9.00 Building Sewers

9.01 General—Sewers referred to in this section are watertight, smooth bore, rigid conduits which convey sewage from a building drain to a pretreatment unit and are not to be confused with public sewers addressed in the *Sewerage Regulations*.

9.02 Minimum Size—Sewers shall have a minimum internal diameter (ID) of three (3) inches. Larger sewers may be required depending on projected flows.

9.03 Slope—The minimum slope for three (3) and four (4) inch sewers is 1.25 inches per 10 feet and for a six (6) inch sewer, 0.75 inches per 10 feet.

9.04 Materials—All sewers shall be of cast iron (CI) pipe not less than service weight, Schedule 40 plastic pipe, extra strength vitrified clay or other acceptable materials to be evaluated on a case by case basis. Bituminous fiber pipe is prohibited. Sewers passing under driveways shall be heavy duty CI or Schedule 40 plastic pipe, or other acceptable material to be evaluated on a case by case basis.

9.05 Sewer Appurtenances

9.05.01 Joints—Sewer joints shall be of the compression type except that plastic pipe may be welded sleeve or chemically fused.

9.05.02 Adapters—Joining of pipes of different sizes and/or material shall be accomplished by use of a manufactured adapter specifically designed for that purpose.

9.05.03 Bends—The building sewer shall have a straight alignment where possible. When a straight alignment is not possible ells not exceeding 45° shall be used.

9.05.04 Cleanouts—Cleanouts shall be brought to the ground surface and shall be provided every fifty (50) feet to sixty (60) feet along the length of the building sewer. Cleanouts shall be brought to the grounds surface for access.

9.06 Sewer Construction

9.06.01 Location—Sewers passing within fifty (50) feet of a nonpublic drinking water supply well or other nonpublic drinking water supply source shall have special construction and pipe materials to provide adequate protection. Special construction constitutes water pipe meeting AWWA specifications, pressure tested (10 feet of water) in place without leakage prior to backfilling. However, under no circumstances shall a sewer come within ten (10) feet of a nonpublic drinking water supply source.

9.06.02 Above Grade Installation—Sewers constructed above grade shall be adequately supported and protected against freezing. When plastic pipe is used for above grade installation the pipe must be protected against ultraviolet radiation i.e. shielded against sunlight.

9.06.03 Bedding—All sewers shall be bedded to supply uniform support along the length of the sewer.

9.06.04 Backfilling and Tamping—Sewer trenches shall be backfilled with suitable material free of large stones and clumps of earth and tamped to prevent movement of the sewer as soon as possible after the installation of the sewer has been approved.

10.00 PreTreatment Systems

10.01 General—As used herein pretreatment refers to treatment works designed to prepare sewage for disposal in a soil medium.

10.02 Types—Three general types of pretreatment systems are described herein. They are as follows:

a. biological;

b. physical; and

c. chemical.

10.03 Aerobic Biological Systems—Aerobic biological treatment systems will be considered on a case by case basis at the request of the owner. These systems shall meet the applicable criteria contained in Section 26.05 of the *Sewerage Regulations* or criteria developed by a testing laboratory/agency approved by the Bureau. Use of an aerobic pretreatment system shall not result in the reduction of the absorption area requirements contained in Section 12.00 of these Regulations.

10.04 Anaerobic Biological Systems—Septic tanks are the most commonly used pre-treatment systems and under normal circumstances are the most inexpensive units which give acceptable results with a minimum of maintenance.

10.04.01 Location—Minimum separation distances for septic tanks to various structures and features are the same as those contained in Table 12.1 entitled *Minimum Separation Distances;* except that for Class III wells the distance shall be fifty (50) feet.

10.04.02 Materials—The preferred material for use in constructing septic tanks is concrete. Other materials may be considered on a case by case basis. All materials must be resistant to corrosion, both chemical and electrolytic and must have sufficient structural strength to contain sewage and resist lateral compressive and bearing loads.

10.04.03 Design

a. **Tank Capacity**—The minimum hydraulic detention time shall be forty-eight (48) hours based on daily design flow. In no case shall the septic tank capacity be less than 750 gallons. Table 10.00 contains the minimum required septic tank capacities for dwelling units.

Table 10.00

Septic Tank Capacities for Dwelling Units

No. Bedrooms	Approximate Tank Volume in Gallons
1	750
2	750
3	900
4	1200
5	1500

b. **Tank Dimensions**—Septic tanks shall be rectangular in plan, cross section and longitudinal view. The length to liquid depth to width ratio should be approximately equal or greater than 2 to 1 to 1 (2:1:1) and less than or equal to 3 to 1 to 1 (3:1:1). In no case shall the liquid depth be less than four (4) feet or greater than eight (8) feet. A minimum of one (1) foot freeboard shall be provided. Inlet and outlet structures shall be placed on the longitudinal axis of the tank. Typical tank dimensions are found in Table 10.01.

Table 10.01

Typical Septic Tank Dimensions in Feet

Approximate Gallons	Length	Width	Liquid Depth	Freeboard
750	7	3.5	4	1
900	8	4	4	1
1200	9	4.5	4	1
1500	9.5	4.5	4.7	1

c. **Inlet—Outlet Structure**

1. **General**—The inlet and outlet structures shall function as a baffle. The invert of the inlet structure shall be greater than one (1) inch but less than two (2) inches higher than the invert of the outlet structure with the tank installed. The inlet structure shall extend six (6) to eight (8) inches below and eight (8) to ten (10) inches above the normal liquid level. The outlet structure shall extend below the normal liquid surface to a distance of 35 to 40% of the liquid depth and eight (8) to ten (10) inches above the normal liquid level. The inlet and outlet structures shall have an open space not less than four (4) inches by four (4) inches in cross-section or four (4) inches in diameter.

2. **Materials**—All materials used for inlet and outlet structures shall have long term resistance to chemical and electrolytic corrosion. When pipe tees are used as inlet and outlet structures, the material shall be compatible with the material used in the sewer.

d. **Top Access and Watertightness**—All septic tanks shall be watertight and shall be provided with a watertight top. As a minimum, access manholes shall be provided over the inlet and outlet structures and shall have a minimum open space of eighteen (18) inches by eighteen (18) inches. When the septic tank has in excess of thirty (30) inches of soil cover an access manhole shall be brought to within eighteen (18) inches of the ground surface and shall be provided with a tight fitting cover. In wet areas the manhole covers shall be watertight.

10.04.04 Construction of Septic Tanks—The contractor and/or manufacturer shall design and construct the septic tank to withstand the lateral and bearing loads to which the septic tank is expected to be subjected. Suggested design and construction criteria are contained in Appendix XIV.

10.04.05 Placement of Septic Tanks—The precast septic tank shall be bedded with at least six (6) inches of sand or fine gravel where rock or other undesirable conditions are encountered. The tank shall be placed level. Where excavation is required the hole shall be sufficiently large to permit placement of the tank. Backfilling the excavation for all septic tanks shall be done in layers with sufficient tamping to avoid settling. Backfill material shall be free of large stones and debris.

10.05 Multiple Septic Tanks in Series—The required volume for a septic tank may be satisfied by the utilization of two septic tanks in series, however, the first septic tank in series shall equal to one half to two thirds the required total volume.

10.06 Physical and/or Chemical Systems—Physical and/or chemical systems utilized as pretreatment for subsurface disposal of sewage shall meet the applicable critieria contained in Sections 30 and 31 of the *Sewerage Regulations*.

10.07 Water Stop—A water stop is a method for sealing the annular space around a conduit and/or pipe for the purpose of preventing infiltration and/or exfiltration. Conduits and/or pipes passing through the walls of a pretreatment unit shall be provided with a water stop.

11.00 Conveyance Systems

11.01 General—For the purpose of these Regulations an effluent conveyance system is defined as the piping, mechanical equipment and appurtenances utilized to transport effluent from a pretreatment system to a point where the flow is split for distribution to a subsurface soil absorption system.

11.02 Conveyance Methods—Three basic methods utilized to convey effluent are:

a. gravity;

b. pumping; and

c. dosing siphons.

11.03 Gravity Effluent Mains

11.03.01 Size—Mains transporting effluent by gravity shall have a minimum internal diameter of three (3) inches.

11.03.02 Slope—Gravity mains shall have a slope of not less than six (6) inches per one hundred (100) feet.

11.03.03 Materials—Gravity mains spanning disturbed soil shall meet the material specifications contained in Section 9.04. The mains shall meet the specifications until placed two feet in undisturbed soil or until termination in a structure. The remaining gravity mains shall have a minimum crush strength of 1500 pounds per foot and may be constructed of cast iron, plastic, vitrified clay or other material resistant to the corrosive action of sewage. All gravity mains shall be watertight, smooth bore, rigid conduits.

11.03.04 Appurtenances

a. **Joints**—Gravity mains shall have joints of the compression type with the exception of plastic mains which may be welded sleeve or chemically fused.

b. **Adapters**—Joining of mains of different size and/or material shall be accomplished by use of a manufactured adapter specifically designed for that purpose.

c. **Valves**—Valves shall be constructed of materials resistant to the corrosive action of sewage. Valves placed below ground level shall be provided with a valve box and a suitable valve stem so that it may be operated from the ground surface.

11.03.05 Flow Diversion Devices—Flow diversion is a technique for increasing the useful life of an absorption area. Flow diversion provides for diversion of flow to two alternate equally sized absorption areas whose sum meets the area requirements in Section 12.06.02 with a rest period of approximately one year for recovery of each absorption area. These devices shall meet the material requirements contained in Section 11.03.04c of these Regulations.

11.03.06 Construction—Construction standards for gravity effluent mains are the same as those for house sewers and are found in Section 9.06 of these Regulations.

11.04 Pumping

11.04.01 Force Mains

a. **Velocity**—At pumping capacity, a minimum self-scouring velocity of two (2) feet per second shall be maintained. A velocity of eight (8) feet per second should not be exceeded.

d. **Air Relief Valve**—Air relief valve shall be placed at high points in the force main, as necessary, to relieve air locking.

c. **Bedding**—All force mains shall be bedded to supply uniform support along their length.

d. **Protection Against Freezing**—Force mains shall be placed deep enough to prevent freezing.

e. **Location**—Force mains shall not pass closer than fifty (50) feet to any drinking water source unless pressure tested in place at pump shut off head. Under no circumstances shall a force main come within ten (10) feet of a nonpublic drinking water source.

f. **Materials of Construction**—All pipe used for force mains shall be of the pressure type with pressure type joints.

g. **Anchors**—Force mains shall be sufficiently anchored within the pump station and throughout the line length. The number of bends shall be as few as possible. Thrust blocks, restrained joints and/or tie rods shall be provided where restraint is needed.

h. **Backfilling and Tamping**—Force main trenches shall be backfilled and tamped as soon as possible after the installation of the force main has been approved. Material for backfilling shall be free of large stones and debris.

11.04.02 Pumping Station and Pumps

a. **Location**—Minimum separation distances for pumping stations to various structures and features are the same as those found in Table 12.1 entitled *Minimum Separation Distances* except in the case of Class III wells which is fifty (50) feet.

b. **Sizing**—Pumping station wet wells shall provide at least one quarter day storage above the high level alarm set point. Actual volume between high and low level limits is determined on a case by case basis depending on the objective of pumping: (1) when low pressure dosing is utilized see Section 12.05.01 for sizing requirements; (2) when pumping to a gravity distribution box the wet well shall be sized to provide a working volume between one fourth (¼) the daily flow and the daily flow; (3) when pumping for the purpose of enhancing flow distribution (See Section 12.04.01) the working volume of the wet well shall be 0.6 of the volume of the percolation piping.

c. **Materials**—Materials for construction of pumping stations are the same as for septic tanks (See Section 10.04.02). All materials and equipment utilized in pumping stations shall be unaffected by the corrosive action of sewage.

d. **Access**—An access manhole terminating above the ground surface shall be provided. The manhole shall have a minimum width dimension of twenty four (24) inches and shall be provided with a shoe box type cover adequately secured.

e. **Construction**—Pumping stations constructed of precast or poured in place concrete shall conform with the construction requirements contained in Section 10.04.04 of these Regulations. When precast concrete pipe is utilized for a pumping station the pipe shall be placed on and bonded to a concrete pad at least six (6) inches thick and having a width at least one (1) foot greater than the diameter of the pipe. All pumping stations shall be watertight. All conduits entering or leaving the pumping station shall be provided with a water stop. The influent pipe shall enter the pumping station at an elevation at lease one (1) inch higher than the maximum water level in the wet well (total usable volume).

f. **Installation**—Placement of pumping stations shall conform to the requirements for placement of septic tanks contained in Section 10.04.05 of these Regulations.

g. **Pumps**—All pumps utilized shall be of the open face centrifugal type designed to pump sewage. Pumps utilized for the sole purpose of pumping effluent to a higher elevation shall have a capacity approximately 2.5 times the average daily flow in gallons per minute but not less than 5 gallons per minute at the system head. Pumps utilized for the purpose of enhancing flow distribution (See Section 12.04.01) shall have a minimum capacity of 36 gallons per minute at system head per 1200 linear feet of percolation piping. Pumps discharging to a low pressure distribution system shall be sized in accordance with Section 12.05.01. Dual alternating pumps are required on systems 1800 linear feet or greater in accordance with Section 12.04.02. Pumps shall be so placed that under normal start conditions it shall be subjected to a positive suction head. When multiple pumps are used each pump shall have its own separate suction line. Suitable shut-off valves shall be provided on the discharge line and suction line (if provided) for normal pump isolation. A check valve shall be placed in the discharge line between the pump and shutoff valve. When the pump discharge is at a lower elevation than the high liquid level in the pump station an antisiphon device shall be provided on the pump discharge. Pumps shall be so piped that they can be removed for servicing without having to dewater the wet well.

h. **Controls**—Each pumping station shall be provided with controls for automatically starting and stopping the pumps based on water level. When float type controls are utilized they shall be so placed as to be unaffected by the flow entering the wet well. Provisions shall be made for automatically alternating the pumps. The electrical motor control center and master disconnect switch shall be placed in a secure location above grade and remote from the pump station. Each motor control center shall be provided with a manual override switch.

i. **Alarms**—A high water alarm with remote sensing and electrical circuitry separate from the motor control center circuitry shall be provided. The alarm shall be audiovisual and shall alarm in an area where it may be easily monitored. When multiple pumps are utilized an additional audiovisual alarm shall be provided to alarm when a pump motor fails to start on demand.

j. **Ventilation**—Positive ventilation shall be provided at pumping stations when personnel are required to enter the station for routine maintenance.

1. **Wet Wells**—Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least 12 complete air changes per hour; if intermittent, at least 30 complete air changes per hour. Such ventilation shall be accomplished by mechanical means.

2. **Dry Wells**—Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least six complete air changes per hour; if intermittent, at least 30 complete air changes per hour. Such ventilation shall be accomplished by mechanical means.

11.05 Siphons

11.05.01 Use—Intermittent dosing siphons have two major uses:

a. low pressure dosing of subsurface soil absorption systems (See Section 12.05) or,

b. to provide more uniform distribution of effluent to large or multiple sectioned subsurface soil absorption systems which split the flow twelve (12) or more times or contain 1200 linear feet or more of percolation piping (See Section 12.04.01 and 12.04.02).

11.05.02 Location—Minimum separation distances for dosing siphons to various structures and features are the same as those found in Table 12.1 entitled *Minimum Separation Distances* except in the case of Class III wells where the separation distance shall be fifty (50) feet.

