B will = 54.6. Q will = 45.3 (cm^2) x r (cm/min)

***<u>Under these given conditions and for this permeameter only</u>*,** the formula for calculating K_{fs} is then reduced to:

$$K_{fs} = (X \times r) / (A+(B/\alpha^*))$$
$$= 45.3\, r / (584.6+ (54.6/0.04))$$
$$= 0.023 \times r \text{ cm/min}$$
$$= 3.8 \times 10^{-4} \times r \text{ cm/sec}$$ (where r is the measured drop in cm/min.)

<u>If the soil is not structured loam and clay and/or if the dimensions of the permeameter and/or the hole diameter are not the values stated above, equation [1] on page B-2 of this Appendix must be used to calculate K_{fs}</u>

Remember that this measurement gives an **<u>estimate</u>** of the soil permeability and other tools such as the examination for soil texture, density, uniformity, color, structure etc. from a test pit as well as the overall lot assessment **must** be considered before deciding on the suitability of the site for on-site disposal and the type and size of disposal field. More than one permeameter test **must** be conducted at a site to be sure that the test results are representative of the true soil conditions. When using K_{fs} in design at least 3 tests should be carried out. Where there is not an extreme variation in K_{fs} in the area of the proposed disposal field it may be appropriate to use the average value of K_{fs}. However if there is an extreme variation in measured K_{fs} the reason should be verified before a value of K_{fs} is selected.

Table B-2 - Reference Table for Soil Permeabilities

Rate of Fall of Water (cm/min)	Field Saturated Hydraulic Conductivity - Kfs (cm/sec) Type 1 (Coarse, gravelly, sands) $a^*(cm^{-1}) = 0.36$, C = 1.2 Without temp. gradient	Type 1 With temp gradient	Acceptable Rate of Fall	Type 2 (Structured loams & clays) $a^*(cm^{-1}) = 0.12$, C = 1.17 Without temp. gradient	Type 2 With temp gradient	Rate of Fall of Water (cm/min)
0.010	1.07E-05	6.41E-06	Too Slow (Type 1) / Too Slow (Type 2)	1.48E-05	8.87E-06	0.02
0.020	2.14E-05	1.28E-05		3.70E-05	2.22E-05	0.05
0.050	5.34E-05	3.21E-05		5.54E-05	3.33E-05	0.075
0.075	**8.00E-05**	4.80E-05		7.39E-05	4.43E-05	0.100
0.100	**1.07E-04**	6.41E-05		**8.00E-05**	4.80E-05	0.108
0.125	**1.33E-04**	**8.00E-05**	Acceptable Range (Type 1) / Acceptable Range (Type 2)	**1.33E-04**	**8.00E-05**	**0.181**
0.200	**2.14E-04**	**1.28E-04**		**1.48E-04**	**8.87E-05**	**0.200**
0.500	**5.34E-04**	**3.21E-04**		**3.70E-04**	**2.22E-04**	**0.500**
1.000	**1.07E-03**	**6.41E-04**		**7.39E-04**	**4.43E-04**	**1.000**
2.000	**2.14E-03**	**1.28E-03**		**1.48E-03**	**8.87E-04**	**2.000**
3.000	**3.21E-03**	**1.92E-03**		**2.22E-03**	**1.33E-03**	**3.000**
4.000	**4.27E-03**	**2.56E-03**		**2.96E-03**	**1.77E-03**	**4.000**
5.000	**5.34E-03**	**3.21E-03**		**3.70E-03**	**2.22E-03**	**5.000**
6.000	**6.41E-03**	**3.85E-03**		**4.43E-03**	**2.66E-03**	**6.000**
7.000	**7.48E-03**	**4.49E-03**		**5.17E-03**	**3.10E-03**	**7.000**
7.490	**8.00E-03**	**4.80E-03**		**5.54E-03**	**3.33E-03**	**7.500**
7.500	8.01E-03	**4.81E-03**	Too Fast (Type 1)	**8.00E-03**	**4.80E-03**	**10.830**
8.000	8.55E-03	**5.13E-03**	Too Fast (Type 2)	1.11E-02	**6.65E-03**	15.000
10.000	1.07E-02	**6.41E-03**		1.33E-02	**8.00E-03**	18.050
12.480	1.33E-02	**8.00E-03**		1.48E-02	8.87E-03	20.000
25.000	2.67E-02	1.60E-02		1.85E-02	1.11E-02	25.000
50.000	5.34E-02	3.21E-02		3.70E-02	2.22E-02	50.000
100.000	1.07E-01	6.41E-02		7.39E-02	4.43E-02	100.000
1000.000	1.07E+00	6.41E-01		7.39E-01	4.43E-01	1000.000

This table is based on the following assumptions:

Internal Reservoir Diameter **D** = 7.6 cm

Well Hole Diameter **d** = 7 cm

Height of Water in Well **H** = 10 cm

Temperature **T** = 20 °C

Temperature Gradient column is based on soil temperature Ts = 4°C and water temperature Tw = 20°C

Appendix C Water Movement Through Soils

A basic understanding of water movement through soils is needed to appreciate the necessity of determining a soil's permeability and its relationship to the design of a disposal field.

Water Movement: Water moves through the voids between soil particles as a result of gravity. The rate of movement is governed by the size and shape of the voids through which water is pulled by gravity.

The basic factors which govern the quantity of water that can move through the soil on a lot are as follows:

Permeability: The rate at which water will move through a soil. Soil permeability is determined by the size, continuity and tortuosity of the pores. Soils such as sand have large continuous pores which conduct more water than a clay which have small disconnected pores.

Porosity: The percentage of a soil that is void of material. Porosity decreases with an increase of compaction, and/or grain size distribution. Particle shape also influences porosity. A soils porosity does not directly convert to a permeability value.

Hygroscopic Water: The water which clings to a soil particle due to surface tension. The finer the grain size the greater the surface area is. As the surface area increases, more of the water in the pores attach to the soil particles through surface tension.

Hydraulic Gradient: The surface slope of a water table. For disposal fields it is usually assumed that the hydraulic gradient parallels the ground surface. A sharp change in grade (ravine) within 50 feet of a system will change this.

Darcy's Law can be used to calculate the theoretical volume of water that will move through a soil under saturated soil conditions.

$Q = V * A$	Q = Volume of water V = Velocity A = Cross Sectional Area
$V = k * I$	K = Permeability I = Hydraulic Gradient

<u>Soil Saturation</u>

Water Flow: Water flows through saturated soils at a faster rate than it does through an unsaturated soil. Sewage treatment is most effective when working in unsaturated conditions.

Zone of Saturation: The zone where all the soil voids are filled with water.

Hydrostatic Water Level: The level of water surface in a hole dug into a saturated soil.

Capillary Fringe: A layer of saturated soil above the zone of saturation. Water is drawn up by capillary action. The finer the soils the higher this zone will be. The soil is saturated above the water table.

Unsaturated Soil: In an unsaturated soil the larger voids are filled with air and water moves through the smaller voids. With a sewage effluent the removal of pathogens is increased because they become trapped.

Boundary Layer: The boundary between layers of soil with different hydraulic conductivities interferes with water movement. The depth to which the water ponds is dependent on the difference in conductivity.

Infiltrative Surface: The interface between the disposal field and the natural soil, where the effluent must enter the soil. The pores in the soil must be open for the sewage to pass through. If the pores become blocked during construction, the bed will not be able to operate at its full potential. The pores will also become partially blocked by the clogging mat. Steps can be taken to avoid or minimize damage to this vital component. Contractors should not work when the soil is saturated, the area should be hand raked, sand and gravel should be placed carefully.

Appendix D Flow Tables

1. The individual on-site sewage disposal system shall be designed and constructed to adequately treat and dispose of the expected maximum flow of sewage.

2. The disposal system must be designed to receive all sewage from the building or structure except cooling water, roof, foundation or surface drains or backwash from water treatment devices, unless otherwise approved by the Department of Environment, Labour and Justice. Backwash from water treatment devices add an extra hydraulic load and may create additional concerns depending on the specific treatment technology. Discharge of this backwash to an on-site sewage disposal system is only recommended if the system has been specifically designed by a professional engineer to accept the specific discharge.

3. The minimum design sewage flow from any residential structure or dwelling, shall be 900 L/day. When it is anticipated that the sewage flows from the dwelling or structure will exceed the 900 L/day minimum, it is recommended that the sewage flows, as indicated in the following **Table D1**, be utilized:

Table D1 Residential Flows		
Number of Bedrooms	W/Standard Water Closets (Litres)	Low Flow Water Closets (Litres)
2 bedrooms or less	900	720
3 bedrooms	1,400	1,100
4 bedrooms	1,900	1,500
Each additional bedroom	450	350

(For residential applications where 6 litre toilets are installed, a 20 percent reduction in design flow may be applied).

4. The minimum design sewage flow from any multi unit residential structure or dwelling such as, apartments, condominiums, cottages, hotels, etc., shall be 900 L/day. When it is anticipated that the sewage flows from the dwelling or structure will exceed the 900 L/day minimum, it is recommended that the sewage flows as indicated in the following **Table D2** be utilized:

Table D2 Multi Unit Residential Flows		
Unit Type	Average Daily Flow (L/Day)	
	Standard Water Closets	Low Flow Water Closets
For each 1 bedroom unit	900	720
For each additional 1 bedroom unit	450	350
For each 2 bedroom unit	900	720
For each 3 bedroom unit	1,400	1,100
For each 4 bedroom unit	1,900	1,500

5. Industrial wastewater shall not be discharged into on-site sewage disposal systems designed for sanitary sewage disposal unless prior approval is obtained from the Department of the Environment Labour and Justice. Special designs or pre-treatment may be required for industrial waste-water.

6. All restaurants or other establishments involved in food preparation activities shall install external grease tanks.

7. The design sewage flows from other residential, commercial, industrial and institutional buildings or structures should be based on the design wastewater flows prescribed in **Table D3** of this appendix. The minimum design flow from other residential, commercial, industrial and institutional buildings or structures shall be 900 L/day. The designer for these types of systems may want to consider the characteristics of the waste water in the process of design.

8. Where actual metered flow data indicating maximum daily flows are available, such flow data may be substituted for the sewage flows listed in this appendix, under the following conditions:

   - The minimum design flow for residential, commercial, industrial and institutional buildings or structures is 900 L/day.
   - They should cover the most recent two (2) week peak period of operation.
   - A 20 to 50 percent increase factor should be used in the design flow to accommodate potential future flow increases, occasional peaks, etc.
   - Flow meter data, from the facility shall be submitted by the Engineer or site assessor at time of submission, also include information regarding actual occupancy or production volume when unit flows are calculated.

9. A reduction in the design flows may be allowed by the Department of Environment, Labour and Justice when permanent low-volume devices are to be installed in the proposed building or structure.

10. Design flows in this **Appendix D** are recommended minimal design flows and if evidence of larger flows exist or are expected, the larger flows should be used.

11. In many cases the tables provide several flow rates for the same/similar activity (examples: church halls, restaurants, etc) and the system designer must decide which of the flows provided in the tables is most representative for the specific design. If there is a question related to which flow rate is most appropriate the Department of Environment, Labour and Justice will have the final decision.

Table D3

Design Wastewater Flows

Facility	Unit of Measure	Maximum Design Flow (Litres/day)
Institutional		
Assembly Hall/Churches: With kitchen	Seat	45
Assembly Hall/Churches: No kitchen	Seat	23
Fire station without full time employee, floor drains or food	Person	19
Town Hall	Seat	23
Medical/Personal Care		
Hospital: Including laundry	Bed	1,050
Nursing/Special Care Home	Resident	600
Nursing/Special Care Home: Add per employee	Employee	80
Medical Office: Doctors, nurses, medical staff	Person	273
Medical Office: Office staff add	Person	80
Medical Office: Patient add	Person	23
Dental Office	Chair	757
Dental Office – waterless units	Chair	0
Dental Office: Staff/Patient add	Person	80
Schools		
School: Cafeteria, gym and shower	Student	90 Add to base flow for school
School: Cafeteria only	Student	80 Add to base flow for school
School: Gym with showers only	Student	30 Add to base flow for school
School: Elementary – washrooms only	Student	26
School: High – washrooms only	Student	45
School: Junior high – washrooms only	Student	34
School Boarding: Resident student	Student	136
School Boarding: Non-resident staff	Person	80

Table D3

Design Wastewater Flows

Facility	Unit of Measure	Maximum Design Flow (Litres/day)
Food Service		
Bakery: Sanitary only	Employee	68
Bar/Lounge	Seat	140
Bar/Lounge: Add per employee	Employee	80
Restaurant: Not 24 hour	Seat	160
Restaurant: Add per employee	Employee	80
Restaurant: Take Out	Seat	70
Taverns/Bars/Lounges with minimal food service	Seat	140
Commercial		
Office	Employee	80
Beauty Salon	Station	400
Beauty Salon: Add for personnel	Person	38
Veterinary Clinic (3 doctors or less): No boarding	Total	2,900
Dog Kennel	Enclosure	73
Laundromat: Self Serve	Machine	1,700
Laundromat: In apartment building	Machine	1,700
Shopping Centre	Space	10
Shopping Centre	Employee	80
Commercial/Automobile		
Automobile Gas Station: Single hose pump	Unit	570 (does not include restaurant)
Car Wash *	Vehicle	189
* requires oil water separators with discharge to a closed storm sewer or an in-ground disposal system.		
Commercial/Hospitality		
Motel	Unit	320
Motel	Housekeeping unit	450
Motel: Dining room	Seat	160
Motel: Bar and lounge	Seat	68
Hotel	Guest	136
Hotel: Add for employees	Employee	36
Boarding House/Dormitory	Resident	180
Senior Citizens Home	Resident	227
Day Care Centers: Staff and children	Person	80

Table D3

Design Wastewater Flows

Facility	Unit of Measure	Maximum Design Flow (Litres/day)
Recreation/Camping		
Campgrounds: Tents only – No service	Site	320
Campgrounds: Trailers - water and electrical – 2 way	Site	320
Campgrounds: Trailers - water, sewer and electrical – 3 way	Site	390
Campgrounds: With central comfort stations	Add for dump station	390
Day Camps: No meal	Person	70
Day Camps: Meals	Person	100
Summer Camps	Camper/Instructor	160
Parks, Beaches and Picnic Grounds		
Picnic and Fairgrounds: With bath houses, showers, toilets	Person	38
Picnic and Fairgrounds: With toilets only	Person	18
Beaches with Showers and Toilets	Person	40
Visitor Centre	Person	18
Visitor Centre: add Employee	Employee	80
Golf/Country Clubs		
Golf/Country Club	Round	18
Golf Clubs and Restaurant add	Seat	35
Golf Clubs	Fixture	1,800
Golf/Country Clubs: Showers	Person	40
Golf/Country Clubs: Day staff – Add	Employee	80
Recreation General		
Theatre	Seat	18
Theatre: Drive-in – food	Space	23

Table D3

Design Wastewater Flows

Facility	Unit of Measure	Maximum Design Flow (Litres/day)
Recreation/Sport		
Bowling Alleys: Without bar and restaurant	Alley	105
Bowling Alleys: With bar or restaurant	Alley	800
Ice Rink	Seat	11
Ice Rink: Participant add	Person	38
Stadium	Seat	18
Swimming Pool	Customer	45
Water Slide Park	Visitor	18
Gym: Participant	Person	38
Gym: Spectator	Person	18
Tennis/Racquetball: Excluding food	Court	946
Outdoor Sport Facilities: Toilet only	Person	18

NOTES:

Approximate Flushing Frequencies

Residential	5 flushes per day
Schools	2 flushes per student per day
Hotel/Motel Room	4-6 flushes per day
Restaurant	0.5 flushes per meal per day
General Commercial	2-4 flushes per employee per 8 hr
Industrial	3 flushes per employee per 8 hr
Ski Areas	1 flush per skier per day
Campgrounds with Facilities	3 flushes per person per night

Note: ***Flow reduction - Facilities that install low flow or no flow fixtures may have reduction of flow applied. Site assessor or consulting engineers may apply 20% to 50% reduction to the design based on design approach.***

Appendix E Conversion Tables

Table E1 – QUICK REFERENCE CONVERSION TABLE

Metric unit (Symbol)	Imperial Units	
	Exact	**Approximation**
FLOWS		
1,000 litres (l)	220 imperial gallons	220 imperial gallons
1,500 litres (l)	330 imperial gallons	330 imperial gallons
LOT AREA		
2,700 square metres (m^2)	29,052 square feet	29,000 square feet
3,150 square metres (m^2)	33,894 square feet	33,900 square feet
3,716 square metres (m^2)	39,984 square feet	40,000 square feet
4,500 square metres (m^2)	48,420 square feet	48,400 square feet
6,800 square metres (m^2)	73,168 square feet	73,200 square feet
9,000 square metres (m^2)	96,840 square feet	96,800 square feet
DEPTH OF PERMEABLE SOIL		
900 millimetres (mm) / 90 cm	35.43 inches	36 inches
600 millimetres (mm) / 60 cm	23.6 inches	24 inches
300 millimetres (mm) / 30 cm	11.81 inches	12 inches
150 millimetres (mm) / 15 cm	5.9 inches	6 inches
CLEARANCE DISTANCES		
1 metre (m)	3.28 feet	3.3 feet
1.5 metres (m)	4.92 feet	5 feet
3 metres (m)	9.84 feet	10 feet
6 metres (m)	19.68 feet	20 feet
6.1 metres (m)	20.00 feet	20 feet
9 metres (m)	29.52 feet	30 feet
12 metres (m)	39.36 feet	40 feet
12.1 metres	39.68 feet	40 feet
12.5 metres	41 feet	40 feet
15.2 metres	49.85 feet	50 feet
15 metres	49.2 feet	50 feet
23 metres	26.28 feet	26 feet
30.5 metres	100.04 feet	100 feet
100 metres	328 feet	325 feet
MINIMUM SYSTEM LENGTH		
25 metres	82 feet	80 feet
15 metres	49.2 feet	50 feet
33 metres	108.24 feet	110 feet

UNITS CONVERSION TABLE

To obtain :	Multiply:	By:
Metres (m)	Feet (ft)	0.3048
Metres (m)	Millimetres (mm)	0.001
Metres (m)	Inches (in)	0.0254
Feet (ft)	Metres (m)	3.28
Inches (in)	Metres (m)	39.37
Centimetres (cm)	Inches (in)	2.54
Millimetres (mm)	Metres (m)	1,000
Litres (l)	Imperial gallons (igal)	4.54
Litres (l)	US gallons (gal)	3.78
Litres (l)	Cubic feet (cf)	28.316
Litres (l)	Cubic metre (m^3)	1000
Imperial gallons (igal)	Litres (l)	0.220
Imperial gallons (igal)	US gallons (gal)	0.83
Imperial gallons (igal)	Cubic feet (cf)	6.229
US gallons (gal)	Litres (l)	0.264
US gallons (gal)	Imperial gallons (igal)	1.2
Cubic feet (cf)	Imperial gallons (igal)	0.1605
Cubic metre (m^3)	Litres (l)	0.001
Square metres (m^2)	Square feet (sq.ft)	0.093
Acres (acre)	Square metres (m^2)	0.000247
Acres (acre)	Square feet (sq.ft)	0.00002296
Acre (acre)	Hectare (ha)	2.471
Square feet (sq.ft)	Square metres (m^2)	10.76
Square feet (sq.ft)	Acres (acre)	43,560
Hectare (ha)	Acre (acre)	0.4047
Hectare (ha)	Square metres (m^2)	0.0001
Square metres (m^2)	Hectare (ha)	10,000
Gram (g)	Pound (lb)	453.59
Gram (g)	Milligram (mg)	0.001
Pound (lb)	Gram (g)	0.0022
Milligram (mg)	Gram (g)	1,000
Feet of water	Pounds/sq.inch (psi)	2.306
Pounds/sq.inch (psi)	Feet of water	0.433
Litres/square metres (l/m^2)	Imperial gallons/square foot (ig/sq.tf)	48.932
Imperial gallons/square foot (ig/sq.tf)	Litres/square metres (l/m^2)	0.020
Litres/metre (l/m)	Imperial gallons/foot (ig/ft)	14.914
Imperial gallons/foot (ig/ft)	Litres/metre (l/m)	0.067
Metres/day	Metres/second	86,400
Metres/second	Metres/day	0.00001157
Feet/day	Metres/second	283,392

Appendix F   Lot Size Standards and Setbacks

Prior to the development of a parcel of land, the land must be categorized in order to determine the appropriate lot size and lot width for servicing. Lot categorization is detailed in Section 23. (1) of the Planning Act Subdivision Development Regulations and it reads as follows:

23. (1) Lots shall be categorized according to the following standards:

(a) Category I, where the lot has a depth of permeable natural soil of 2 feet (0.61 metre) or greater, and where the depth to bedrock and the depth to the maximum groundwater elevation is 4 feet (1.22 metres) or greater:

(b) Category II, where the lot has a depth of permeable natural soil greater than 1 foot (0.3 metre),but less than 2 feet (0.61 metre), and where the depth to the bedrock and the depth to the maximum groundwater elevation is 4 feet (1.2 metre) or greater:

(c) Category III, where the lot has a depth of permeable natural soil of 1 foot (0.3 metre) or greater, and where either or both of the following conditions exist:

(i) the depth to the bedrock is 2 feet (0.61 metre) or greater, but less than 4 feet (1.22 metre)

(ii) the depth to the maximum groundwater elevation is 2 feet (0.61 metre) or greater, but less than 4 feet (1.22 metre).

(d) Category IV, where the lot has a depth of permeable natural soil of less than 1 foot (0.3 metre), and where the depth to the bedrock is greater than 1 foot (0.3 metre) and water table greater than 2 feet (0.61 metre) but less than 4 feet (1.22 metre).

(e) Category V, where the depth to bedrock is less than 1 foot (0.3 metre), or the depth to water table is less than 2 feet (0.6 m), the lot is not developable.

Table F1 – Minimum Lot Size Standards – Residential Developments

a) Servicing	b) Lot Category	c) Number of Dwelling Units	d) Minimum Lot Area sq.ft. / sq.m.	e) Minimum Circle Diameter to be Contained Within the Boundaries of the Lot feet/metres
On-site water and on-site sewerage system	I	1	25,000 sq.ft / 2,322.5 sq.m.	150 ft. / 45.7 m
		2	30,000 sq.ft. / 2,787 sq.m.	160 ft. / 48.8 m
		3	35,000 sq.ft. / 3,251.5 sq.m.	175 ft. / 53.5 m
		4	40,000 sq.ft. / 3,717 sq.m.	200 ft. / 61 m
		more than 4	40,000 sq.ft. / 3,717 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	200 ft. / 61 m
On-site water and on-site sewerage system	II	1	35,000 sq.ft / 3,251.5 sq.m.	175 ft. / 53.3 m
		2	40,000 sq.ft. / 3,717 sq.m.	200 ft. / 68.6 m
		3	45,000 sq.ft. / 4,180.5 sq.m.	225 ft. / 68.6 m
		4	50,000 sq.ft. / 4,645 sq.m.	250 ft. / 76.2 m
		more than 4	50,000 sq.ft. / 4,645 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	250 ft. / 76.2 m
On-site water and on-site sewerage system	III	1	51,000 sq.ft / 4,738.5 sq.m.	225 ft. / 68.6 m
		2	56,000 sq.ft. / 5,202 sq.m.	250 ft. / 76.2 m
		3	61,000 sq.ft. / 6,131 sq.m.	275 ft. / 83.8 m
		4	66,000 sq.ft. / 6,131 sq.m.	300 ft. / 91.4 m
		more than 4	66,000 sq.ft. / 6,131 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	300 ft. / 91.4 m

On-site water supply and on-site sewerage system	IV	1 2 3 4 more than 4	75,000 sq.ft / 6,975 sq.m. 80,000 sq.ft / 7,440 sq.m. 85,000 sq.ft / 7,905 sq.m. 90,000 sq.ft / 8,370 sq.m. 90,000 sq.ft. / 8,370 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	300 ft. / 91.4 m
On-site water supply and on-site sewerage system	V	N/A	Not Developable	N/A
Central water supply and on-site sewerage system	I	1	20,000 sq.ft. / 1,858 sq.m.	125 ft. / 38.1 m
		2	25,000 sq.ft. / 2,322.5 sq.m.	150 ft. / 45.7 m
		3	30,000 sq.ft. / 2,787 sq.m.	160 ft. / 48.8 m
		4	35,000 sq.ft. / 3,251.5 sq.m.	175 ft. / 53.3 m
		more than 4	35,000 sq.ft. / 3,251.5q.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	175 ft. / 53.3 m
Central water supply and on-site sewerage system	II	1	25,000 sq.ft / 2,322.5 sq.m.	150 ft. / 45.7 m
		2	30,000 sq.ft. / 2,787 sq.m.	160 ft. / 48.8 m
		3	35,000 sq.ft. / 3,251.5 sq.m.	175 ft. / 53.3 m
		4	40,000 sq.ft. / 3,717 sq.m.	200 ft. / 61 m
		more than 4	40,000 sq.ft. / 3,717 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	200 ft. / 61 m
Central water supply and on-site sewerage system	III	1	40,000 sq.ft. / 3,717 sq.m.	200 ft. / 61 m.
		2	45,000 sq.ft. / 4,180.5 sq.m.	225 ft. / 68.6 m
		3	50,000 sq.ft. / 4,645 sq.m.	250 ft. / 76.2 m
		4	55,000 sq.ft. / 5,110 sq.m.	275 ft. / 83.8 m
		more than 4	55,000 sq.ft. / 5,110 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	275 ft. / 83.8 m
Central water supply and on-site sewerage system	IV	1 2 3 4 more than 4	60,000 sq.ft. / 5,580 sq.m 65,000 sq.ft. / 6,450 sq.m. 70,000 sq.ft. / 6,510 sq.m. 75,000 sq.ft. / 6,975 sq.m. 75,000 sq.ft. / 6,975 sq.m., plus 1,500 sq.ft. / 457 sq.m. for each additional unit	275 ft. / 83.8 m
Central water supply and on-site sewerage system	V	N/A	Not Developable	N/A

Table F2 Minimum Setback Distances

	Septic Tank *(holding tank, pumping and dosing chamber)*		Grease Tank		Disposal Field		Sewer Line	
	Metres	Ft.	Metres	Ft.	Metres	Ft.	Metres	Ft.
Water well	15.2	50	15.2	50	15.2	50	3.0	10
Property boundary	3.0	10	3.0	10	3.0	10		--
Beach setback *	22.9	75	22.9	75	22.9	75		--
Building with foundation **	4.6	15	1.5	5	6.1	20		--
Building without foundation	---	---	---	---	4.6	15		--
Water line	3.0	10	3.0	10	3.0	10	0.45	1.5
Natural boundary of a body of water	15.2	50	15.2	50	15.2	50		--

* existing lots prior to 1993 only require 50-foot setback from bank or twice the erosion rate for the area.