11.05.03 Materials—Materials for construction of dosing siphon chambers are the same as for septic tanks. (See Section 10.04.02)

11.05.04 Number and Sizing—Dosing siphons discharging to subsurface soil absorption systems shall have an average discharge rate greater than 2.5 times the average daily influent flow in gallons per minute but not less than 70 gallons per minute per 1200 linear feet of percolation lines. Twin alternating siphons are required where the system to be dosed exceeds 1800 linear feet in accordance with Section 12.04.02. The volume of the dosing chamber shall equal 0.6 the volume of the percolation piping for enhanced flow distribution. Actual dosing chamber volume is determined on a case by case basis where low pressure distribution is utilized (See Section 12.05.01).

11.05.05 Access—The siphon chamber shall terminate at or above the ground surface. The top of the chamber shall be removable to an extent to allow access for maintenance, repairs and removal of the siphon components.

11.05.06 Construction—Dosing chambers constructed of precast or poured in place concrete shall conform with the construction requirements contained in Section 10.04.04 of these Regulations.

11.05.07 Force Mains—Force mains used in conjunction with siphons shall meet the applicable criteria contained in Section 11.04.01.

12.00 Subsurface Soil Absorption Systems

12.01 General—Subsurface soil absorption systems are sewage disposal systems which utilize the soil to further treat and dispose of effluent from a treatment works in a manner that does not result in a point source discharge and does not create a nuisance, health hazard or ground or surface water pollution.

12.02 Scope—For the purpose of these Regulations a subsurface soil absorption system shall refer to that part of a sewage disposal system beginning at the flow splitting device and extending through the absorption area(s).

12.03 Distribution Methods—The term distribution methods refers to the piping, flow splitting devices, gravel and other appurtenances beginning at the point of flow splitting and ending at the soil-gravel or sand interface. Two basic methods are considered

a. gravity, and

b. pressure.

12.04 Gravity Distribution—Gravity distribution is the conveyance of effluent from a distribution box through the percolation lines at less than full flow conditions. Flow to the initial distribution box may be initiated by pump, siphon or gravity.

12.04.01 Enhanced Flow Distribution—Enhanced flow distribution is the initiation of the effluent flow to the distribution box by pump or siphon for the purpose of insuring more uniform flow splitting to the percolation lines. Enhanced flow distribution shall be provided on systems where the flow is split more than twelve (12) times or the system contains more than 1200 linear feet of percolation lines. For the purpose of these Regulations enhanced flow distribution is considered to produce unsaturated soil conditions.

12.04.02 System Size—Distribution systems containing 1800 or more linear feet of percolation piping shall be split into multiple systems containing a maximum of 1200 linear feet of percolation piping per system.

12.04.03 Distribution Boxes—The distribution box is a device for splitting flow equally by gravity to points in the system. Improperly installed distribution boxes are a cause for absorption field malfunction.

a. **Materials**—The preferred material for use in constructing distribution boxes is concrete (3000 psi). Other materials may be considered on a case by case basis. All materials must be resistant to both chemical and electrolytic corrosion and must have sufficient structural strength to contain sewage and resist lateral compressive and bearing loads.

b. **Design**—Each distribution box shall be designed to split the influent flow equally among the multiple effluent ports. All effluent ports shall be at the same elevation and be of the same diameter. The elevation of the effluent ports shall be at a lower elevation than the influent port. The placement of the influent ports shall be such as to prevent short circuiting unless baffling is provided to prevent short circuiting. The minimum inside width of a gravity flow distribution box shall be equal to or greater than twelve (12) inches. The inside bottom shall be at least four (4) inches below the invert of the effluent ports and at least five (5) inches below the invert of the influent port. A minimum of eight (8) inches freeboard above the invert of the effluent piping shall be provided. The distribution box shall be fitted with a watertight, removable lid for access.

c. **Installation**—The hole for placement of the distribution box shall be excavated to undisturbed soil. The distribution box shall be placed in the excavation and stabilized. The preferred method of stabilizing the distribution box is to bond the distribution box to a 4″ poured in place Portland cement concrete pad with dimensions six (6) inches greater than the length and width dimensions of the distribution box. The box shall be permanently leveled and checked by water testing. Conduits passing through the walls of a distribution box shall be provided with a water stop.

12.04.04 Lead or Header Lines—Header or lead lines are watertight, semirigid or rigid lines that convey effluent from a distribution box to another distribution box or to the percolation piping.

a. **Size**—The lead or header lines shall have an internal diameter of four (4) inches.

b. **Slope**—Minimum slope shall be two (2) inches per one hundred (100) feet.

c. **Materials**—The lead or header lines shall have a minimum crush strength of 1500 pounds per foot and may be constructed of cast iron, plastic, vitrified clay or other material resistant to the corrosive action of sewage.

d. **Appurtenances**

1. **Joints**—Lead or header lines shall have joints of the compression type with the exception of plastic lead or header lines which may be welded sleeve, chemically fused or clamped (noncorrosive) flexible sleeve.

2. **Adapters**—Joining of lead or header lines of different size and/or material shall be accomplished by use of a manufactured adapter specifically designed for the purpose.

3. **Valves**—Valves shall be constructed of materials resistant to the corrosive action of sewage. Valves placed below ground level shall be provided with a valve box and a suitable valve stem so that it may be operated from the ground surface.

e. **Construction**

1. Location of header or lead lines shall be in accordance with Table 12.1 "Minimum Separation Distances".

2. **Bedding**—All lead or header lines shall be bedded to supply uniform support and maintain grade and alignment along the length of the lead or header lines. Special care shall be taken when using semirigid pipe.

3. **Backfilling and Tamping**—Lead and header lines shall be backfilled and tamped as soon as possible after the installation of the lead or header lines has been approved. Material for backfilling shall be free of large stones and debris.

f. **Termination**—Header or lead lines shall extend for a minimum distance of two (2) feet into the absorption trenches.

12.04.05 Gravity Percolation Lines—Gravity percolation lines are perforated or open joint pipes that are utilized to distribute the effluent along the length of the absorption trenches.

a. **Size**—All gravity percolation lines shall have an internal diameter of four (4) inches.

b. **Slope**—The slope of the lines shall be uniform and shall not be less than two (2) inches or more than four (4) inches per one hundred (100) feet.

c. **Design**—Effluent shall be split by the distribution system so that all gravity percolation lines installed shall receive an equal volume of the total design effluent load per square foot of trench i.e. the fraction of the flow received by each percolation line divided by the length of the gravity percolation line shall be equal for all gravity percolation lines in a system.

d. **Length**—No individual gravity percolation line shall exceed one hundred (100) feet in length.

e. **Materials**

1. **Clay**—Clay tile shall be Extra-Strength and meet current ASTM standards for clay tile.

2. **Perforated Plastic Drainage Tubing**—Perforated plastic drainage tubing shall meet ASTM standards. At not greater than ten feet (10) intervals the pipe shall be plainly marked, embossed or engraved thereby showing the manufacturer's name or hallmark and showing that the product meets a bearing load of 1000 lb. per foot. In addition, a painted or other clearly marked line or spot shall be marked at not greater than 10 feet intervals to denote the top of the pipe.

The tubing shall have three (3) holes 0.75 inch in diameter evenly spaced and placed within an arc of 130 degrees, the center hole being directly opposite the top marking.

Spacing of each set of three (3) holes shall be at four (4) inch intervals along the tube. If there is any break in the continuity of the tubing, an appropriate connection shall be used to join the tubing.

f. **Installation**

1. **Crushed Stone or Gravel**—Clean gravel or crushed stone having a size range from 0.5 inch to 1.5 inches shall be utilized to bed the gravity percolation lines.

Minimum depth of gravel or crushed stone beneath the percolation lines shall be six (6) inches. Clean coarse silica sand (does not effervesce in presence of dilute hydrochloric acid) may be substituted for the first two (2) inches (soil interface) of the required six (6) inches of gravel beneath the percolation lines. The absorption trench shall be backfilled to a depth of two (2) inches over the gravity percolation lines with the same gravel or crushed stone. Clean sand, gravel or crushed stone shall be free of fines, clay and organic materials.

2. **Grade Boards and/or Stakes**—Grade boards and/or stakes placed in the bottom or sidewalls of the absorption trench shall be utilized to maintain the grade on the gravel for placement of the gravity percolation lines. Grade stakes shall not be placed on centers greater than ten (10) feet.

3. **Placement and Alignment**—Perforated gravity percolation piping shall be placed so that the center hole is in the horizontal plane and interfaces with the minimum six (6) inches of graded gravel. When open joint piping is utilized the upper half of the top of the 0.25 inch open space shall be covered with tar or building paper to block the entrance of fines into the pipe during the backfilling operation. All gravity percolating piping shall be placed in the horizontal center of the absorption trench and shall maintain a straight alignment and uniform grade.

4. **Backfilling**—After the placement of the gravity percolation piping the absorption trench shall be backfilled evenly with crushed stone or gravel to a depth of two (2) inches over the piping. Untreated building paper, or other suitable material shall be placed at the interface of the gravel and soil to prevent migration of fines to the trench bottom. The remainder of the trench shall be backfilled with soil to the ground surface.

12.05 Low Pressure Distribution—Low pressure distribution is the conveyance of effluent through the pressure percolation lines at full flow conditions into the absorption area with the prime motive force being a pump or siphon. Low pressure systems are limited to a working pressure of from one (1) to four (4) feet of head at the distal end of the pressure percolation lines. For the purpose of these Regulations low pressure distribution is considered to provide unsaturated soil conditions.

12.05.01 Dosing Cycle—Systems shall be designed so that the effluent volume applied to the absorption area per dosing cycle is from seven (7) to ten (10) times the volume of the distribution piping, however, the volume per dosing cycle should not result in a liquid depth in the absorption trench greater than two (2) inches.

12.05.02 Manifold Lines—Manifold lines are watertight lines that convey effluent from the initial point of flow splitting to the pressure percolation lines.

a. **Size**—The manifold line shall be sized to provide a minimum velocity of two (2) feet per second and a maximum velocity of eight (8) feet per second.

b. **Materials**—All pipe used for manifolds shall be of the pressure type with pressure type joints.

c. **Bedding**—All manifolds shall be bedded to supply uniform support along its length.

d. **Location**—Manifolds shall not pass closer than fifty feet to any drinking water source unless pressure tested in place at pump shut off head. Under no circumstances shall a manifold come within ten (10) feet of a drinking water source.

e. **Backfilling and Tamping**—Manifold trenches shall be backfilled and tamped as soon as possible after the installation of the manifold has been approved. Material for backfilling shall be free of large stones and debris.

f. **Valves**—Valves for throttling and check valves to prevent backflow are required wherever necessary. Each valve shall be supplied with a valve box terminating at the surface.

12.05.03 Pressure Percolation Lines—Pressure percolation lines are perforated pipes utilized to distribute the flow evenly along the length of the absorption trench.

a. **Size**—Pressure percolation lines should normally have a 1.25 inch inside diameter.

b. **Hole Size**—Normal hole size shall be 0.18 (3/16) inch to 0.25 (1/4) inch.

c. **Hole Placement**—Center to center hole separation shall be between three (3) and five (5) feet.

d. **Line Length**—Maximum line length from manifold should not exceed fifty (50) feet.

e. **Percent Flow Variation**—Actual line size, hole size and hole separation shall be determined on a case by case basis based on a maximum flow variation of ten (10) percent along the length of the pressure percolation lines.

f. **Materials and Construction**—The preferred material is plastic, either PVC or ABS, designed for pressure service. The lines shall have burr free and counter sunk holes (where possible) placed in a straight line along the longitudinal axis of the pipe. Joining of pipes shall be accomplished with manufactured pressure type joints.

g. **Installation**

1. **Crushed Stone or Gravel**—Clean gravel or crushed stone having a size range from 0.5 inch to 0.75 inches shall be utilized to bed the pressure percolation lines. Minimum depth of gravel or crushed stone beneath the percolation lines shall be 8.5 inches. Clean coarse silica sand (does not effervesce in the presence of dilute hydrochloric acid) may be substituted for the first two (2) inches (soil interface) of the required eight and one-half (8.5) inches of gravel beneath the pressure percolation lines. The absorption trench shall be backfilled to a depth of two (2) inches over the pressure percolation lines with the same gravel or crushed stone. Clean sand, gravel or crushed stone shall be free of fines, clay and organic materials.

2. **Grade Boards and/or Stakes**—Grade boards and/or stakes placed in the bottom or sidewalls of the absorption trench shall be utilized to maintain the gravel level for placement of the pressure percolation lines. Grade stakes shall not be placed on centers greater than ten (10) feet.

3. **Placement and Alignment**—Pressure percolation lines shall be placed so that the holes face vertically downward. All pressure percolation piping shall be placed at the same elevation, unless throttling valves are utilized, and shall be level. The piping shall be placed in the horizontal center of the trench and shall maintain a straight alignment. Normally the invert of the pressure percolation lines shall be placed eight and one-half (8.5) inches above the trench bottom. However, under no circumstances shall the invert of the pressure percolation lines be placed closer than 16.5 inches to the seasonal water table as defined in 12.06.01c. When the invert of the pressure percolation lines must be placed at an elevation greater than eight and one-half (8.5) inches above the trench bottom landscaping over the absorption area may be required to provide the two (2) inches of gravel and six (6) inches of fill over the pressure percolation lines required in 12.05.03g1 above.

Table 12.1
Minimum Separation Distances

Structure or Topographic Features	Soil Texture Group	Minimum Distance (Ft) From Bottom or Sidewall Of Subsurface Soil Absorption System Trench	
		Vertical	Horizontal
Property Lines	I, II, III, IV	—	5
Building Foundations	I, II, III, IV	—	10
Basements	I, II, III, IV	—	20
Drinking Water Wells			
Class I & II	I, II, III, IV	—	50
Class III	I, II, III, IV	—	100
Cisterns (Bottom Elevation Lower Than Ground Surface in Area of Subsurface Soil Absorption System)	I, II, III, IV	—	100
Shellfish Waters	I, II, III, IV	—	70
Natural Lakes & Impounded Waters	I, II, III, IV	—	50
Streams	I, II, III, IV	—	50*
Development Springs (Upslope)	I, II, III, IV	—	200®
Rock, Rock outcropping, Pans and Impervious Strata	I	1	1
	II	1	1
	III	1	1
	IV	1	1
Drainage Ditches			
Ditch Bottoms Above Seasonal Water Table	I, II, III, IV	—	10
Ditch Bottom Below Seasonal Water Table and Ditch Normally Contains Water	I	—	70*
	II	—	70*
	III	—	50*
	IV	—	50*
Water Table Depressor System	I	6†	70
	II	3†	70
	III	2†	50
	IV	2	50
Lateral Groundwater Movement Interceptor	I	—	70™ 10©
	II	—	70™ 10©
	III	—	50™ 10©
	IV	—	50™ 10©
Low Point of Sink Holes When Placed Within The Bowl Of The Sink Hole	I, II, III, IV	—	100
Utility Lines	I, II, III, IV	—	10

*The set back distance may be reduced to 10 feet in Group III and IV soils and 20 feet in Group I and II soils if the subsurface soil absorption system is designed to produce unsaturated flow conditions in the soil.

†Vertical Distance to the invert of the drain tile in the water table depressor system.

™Absorption trench up slope from interceptor

©Absorption trench down slope from interceptor

®Arc of 180° up slope of spring and 100 ft. down slope

4. **Backfilling**—After the placement of the pressure percolation piping the absorption trench shall be backfilled evenly with crushed stone or gravel to a depth of two (2) inches over the piping. Untreated building paper or other suitable material shall be placed at the interface of the gravel and soil to prevent migration of fines to the trench bottom. The remainder of the trench shall be backfilled with soil to the ground surface.

h. **Appurtenances**—The distal (terminal) end of each pressure percolation line shall be fitted with a vertical riser and threaded cap extending to the ground surface. Systems requiring throttling valves shall be supplied with couplings and threaded riser extensions at least four (4) feet long so that the flow may be adjusted in each line.

12.06 Absorption Area—The absorption area is the undisturbed soil medium beginning at the soil-gravel or sand interface which is utilized for absorption of the effluent. The absorption area includes the infiltrative surface in the absorption trench and the soil between and around the trenches.

12.06.01 Minimum Soil Conditions Necessary for Placement of Absorption Trenches

a. **Suitability of Soil Horizon**—The absorption trench bottom shall be placed in the soil horizon(s) with the "fastest" average estimated or measured percolation rate. Soil horizons are to be identified in accordance with Subsection 4.04 of these Regulations. The soil horizon must meet the following minimum conditions:

1. it shall have an estimated or measured percolation rate equal to or less than 120 minutes per inch;

2. the soil horizon(s) shall be of sufficient thickness so that at least twelve (12) inches of absorption trench sidewall is exposed to act as an infiltrative surface; and

3. if no single horizon meets the condition in 12.06.01a2 above, a combination of adjacent horizons may be utilized to provide the required twelve (12) inch sidewall infiltrative surface. However, no horizon utilized shall have an estimated or measured percolation rate greater than 120 minutes/inch.

b. **Distance to Rock, Rock Outcroppings, Impervious Strata and Pans**—The minimum acceptable separation distance, both vertical and horizontal, from the absorption trench bottom and sidewalls to rock, rock outcroppings impervious strata and pans is one (1) foot. (See Table 12.1 "Minimum Separation Distances")

c. **Minimum Depth to Seasonal Water Table**—As used herein the term seasonal water table means that portion of the soil profile where a color change has occurred in the soil as a result of saturated soil conditions or where soil concretions have formed. Typical colors are gray mottlings, solid gray or black. The depth in the soil at which these conditions first occur is termed "seasonal water table". The minimum separation distance from the absorption trench bottom to the seasonal water table for various soil percolation rates is tabulated in Table 12.2.

Table 12.2

Separation Distance from Trench Bottom to Seasonal Water Table

Percolation Rate Minutes/Inch	Distance from Trench Bottom Inches
5	2
17	3
46	12
90	18
120	20

d. **Placement of Absorption Trenches Below Soil Restrictions**—Placement of the soil absorption trench bottom below soil restrictions as defined in Section 4.05.05, whether or not there is evidence of a perched water table as indicated by free standing water or gray mottlings or coloration, requires a special design based on the following criteria:

1. the soil horizon into which the absorption trench bottom is placed shall be a Texture Group I and/or II soil;

2. the soil horizon shall be a minimum of three (3) feet thick and shall exhibit no characteristics that indicate wetness or restriction of water movement. The absorption trench bottom shall be placed so that at least two (2) feet of the soil horizon separates the trench bottom from the water table and/or rock. At least one (1) foot of the absorption trench side wall shall penetrate the soil horizon;

3. a lateral groundwater movement interceptor (LGMI) shall be placed upslope of the absorption area. The LGMI shall be placed perpendicular to the general slope of the land. The invert of the LGMI shall extend into, but not through, the restriction and shall extend for a distance of ten (10) feet on either side of the absorption area (See Section 8.05.04c); and

4. pits shall be constructed to facilitate soil evaluations as necessary.

12.06.02 Sizing of Absorption Trench Area

a. **Required Area**—The total absorption trench bottom area required shall be based on the average estimated or measured percolation rate for the soil horizon(s) into which the absorption trench is to be placed. If more than one soil horizon is utilized to meet the sidewall infiltrative surface required in subsection 12.06.01a of these Regulations, the absorption trench bottom area shall be based on the average estimated or measured percolation rate of the "slowest" horizon. The trench bottom area required in square feet per one hundred gallons (Ft^2/100 Gals) of sewage applied for various soil percolation rates is tabulated in Table 12.3. The area requirements are based on the equation:

$$\log y = 2.00 + 0.008\,(x)$$

where $y = Ft^2/100$ Gals

x = Percolation rate in minutes/inch

Not withstanding the above, the minimum absorption area for single family residential dwellings shall be 400 square feet.

b. **Area Reduction**—See Table 12.3 for percent area reduction when low pressure distribution is utilized. A reduction in area shall not be permitted when flow diversion is utilized with low pressure distribution.

12.06.03 Minimum Cross Section Dimensions for Absorption Trenches

a. **Depth**—The minimum trench sidewall depth as measured from the surface of the mineral soil shall be eighteen (18) inches when placed in a landscape with a slope less than ten (10) percent. Mineral soil is a soil consisting predominantly of, and having its properties determined predominantly by mineral matter. A mineral soil usually contains less than 20% organic matter, but it may contain an organic surface layer up to 12 inches thick. The minimum trench depth shall be increased by at least five (5) inches for every ten (10) percent increase in slope. Sidewall depth is measured from the ground surface on the downhill side of the trench.

b. **Width**—(1) All absorption trenches utilized with gravity distribution shall have a width of from eighteen (18) inches to thirty six (36) inches. (2) All absorption trenches utilized with low pressure distribution shall have a width of from eight (8) inches to twenty four (24) inches.

12.06.04 Lateral Separation of Absorption Trenches—The absorption trenches shall be separated by a center to center distance no less than three times the width of the trench for slopes up to ten (10) percent. However, where trench bottoms are two (2) feet or more above rock, pans and impervious strata, the absorption trenches shall be separated by a center to center distance no less than three times the width of the trench for slopes up to twenty (20) percent. The minimum horizontal separation distance shall be increased by one (1) foot for every ten (10) percent increase in slope. In no case shall the center to center distance be less than thirty (30) inches.

12.06.05 Slope of Absorption Trench Bottoms

a. **Gravity Distribution**—The bottom of each absorption trench shall have a uniform slope not less than two (2) inches or more than four (4) inches per hundred (100) feet.

b. **Low Pressure Distribution**—The bottom of each absorption trench shall be uniformly level to prevent ponding of effluent.

12.06.06 Placement of Absorption Trenches in the Landscape

a. The absorption trenches shall be placed on contour.

b. When the ground surface in the area over the absorption trenches is at a higher elevation than any plumbing fixture(s), sewage from the plumbing fixture(s) shall be pumped.

Table 12.3

Area Requirements for Absorption Trenches

Percolation Rate Minutes/Inch	Area Required Ft²/100 Gals		Area Required Ft²/Bedroom*	
	Gravity	Low Pressure Distribution	Gravity	Low Pressure Distribution
5	110	110	165	165
10	120	120	180	180
15	132	132	198	198
20	146	146	218	218
25	158	158	237	237
30	174	164	260	255
35	191	170	286	260
40	209	176	314	264
45	229	185	344	279
50	251	193	376	293
55	275	206	412	309
60	302	217	452	325
65	331	228	496	342
70	363	240	544	359
75	398	251	596	375
80	437	262	656	394
85	479	273	718	409
90	525	284	786	424
95	575	288	862	431
100	631	316	946	473
105	692	346	1038	519
110	759	379	1138	569
115	832	416	1248	624
120	912	456	1368	684

*For Residential Dwelling

12.06.07 Controlled Blasting—When rock or rock outcroppings are encountered during construction of absorption trenches the rock may be removed by blasting in a sequential manner from the top to remove the rock. Percolation piping and sewer lines shall be placed so that at least one foot of compacted clayey soil lies beneath and on each side of the pipe where the pipe passes through the area blasted. The area blasted shall not be considered as part of the required absorption area.

12.07 Elevated Sand Mound—An elevated sand mound is a soil absorption system that incorporates low pressure distribution and sand filtration to produce treated sewage prior to absorption in the natural underlying soil. The elevated sand mound utilizes less gross soil area than most other soil absorption systems.

12.07.01 Mound systems are considered Type III systems (See Section 3.13c).

12.07.02 Mound systems shall be designed and constructed in accordance with the *Design and Construction Manual for Wisconsin Mounds* prepared by the Agricultural Engineering Department, University of Wisconsin-Madison dated September 1978.

12.07.03 Soil and site factors required for installation of the Wisconsin Sand Mound are contained in Table 12.4. Table 12.4 is a reprint of Table 1 contained in the *Design and Construction Manual for Wisconsin Mounds* as referenced above.

Table 12.4

Soil and Site Factors That Restrict Mound Systems

Restricting Factors	Soil Group		
	Slowly Permeable Soils	Permeable Soils With Previous Bedrock	Permeable Soils With High Water Tables
Percolation rate[a]	60-120 min/in	3-60 min/in	3-60 min/in
Depth to pervious rock	24 in.	24 in.	24 in.
Depth to high water tables	24 in.	24 in.	24 in.
Depth to impermeable soil layer or rock strata	60 in.[b]	60 in.	60 in.[b]
Depth to 50% by volume rock fragments	24 in.	24 in.	24 in.
Slope	6%	12%[c]	12%[c]

[a] Percolation test depth at 24 in., 12 in. and 24 in. for slowly permeable, shallow soils and high water table soils, respectively, unless there is a more restrictive horizon above. If perched water is at 24 in., test depth should be held to 16 in.

[b] See discussion in Design and Construction Manual.

[c] For percolation rate of 3-29 min/in. max. slope is 12% and for 30-60 min/in., max. slope is 6%.

13.00 Privies

13.01 General—A privy is a nonwater carriage device for temporary storage or permanent disposal of human excreta. The privy shall not be used as the receptacle of any water carriage wastes.

13.02 Types—Privies are divided into two categories, those that function as disposal facilities and those that function merely as holding facilities with ultimate disposal of the contents at another facility via pump and haul.

13.02.01 Disposal Privies

a. **Pit Privy**

1. **Description**—A pit privy consists of a lined earthen pit with suitable rodent and insect proof structure and pit vent stack. The structure shall be provided with self closing lid(s) on the seat riser. The pit privy is located exterior to a dwelling.

2. **Location**—Required separation distances from various structures and topographic features are the same as for subsurface soil absorption systems and may be found in Table 12.1. The bottom of the pit privy shall be at least two (2) feet above the seasonal water table and any rock. Location of pit privies shall also comply with Sections 4.03.01, 4.03.03, 4.03.06, 4.03.07.

3. **Utilization**—The Uniform Statewide Building Code of Virginia normally prohibits the installation of pit privies at new homes. In case of hardship, unsuitable soil condition or temporary recreational use a privy can sometimes be constructed after obtaining a variance to the building code granted by the building official with the approval of the Department. A sewage disposal system meeting the requirements of Section 3.13 a and b shall be provided to treat other sewage (wastewater) generated from activities such as laundering, bathing, handwashing, and cooking. Pit privies utilized at existing dwellings should be abandoned within one year of the availability of sanitary sewers. Proper abandonment consists of removing the structure and covering the pit with at least two (2) feet of soil. Pit privies are an acceptable means of sewage disposal at isolated areas such as primitive camping areas, public boat launching areas, recreation areas, State Parks and wilderness areas where pressurized water systems are not provided.

b. **Incinerator Toilets**

1. **Description**—Incinerator toilets are devices which utilize electrical energy or burning gas to incinerate human excreta deposited directly into them. They function both as toilet and disposal facility and produce an inert ash. Incinerator toilets are located in the interior of a dwelling.

2. **Utilization**—In addition to the conditions stated in 13.02.01,a,3 for pit privies, incinerator toilets shall not be utilized where they are subjected to frequent use and/or peak loading conditions.

3. **Certification**—All incinerator toilets must be certified by the National Sanitation Foundation as meeting the current Standard 41.

c. **Composting Toilets**

1. **Description**—Composting toilets are devices which incorporate an incline plane, baffles or other suitable devices onto which human excreta is deposited for the purpose of allowing aerobic decomposition of the excreta. The decomposing material is allowed to accumulate to form a humus type material. These units serve as both toilet and disposal devices. Composting toilets are located interior to a dwelling.

2. **Utilization**—In addition to the conditions stated in 13.02.01,a,3 for pit privies, all materials removed from a composting privy shall be buried. Compost material shall not be placed in vegetable gardens or on the ground surface.

3. **Certification**—All composting toilets must be certified by the National Sanitation Foundation as meeting the current Standard 41.

13.02.02 Holding Privies

a. **General**—due to the nature of these devices, i.e. they require routine pump and haul, special care shall be taken in selecting these devices for use. These devices are satisfactory for use at mass gatherings, transient worker populations, construction sites, recreation areas etc.

b. **Vault Privy**

1. **Description**—a vault privy is similar to a pit privy except that, instead of an earthen pit, a water and corrosion proof containment vessel (vault) is provided. The vault shall be provided with access for periodic removal of the vault contents.

2. **Location**—Vault privies shall be located to prevent contamination of groundwater or surface water. The elevation of the top of the vault or access port shall be placed two (2) feet above the annual flood elevation. Separation distances from structures and topographic features will be determined on a case by case basis.

3. **Utilization**—Vault privies are an acceptable method of holding human excreta where groundwater, surface water or other conditions prohibit the installation of other approved sewerage facilities. The conditions contained in Section 13.02.01,a,3 shall be met.

c. **Portable Privies**

1. **Description**—A portable privy is a type of vault privy that is generally manufactured as a single unit and is easily transported.

2. **Location**—Location of portable privies should be determined on a case by case basis under the supervision of the district or local health department.

3. **Utilization**—Portable privies are normally used in association with mass gatherings, construction sites, etc. where temporary facilities are required.

4. **Numbers Required**

(a) When portable privies are used at mass gatherings one (1) privy per one hundred (100) persons shall be provided as a minimum.

(b) When portable privies are used at construction sites or transient worker locations one (1) privy per twenty five (25) persons shall be provided as a minimum.

5. **Pumping**—The containment vessel of the portable privies shall be pumped as often as necessary to prevent overflow. It is recommended that they be pumped when 0.67 full.

14.00 Storage Facilities Criteria for Pump and Haul of Sewage

14.01 General—Storage facilities associated with pump and haul operations permitted under Section 3.30 shall meet the criteria contained herein.

14.02 Location—The storage facilities shall be accessible by an all weather road of suitable carrying capacity to handle a fully loaded tank truck. Sufficient all weather surface area with appropriate carrying capacity shall be provided for maneuvering the tank truck.

14.03 Design

14.03.01 Capacity—Temporary storage facilities shall have sufficient capacity to store the projected flow for 48 hours.

14.03.02 Materials—The materials utilized shall be resistant to the corrosive action of sewage and shall be capable of withstanding the internal and external loads placed upon it.

14.03.03 Watertightness—The storage facility shall be watertight.

14.03.04 Access—The storage facility shall be easily accessible for the removal of the sewage. An access manhole with minimum dimensions of 18 by 18 inches terminating at or above the ground surface shall be provided. The storage facility shall be a closed containment vessel and all access ports shall be provided with removable covers.

14.03.05 Venting—Adequate venting shall be provided in all storage facilities.

14.03.06 Level Alarm—All facilities shall be provided with an audiovisual alarm to be activated when the storage facility is 0.75 full. Audiovisual alarms shall alarm at two locations, one that is manned twenty four (24) hours per day and the other at the site of the storage facility where the storage facility receives sewage on a 24 hour basis. When sewage flow is intermittent only one alarm at the storage facility is required.