** variances may be given for slab on grade or walk out basements in tight situations.

Minimum Field Tile Length by Lot Category

Category I

Distance to Bedrock or Water Table from Ground Surface: Greater than 1.2 m (4 ft)

Depth of Permeable Soil from Ground Surface: Greater than 0.6 m (2 ft)

System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
1. Multiple Trench System	0.6 m (2.0 ft)	85 m (280 ft)	68 m (224 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108 m (352 ft)	162 m (530 ft)	130 m (425 ft)	Y	P	N
2. Alternative Multiple Trench System	0.6 m (2.0 ft)	67 m (220 ft)	54 m (176 ft)	91 m (300 ft)	73 m (240 ft)	116 m (380 ft)	93 m (305 ft)	140 m (460 ft)	112 m (368 ft)	Y	P	N
3. Contour System Type C1	0.9 m (3.0 ft)	30 m (100 ft)	—	37 m (120 ft)	—	49 m (160 ft)	40 m (130 ft)	61 m (200 ft)	49 m (160 ft)	N	Y	EDS
4. Contour System Type C2	0.9 m (3.0 ft)	30 m (100 ft)	—	37 m (120 ft)	—	49 m (160 ft)	40 m (130 ft)	61 m (200 ft)	49 m (160 ft)	N	Y	EDS
5. Chamber system Multiple Trench	0.9 m (3.0 ft)	43 m (138 ft)	—	55 m (175 ft)	—	69 m (225 ft)	—	80 m (262 ft)	—	Y	P	EDS
6. EZ *flow* System [1] Multiple Trench	0.6 m (2.0 ft)	57 m (187 ft)	—	74 m (243 ft)	—	90 m (296 ft)	—	108 m (355 ft)	—	N	N	EDS

Category II

Distance to Bedrock or Water Table from Ground Surface: Greater than 1.2 m (4 ft)

Depth of Permeable Soil from Ground Surface: 0.3 to 0.6 m (1 to 2 ft)

[2] System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
1. Multiple Trench System	0.6 m (2.0 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108m (352 ft)	162 m (530 ft)	130 m (425 ft)	180 m (590 ft)	144 m (473 ft)	Y	P	EDS
2. Alternative Multiple Trench System	0.6 m (2.0 ft)	85 m (280 ft)	68 m (224 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108 m (352 ft)	162 m (530 ft)	130 m (425 ft)	Y	P	N
3. Contour System Type C2 and Type C3	0.9 m (3.0 ft)	37 m (120 ft)	—	46 m (150 ft)	37 m (120 ft)	57 m (187 ft)	46 m (150 ft)	71 m (235 ft)	57 m (187 ft)	N	Y	EDS
4. Chamber System Multiple Trench	0.9 m (3.0 ft)	53 m (175 ft)	—	69 m (225 ft)	—	86 m (280 ft)	—	100 m (328 ft)	—	Y	P	EDS
5. EZ *flow* System [1] Multiple Trench	0.6 m (2.0 ft)	74 m (243 ft)	—	90 m (296 ft)	—	108 m (355 ft)	—	120 m (395 ft)	—	N	N	EDS

Category III

Distance to Bedrock from Ground Surface: 0.6 to 1.2 m (2 to 4 ft)

Depth of Permeable Soil from Ground Surface: 0.6 to 1.2 m (2 to 4 ft)

[2] System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
1. Multiple Trench System	0.6 m (2.0 ft.)	85 m (280 ft)	68 m (224 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108 m (352 ft)	162 m (530 ft)	130 m (425 ft)	Y	P	N
2. Alternative Multiple Trench System	0.6 m (2.0 ft)	67 m (220 ft)	54 m (176 ft)	91 m (300 ft)	73 m (240 ft)	116 m (380 ft)	93 m (305 ft)	140 m (460 ft)	112 m (368 ft)	Y	P	N
3. Contour System Type C1 and Type C3	0.9 m (3.0 ft)	30 m (100 ft)	—	37 m (120 ft)	—	49 m (160 ft)	40 m (130 ft)	61 m (200 ft)	49 m (160 ft)	N	P	EDS
4. Contour System Type C2	0.9 m (3.0 ft)	30 m (100 ft)	—	37 m 120 ft)	—	49 m (160 ft)	40 m (130 ft)	61 m (200 ft)	49 m (160 ft)	N	Y	EDS
5. Chamber System Multiple Trench	0.9 m (3.0 ft)	43 m (138 ft)	—	55 m (175 ft)	—	69 m (225 ft)	—	80 m (262 ft)	—	Y	P	N
6. EZ *flow* System [1] Multiple Trench	0.6 m (2.0 ft)	57 m (187 ft)	—	74 m (243 ft)	—	90 m (296 ft)	—	108 m (355 ft)	—	N	N	EDS

Category III

Distance to Bedrock from Ground Surface: 0.6 to 1.2 m (2 to 4 ft.)

Depth of Permeable Soil from Ground Surface: 0.3 to 0.6 m (1 to 2 ft)

[2] System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
1. Multiple Trench System	0.6 m (2.0 ft.)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108m (352 ft)	162 m (530 ft)	130 m (425 ft)	180 m (590 ft)	144 m (473 ft)	Y	P	N
2. Alternative Multiple Trench System	0.6 m (2.0 ft)	85 m (280 ft)	68 m (224 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108 m (352 ft)	162 m (530 ft)	130 m (425 ft)	Y	P	N
3. Contour System Type C1	0.9 m (3.0 ft)	37 m (120 ft)	—	46 m (150 ft)	37 m (120 ft)	57 m (187 ft)	46 m (150 ft)	71 m (235 ft)	57 m (187 ft)	N	P	EDS
4. Contour System Type C2 and Type C3	0.9 m (3.0 ft)	37 m (120 ft)	—	46 m (150 ft)	37 m (120 ft)	57 m (187 ft)	46 m (150 ft)	71 m (235 ft)	57 m (187 ft)	N	Y	EDS
5. Chamber System Multiple Trench	0.9 m (3.0 ft)	53 m (175 ft)	—	69 m (225 ft)	—	86 m (280 ft)	—	100 m (328 ft)	—	Y	P	EDS
6. EZ *flow* System [1] Multiple Trench	0.6 m (2.0ft)	74 m (243 ft)	—	90 m (296 ft)	—	108 m (355 ft)	—	120 m (395 ft)	—	N	N	EDS

Category III

Water Table 0.6 to 1.2 m (2 to 4 ft)

[2] System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
All systems to be designed by a Professional Engineer	EDS	EDS		EDS		EDS		EDS		EDS	EDS	EDS

Category IV

Distance to Bedrock from Ground Surface is greater than 0.3 m (1 ft.)

Depth of Permeable Soil from Ground Surface: 0.0 to 0.3 m (0 to 1 ft)

Note: Where the distance to Water Table from Ground Surface is less than 1.2 m (4 ft.) the system is to be designed by a Professional Engineer

[3] System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
1. Multiple Trench System	0.6 m (2.0 ft.)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108m (352 ft)	162 m (530 ft)	130 m (425 ft)	180 m (590 ft)	144 m (473 ft)	Y	P	N
2. Alternative Multiple Trench System	0.6 m (2.0 ft)	85 m (280 ft)	68 m (224 ft)	110 m (360 ft)	88 m (288 ft)	134 m (440 ft)	108 m (352 ft)	162 m (530 ft)	130 m (425 ft)	Y	P	N
4. Contour System Type C1 and Type C2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N
4. Contour System Type C3	0.9 m (3.0 ft)	37 m (120 ft)	—	46 m (150 ft)	37 m (120 ft)	57 m (187 ft)	46 m (150 ft)	71 m (235 ft)	57 m (187 ft)	N	Y	EDS
5. Chamber System Multiple Trench	0.9 m (3.0 ft)	53 m (175 ft)	—	69 m (225 ft)	—	86 m (280 ft)	—	100 m (328 ft)	—	Y	P	EDS
6. EZ *flow* System [1] Multiple Trench	0.6 m (2.0 ft)	74 m (243 ft)	—	90 m (296 ft)	—	108 m (355 ft)	—	120 m (395 ft)	—	N	N	EDS

Category V

Distance to Bedrock from Ground Surface is less than 0.3 m (1 ft.)

Distance to water table is less than 0.6 m (2 ft.)

System Description	Minimum Trench Width	Number of Bedrooms								Slope %		
		2		3		4		5		<5	5-30	>30
		Standard	LF	Standard	LF	Standard	LF	Standard	LF			
Development of sewage disposal systems is not permitted in this Category	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LF 20% reduction for low flow fixtures (6L toilets)
EDS Engineered Designed System
Y "Yes" - System type permitted
P "Possible" - System is permitted depending on slope
N "No" - System type not permitted
N/A Not Applicable
[1] An allowance of a 1/3 reduction from a standard multiple trench system is permitted for the EZ *flow* system. This is for a double line format with the second line being the aggregate line only (no pipe).
[2] Systems in this category will require the addition of Good Quality Fill.
[3] Systems in this category will require the addition of a minimum of 1.2 meters (4 feet) of Good Quality Fill.

Notes:

- Systems up to 5 bedrooms (2,270 L/day) can be selected by a Licensed Contractor and a Site Assessor from the above table.
- Systems greater than 5 bedroom and up to 6810 L/day (1500 Igal/day) can be determined by using Design Flow table, Appendix D and the above table in Appendix G.
- Systems greater than 6810 L/day (1500 Igal/day) shall be designed by a Professional Engineer Licensed to practice in Prince Edward Island.
- For septic tank sizing refer to Table 4.1 Minimum capacity of Septic Tanks for Dwellings.

Appendix H STANDARD SUBMISSION DOCUMENTS

This appendix provides the standard submission forms that must be completed by the site assessor and contractor, prior to submitting them to the Department of Environment, Labour and Justice for registration. Some documents shown in this section are submission documents which are not submitted at the time of registration. For example the **Certificate of Compliance** is submitted following the installation by the contractor and the **Audit Report** is submitted by the Safety Standards Officer.

The submission documents to be included at the time of registration are the following:

- **Site Assessment Registration Form**
- **Form A – Test Pit Record**
- **Field Permeability Data Sheet** *(see **Appendix B**, not shown here)*
- **Site Plan**
- **Relevant Disposal System Figure (H1 to H11)**
- **Soils Map** *(not shown here)*

The submission documents to be filed with Department of Environment, Labour & Justice, following installation are as follows:

- **Certificate of Compliance** *(from contractor or Engineer)*
- **On-Site Sewage Disposal System Audit Report** *(from Safety Standards Officer)*

Prince Edward Island CANADA

Environment, Labour and Justice
Inspection Services

Registration Form

☐ Site Suitability Assessment

☐ On-Site Sewage Disposal System

(Please check one or both boxes if necessary)

Freedom of Information and Protection of Privacy

Personal information on this form is collected under section 31(c) of the Freedom of Information and Protection of Privacy Act R.S.P.E.I. 1998, c. F-15.01 as it relates directly to and is necessary for registration of this document and will be used for the administration of the *Environmental Protection Act* . If you have any questions about this collection of personal Information, you may contact the Safety Standards Chief, Department of Environment, Labour and Justice, 31 Gordon Drive, Charlottetown, PE C1A 6B8, Telephone (902) 368-5280.

Registration #: **RD**________________

Date Submitted: ___________________

Section A – Site Suitability Assessment

Site Assessor Information:

Site Assessor's Name: ____ License #: ___________

Company Name: ____ Phone #:______________

Property Information:

Owner's name: ____

Civic Address: ____

Community:____ County:________________

New Development: Y__ N__ Case #: _________________________ Lot #:__________

Development/Building Permit #:_____________________ Property #:___________________

Assessment Information:

☐ ***Please check this box if the person making the request is the same as the property owner above.***

I, ____________________________________ hereby submit this registration documents for the above noted property as requested by the following person:

Name: ____

Address: ____

____ Postal Code: __________________

Note: Indicate site category in the box below. *(based on assessment findings)*

Prior Assessment:

Was this site previously assessed? Y___ N___; If yes, when _________________________

If yes, indicate the site category in the box below.