15.00 Vehicle Specifications for Sewage Handling

15.01 General—All vehicles utilized to transport sewage shall be kept in a clean and sanitary condition.

15.02 Vehicle Identification—The name and address of the owner shall be displayed on each side of the vehicle in letters at least four (4) inches high. In addition, the Sewage Handling Permit number shall be displayed immediately beneath the owners name and address and in plain sight.

15.03 Sewage Containment Vessel (Tank)—The tank in which the sewage is to be transported shall be fully enclosed and watertight. All inlets and outlets to the tank shall be secured and made watertight during transit. The tank shall be secured to the truck.

15.04 Pumps—When a pump is utilized to transfer sewage, the pump shall be watertight and properly valved and/or capped to prevent spillage during transport.

15.05 Valves—All valves shall be watertight.

15.06 Hoses—Suction and discharge hose shall be watertight and provisions shall be made for carrying the hose in a manner to prevent leakage.

16.00 Anaerobic Lagooning of Septage

16.01 General—An anaerobic lagoon for the purpose of these Regulations is a non-discharging facility consisting of an open impervious structure, constructed of earth or other material specifically designed for receiving and stabilizing septage and other sewage sludges. Industrial waste sludges and sludges containing toxic material shall not be placed in these lagoons.

16.02 General Site Requirements

16.02.01 Engineering, Geologic, Soil and Hydrologic Evaluation—Geologic information shall be submitted to the district or local health department to include, but not limited to, soil characteristics, percolation information, maximum groundwater table, direction of groundwater movement and permeability.

16.02.02 Location

a. Minimum setback distances for topographic features are the same as those for subsurface soil absorption systems and are contained in Table 12.1..

b. **Buffer Zone**—Buffer zone criteria are contained in Appendix IX.

c. **Flood Protection**—The anaerobic lagoon and operational components shall be located at an elevation which is not subject to the one hundred (100) year flood/wave action or shall otherwise be adequately protected against the one hundred (100) year flood/wave action damage. The anaerobic lagoon shall remain fully operational during the twenty five (25) year flood/wave action.

d. **Surface Runoff**—Adequate provisions shall be made to divert storm water around the anaerobic lagoon and otherwise protect the lagoon's embankments.

16.02.03 Access—An all weather access road shall be provided.

16.02.04 Fencing—The facility site to include treatment units and appurtenances shall be fenced with a five (5) foot fence (woven wire plus barbed wire); gates and locks to provide controlled entry into the facility. The fence shall be posted with signs identifying the facility, safety and health dangers and trespass penalties. The fence shall not be constructed closer than ten (10) feet to the outside edge of any treatment unit or appurtenance.

16.03 Design Requirements (See Figure 16.0 for typical sections)

16.03.01 Receiving Facilities

a. An impervious pad of sufficient strength to support a loaded tank truck and with drainage to the lagoon shall be provided at the point(s) where the contents of the tank truck is off-loaded into the lagoon or receiving facilities.

b. The receiving and inlet facilities shall be designed to transport the septage into the lagoon, to distribute the septage as evenly as possible throughout the lagoon and to minimize generation of odors and suspension of solids.

16.03.02 Treatment Units

a. **Anaerobic Lagoons**

1. **Number and Capacity**—A minimum of two (2) lagoons shall be provided. The combined total capacity of the lagoons shall provide eight (8) months storage based on the average daily discharge into the lagoon.

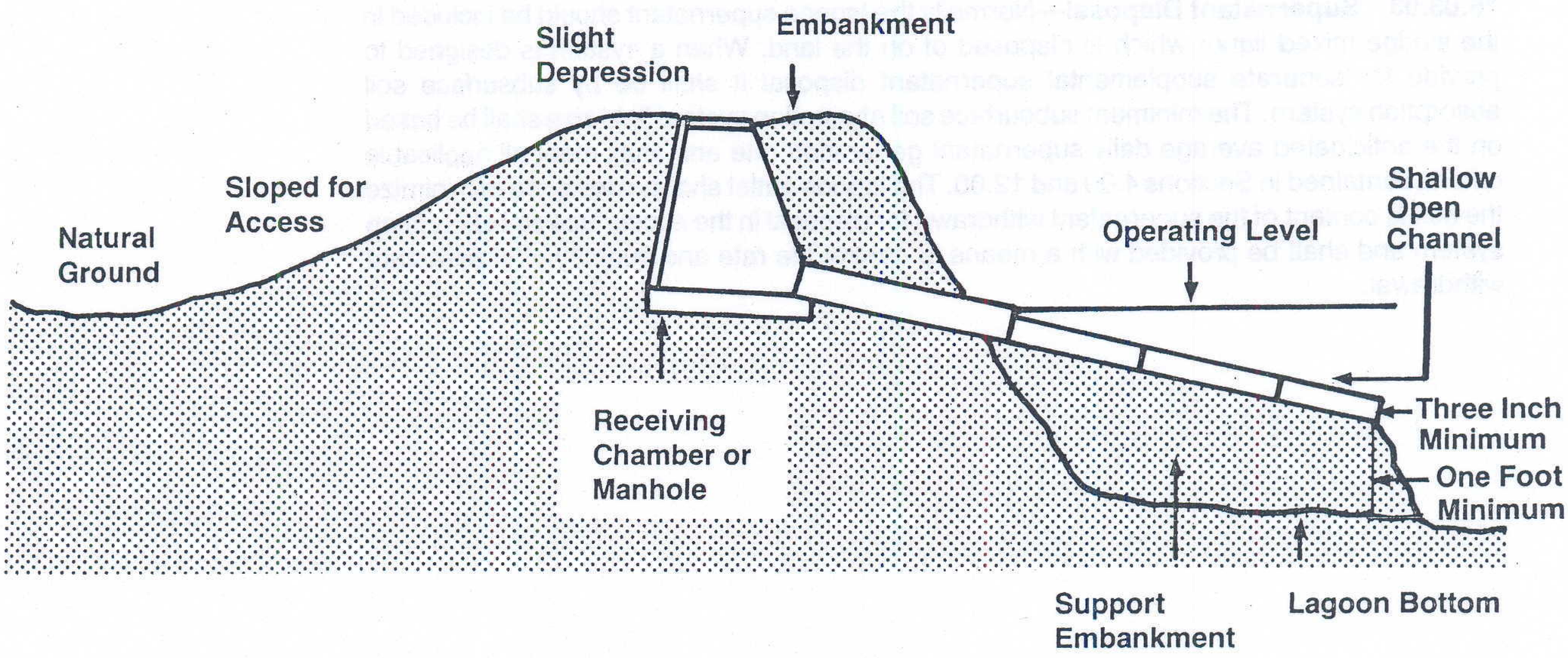
2. **Operating Depth**—The normal operating depth shall be from three (3) to five (5) feet.

3. **Lagoon Bottom**—The lagoon bottom shall be level, constructed of impervious material (10^{-6} cm/sec) and be a minimum of two (2) feet above the seasonal water table or at the original ground surface.

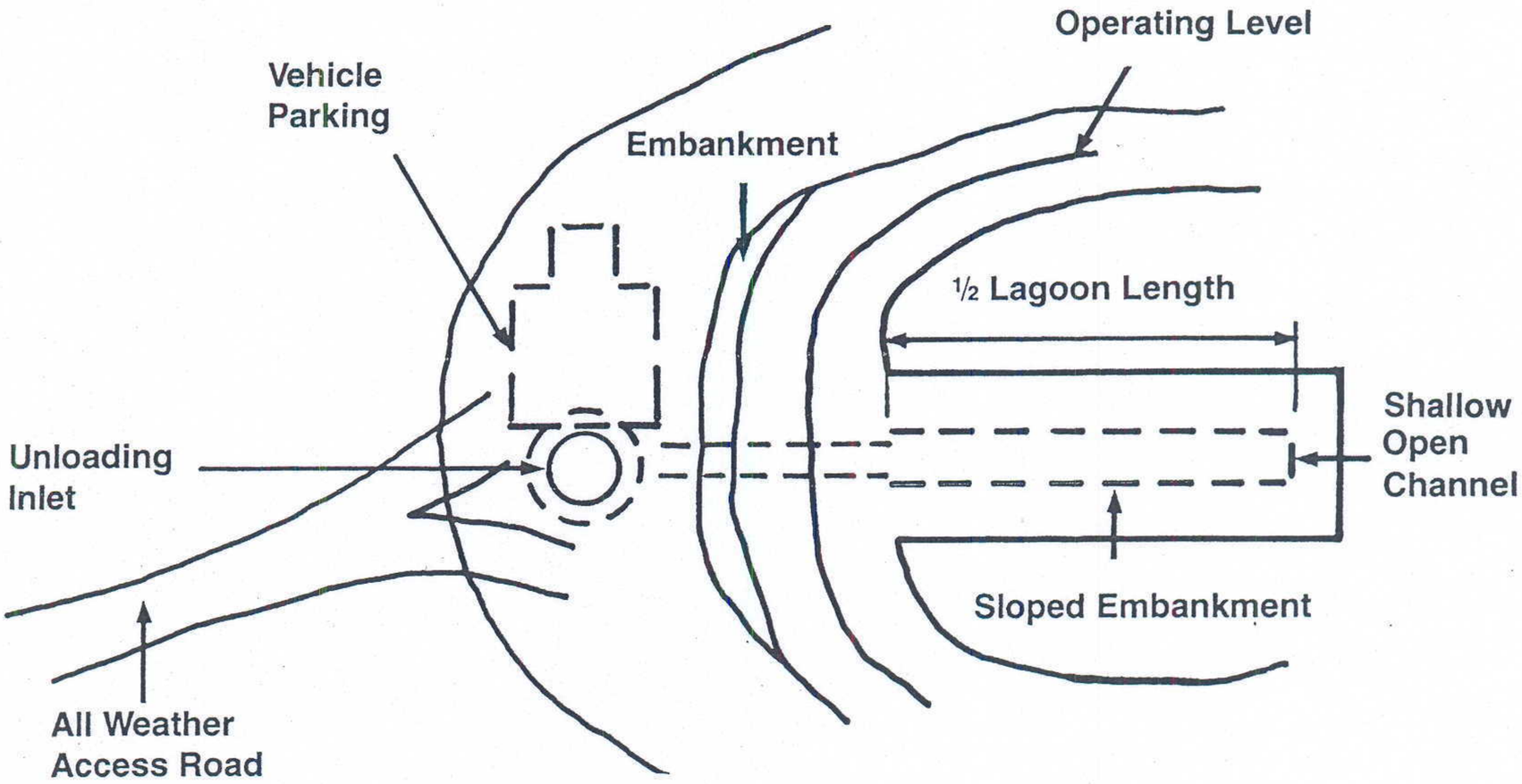
FIGURE 16.0 TYPICAL ANAEROBIC LAGOON INLET STRUCTURE

Figure 16.0
Typical Anaerobic Lagoon Inlet Structure

ELEVATION VIEW



PLAN VIEW



4. **Lagoon Embankments**—Embankments and/or dike walls shall be impervious (10^{-6} cm/sec) and structurally stable. They shall be designed to permit access of equipment necessary for sludge removal in a nuisance free and safe manner, and to minimize risk, supervision, operation and maintenance. Earthen embankments shall be sloped (minimum 1:3) and seeded with proper cover, subject to soil characteristics, to minimize erosion.

5. **Freeboard**—A minimum freeboard of two (2) feet above the normal depth shall be provided.

6. **Shape**—A uniform shape shall be provided i.e. round, square, or rectangular with no narrow or elongated portions. The lagoon shall not contain islands, peninsulas or coves unless they are a part of the inlet/outlet design.

b. **Sludge Dewatering**—When sludge dewatering units are provided they shall be designed in accordance with Section 25.05, Sludge Dewatering, *Virginia Sewerage Regulations* contained in Appendix X.

16.03.03 Supernatant Disposal—Normally the lagoon supernatant should be included in the sludge mixed liquor which is disposed of on the land. When a system is designed to provide for separate supplemental supernatant disposal it shall be by subsurface soil absorption system. The minimum subsurface soil absorption system field size shall be based on the anticipated average daily supernatant generation rate and shall meet all applicable criteria contained in Sections 4.00 and 12.00. The lagoon outlet shall be designed to minimize the solids content of the supernatant withdrawn for disposal in the subsurface soil absorption system and shall be provided with a means to control the rate and quantity of supernatant withdrawal.

Appendix I
Excerpts from Title 32.1 Code of Virginia (1950)
As Amended

The following are excerpts from Title 32.1 Code of Virginia (1950) as amended which are pertinent to these Regulations.

32.1-12 Regulations—The Board may make, adopt, promulgate and enforce such regulations and provide for reasonable variances and exemptions therefrom as may be necessary to carry out the provisions of this title and other laws of the Commonwealth administered by it, the Commissioner or the Department.

32.1-25 Right of entry to inspect, etc; warrants—Upon presentation of appropriate credentials and upon consent of the owner or custodian, the Commissioner or his designee shall have the right to enter at any reasonable time onto any property to inspect, investigate, evaluate, conduct tests or take samples for testing as he reasonably deems necessary in order to determine whether the provisions of any law administered by the Board, Commissioner or Department, any regulations of the Board, any order of the Board or Commissioner or any conditions in a permit, license or certificate issued by the Board or Commissioner are being complied with. If the Commissioner or his designee is denied entry, he may apply to an appropriate circuit court for an inspection warrant authorizing such investigation, evaluation, inspection, testing or taking of samples for testing as provided in Chapter 24 of Title 19.2.

32.1-26 Orders—The Board is authorized to issue orders to require any person to comply with the provisions of any law administered by it, the Commissioner or the Department or any regulations promulgated by the Board or to comply with any case decision, as defined in §9-6,14:4, of the Board or Commissioner. Any such order shall be issued only after a hearing with at least thirty days notice to the affected person of the time, place and purpose thereof. Such order shall become effective not less than fifteen days after mailing a copy thereof by certified mail to the last known address of such person. The provisions of this section shall not affect the authority of the Board to issue separate orders and regulations to meet any emergency as provided in §32.1-13.

32.1-27 Penalties, injunctions, civil penalties and charges for violations—

A. Any person willfully violating or refusing, failing or neglecting to comply with any regulation or order of the Board or Commissioner or any provision of this title shall be guilty of a Class 1 misdemeanor unless a different penalty is specified.

B. Any person violating or failing, neglecting, or refusing to obey any lawful regulations or order of the Board or Commissioner or any provision of this title may be compelled in a proceeding instituted in an appropriate court by the Board or Commissioner to obey such regulation, order or provision of this title and to comply therewith by injunction, mandamus, or other appropriate remedy.

C. Without limiting the remedies which may be obtained in subsection B, any person violating or failing, neglecting or refusing to obey any injunction, mandamus, or other remedy obtained pursuant to subsection B shall be subject, in the discretion of the court to a civil penalty not to exceed ten thousand dollars for each violation. Each day of violation shall constitute a separate offense.

D. With the consent of any person who has violated or failed, neglected or refused to obey any regulation or order of the Board or Commissioner or any provision of this title, the Board may provide, in an order issued by the Board against such person, for the payment of civil charges for past violations in specific sums, not to exceed the limit specified in subsection C. Such civil charges shall be instead of any appropriate civil penalty which could be imposed under subsection C.

32.1-30 Local health departments—Each county and city shall establish and maintain a local department of health which shall be headed by a local health director. Each such local health director shall be a physician licensed to practice medicine in this Commonwealth.

32.1-31C Whenever in the opinion of the State Health Commissioner the operation of any local health departments operated under contractual agreement with the Board may be accomplished in a more efficient and economical manner by the consolidation of such local

health departments, the Commissioner may propose the creation of a district health department composed of such local health departments. Such district health department shall be created by resolution duly adopted by the governing body of each county and city to be included in such district.