Are any conditions attached Y ___ N ___

____
(signature of site assessor)

Category

I II III IV V

(circle one)

Environment, Labour and Justice
Inspection Services

Section B
Sewage Disposal System Information

*Registration #: **RD*** ________________________

Freedom of Information and Protection of Privacy
Personal information on this form is collected under section 31(c) of the Freedom of Information and Protection of Privacy Act R.S.P.E.I. 1998, c. F-15.01 as it relates directly to and is necessary for registration of this document and will be used for the administration of the *Environmental Protection Act*. If you have any questions about this collection of personal information, you may contact the Safety Standards Chief, Department of
Environment, Labour and Justice, 31 Gordon Drive, Charlottetown, PE, C1A 6B8 Telephone (902) 368-5280.

Activity:

New System: _______ Replacement system: ________ Replace a failed system: _______ (how old: _______)

Other: _________________________________

Use of the structure or area to be serviced:

Single family: ___________ Duplex: __________ Multi-unit: ___________ (how many #: ___________)

Summer cottage: _________ Travel trailer: _________ Industrial: _________ Institutional: ___________

Agriculture building: ____________

If single family dwelling, provide number of bedrooms: ____________________

Additional information: (# of motel rooms, # of restaurant seats, cottages, etc.) ________________________

____

Will the daily sewage rate exceed 1500 gallons per day: Yes _____ No _____

Septic System Details:

Septic Tank Type:

Pre-cast concrete: __________ Polyethylene: _____________ Poured in place concrete: ______________

Holding tank **(H11):** ____________ Other (specify): _____________ Septic tank size: _____________litres
(1 gal = 4.54 litres)

Disposal Field Type:

Multiple trench system **(H6):** _______Leaching chamber **(H8-10):** ______ EZ *flow* system **(H6a):**_________

Alternative multiple trench **(H7):** ________Contour trench **(H1-5):** _________ (specify C1,C2,C3): ______

Mound system: ________Consultant designed system: ________Other type (specify): _________________

Number of disposal fields: _________ Total length of pipe in all fields _________ metres *(1 foot = .3048 metres)*

Good Quality Fill (GQF) added: _____________cm *(1 foot = 30 cm)*

Please check if required: Pumping station: ____ Siphon chamber: ____Pressure distribution system: ____

Contractor's Notes: ____

____

I ______________________________ declare the information above is accurate and true, the system will be installed by a licensed contractor and will comply with the Sewage Disposal Systems Regulations of the Environmental Protection Act and the Construction Standards for On-Site Sewage Disposal Systems in PEI.

FORM A - Test Pit Record

Date: ________ Time: ________ Registration No:________

Proponent's Name:________ Property No:________

Site Location: ________ Contractor:________

Test Pit No: ________ Technician: ________

Lot Classification:

Category
(circle one)

I II III IV V

Horizon (Fig. 3.3)	Depth (cm)	Texture (Fig. 3.4)	Structure (Table 3.2)	Colour (Sec.3.3.6)	Density (Table 3.3)	Permeability Test		
						test #	depth (cm)	rate (cm/min)
Root Mat								

Estimated Depth of Permeable Soil: ________cm. Depth to Water Table: ________cm. Depth to bedrock: ________cm.

% Slope (table 3.1):________ Rootlet depth:________cm Test Pit depth:________cm

Comments:

Signature: ________

Form A must be accompanied by a soil map showing site, test pit & permeability location.

(May 2009)

NORTH

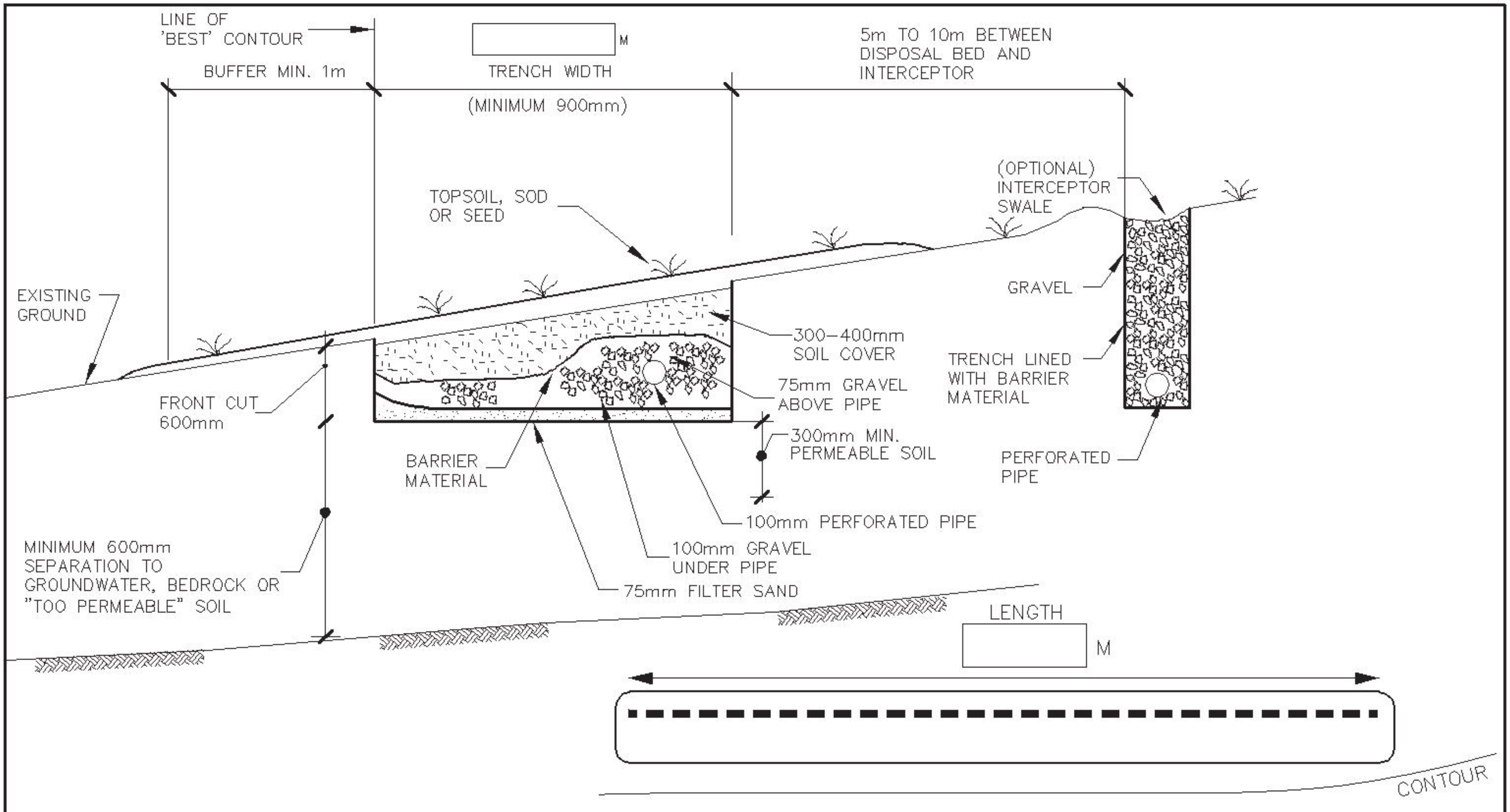
Prince Edward Island
CANADA

SITE PLAN

(sketch showing location of test pits, permeability tests, septic system, house, watercourse etc.)

Parcel #: ______________

Date: ______________



DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
100	mm	Gravel below pipe
75	mm	Filter sand
	mm	Trench width

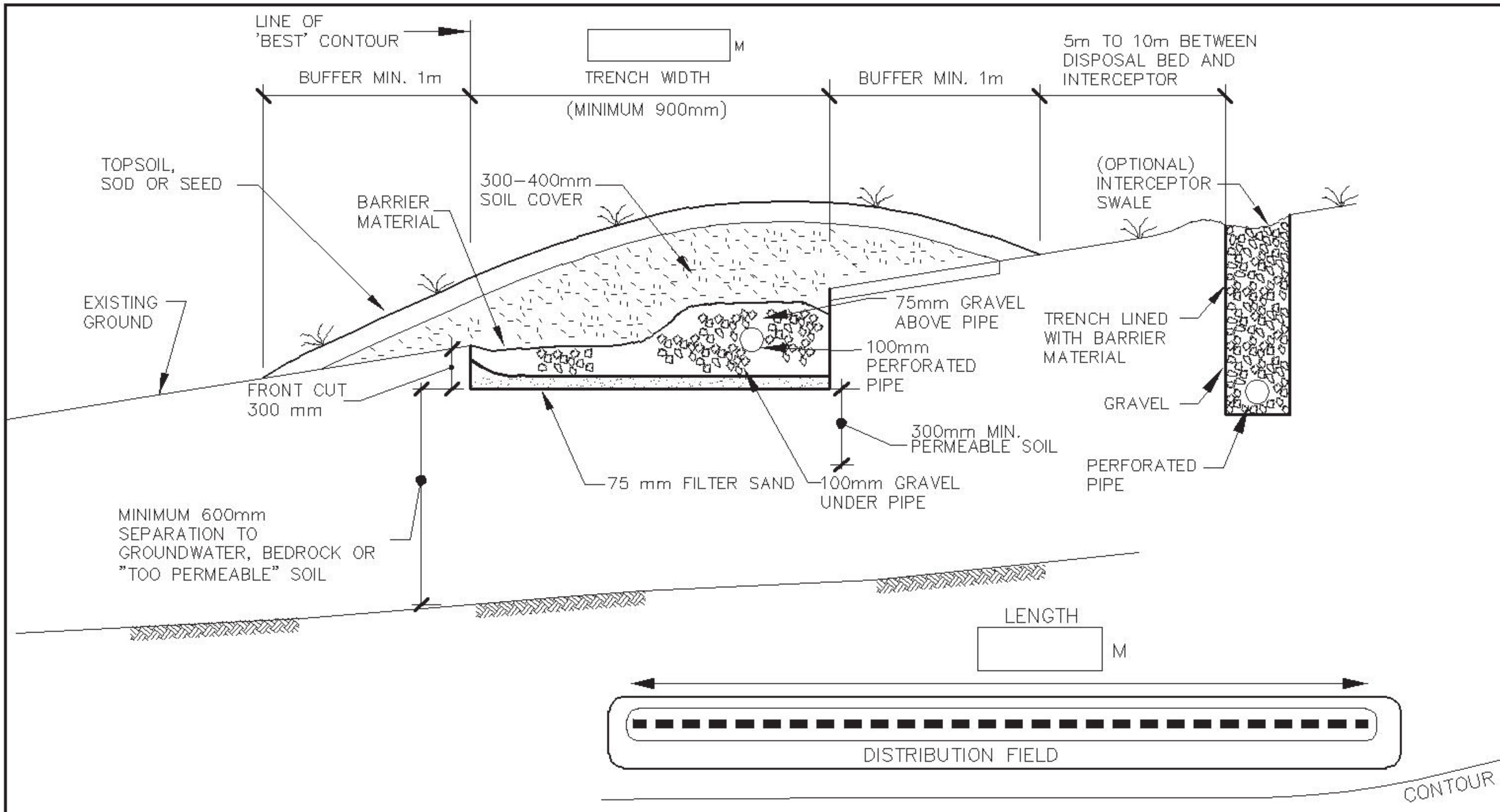
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

CONTOUR SYSTEM C1

FIGURE No. H1



DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
100	mm	Gravel below pipe
75	mm	Filter sand
	mm	Trench width

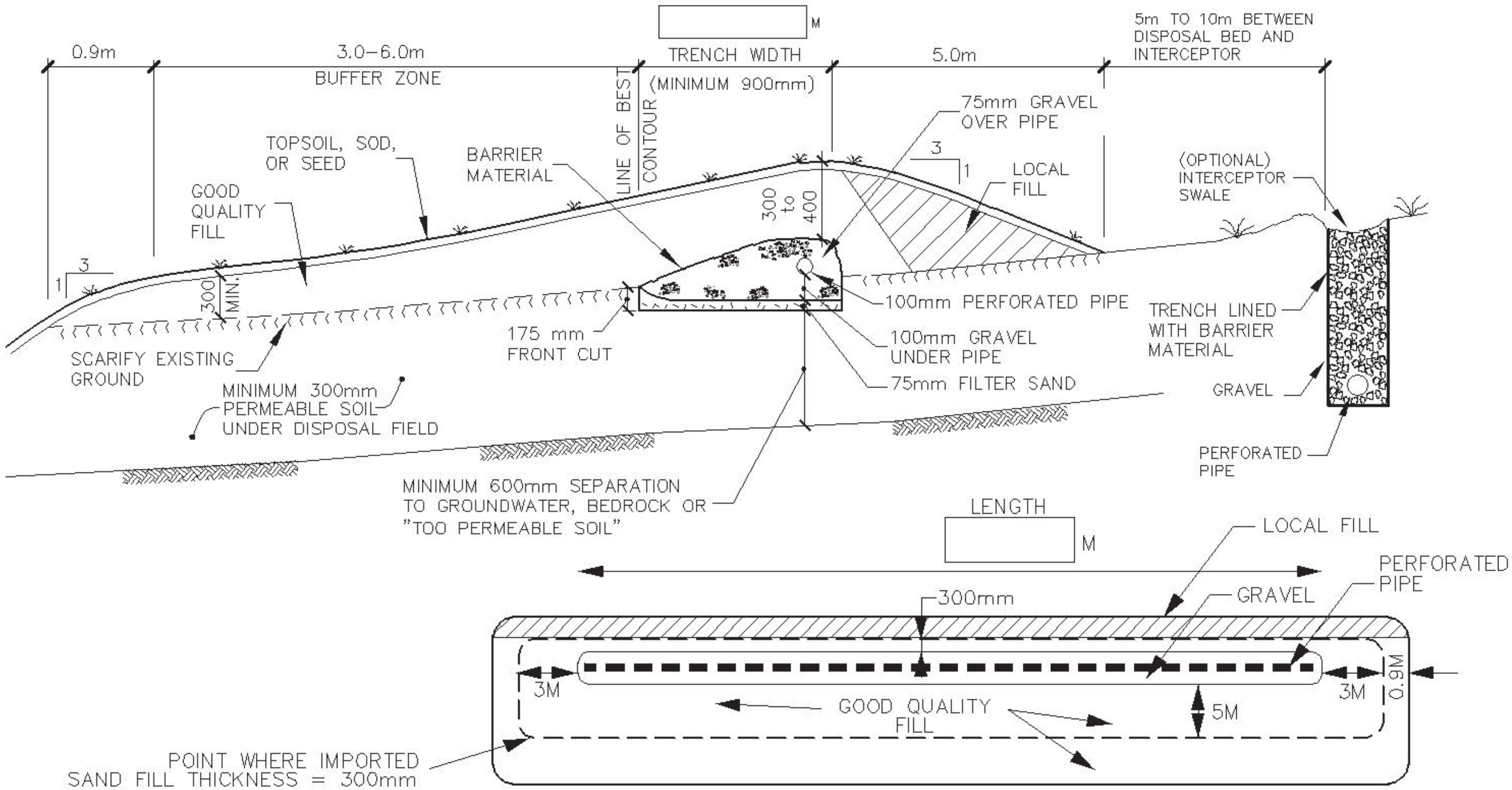
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

CONTOUR SYSTEM RAISED C1

FIGURE No. H2



DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Good quality fill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
100	mm	Gravel below pipe
75	mm	Filter sand
	mm	Trench width

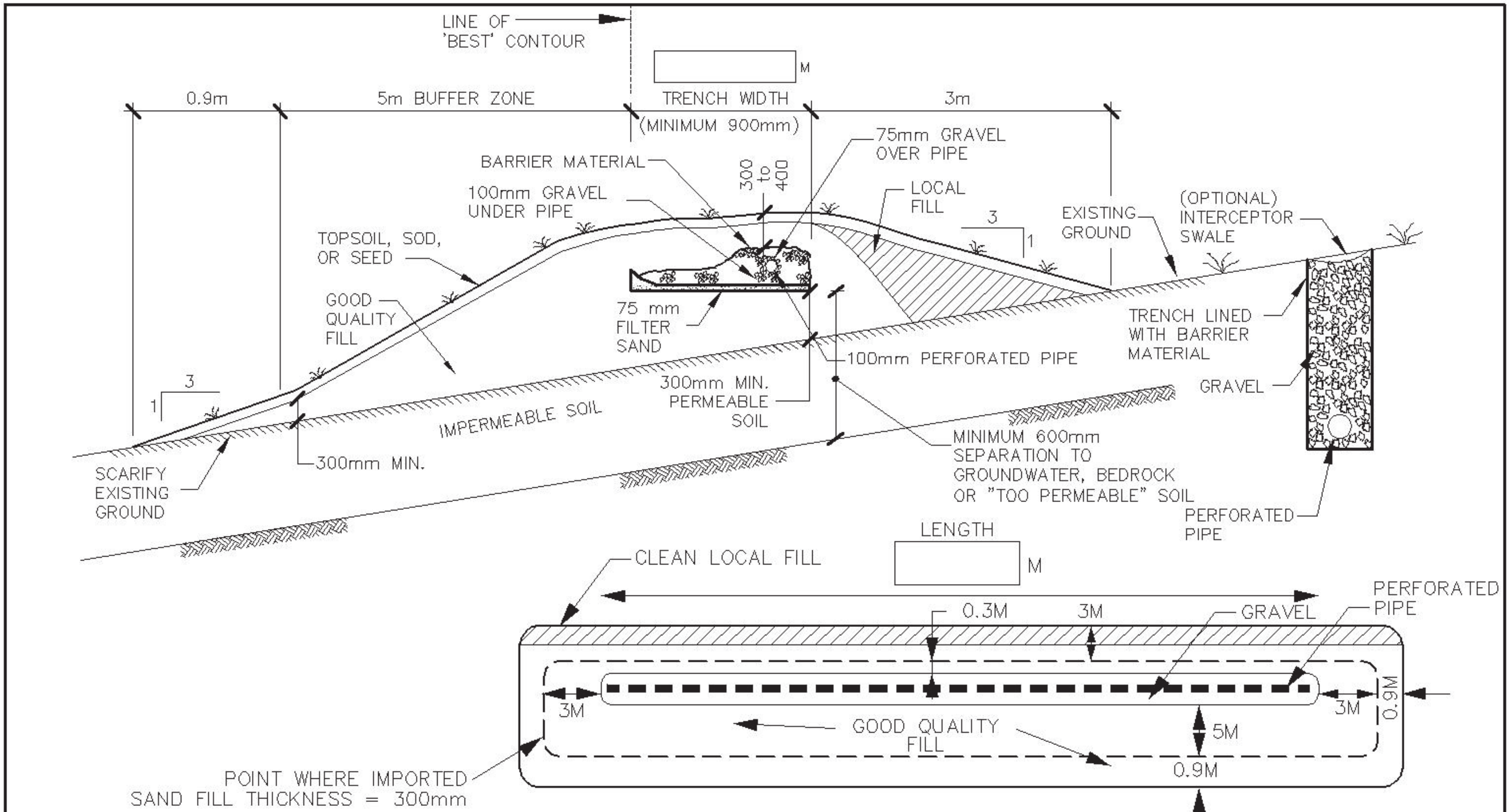
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

CONTOUR SYSTEM C2

FIGURE No. H3



DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Good quality fill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
100	mm	Gravel below pipe
75	mm	Filter sand
	mm	Trench width

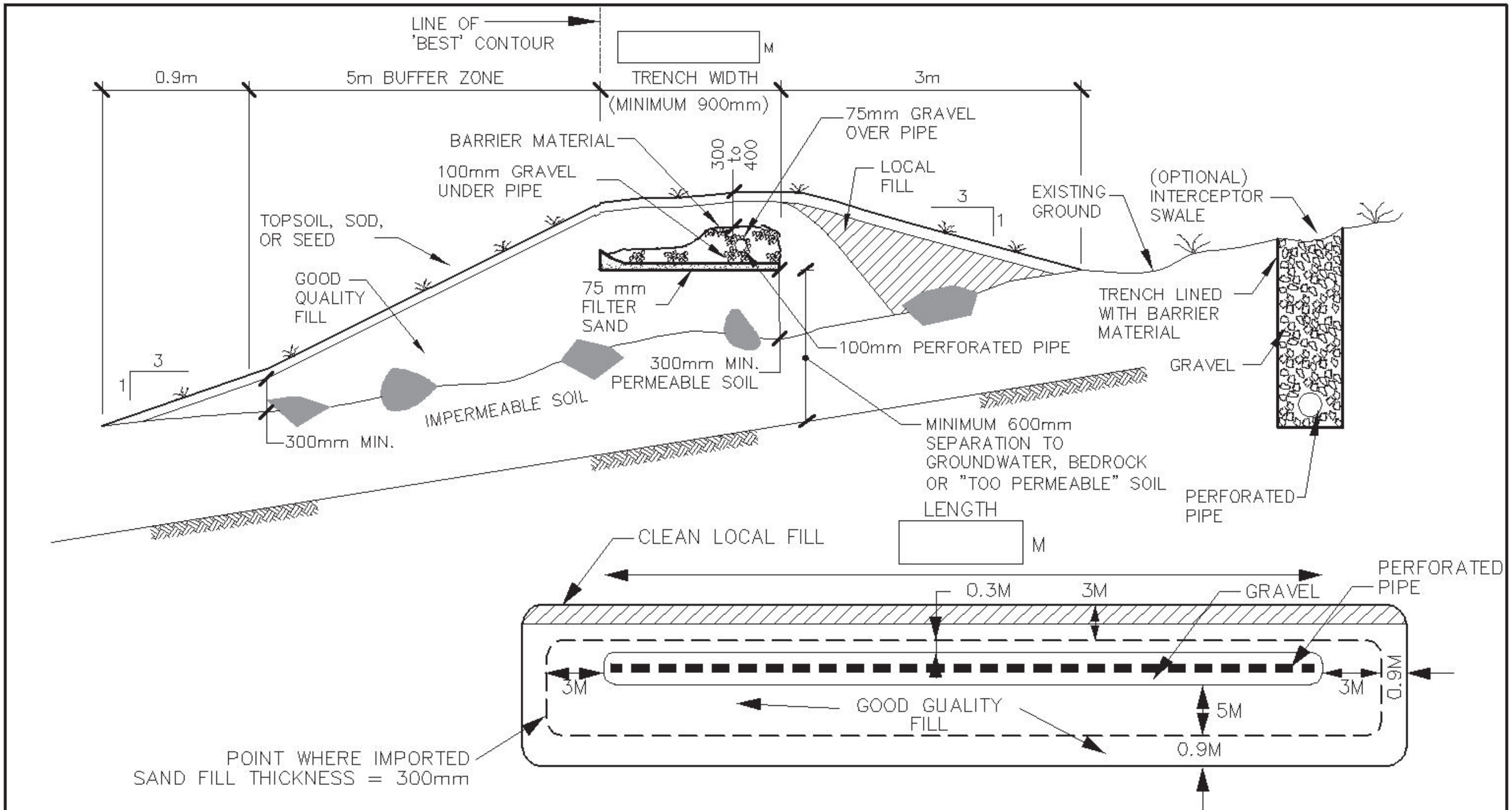
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

CONTOUR SYSTEM C3

FIGURE No. H4



DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Good quality fill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
100	mm	Gravel below pipe
75	mm	Filter sand
	mm	Trench width

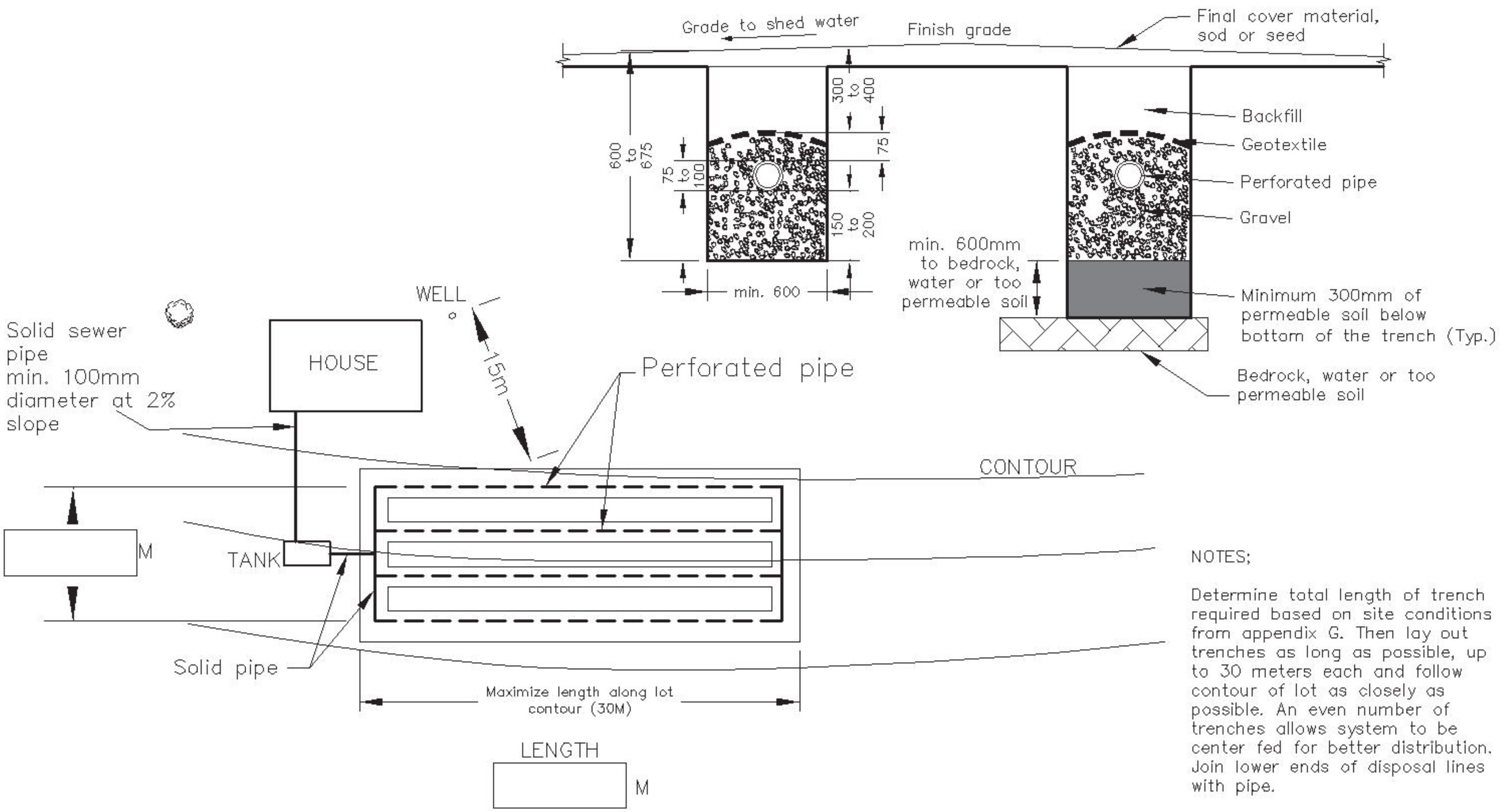
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