CHAPTER 6
ENVIRONMENTAL HEALTH SERVICES
Article 1,
Sewage Disposal

32.1-163 Definitions—As used in this article, unless the context clearly requires a different meaning:

1. "Owner" means the Commonwealth or any of its political subdivisions, including sanitary districts, sanitation district commissions and authorities, any individual, any group of individuals acting individually or as a group, or any public or private institution, corporation, company, partnership, firm or association which owns or proposes to own a sewerage system or treatment works.

2. "Sewage" means water-carried and nonwater carried human excrement together with such kitchen, laundry, shower, bath, lavatory, underground, surface, storm and other water and liquid industrial wastes as may be present from residences, buildings, vehicles, industrial establishments or other places.

3. "Sewerage System" means pipelines or conduits, pumping stations and force mains and all other construction, devices and appliances appurtenant thereto, used for the collection and conveyance of sewage to a treament works or point of ultimate disposal.

4. "Subsurface Drainfield" means a system installed within the soil and designed to accommodate treated sewage from a treatment works.

5. "Transportation" means the vehicular conveyance of sewage.

6. "Treatment Works" means any device or system used in the storage, treatment, disposal or reclamation of sewage or combinations of sewage and industrial wastes, including but not limited to pumping, power and other equipment and appurtenances, septic tanks, and any works, including land, that are or will be (i) an integral part of the treatment process or (ii) used for ultimate disposal of residues or effluent resulting from such treatment.

32.1-164 Powers and duties of the Board.—A. The Board shall have supervision and control over the safe and sanitary collection, conveyance, transportation, treatment and disposal of sewage, all sewerage systems and treatment works as they affect the public health and welfare. The regulation of sewage, as it may affect the public health, shall be primarily the responsibility of the Board and, in cases to which the provisions of Chapter 3.1 of Title 62.1 of the Code of Virginia are applicable, the joint responsibility of the Board and the State Water Control Board in accordance with such chapter.

B. The Regulations of the Board shall govern the collection, conveyance, transportation, treatment and disposal of sewage. Such regulations shall be designed to protect the public health and promote the public welfare and may include, without limitation:

1. A requirement that the owner obtain a permit from the Commissioner prior to the construction, installation, modification or operation of a sewerage system or treatment works except in those instances where a permit is required pursuant to Chapter 3.1 of Title 62.1 of the Code of Virginia.

2. Criteria for the granting or denial of such permits.

3. Standards for the design, construction, installation, modification and operation of sewerage systems and treatment works.

4. Standards governing disposal of sewage on or in soils.

5. Standards specifying the minimum distance between sewerage systems or treatments works and:

(a) public and private wells supplying water for human consumption.

(b) lakes and other impounded waters

(c) streams and rivers

(d) shellfish waters

(e) groundwaters

(f) areas and places of human habitation

(g) property lines.

6. Standards as to the adequacy of an approved water supply and the siting of wells prior to the issuance of a septic tank permit, provided that no permit shall be required for the installation of private wells.

7. Standards governing the transportation of sewage.

8. A prohibition against the discharge of untreated sewage onto land or into waters of the Commonwealth.

9. A requirement that such residences, buildings, structures and other places designed for human occupancy as the Board may prescribe be provided with a sewerage system or treatment works.

32.1.164.1 Septic Tanks Permits—A. Whenever administrative action is taken to deny a septic tank permit or to grant a septic tank permit with conditions, the applicant shall be advised in writing of the administrative remedies that are available to obtain a reversal of the denial or a modification or elimination of the conditions, or, if no further administrative remedies are available, of the right of appeal provided for hereinafter. After exhausting his administrative remedies, a person who is denied a permit for a septic tank or who objects to any conditions upon which a septic tank permit is issued shall have the right to appeal to the circuit court in the jurisdiction where all or part of the site or proposed site of the septic system is located for a hearing before the judge of said court. The court shall consider all relevant evidence. If the court, after hearing, reverses the administrative decision, it may do so upon such terms and conditions, including a probationary period, as may be fair and just under all of the circumstances.

B. The holder of any permit for a septic tank issued with conditions shall have the permit recorded in the land records of the clerk of the circuit court having jurisdiction over the site of the septic system. The holder of the permit and any subsequent holders of the permit through land purchase or transfer shall be bound by the conditions stated in the permit unless the holder or subsequent holder obtains an additional permit for modification or alteration of the septic system to meet any new use conditions.

C. In adopting regulations prescribing criteria for the granting or denial of permits for septic tanks, the Board shall consider varying circumstances such as population density, extent of use of the septic tank and such other circumstances as may affect the stringency of the criteria necessary to protect the public health and promote the general welfare and may provide for the issuance of permits for septic tanks subject to such conditions as may be necessary to protect the public health.

D. Upon receipt of an application for a septic tank permit, the local health department shall notify the governing body of the county or city where the septic tank will be located or the official designated by the governing body for the purpose and shall provide such information concerning the application and the actions taken on the application as the governing body or officer may request.

32.1-165 Prior approval required before issuance of a building permit—No county, city, town or employee thereof shall issue a permit for a building designed for human occupancy without the prior written authorization of the Commissioner or his agent. The

Commissioner or his agent shall authorize the issuance of such permit upon his finding that safe, adequate and proper sewage treatment is or will be made available to such building.

32.1-166 State-federal agreements—The Board may enter into agreement with any appropriate federal agency to regulate and monitor the collection, transportation, conveyance, treatment and disposal of sewage from common carriers or at federal facilities pursuant to the Public Health Services Act, United States Public Law 78-410, and any other applicable federal law.

Appendix II

i Application for a Sewage Disposal Construction Permit

ii Sewage Disposal Construction Permit

iii Sewage Disposal Operation Permit

Application for a Sewage Disposal System Construction Permit

Commonwealth of Virginia
Department of Health

Map Reference ☐☐☐

Health Department Identification No. _____

_____ Health Department

☐ New ☐ Expanded ☐ Modified ☐ Conditional

Owner _____ Address _____ Phone _____

_____

Agent _____ Address _____ Phone _____

_____

Directions to Property _____

_____

Subdivision _____ Section _____ Block _____ Lot _____

Other Property Identification _____

Dimensions/Size of Lot/Property _____

USE New _____ Existing _____ Repair _____ Intermittent YES _____ NO _____

Describe _____

Number of Units: Single Family _____ Multiple Family _____ Commercial _____ Other _____

Describe _____

WATER USE Number of: Bedrooms _____ Patrons _____ Employees _____

Basement YES _____ NO _____ Dishwasher YES _____ NO _____

Fixtures in Basement YES _____ NO _____ Garbage Disposal YES _____ NO _____

Automatic Washmachine YES _____ NO _____

Commercial Wastewater YES _____ NO _____

If yes, give volumes and describe _____

WATER SUPPLY Public _____ Private _____ Describe _____

BUILDINGS Termite Treatment YES _____ NO _____ DATE _____

PROPOSED INSTALLATION Septic Tank Drainfield System _____ Other _____

Describe _____

SITE PLAN Attach a site plan (sketch) showing dimensions of property, proposed and/or existing structures and driveways, underground utilities, adjacent soil absorption systems, bodies of water, drainage ways, and wells and springs within 200 feet radius of the center of the proposed building or drainfield.

The property lines and building location are clearly marked and the property is sufficiently visible to see the topography. I give permission to the Department to enter onto the property described for the purpose of processing this application.

_____ _____

Signature of owner/agent Date

For Department Use Only (Date and Initial Appropriate items)

Received _____ System Type _____

Site Visit _____ Plans Received _____

Soil Evaluation _____ FHA/VA No. _____

Approved/Disapproved _____

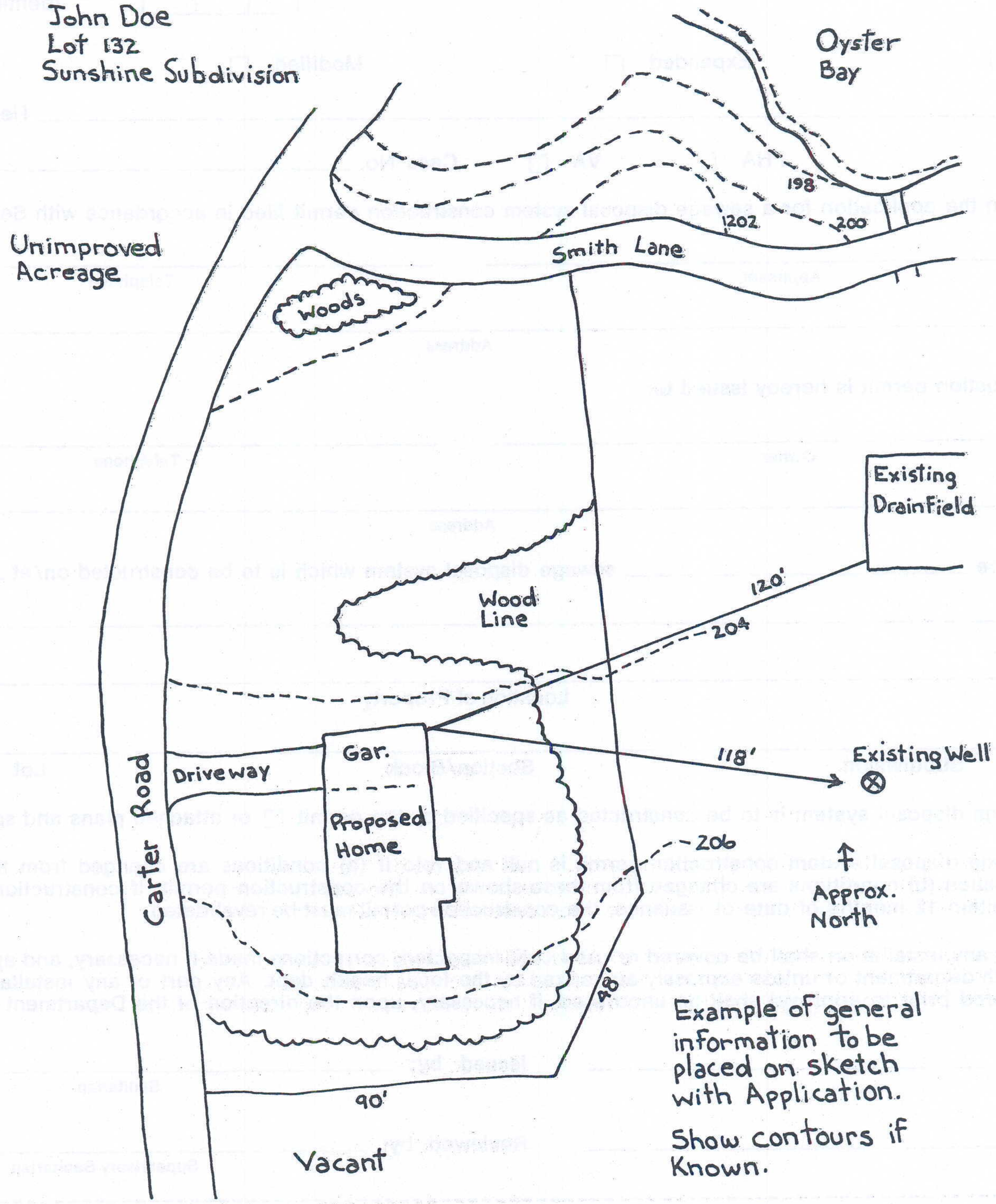
Comments _____

_____

B.W.E. 20-1

Location:

Part of Parcel G
Section 2
TM 100
John Doe
Lot 132
Sunshine Subdivision



Example of general information to be placed on sketch with Application.

Show contours if Known.

Approximate Scale = 1" = 30'

Sewage Disposal System Construction Permit

Page _____ of _____

Commonwealth of Virginia
Department of Health

Map Reference

_____
Health Department Identification Number

New ☐ Expanded ☐ Modified ☐ Conditional ☐

_____ Health Department

FHA ☐ VA ☐ Case No. _____

Based on the application for a sewage disposal system construction permit filed in accordance with Section 3.13.01 by:

_____ _____
Applicant Telephone

_____
Address

A construction permit is hereby issued to:

_____ _____
Owner Telephone

_____
Address

For a Type _____ sewage disposal system which is to be constructed on/at _____

_____

_____
Location of Property

_____ _____ _____
Subdivision Section/Block Lot

The sewage disposal system is to be constructed as specified by the permit ☐ or attached plans and specifications ☐

This sewage disposal system construction permit is null and void if (a) conditions are changed from those shown on the application (b) conditions are changed from those shown on the construction permit. If construction has not commenced within 12 months of date of issuance, the construction permit must be revalidated.

No part of any installation shall be covered or used until inspected, corrections made if necessary, and approved, by the local health department or unless expressly authorized by the local health dept. Any part of any installation which has been covered prior to approval shall be uncovered, if necessary, upon the direction of the Department.

Date: _____ Issued by: _____
Sanitarian

Date: _____ Reviewed by: _____
Supervisory Sanitarian

Date: _____ Inspected and Approved by _____
Sanitarian

If FHA or VA Financing

Reviewed By Date_____ _____
Supervisory Sanitarian

Date_____ _____
Regional Sanitarian

B.W.E. 21-1

Page _____ of _____

_____
Health Department
Identification Number

_____
Owner

_____ _____
Case Number

_____
Address

Schematic drawing of sewage disposal system and topographic features.

Show the lot lines of the building lot and building site, sketch of property showing all topographic features (natural features and manmade), all existing and/or proposed structures including sewage disposal systems and wells within 100 feet of sewage disposal system and reserve area. The schematic drawing of the sewage disposal system shall show sewer lines, pretreatment unit, conveyance system, and subsurface soil absorption system, reserve area, etc. When a nonpublic drinking water supply is to be located on the same lot show all sources of pollution within 100 feet.

Attach additional sheets as necessary to illustrate the design.

Scale _____ _____ Feet

Page _____ of _____

_____
Health Department
Identification Number

_____
Owner

_____
Case Number

_____
Address

Inspection Comments

Design

1. WATER SUPPLY: (Existing) Yes ☐ No ☐
   (to be installed) Class _____ Cased _____ Grouted _____
2. BUILDING SEWER: Size _____ I.D.; Material _____
   Minimum Slope _____ Inches in _____ feet
3. PRE-TREATMENT UNIT: Type _____ Material _____
   Liquid Capacity _____ gallons
   Free board space _____ inches
   Inside dimensions Length _____ ft. - Width _____ ft.
   Depth _____ ft.
   Inlet-Outlet Structure Type _____ Material _____
   Size _____ I.D.
4. CONVEYANCE METHOD: Type _____ Material _____
   Size _____ I.D., Slope _____
5. DISTRIBUTION BOX: Material _____
   Number Ports Required _____
6. HEADER LINES: Material _____
   Size _____ I.D., Slope _____
7. PERCOLATION LINES: Type _____ Material _____
   Size _____ I.D., Slope _____
8. ABSORPTION TRENCHES: Number Square Feet Required:
   _____ Depth from ground surface to
   bottom of ditch _____
   Type aggregate required _____
   Depth of aggregate from base of tile to bottom of ditch _____
   _____ Total depth of aggregate _____
   Slope in bottom of ditch _____
   Number of ditches required _____ length of ditches _____
   Width of ditch _____

Sewage Disposal System Operation Permit

Commonwealth of Virginia
Department of Health

Health Department
Identification No. _____

_____ Health Department

Tax Map No. _____

_____ is Hereby Granted Permission

to Operate a (Type) _____ _____ Sewage Disposal System Having a Design Capacity of _____ gpd, at

_____

_____ _____ _____

Subdivision | Section/Block | Lot

This permit is Issued in Accordance with the Provisions of Title 32.1, Chapter 6 of the Code of Virginia as Amended and Section(s) _____ of the Sewage Handling and Disposal Regulations of the Virginia Department of Health and with Previously Issued Permits _____

_____ Dated _____

with the Understanding that the Owner and/or any Subsequent Owner will Operate the Sewage Disposal System in Accordance with the Sewage Handling and Disposal Regulations of the Virginia Department of Health and any Variances or Conditions Granted. Issuance of an Operation Permit does not Imply or Guarantee that the Sewage Disposal System will Function for any Specified Period of Time.