MODIFIED C3 FOR UNEVEN SURFACE LOT

FIGURE No. H5



NOTES;

Determine total length of trench required based on site conditions from appendix G. Then lay out trenches as long as possible, up to 30 meters each and follow contour of lot as closely as possible. An even number of trenches allows system to be center fed for better distribution. Join lower ends of disposal lines with pipe.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
150	mm	Gravel below pipe
	M	Disposal Bed width
600	mm	Trench width

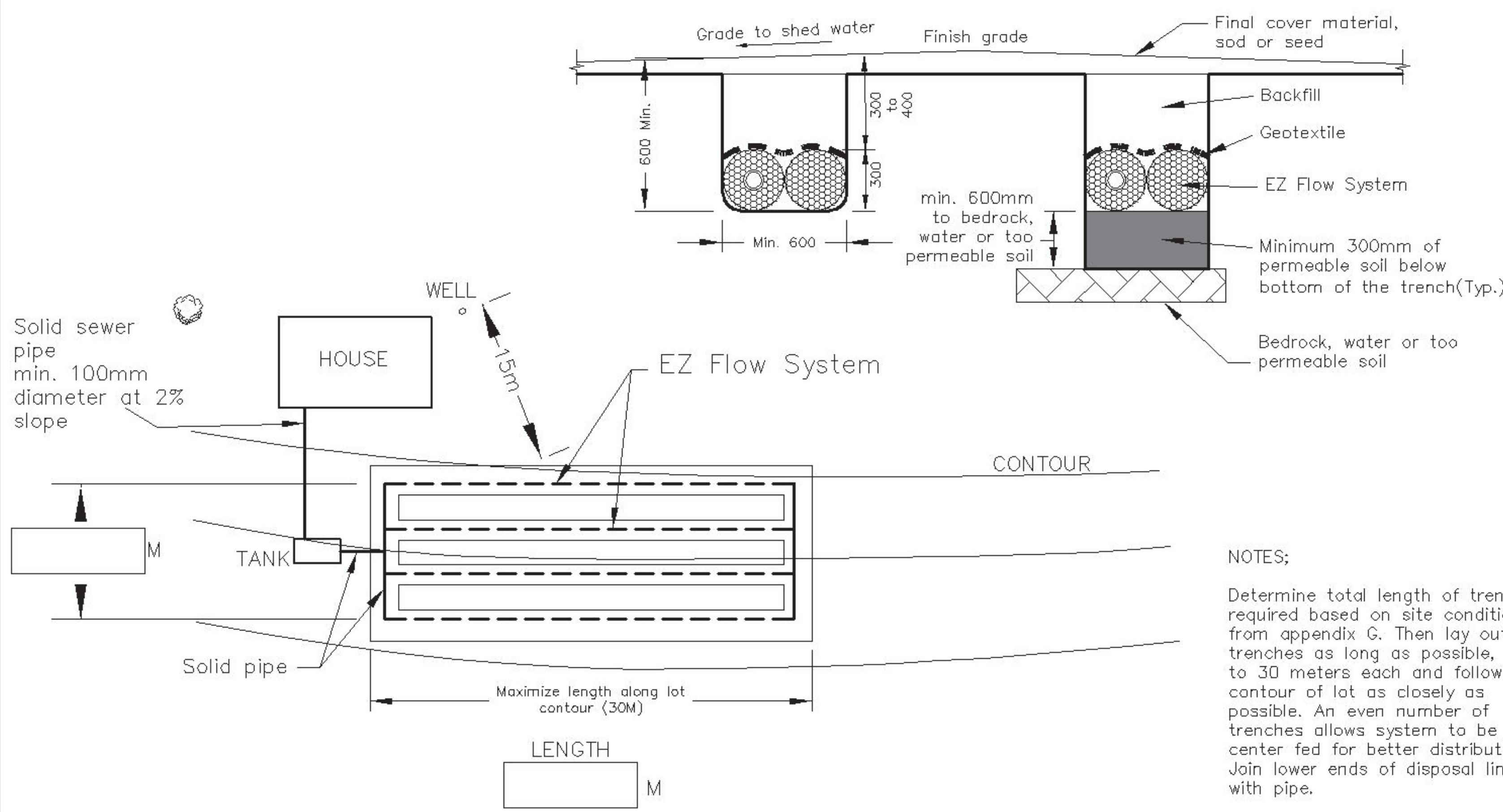
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

MULTIPLE TRENCH

FIGURE No. **H6**



NOTES;

Determine total length of trench required based on site conditions from appendix G. Then lay out trenches as long as possible, up to 30 meters each and follow contour of lot as closely as possible. An even number of trenches allows system to be center fed for better distribution. Join lower ends of disposal lines with pipe.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
300 Min.	mm	Clean local permeable backfill
100	mm	EZ Flow System diameter
	M	EZ Flow System length
	M	Disposal Bed width
600	mm	Trench width

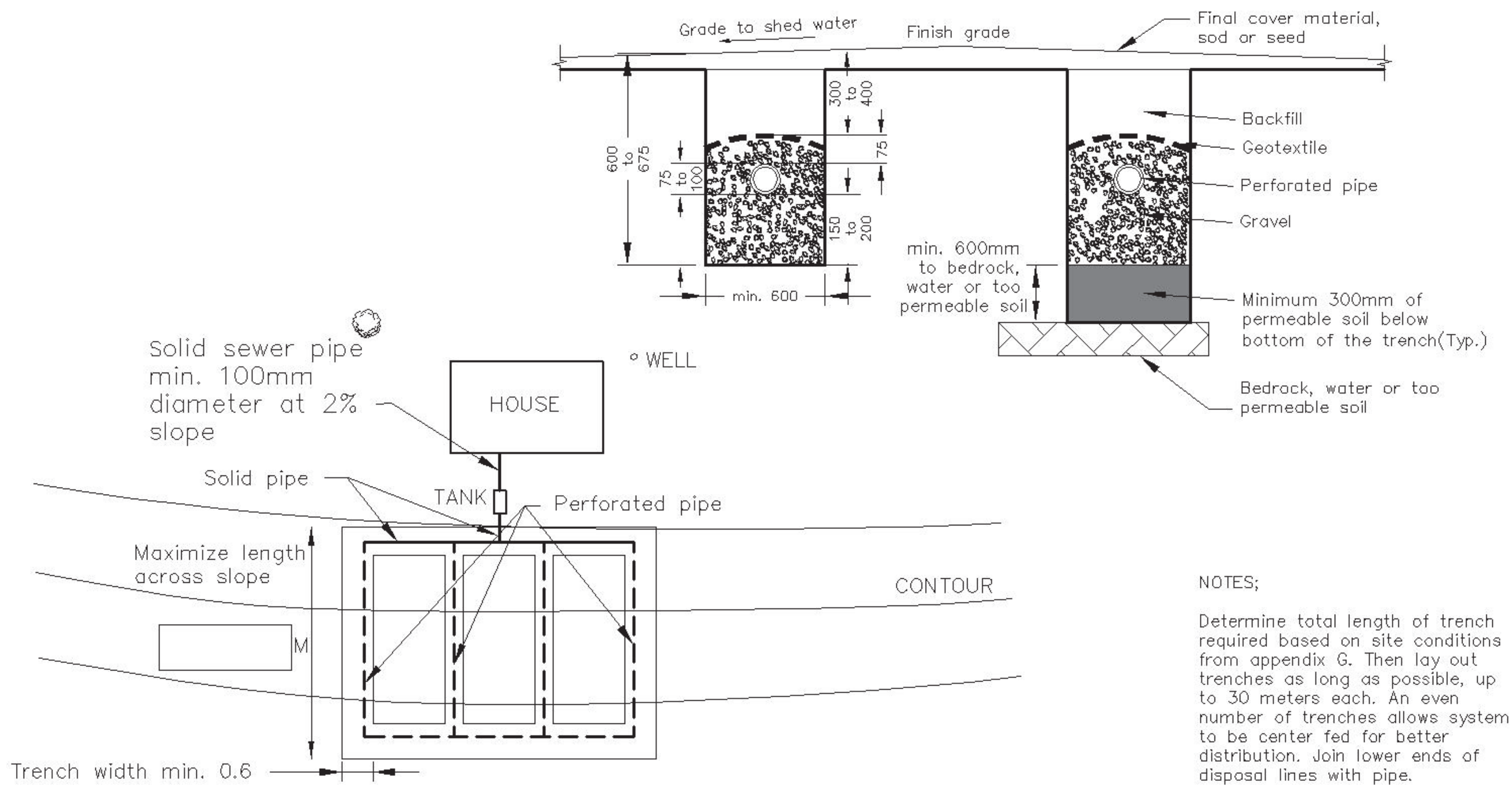
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON-SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

EZ FLOW SYSTEM

FIGURE No. H6a



NOTES;

Determine total length of trench required based on site conditions from appendix G. Then lay out trenches as long as possible, up to 30 meters each. An even number of trenches allows system to be center fed for better distribution. Join lower ends of disposal lines with pipe.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
Required over gravel barrier material		
75	mm	Gravel above pipe
100	mm	Perforated pipe diameter
	M	Perforated pipe length
150	mm	Gravel below pipe
	M	Disposal Bed width
600	mm	Trench width

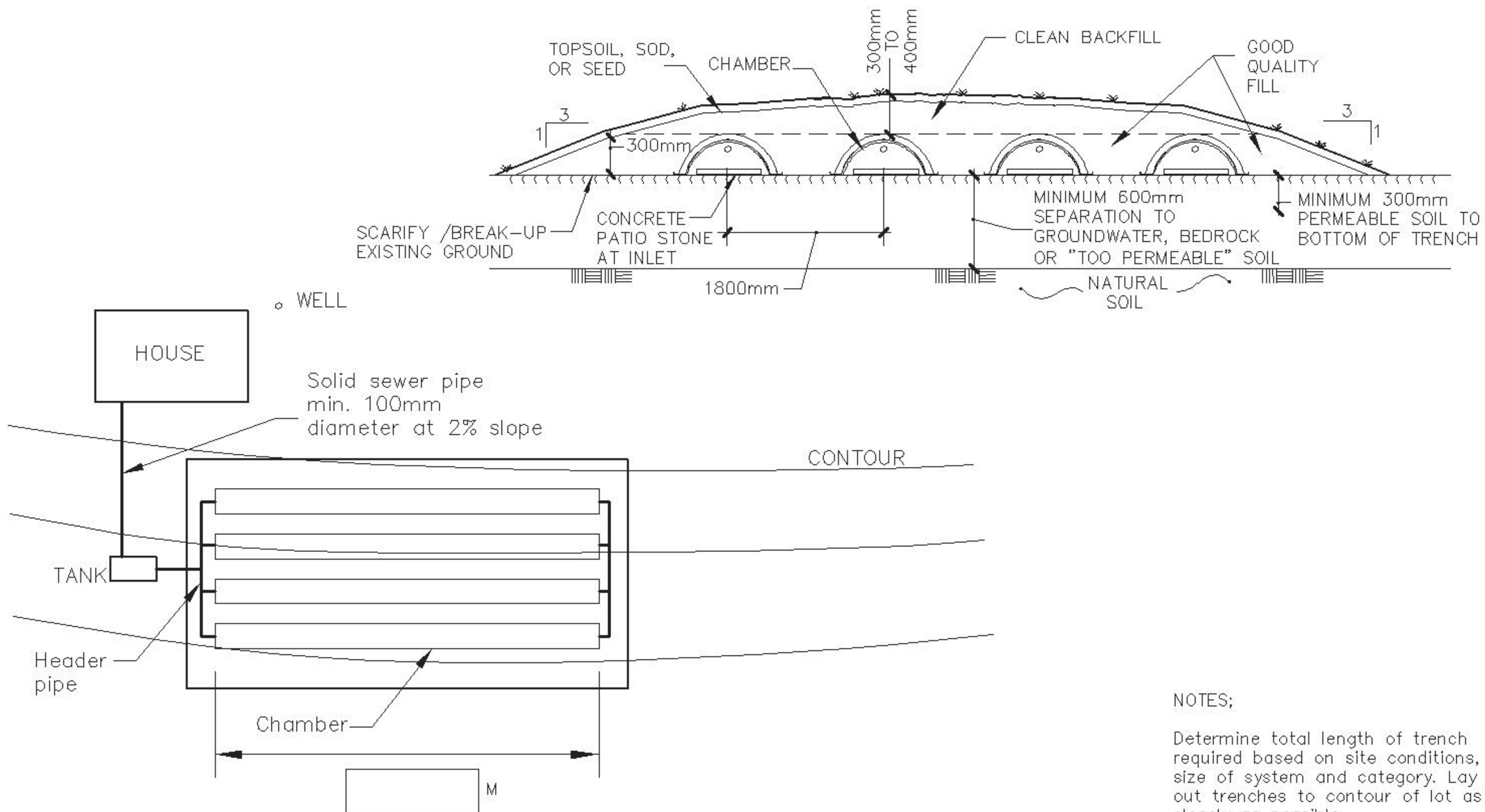
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

ALTERNATIVE MULTIPLE TRENCH

FIGURE No. H7



NOTES;

Determine total length of trench required based on site conditions, size of system and category. Lay out trenches to contour of lot as closely as possible.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
	mm	Good quality fill under chamber
	mm	Chamber center line spacing
900	mm	Trench width
	mm	Trench height
	M	Length of chamber (Max 30M)
	#	No. of chambers

SELECTION CRITERIA:	
Flow (l/d):	
Slope (%):	
Soil Category :	
Permeable soil depth(mm):	

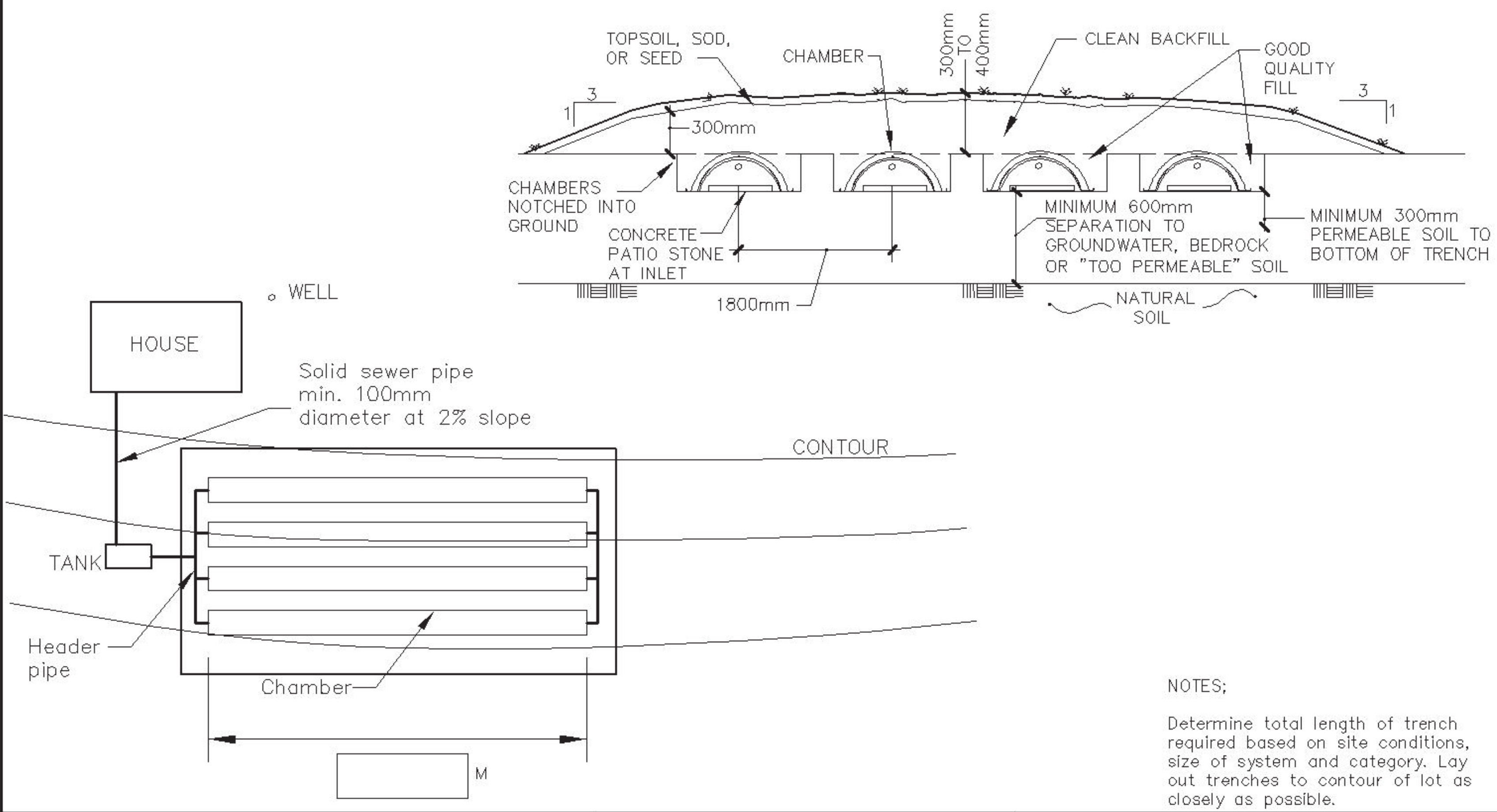
Scale : N.T.S.
Owner:
Location:
Registration #:
Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

AT GRADE CHAMBER SYSTEM

FIGURE No. H8



NOTES;

Determine total length of trench required based on site conditions, size of system and category. Lay out trenches to contour of lot as closely as possible.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
	mm	Good quality fill under chamber
	mm	Chamber center line spacing
900	mm	Trench width
	mm	Trench height
	M	Length of chamber (Max 30M)
	#	No. of chambers

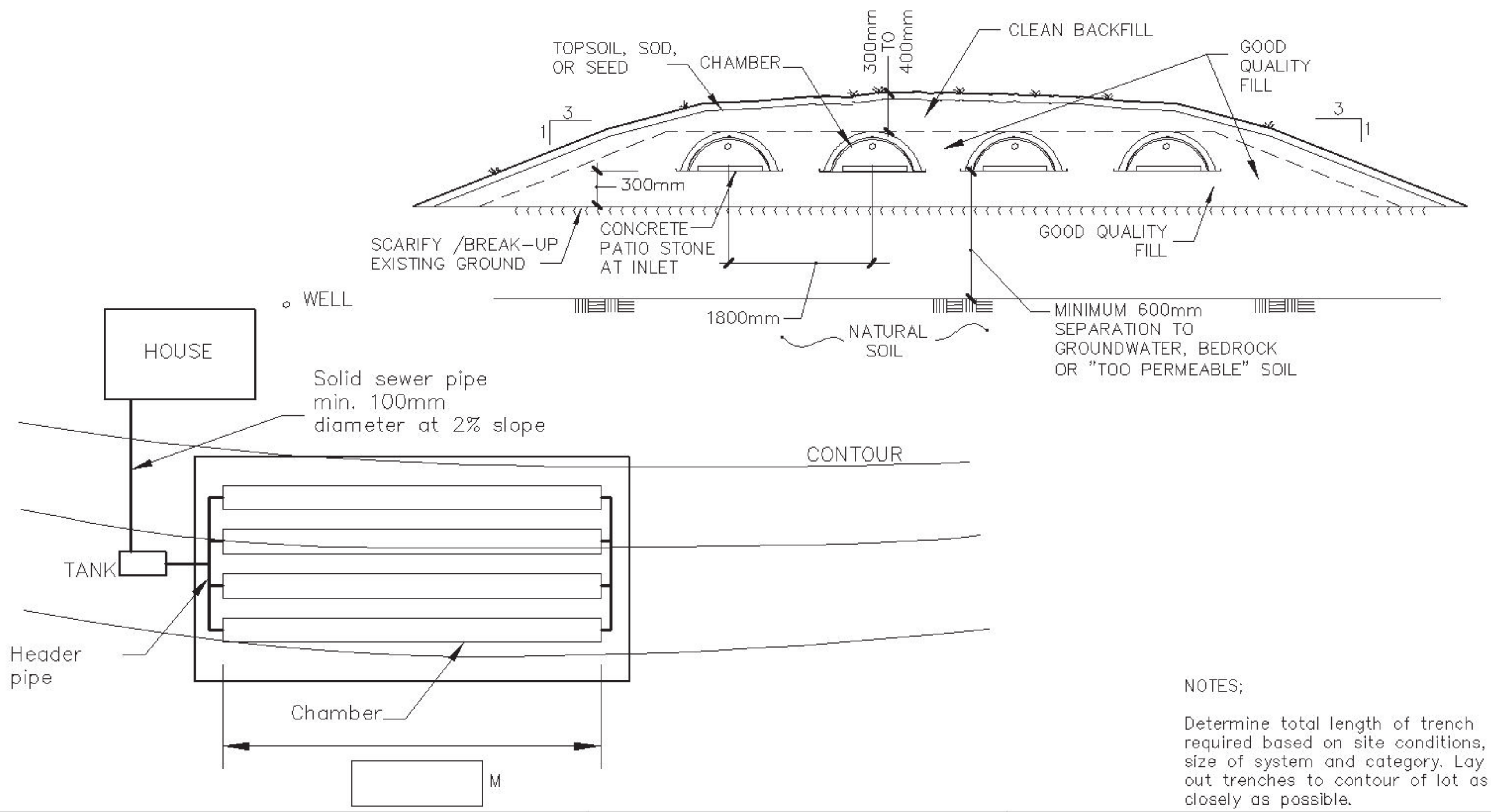
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

FULLY TRENCHED CHAMBER SYSTEM

FIGURE No. **H9**



NOTES;

Determine total length of trench required based on site conditions, size of system and category. Lay out trenches to contour of lot as closely as possible.

DISPOSAL FIELD REQUIREMENTS		
100	mm	Final cover material, seed or sod
200–300	mm	Clean local permeable backfill
	mm	Good quality fill under chamber
	mm	Chamber center line spacing
900	mm	Trench width
	mm	Trench height
	M	Length of chamber (Max 30M)
	#	No. of chambers

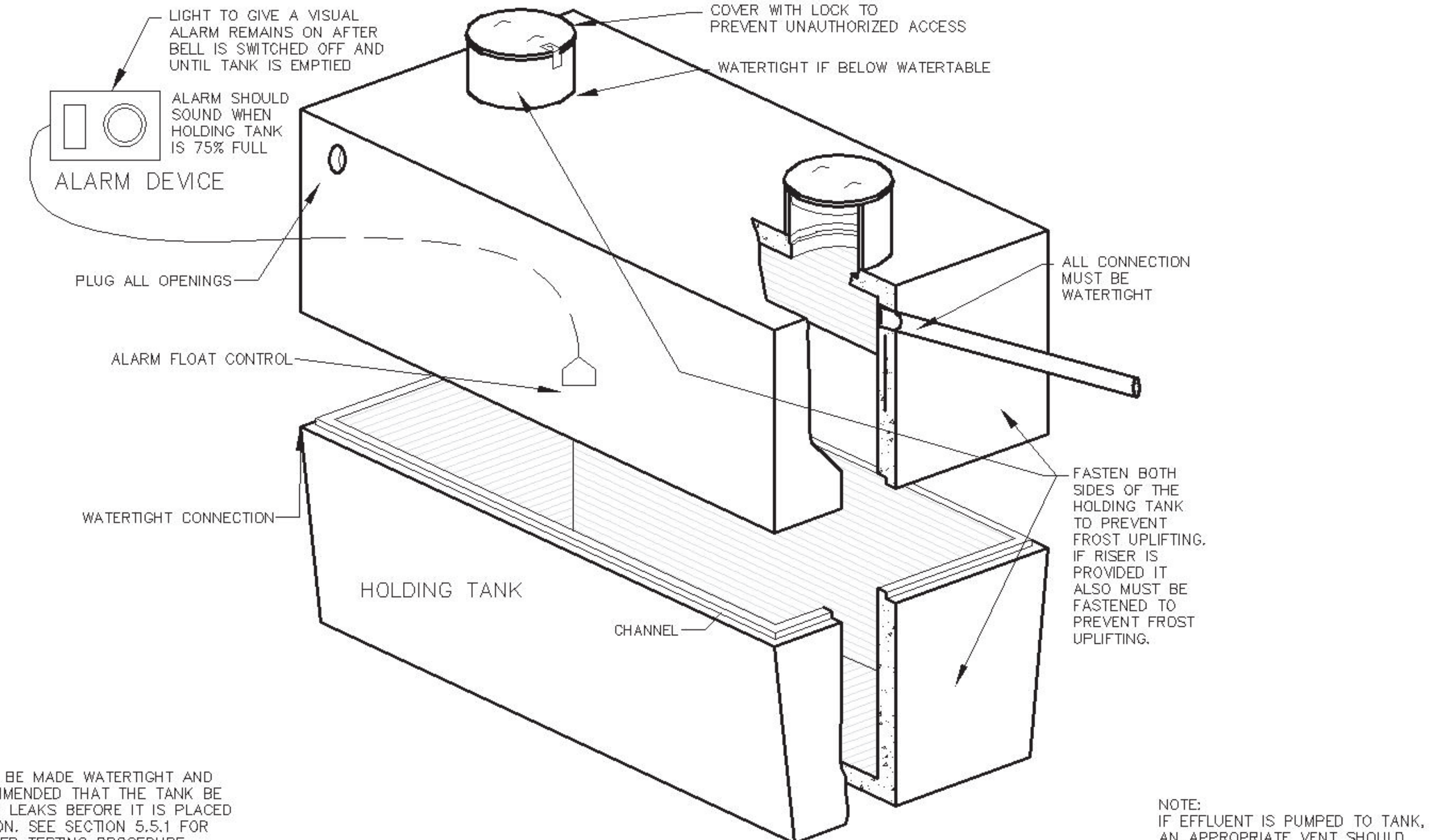
SELECTION CRITERIA:		Scale : N.T.S.
Flow (l/d):		Owner:
Slope (%):		Location:
Soil Category :		Registration #:
Permeable soil depth(mm):		Site Assessor:

Prince Edward Island CANADA

ON–SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

BUILT–UP CHAMBER SYSTEM

FIGURE No. H10



NOTE:
TANK MUST BE MADE WATERTIGHT AND IT IS RECOMMENDED THAT THE TANK BE TESTED FOR LEAKS BEFORE IT IS PLACED IN OPERATION. SEE SECTION 5.5.1 FOR RECOMMENDED TESTING PROCEDURE.