Variances Granted ☐ None ☐ See Attached

Special Conditions ☐ None ☐ See Attached

Recommended _____
Sanitarian

Effective Date _____

Approved _____
State Health Commissioner

B.W.E. 22-1

Appendix III

i Application for a Sewage Handling Permit
ii Sewage Handling Operation Permit

Application for Sewage Handling Permit

Commonwealth of Virginia
Department of Health

Health Department Identification Number _____

_____ Health Department

Name of Business _____ Owner's Name _____

Business Address _____ Owner's Address _____

_____ _____

Business Telephone _____ Home Telephone _____

Area(s) to be Served _____
City/County

Vehicle	Make	Model	State License Number	Vehicle Identification Markings	Vehicle Tank Size (Gal)
1					
2					
3					
4					
5					

Name and location of facility receiving septage for treatment and/or disposal _____

If Discharging Septage to an Approved Sewage Treatment or Disposal Facility Append Statement from Owner Authorizing Discharge in accordance with Section 3.26.04 of the Sewage Handling and Disposal Regulations.

Estimated daily or monthly volume of septage _____ gallons

Date _____ _____
Owners Signature

Department Use

A. Approved Sewerage System or Treatment Works Yes ☐ No ☐

1. Statement from owner authorizing use Yes ☐ No ☐
2. DWP confirmation of facility's ability to accept volume of proposed septage. Yes ☐ No ☐

   Comments _____

3. Conference Scheduled ..... Yes ☐ No ☐ Date _____

   Comments _____

4. Equipment Inspected Yes ☐ No ☐ Date _____

   Comments _____

B. Special Facility Required Yes ☐ No ☐

1. Preliminary findings of site visit: _____

2. Conference Scheduled Yes ☐ No ☐

	Yes	No
a) Date _____		
b) District Sanitarian notified		
c) Regional Sanitarian notified		
d) Region Director, Division of Water Programs notified		
e) State Water Control Board notified		

3. Comments from Conference _____

4. Land Application Site Approved by State Water Control Board Yes ☐ No ☐
   Date Certificate Issued _____ Certificate No. _____

5. Type III Facility approved Yes ☐ No ☐
   Construction Permit Issued _____ Permit No. _____
   Date
   Operation Permit Issued _____ Permit No. _____
   Date

Equipment Inspected Yes ☐ No ☐ Date _____

Comments

C. Equipment Inspection

Vehicle	Tank		Pump	Valves		Hoses		Other (list and/or Comment)
	Water-tight	Secured	Water-tight	Water-tight	Capped	Water-tight	Properly Stored	
1								
2								
3								
4								
5								

Comments _____

D. Permit Recommended Yes ☐ No ☐ _____ Sanitarian _____ Date

E. Permit Authorized Yes ☐ No ☐ _____ Supervisory Sanitarian _____ Date

Reasons for Denial: _____

Sewage Handling Permit

Commonwealth of Virginia
Department of Health

Health Department
Identification Number _____

_____ Health Department

_____ is Hereby Granted Permission to Operate Sewage Handling Equipment in the City(s)/County(s) of _____

Pursuant to Title 32.1, Chapter 6 of the Code of Virginia as amended and sections 3.27, 6.00 and 15.00 of the Sewage Handling and Disposal Regulations and in accordance with application number _____ Dated _____

Effective Date _____ Recommended _____
Sanitarian

Expiration Date _____ Approved _____
State Health Commissioner

B.W.E. 24-1

III-2

Appendix IV
Application and Permit for Pump and Haul
Construction Permit for Storage Facilities
Permit for Pump and Haul

Application for Pump and Haul

Commonwealth of Virginia
State Department of Health

1. OWNER _____ _____
Print Name Signature

COMPANY _____

ADDRESS _____

_____ ZIP _____ TELEPHONE _____

does hereby apply for a permit to remove and transport sewage from _____

_____ to _____
(IF ADDITIONAL SPACE IS REQUIRED USE ATTACHMENT)

2. Justification _____

3. Brief description of storage or holding facilities (Type, capacity, etc.) _____

4. Plans and Specifications of holding facility (if required) prepared by _____
Engineer

Address _____ Date _____

5. Date of completion of permanent facilities _____ Describe facility to be completed

6. Method of guarantee that facility will be completed. Attach documents as proof such as Bond, Contracts, etc.

_____

_____

Sewage Handling Permit Holder _____
Name and Number of Permit Holder

Address _____ Telephone _____
(Attach copy of contract with Sewage Handling Permit Holder)

8. Time period requested for pump and haul (maximum time one year) from _____

_____ to _____

9. Method of bonding to insure pump and haul for the specified time period in 8 above _____

_____

10. Quantity of sewage to be hauled per day _____ gallons

11. Route(s) of transport _____

12. Time of day for transport _____

13. Emergency response capability _____

14. Disposition of Sewage _____
(Attach copy of agreement with owner of receiving treatment facility)

15. Conference Date Requested _____

16. Concurrence of Local Political Subdivision _____ _____
Name Date

_____
Title

Department Use

1. Contract with Handler having valid sewage handling permit Yes ☐ No ☐
2. Receiving facility satisfactory Yes ☐ No ☐
   Comments _____

   _____
3. Bonding and/or assurances approved by Bureau and Attorney General Yes ☐ No ☐
   Comments _____

   _____
4. Plans and Specifications for storage facility satisfactory Yes ☐ No ☐ Not Required ☐
5. Construction Permit issued for storage facility Yes ☐ No ☐ Not Required ☐
   Permit No. _____ Date _____
6. Storage Facilities Inspected Yes ☐ No ☐
   Comments _____

   _____
7. Recommend Pump & Haul Permit Be Issued

   _____ _____
   Sanitarian Date

   Authorize Pump & Haul Permit To Be Issued

   _____ _____
   Supervisory Sanitarian Date

Pump & Haul Storage Facility Construction Permit

Commonwealth of Virginia
Department of Health

Health Department
Identification Number _____

_____ Health Department

_____ is Hereby Granted Permission to Construct Storage Facilities for the Pumping and Hauling of Sewage in Accordance with Application Identification No. _____ and Plans and Specifications Identified as _____

_____

_____

and in Accordance with Section 3.31 of the Sewage Handling & Disposal Regulations adopted pursuant to Title 32.1, Chapter 6 Code of Virginia as amended.

Effective Date _____ Recommended _____
Sanitarian

Approved _____
State Health Commissioner

B.W.E. 26-1

Sewage Pump & Haul Operation Permit

Commonwealth of Virginia
Department of Health

Health Department
Identification Number _____

_____ Health Department

_____ is Hereby Granted Permission to Pump and Haul Sewage in the City/County of _____ in accordance with Application Identification Number _____ Dated _____ and Pursuant to Section 3.32 of the Sewage Handling and Disposal Regulations adopted in accordance with Title 32.1, Chapter 6, Code of Virginia as amended.

Effective Date _____ Recommended _____
Sanitarian

Expiration Date _____ Approved _____
State Health Commissioner

B.W.E. 27-1

Appendix V
Soil Evaluation Forms

Soil Evaluation Form

Commonwealth of Virginia
Department of Health

Page _____ of _____

Health Department
Identification Number _____

Tax Map No. _____

Date _____ _____ Health Department

Applicant _____ Telephone No. _____

Owner of Property _____

Address _____

Location of Property _____

_____

Subdivision _____ Section _____

Block _____ Lot _____

City or County _____ Physiographic Province _____

Name and Title of Evaluator _____

Date _____ Signature _____

Vegetation _____ Slope _____

Parent Material If Known _____

Note:

Location of Profile Holes

Sketch of area investigated including all structural features i.e. sewage disposal systems, wells, etc., within 100 feet of site (See Section 4) and reserve site.

Scale _____

SOIL EVALUATION REPORT

Health Department
Identification No. ____________________

Page ________ of ________

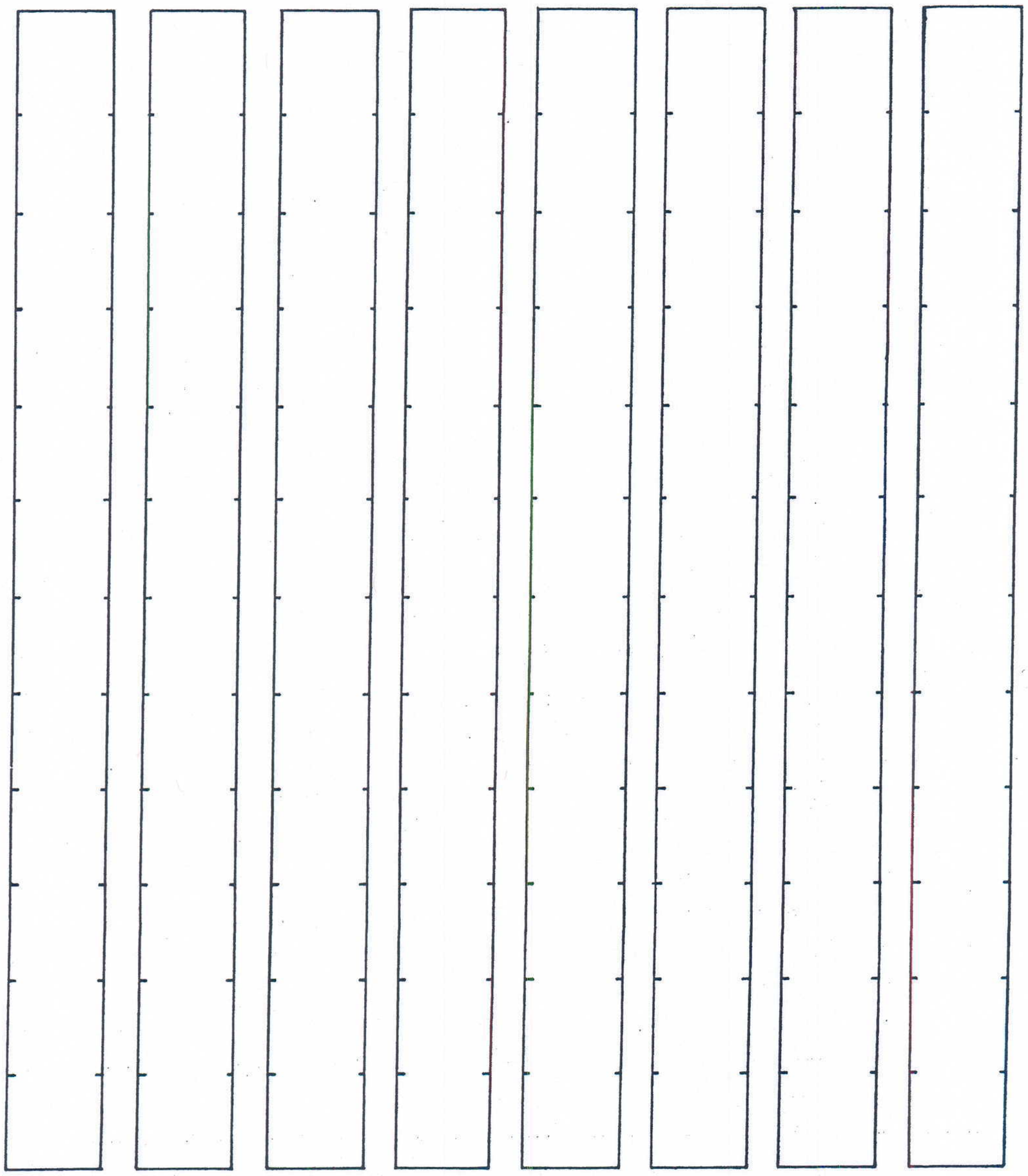
Hole #	Horizon	Depth (inches)	Description of, color, texture, etc.	Texture Group

Remarks:

PROFILE SKETCHES

Health Department
Identification No. _____
Page ____ of _____

Sketch profile to scale noting texture group and seasonal water table, impervious stratum and rock where applicable.



Comments

Notes _____

Health Department
Identification No. _____

Page _____ of _____

mmary of Evaluation:

Position(s) in landscape subject to flooding or periodic saturation (drainageways and floodplains).

Describe

Depth to rock/impervious strata. Max _____ Min _____

Rock Type or Impervious Strata—Describe

Depth to seasonal water table (gray mottling or gray color/range).

Describe

Depth to free water if present/range.

Describe

Soil percolation rate estimated YES ☐ NO ☐

Texture group I ☐ II ☐ III ☐ IV ☐

Estimated rate _____ min/inch.

Percolation Test Required YES ☐ NO ☐

Number of percolation test holes _____

Depth of percolation test holes _____

Average measured percolation rate _____

Department Use

Site Approved YES ☐ NO ☐

Drainfield to be placed in _____ horizon at _____ depth at site designated on permit.

Site Disapproved YES ☐ NO ☐

Reason(s) for Rejection

☐ Position in landscape subject to flooding or periodic saturation

☐ Insufficient depth of suitable soil over hard rock.

☐ Insufficient depth of suitable soil to seasonal water table.

☐ Rates of absorption too slow.

☐ Insufficient area of acceptable soil for required drainfield, and/or Reserve Area.

☐ Proposed system too close to well.

☐ Other specify _____

_____

_____

_____

Appendix VI
Field Guide To Soil Texture Classes

Field Guide To Soil Texture Classes (USDA)

Introduction—The purpose of this test is to provide a standard procedure for estimating soil texture in the field. The texture is estimated by the "feel" of *moist* soil. The texture of a soil cannot be estimated by "feel" if it is either dry or wet.

Definitions

Particle Size Classes

- **Sand**—Sand has a particle size ranging from 0.05 millimeters (mm) to 2.0 millimeters (mm) in diameter. Sand imparts a gritty feel to soil due to the shape of the individual particles.

- **Silt**—Silt has a particle size ranging from 0.002 millimeters (mm) to 0.05 millimeters (mm) in diameter. When moist, silt has a floury feel and does not ribbon when pressed between the thumb and forefinger due to the shape of the individual particles. When placed between the teeth silt has a gritty feeling.

- **Clay**—Clay has a particle size less than 0.002 millimeters (mm) in diameter. Clay exhibits collodial properties, has a negative charge and is flat and platelike in shape. Moist clay is sticky and will ribbon readily when pressed between the thumb and forefinger. When placed between the teeth clay has a smooth slick feeling.

- **Soil Texture**—Soil texture refers to the relative proportions of sand, silt and clay particles in a soil material that has a particle size less than two (2) millimeters (mm) in diameter. Soil texture is an indicator of infiltration capacity, permeability, degree of aeration and drainage as well as other physical characteristics of a soil material.

- **Soil Texture Classes**—The United States Department of Agriculture (USDA) has identified twelve (12) soil texture classes as follows; sand, loamy sand, sandy loam, sandy clay loam, loam, silt loam, silt, silty clay loam, clay, clay loam, sandy clay and silty clay. Each texture class has a distinctive characteristic(s) which can be estimated in the field by trained personnel.