NOTE:
IF EFFLUENT IS PUMPED TO TANK, AN APPROPRIATE VENT SHOULD BE INSTALLED

		HOLDING TANK REQUIREMENTS	SELECTION CRITERIA:		Scale : N.T.S.
		TANK SIZE (litres)	Flow (l/d):		Owner:
		NUMBER OF BEDROOMS	Slope (%):		Location:
		DEPTH OF COVER (millimeters)	Soil type:		Registration #:
			Soil depth (mm):		Site Assessor:
Y	N				
		ALARM SYSTEM			
		DIVERTED SURFACE WATER			
		WATER TIGHT TESTED			

Prince Edward Island CANADA

ON-SITE SEWAGE DISPOSAL CONSTRUCTION STANDARDS

HOLDING TANK

FIGURE No. **H11**

Environment,
Labour and Justice
Inspection Services

CERTIFICATE OF COMPLIANCE
ON-SITE SEWAGE DISPOSAL SYSTEM INSTALLATION

Registration # ____________________

I, ______________________________________ hereby certify the work completed at this On-site
(print name)
Sewage Disposal System site has been completed on ___________________________ and in accordance
(date)
with the site plan and registered design, and is in compliance with the Environmental Protection Act Sewage Disposal Systems Regulations and the Construction Standards for On-Site Sewage Disposal Systems on Prince Edward Island (2013).

Comments:

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______________________________ Property No.	______________________________ Lot # if in a subdivision
______________________________ Property Owner	______________________________ Address of Installation
______________________________ Contractor Signature	______________________________ Date

May 2013

Prince Edward Island CANADA
Environment, Labour and Justice
Inspection Services

SEWAGE DISPOSAL SYSTEM INSTALLATION & ASSESSMENT *AUDIT REPORT*

Registration No. ______________________________ PID No. ________________
Owner's Name ______________________________ Civic Address ________________
Community ______________________________ County ________________
Licensed Installer ______________________________ License No. ________________
Company ______________________________

Septic System Details:

Septic Tank Type:

Pre-cast concrete:_______________ Polyethylene:___________ Poured in place concrete:____________

Holding Tank: ___________ Other (specify): ______________________ Septic tank size: _____________ litres
(1 gal = 4.54 litres)

Disposal Field Type:

Multiple trench system:___________ Leaching chamber:_____________ Leaching chamber serial:___________

Alternate multiple trench:_________ Contour trench:________________ (specify C1, C2, C3):______________

Mound system:_________ Consultant designed system________ Other type (specify):_______________________

Number of disposal fields:_________ Total length of pipe in all fields ___________ metres *(1foot = .3048 metres)*

Good Quality Fill (GQF) added: _________cm *(1 foot = 30 cm)* Barrier Material ___ Gravel ___ Filter Sand ____

Site Assessment Audit:

Depth of Permeable Soil _______________cm; Permeability Rate ____________cm/sec; Lot Category _______

Depth to Water Table____________ cm; Depth to Bedrock ___________ cm

Comments:____
____
____
____
____
____

I have audited the installation of this system and it complies with the information on the registered plan filed with the Department of Environment, Labour & Justice and meets with the Environmental Protection Act, Sewage Disposal System Regulations and the On- Site Sewage Disposal Systems Construction Standards.

________________________________ ________________________________
Date Officer

Feb 2013

Appendix I SEPTIC TANK, HOLDING TANK AND GREASE CHAMBER CALCULATION EXAMPLES

Septic Tank Sizing Calculations Examples

1. For peak average flows up to 6,810 l/day (1,500 Igal/day) (see Section 4.3.1):

Tank Volume (TV) = 2 x Q

Where: Q = Peak average daily flow in litres
TV = Liquid volume of septic tank in litres

Therefore: Peak Average Daily Flow (Q) = 3,000 litres

TV = 2 x 3,000
TV = 6,000 litres (tank volume)

Note: If using Igal/day, use TV = 1,125 + Q.

Holding Tank Sizing Calculations Examples

1. For peak average flows up less than 4,500 l/day (see Section 4.5.1):

Tank Volume (TV) = 2 x Q

Where: Q = Peak average daily flow in litres
TV = Liquid volume of septic tank in litres

Therefore: Peak Average Daily Flow (Q) = 2,000 litres

TV = 2 x 2,000
TV = 4,000 litres (tank volume), since 4,000 > 4,500, use
TV = 4,500 litres (tank volume)

2. For peak average daily flows 4,500 l/day or more (see Section 4.5.1):

Tank Volume (TV) = 2 x Q

Where: Q = Peak average daily flow in litres
TV = Liquid volume of septic tank in litres

Therefore: Peak Average Daily Flow (Q) = 5,000 litres

TV = 2 x 5,000
TV = 10,000 litres (tank volume)

Grease Chamber Volume Calculation Examples

1. For Restaurants (see Section 4.7):

Vgrease = D x (HR/2) x GL x ST x LF

D = Number of seats in dining room
HR = Number of hours open per day
GL = Gallons of wastewater
ST = Storage capacity (normally 2)
LF = Loading factor depending on restaurant location
1.25 – central locations
1.0 – recreational areas
0.5 - 0.8 – other locations

Therefore: D = 48 seats
HR = 12 hours open/day
GL = 3 GWW per meal
ST = 2
LF = 1.25 (central)

Vgrease = 48 x (12/2) x 3 x 2 x 1.25
= 48 x 6 x 3 x 2 x 1.25
= 2,160 (litres)

Since 2,160 > 2725 sue

V grease = 2,275 (litres)

2. For Cafeterias or Institutional Kitchens (see Section 4.7)

Vgrease = M x GL x ST x LF

M = Total number of meals served per day
GL = Gallons of wastewater per meal (2 or more)
ST = Storage capacity (normally 2)
LF = Loading factor – 1.0 with dishwasher; 0.5 without dishwasher

Therefore: M = 100 seat cafeteria
GL = 3 gallons wastewater per meal
ST = 2 storage capacity
LF = 1.0 (with dishwasher)
Vgrease = 100 x 3 x 2 x 1
Vgrease = 600 (litres)

APPENDIX J DISPOSAL FIELD SIZING

Imperial Version of Formula

Drainage pipe length (ft) = $$\frac{Q\ (Igal/d) \times SLR\ (ft^2/Igal/d)}{CA\ (ft^2/ft)}$$

1. Calculate the wastewater flow **(Q)**
2. Calculate septic tank volume (size)
1. Calculate the length of the disposal field system according to the following:

   1) Choose the soil loading rate **(SLR)**
      i) For Category I & Category III (permeable soil 2-4 feet) conditions choose:
         - 1.75 ft^2/Igal/day for multiple trench disposal field
         - 1.75 ft^2/Igal/day for leaching chamber disposal field
         - 1.50 ft^2/Igal/day for contour trench disposal field

      ii) For Category II, Category III (permeable soil 1-2 feet) & Category IV conditions choose:
         - 2.00 ft^2/Igal/day for multiple trench disposal field
         - 2.00 ft^2/Igal/day for leaching chamber disposal field
         - 1.75 ft^2/Igal/day for contour trench disposal field

   2) Choose the contact area / linear foot of trench **(CA)**
      i) For multiple trench system the CA is 2.0 (ft^2/ft)
      ii) For a leaching chamber system the CA is 4.0 (ft^2/ft)
      iii) For a contour trench disposal field the CA is
         - for a 3-foot wide trench is 3.5 (ft^2/ft)
         - for a 4-foot wide trench is 4.5 (ft^2/ft)
         - for a 5-foot wide trench is 5.5 (ft^2/ft)
         - for a 6 foot wide trench is 6.5 (ft^2/ft)

Where:

Flow (Q) is the design flow referenced from **Appendix D** or as determined by actual measured readings.

Soil Loading Rate (SLR) is the disposal area required for each imperial gallon per day of wastewater generated and is expressed in square feet/imperial gallon/day (ft^2/Igal/day).

Contact area (CA) is the minimum square feet per linear foot of gravel / soil interface on the bottom of the trenches in the disposal field. The contact area is expressed as square feet per linear foot (ft^2/ft).

Example of Metric Version of Formula

Design a sewage disposal system for a 5 unit motel. Each unit contains one bedroom and a kitchen. Calculate the length of drainage pipe required for the sewage disposal system for (i) a multiple trench disposal field, (ii) a 0.9 metre wide contour trench disposal field, and (iii) a leaching chamber disposal field. The motel is located on a 'Category I' lot.

Step 1 - from **Appendix D**, choose Flow (Q) = 450 L/day
therefore, Q = 5 units x 450 L/day = 2250 L/day

Step 2 - choose septic tank capacity (see **Appendix I**) = 2 x Q (2 x 2250 L/d) = 4500 L/d

Step 3 - (a) choose the SLR for Category I conditions
- 36 m^2/1000 L/day for multiple trench and chamber disposal fields
- 31 m^2/1000 L/day for contour trench

(b) choose the CA
- 0.6 (m^2/m) for multiple trench
- 1.2 (m^2/m) for leaching chambers
- 1.1 (m^2/m) for 0.9 metre wide contour trench

Step 4 -

$$\text{Drainage pipe length (m)} = \frac{Q\ (L/d) \times SLR\ (m^2/1000L/d)\ /\ 1000}{CA\ (m^2/m)}$$

$$\text{Drainage pipe length (m)} = \frac{2250\ (L/d) \times 36\ (m^2/1000L/d)\ /\ 1000}{0.6\ (m^2/m)} = 135 \text{ metres (multiple trench)}$$

$$\frac{2250\ (L/d) \times 36\ (m^2/1000L/d)\ /\ 1000}{1.2\ (m^2/m)} = 67.5 \text{ metres (chambers)}$$

$$\frac{2250\ (L/d) \times 31\ (m^2/1000L/d)\ /\ 1000}{1.1\ (m^2/m)} = 63.4 \text{ metres (contour trench)}$$

Example of Imperial Version of Formula

Design a sewage disposal system for a 5 unit motel. Each unit contains one bedroom and a kitchen. Calculate the length of drainage pipe required for the sewage disposal system for (i) a multiple trench disposal field, (ii) a 3-foot wide contour trench disposal field, and (iii) a leaching chamber disposal field. The motel is located on a 'Category I' lot.

Step 1 - from **Appendix D**, choose Flow (Q) = 100gal/day
therefore, Q = 5 units x 100 gal/day = 500 Igal/day

Step 2 - choose septic tank capacity (see **Appendix I**) = 2 x Q (2 x 500 Igal/d) = 1000 Igal/d

Step 3 - (a) choose the SLR for Category I conditions
- 1.75 ft^2/Igal/d for multiple trench and chamber disposal fields
- 1.5 ft^2/Igal/d for contour trench

(b) choose the CA
- 2.0 (ft^2/ft) for multiple trench
- 4.0 (ft^2/ft) for leaching chambers
- 3.5 (ft^2/ft) for a 3 foot wide contour trench

Step 4 -

$$\text{Drainage pipe length (ft)} = \frac{Q\ (\text{Igal/d}) \times SLR\ (\text{ft}^2/\text{Igal/d})}{CA\ (\text{ft}^2/\text{ft})}$$

$$\text{Drainage pipe length (ft)} = \frac{500\ (\text{Igal/d}) \times 1.75\ (\text{ft}^2/\text{Igal/d})}{2.0\ (\text{ft}^2/\text{ft})} = 438 \text{ feet (multiple trench)}$$

$$\frac{500\ (\text{Igal/d}) \times 1.75\ (\text{ft}^2/\text{Igal/d})}{4.0\ (\text{ft}^2/\text{ft})} = 219 \text{ feet (chamber)}$$

$$\frac{500\ (\text{Igal/d}) \times 1.5\ (\text{ft}^2/\text{Igal/d})}{3.5\ (\text{ft}^2/\text{ft})} = 214 \text{ feet (contour trench)}$$