Distinguishing Characteristics—The following characteristics are based on *moist* soil.

- **Sand**—Sand has a gritty feel, does not stain the fingers and does not form a ball when moist.

- **Loamy Sand**—Loamy sand has a gritty feel, stains the fingers (silt and clay) and forms a weak ball but cannot be handled without breaking.

- **Sandy Loam**—Sandy loam has a gritty feel, forms a ball that can be picked up with the fingers and handled with care without breaking.

- **Loam**—Loam may have a slight gritty feel but does not show a finger print and forms only short ribbons of from 0.25 inch to 0.50 inch in length. Loam will form a ball that can be handled without breaking.

- **Silt Loam**—Silt loam has a floury feel when moist and will show a finger print but will not ribbon and forms only a weak ball.

- **Silt**—Siit has a floury feel when moist and sticky when wet but will not ribbon and forms a ball that will tolerate some handling. Silt texture has not been found in any Virginia soils.

- **Sandy Clay Loam**—Sandy clay loam has a gritty feel but contains enough clay to form a firm ball and may ribbon to form 0.75 inch to 1 inch long pieces.

- **Silty Clay Loam**—Silty clay loam is sticky when moist and will ribbon from one (1) to two (2) inches. Rubbing silty clay loam with the thumb nail produces a moderate sheen. Silty clay loam produces a distinct finger print.

- **Clay Loam**—Clay loam is sticky when moist. Clay loam forms a thin ribbon of one (1) to two (2) inches in length and produces a slight sheen when rubbed with the thumb nail. Clay loam produces a nondistinct finger print.

- **Sandy Clay**—Sandy clay is plastic, gritty and sticky when moist and both forms a firm ball and produces a thin ribbon to over two (2) inches in length.

- **Silty Clay**—Silty clay is both plastic and sticky when moist and lacks any gritty feeling. Silty clay forms a firm ball and readily ribbons to over two (2) inches in length.

- **Clay**—Clay is both sticky and plastic when moist, produces a thin ribbon over two (2) inches in length, produces a high sheen when rubbed with the thumb nail and forms a strong, ball resistant to breaking.

Appendix VII
i Percolation Test Procedure
ii Percolation Test Data Forms

Percolation Test Procedure

Definition—The percolation test is a field procedure conducted in the soil horizon(s) selected for installation of the proposed subsurface soil absorption system for the purpose of observing the rate that clean water will permeate the soil under saturated conditions. The test provides a method for approximating the actual movement of wastewater through the soil which will occur during operation of the subsurface soil absorption system.

Test Holes

1. Test holes shall be located at points and depths selected by and/or approved by the district or local health department.

2. The depth of the test hole shall be placed in the "slowest" portion of the horizon(s) selected for installation of the absorption trenches. (See Section 12.06.01).

3. The portion of the test hole penetrating the horizon(s) selected for placement of the absorption trenches shall be 7 ± 2 inches in diameter. Minimum acceptable horizon thickness is twelve (12) inches. The diameter of the test hole above the selected horizon(s) may be as large as necessary to conduct the test and prepare the hole in the selected soil horizon(s).

4. Test holes shall, where possible, be constructed within four (4) to six (6) feet of an existing profile hole.

5. A portion of the material excavated from the test hole should be mounded around the test hole to prevent surface water runoff from entering the hole in the event of rainfall during the period preceding and continuing through the conduct of the test.

6. Where indicated the bottom and sidewalls of the hole shall be scarified with a sharp pointed instrument or knife to remove any smeared soil surfaces. Two inches of clean coarse sand or clean fine gravel (pea gravel) shall be added to the hole to protect the bottom infiltrative surface from scouring and sedimentation.

Presoaking

1. Swelling Procedure—When shrink-swell soils are suspected the soil surrounding the test hole shall be saturated for at least 24 hours by keeping at least 12 inches of water in the hole for the 24 hour period. An additional three days for swelling may be required during dry periods when cracking has occured. After completion of the swelling procedure stated above the hole shall be left overnight before proceeding with the measurement procedure.

2. Saturation Procedure—All test holes not subject to the swelling procedure shall be kept saturated with at least 12 inches of water for a 4 hour period on the day preceeding the measurement of the percolation rate. Residual water in the hole shall be left to provide overnight soaking.

Measurement of Percolation Rate—All measurements shall be made from a fixed reference point.

1. Test holes with 6 inches or less of water remaining after the overnight soaking period.

   a. Carefully fill the hole with water to a depth of 6 inches over the sand/gravel.

   b. Record water surface drop every 30 minutes for a 4 hour period.

   c. After recording the water surface drop each 30 minutes estimate if, based on the last reading, the hole will go dry before the remainder of the four hour test period has elapsed. If the estimation indicates that the hole will go dry add sufficient water to maintain not more than a one (1) inch water depth over the sand/gravel at the end of the test period.

   d. The drop measured during the last 30 minute period shall be used to compute the percolation rate for the hole tested.

   e. In soils where the first 6 inches of water seep away in less than 30 minutes after the overnight saturation period, add an additional 6 inches of water and the time interval between measurements shall be taken as 10 minutes and the test run to completion, i.e. hole goes dry. The drop that occurs during the final 10 minutes is used to calculate the percolation rate.

2. Test hole with more than 6 inches of water remaining after the overnight soaking period. The water depth over the gravel shall be recorded. More than 6 inches of water remaining in the hole after the soaking procedure is prima facie evidence of unsatisfactory percolation for installation of a subsurface soil absorption system.

Soils Evaluation Percolation Test Data

Commonwealth of Virginia
Department of Health

Owner _____

Address _____

_____

Phone _____

_____ Sheet ____ of ____

Health Department
Identification Number

_____ Health Department

Property Identification

Tax Map # _____

Subdivision _____
Lot Section Block

Subdivision File # _____

Other _____

_____

Weather _____ Temp. _____

	Test	Required Time (HRS.)
Saturation =	ST	
Shrink Swell =	SS	
Percolation =	P	

Date of Test _____

Report Results To:

Name _____

Address _____

_____

Phone _____

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
HOLE DIA. IN INCHES	HOLE DEPTH	TYPE TEST	HOLE NO.	TIME BEGUN / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	TIME / DEPTH TO WATER	RATE MIN. PER INCH	REMARKS*
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		
				- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -		

*Specify if water added

Use back of form for proposed layout, lot lines and hole locations

Recommendations _____

_____

_____

Sanitarian _____
Signature of Sanitarian

STATEMENT: These percolation tests were conducted as specified in the Sewage Handling and Disposal Regulation and are accurate.

_____
Signature of tester/owner/agent

B.W.E. 30-1

Appendix VIII
Land Disposal Criteria

Land Disposal Criteria

The following sections are reproduced from the *Commonwealth of Virginia Sewerage Regulations, State Department of Health and State Water Control Board February 1977.*

25.07 SLUDGE AND SOLIDS DISPOSAL

25.07.01 General

A plan shall be provided for the disposal of sludge and solids from each treatment facility as part of the final engineering documents (cf. Section 2.04.02). Before sludge is disposed of by land application, its short term and long term chemical effects on the land and groundwater must be evaluated. The evaluation program should consider the existing industrial waste surveys and general characteristics of the land to be used as well as other appropriate information. Adequate provisions for residue disposal, air pollution control, soil contamination prevention and groundwater/surface water contamination prevention shall be provided. Sludge shall not be applied to root crops or crops intended for human consumption in the raw form. Disposal of sludge shall be in such a manner as not to cause health hazards, destroy vegetation, create odor and/or vector problems, render the soil unsuitable for future land use or create other nuisances. Land areas proposed for sludge disposal should be remote from inhabited dwellings, water supplies and shellfish areas. Disposal of sludge to open dumps is prohibited. Designs incorporating the use of sludge as a soil conditioner should be forwarded to the Department of Agriculture and Commerce by the Department for appropriate review and comment.

25.07.02 Land Acquisition or Control

When land application constitutes a primary means of sludge disposal for a facility and the facility does not possess sufficient alternate disposal means, the continued availability of the land shall be protected. Such land shall also be protected from improper concurrent uses during utilization periods. The means of such protection for land availability and from improper concurrent uses shall be determined by the Department, the Board and the owner at the preliminary engineering conference.

25.07.03 Sludge Stabilization and Pathogen Reduction Prior to Land Application

Sludge shall be subjected to a treatment process which will stabilize many of the organic materials present in raw sludge. Anaerobic digestion, composting, aerobic digestion, heat treatment processes or chemical treatment processes such as high lime or chlorine dosages are considered to produce stabilized sludges. For some projects, it may be necessary to achieve additional pathogen reduction beyond that attained by stabilization.

25.07.04 Sludge Composition and Soil Evaluation

The following parameters for sludge and soil composition may be employed to determine the sludge classification and suitability of soils for sludge application. Determination of specific parameters to be run shall be made at the preliminary engineering conference and the results of the analyses shall be included as a portion of the sludge disposal plan required in accordance with Section 25.07.01.

Sludge		**Soil**	
pH	(pH units)	pH	(pH units)
Cake or Slurry		Cation Exchange	
Water (percent)		Capacity (meg/100 gm)	
total solids (percent)		Components	
Components		Clay Content (percent)	
Organic Matter		Organic Matter (percent)	
Total Kjeldahl Nitrogen		Total Nitrogen	
Ammonia Nitrogen		Organic Nitrogen	
Nitrates		Ammonia Nitrogen	
Nitrites		Total Phosphorus	
Chlorides		Available Phosphorus	
Phosphates		Boron	
Potassium		Exchangeable	

Sludge		Soil	
pH	(pH units)	pH	(pH units)
Alkalinity as $CaCO_3$		Potassium	
Boron		Sodium	
Calcium		Calcium	
Magnesium		Magnesium	
Chlorinated Hydrocarbons		Iron	
Copper		Copper	
Nickel		Nickel	
Chromium		Chromium	
Zinc		Zinc	
Manganese		Lead	
Cadmium		Manganese	
Mercury		Cadmium	
Lead		Mercury	
Micro-organisms		Drainage Characteristics	
Total Coliforms (MPN/100 gms. sample)		Soil profile	
Fecal Coliforms (MPN/100 gms. sample)		Soil Depth	

*unless otherwise noted, parameters shall be reported in mg/kg on a dry weight basis.

Appendix J contains forms which are recommended for use by the owner of the treatment facility in providing the results of background sludge and soil analyses. A one-quart soil sample shall be taken from the top four inches of soil and retained indefinitely.

After the sludge disposal plans required in accordance with Section 25.07.01 is approved by the Department and the Board, the Department and the Board waive the requirement for the sludge composition analyses and soil evaluation at any new application site for which either of the two following criteria apply:

a. the sludge is applied as a single application not to be repeated for at least five years.

b. the sludge application area is no larger than 10 acres.

This waiver in no way limits the power of the Board and the Department in the control of any sludge application practice, regardless of frequency of application or size of the application area, for which groundwater contamination, surface runoff, soil toxicity, health hazards or nuisance conditions are considered to be a problem or a potential problem. Additionally, all other requirements contained in Section 25.07 including protection from improper concurrent uses, stabilization, sludge classification, application and disposal methods, soils, application rates, runoff control, sludge transport, etc., shall apply to all sludge application sites, regardless of size. As a further condition of this waiver provision, the plant owner shall provide advance notification for concurrence to the appropriate Regional Offices of the Department and the Board of any new site(s) for which sludge application is intended. The notification for concurrence may be made by phone call to be confirmed in writing or by letter mailed in time to ensure receipt by the Department and Board prior to utilization of the new site(s). As a minimum, the notification for concurrence shall provide the location and size of the area, owner's name, proposed application rate, percentage of solids and any special or unusual conditions which may exist.

25.07.05 Sludge Classification

Prior to land application, sludge shall be evaluated in accordance with Section 25.07.03 and 25.07.04. The sludge shall be classified by its characteristics. For new projects, sludge characteristics may be approximated by data obtained from like treatment facilities receiving flow from similar waste contributors. Pilot studies for sludge characteristics may be required when deemed appropriate by the Department and the Board.

a. **Class A**—Class A sludge shall be suitable for land application at the approved site in accordance with the approved application conditions indefinitely under proper management. Sludge which is classified as Class A shall be stabilized and shall not contain heavy metals or other undesirable components in quantities that (1) may be harmful to the production of crops, trees or other vegetation; (2) may result in crops or vegetation containing components

which may be harmful to the health of animals or humans when consumed; (3) may render the soil unsuitable for future land use; and (4) degrade existing groundwater quality. Appendix K presents standards for Class A sludge based on maximum allowable levels of certain heavy metals.

b. **Class B**—Class B sludge is sludge which is raw, partially stabilized, chemically or bacteriologically contaminated or contains undesirable components which makes it unfit for land application. This shall include unstabilized pumpage from septic tanks. Disposal of Class B sludge may be implemented by (1) conveyance to a sewage treatment plant having approved sludge handling facilities, provided that detrimental effects to the plant shall not occur; (2) stabilization of sludge such that it shall meet the requirements of Section 25.07.05a. above; and (3) other methods which will be evaluated on a case by case basis. Raw or partially stabilized sludge shall not be mixed with solid waste for disposal in solid waste landfills.

25.07.06 Application and Disposal Methods

Spray application of Class A sludge to the land is acceptable when no transport of aerosols beyond the boundaries of the application area is predicted.

a. **Liquid Sludge**

Liquid sludge shall generally have a solids content of less than 12 percent. Liquid Class A sludges shall be applied to land by plowing, discing, or direct injection so that the sludges are immediately covered or by spraying or spreading on pasture that has been clipped short, permanent crop land or land that is producing trees or nursery stock. Only application sites especially selected for sludge application and approved by the Department and the Board may be used. Liquid sludges shall not be mixed with solid wastes for disposal in solid waste landfills.

b. **Final Dewatered Sludge**

Final dewatered sludge is sludge that is dewatered for the purpose of ultimate disposal and is defined as having a solids content usually ranging between 12 percent and 30 percent. Dewatered sludges including those dewatered through the use of centrifuges, vacuum filters and filter presses may be disposed with solid wastes if the ratio of sludge is high enough so as to prevent problems with compaction and extruding of sludges to the surface of the ground. These dewatered sludges may also be disposed in separate trenches at approved solid waste landfill sites or other approved sites. Dewatered Class A sludges may also be applied to the land by plowing or discing into the soil immediately after application or by spraying or spreading on pasture that has been clipped short, permanent crop land or land that is producing trees or nursery stock. Only application sites especially selected for sludge application and approved by the Department and the Board may be used.

c. **Dried Sludge**

Dried sludge is sludge that has a solids content greater than 30 percent. Dried Class A sludges from treatment processes may be disposed in solid waste landfills or atop the landfills to promote growth of vegetation, landfills selected for sludge disposal or plowing or discing into the ground or by spraying or spreading on pasture that has been clipped short, permanent crop land or land that is producing trees or nursery stock. Only application sites especially selected from sludge application and approved by the Department and the Board may be used.

d. **Other Solids**

Grit, rags and other debris or screenings from sewage treatment plants shall be stored in covered containers. These solids are classified as Class B, and subsequent disposal shall be by burial at solid waste landfill sites or other sites approved by the Department and the Board.

25.07.07 Soil

Soils shall be well drained. A minimum soil depth of two feet is preferred.

25.07.08 Application Rates

For land application systems, the engineer shall consider sludge composition, soil characteristics, climate, vegetation, cropping practices and other critical factors in determining

application rates. Since sludge and site factors vary widely, application rates shall be determined for each specific site. Application rates shall be approved by the Department and the Board.

Nitrogenous substances are usually the limiting factor in determining annual application rates. Unless it can be satisfactorily demonstrated that the nitrogen uptake of crops to be harvested justifies a higher loading rate, the initial design application rate shall not exceed five tons of dry weight solids/acre/year. Guidelines for allowable application rates for specific crops are presented in Appendix K. Additionally, Appendix K presents guidelines on maximum loadings of cadmium, maximum cumulative levels for metals and acceptable soil pH levels. For any site receiving only a single application of sludge not to be repeated for at least five years, the maximum allowable loading rate for the one-time application shall be 15 tons of dry weight solids/acre. The above notwithstanding, at no time shall sludge be applied to a depth greater than 0.5 inches in any single application procedure.

No crops should be removed by harvesting or grazing less than 30 days after the last application of sludge. Pasture should be clipped immediately prior to sludge application.

25.07.09 Groundwater Quality

Land application sites, landfills, sludge lagoons and sludge holding facilities shall be designed and operated so that the utilization of sludge does not result in groundwater quality changes. If the presently existing concentration of any parameter is higher in the groundwater than the level allowed for a raw water supply source (reference: *Commonwealth of Virginia Waterworks Regulations*), then the sludge utilization or disposal technique shall not result in an increase in the concentration of that parameter.

25.07.10 Holding Facilities

a. Emergency Holding

Raw sludges, septic tank sludges, sludges from upset digesters and sludges of similar nature may be stored in emergency holding facilities. Subsequent processing of the supernatant and sludge shall be provided in an approved manner. Such holding facilities should be located remote from human activity. The engineer shall provide a plan for approval by the Department and the Board. The plan shall address sampling, odor control, vector control, potential soil and water pollution, and security.

b. Routine Holding

During periods when application of sludges to agricultural land is not possible due to climatic or other conditions, a holding facility shall be provided. The engineer shall provide a mass balance which determines the amount of sludge storage which is to be provided. The location and protection of the holding facility shall conform to the requirements stated in Section 25.07.01a. above. Holding shall be utilized to enhance runoff prevention.

25.07.11 Incineration

Incineration of sludges and screenings from treatment facilities is an approved method of solids reduction. Such facilities shall meet all requirements for air pollution control. The ash from such processes may be buried or spread on land selected for such purposes and approved by the Department and the Board.

25.07.12 Sludge Lagoons

a. Long Term Storage Lagoons

Long term storage lagooning of stabilized sludges is allowable if provisions are made for ultimate disposal of the sludge in accordance with the requirements of this section. Decant liquid from the lagoon shall be conveyed to a plant by an approved method for treatment in a manner that will not upset the plant's operational efficiency. Adequate provisions shall be made to prevent seepage from the lagoon. Fencing and warning signs shall be required.

b. **Ultimate Disposal Lagoons**

Lagooning of stabilized sludges as a means of ultimate disposal is allowable if stored in accordance with Section 25.07.12a. above and covered with soil upon completion of use to a depth of two feet.

25.07.13 Transport of Sludge

The engineer shall furnish the final engineering documents (Section 2.03) the equipment and materials needed for sludge handling, including nonspill, water-tight vehicles for transport, routes, quantities of sludge and procedures to be used. Transport vehicles should be equipped with tow hooks, and transport routes through heavily populated areas should be avoided.

25.07.14 Land Reclamation

Land reclamation is an accepted practice usually utilizing high application rates of liquid sludge. Class A sludges are acceptable for land reclamation. The sludge utilization program shall be developed between the owner, the Department, the Board, the Division of Mined Land Reclamation (when appropriate) and other agencies as appropriate.

25.07.15 Other Methods

Other methods of sludge and solids disposal, such as preparation and use as a soil conditioner, will be considered on a case by case basis.

25.07.16 Runoff Prevention

An area which has sludge applied by spraying or spreading shall be located a minimum distance of 50 feet from all surface water. Containment and controlled release of runoff from sludge application areas or effective erosion control methods should be practiced as necessary.

Appendix IX
Buffer Zones

Buffer Zones

A. All anaerobic lagoons shall provide the minimum buffer zone as shown below unless they qualify for reduced requirements as provided in (B) below. Buffer zones are areas of controlled or limited use. Within buffer zones residential uses or high density, human activities or activities involving food preparation are prohibited. The extent of the buffer zone perimeter is measured from the perimeter of the lagoon.

Lagoon Size	Buffer Zone Requirement
40,000 per day and less	500 feet
Less than 500,000 gallons per day and greater than 40,000 gallons per day	750 feet

B. The Department shall consider reduction of up to one half of the above listed buffer zone requirements based on topography, prevailing wind directions, provision of covered units or the inclusion of an effective wind break in the overall anaerobic lagoon design.

1. The prevailing wind direction should be determined by on-site data. Local weather station records may be utilized if they are demonstrated to be applicable. Attention should be paid to both moderate and high speed winds since the high velocity winds often have a prevailing direction different from the prevailing direction of moderate winds.

2. A windbreak should be located on both sides of the anaerobic lagoon normal to a line projected through the plant and area which is to be protected, as close to the plant as practical. An effective windbreak is comprised of manmade or natural barriers which extend from the ground surface to minimum height of 16 feet. A cultivated tree windbreak may be developed by planting at least four rows of fast growing evergreens (pine family preferred) planted on staggered 10 feet centers. Rows should be spaced no greater than 16 feet apart. The variety of tree used should be readily adaptable to the soil and climate at the plant site.

C. The required buffer zone shall be maintained by an adequate legal instrument throughout the life of the anaerobic lagoon.

Appendix X
Sludge Dewatering

The following section is reproduced from the Commonwealth of Virginia Sewerage Regulations State Department of Health, State Water Control Board, February 1977

25.05 Sludge Dewatering

25.05.01 General

Drainage from beds and concentrate or filtrate from dewatering units shall be returned to the sewage treatment process at appropriate points preceding disinfection. These organic loads shall be considered in plant design, and alternatives for handling these loads may be considered similar to those for supernatant. (See Section 25.01.06d)

25.05.02 Sludge Drying Beds

a. **Area**

The sludge drying bed area required for dewatering aerobic and anaerobic digested sludge shall not be less than the following:

	Area in Square Feet Per Capita	
Type of Treatment	**Open Beds**	**Covered Beds**
Primary	1.25	0.75
Trickling Filter	1.50	1.25
Activated Sludge	1.75	1.35
Chemical Precipitation	2.00	1.50
Aerated Plant with Aerobic Digesters	1.50	1.25

For other types of sludge treatment, the drying bed area will be evaluated on a case by case basis.

b. **Percolation Type**

1. **Gravel**

The lower course of gravel around the underdrains shall be properly graded and should be 12 inches in depth, extending at least six inches above the top of the underdrains. It is desirable to place this in two or more layers. The top layer of at least three inches shall consist of gravel 1/8 inch to 1/4 inch in size.

2. **Sand**

The top course shall consist of at least 12 inches of sand with a uniformity coefficient of less than 4.0 and an effective grain size between 0.3 and 0.75 millimeters.

3. **Underdrains**

Underdrains shall be clay pipe, concrete drain tile or other underdrain material acceptable to the Department and the Board and shall be at least four inches in diameter and sloped not less than one percent to drain. Underdrains shall be spaced not more than 20 feet apart.

c. **Impervious Types**

Paved surface beds may be used if supporting data to justify such usage are provided.

d. **Walls**

Walls shall be watertight and extended 15 to 18 inches above and at least six inches below the surface.

e. **Sludge Removal**

Not less than two beds shall be provided and they shall be arranged to facilitate sludge removal. Concrete truck tracks should be provided for all percolation type sludge beds. Pairs of tracks for percolation type beds should be on 20-foot centers.

f. **Sludge Influent**

The sludge pipe to the beds shall terminate at least 12 inches above the surface and be arranged so that it will drain. Concrete splash plates shall be provided at sludge discharge points.

25.05.03 Rotary Vacuum Filtration

a. Where units will not operate on a continuous basis and the plant does not have digesters, aerated storage tanks should be provided for the sludge.

b. A maximum amount of flexibility consistent with reasonable economy should be designed into the system. Design flexibility should include, but not be limited to, the following:

1. sludge and chemical dilution facilities;
2. separate chemical conditioning tanks;
3. variable speed filter pan agitator drives; and
4. effective filter media cleaning facilities.

25.05.04 Centrifugation

a. Where units will not operate on a continuous basis and plant does not have digesters, aerated storage tanks should be provided for the sludge.

b. Successful application of centrifugation of municipal type sludges requires consideration of numerous factors. Therefore, proper scale-up data pertaining to the particular sludge to be dewatered shall be obtained and submitted to the Department and Board for approval.

c. Provisions for addition of coagulants to the sludge before or during introduction of the centrifuge shall be considered.

25.05.05 Pressure Filtration

a. The addition of and mixing of coagulants before filtration shall be considered.

b. Design data shall be collected from laboratory tests and be properly scaled-up to plant size.

c. Adequate storage should be provided for single unit systems for down time and for multiunit systems on one or two shift cycles.

25.05.06 Lagooning

a. Lagooning for dewatering may be used where suitable land is available for this use.

b. The soil shall be reasonably porous, or underdrains shall be provided. The maximum water table level shall be 18 inches below the bottom of the lagoon. The surrounding areas shall be graded to prevent surface water from entering the lagoon. The maximum depth shall be 24 inches or less. There shall be two or more lagoons. Any underdrainage fluids shall be returned to the treatment plant and be treated.

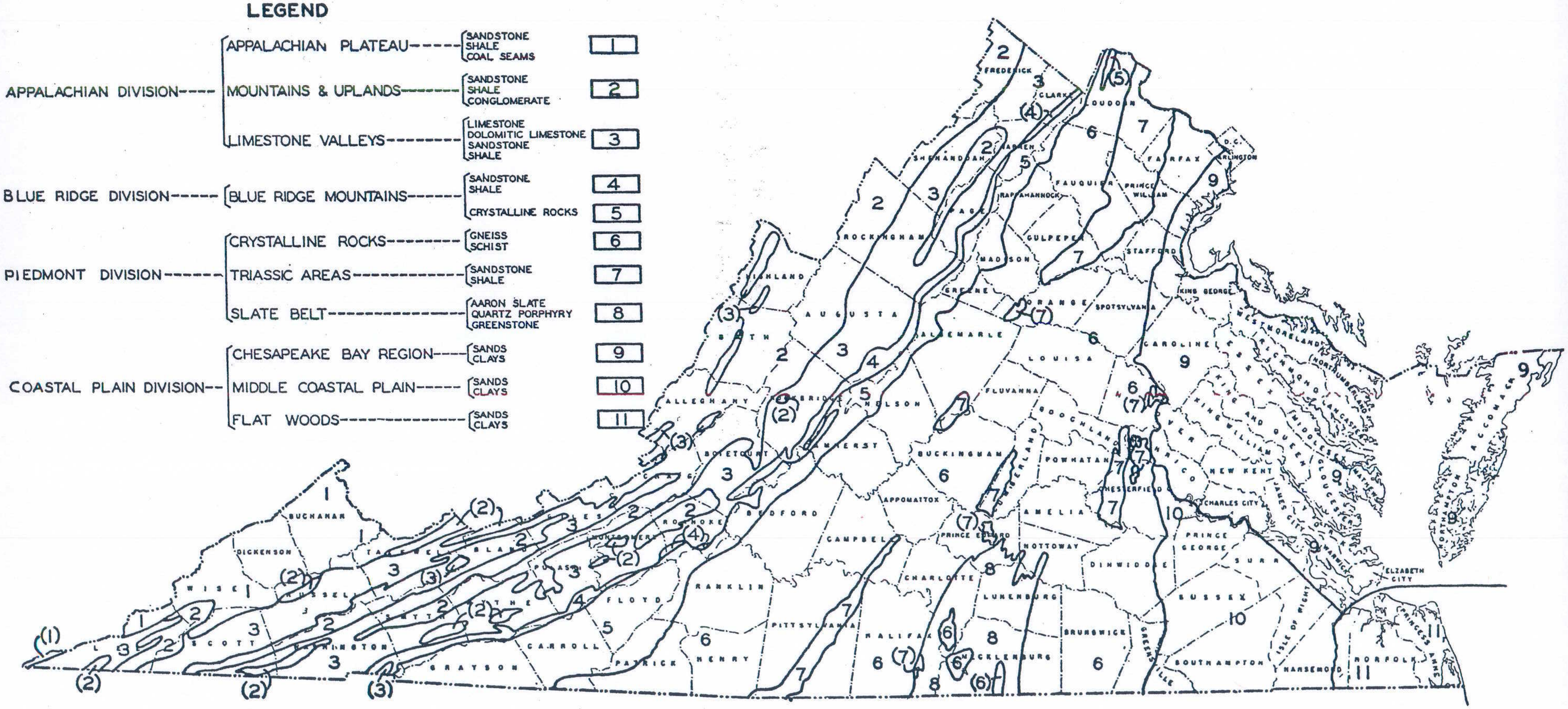
c. Loading rates, buffer zones, odor control and groundwater protection will be addressed in the preliminary engineering conference.

Appendix XI
Map of Physiographic Provinces

PHYSIOGRAPHIC AND SOIL PARENT MATERIAL MAP OF VIRGINIA

LEGEND

APPALACHIAN DIVISION	APPALACHIAN PLATEAU	SANDSTONE, SHALE, COAL SEAMS	1
	MOUNTAINS & UPLANDS	SANDSTONE, SHALE, CONGLOMERATE	2
	LIMESTONE VALLEYS	LIMESTONE, DOLOMITIC LIMESTONE, SANDSTONE, SHALE	3
BLUE RIDGE DIVISION	BLUE RIDGE MOUNTAINS	SANDSTONE, SHALE	4
		CRYSTALLINE ROCKS	5
PIEDMONT DIVISION	CRYSTALLINE ROCKS	GNEISS, SCHIST	6
	TRIASSIC AREAS	SANDSTONE, SHALE	7
	SLATE BELT	AARON SLATE, QUARTZ PORPHYRY, GREENSTONE	8
COASTAL PLAIN DIVISION	CHESAPEAKE BAY REGION	SANDS, CLAYS	9
	MIDDLE COASTAL PLAIN	SANDS, CLAYS	10
	FLAT WOODS	SANDS, CLAYS	11



XI-1

Appendix XII
Suggested Scale and Contour Interval for Subdivision Plats

XII-1

Suggested Scale and Contour Interval for Subdivision Plats

Lot Size (Acre)	Scale	Slope (%)	Contour Interval (ft)
0.5	1″ = 20′	0-2	2
		6-10	5
		11-25	5
		26-50	10
0.5-3	1″ = 50′	0-5	2
		6-10	5
		11-25	10
		26-50	20
3	1″ = 100′	0-5	2
		6-10	5
		11-25	10
		26-50	20

Appendix XIII
Completion Statement

Completion Statement

Commonwealth of Virginia
State Department of Health

Health Department
Identification Number _____

_____ Health Department

Date _____

Name of Company/Corporation/Individual: _____

Address: _____ Telephone: _____

Owner's Name _____

Owner's Address _____

Location of Installation: Lot _____ Block _____

Section: _____ Subdivision: _____

Other: _____

I hereby certify that the onsite sewage disposal system has been installed and completed in accordance with the construction permit issued (date) _____ and is in compliance with Part D of the Sewage Handling and Disposal Regulations and when appropriate the plans and specifications for the project.

_____

Signature and Title

B.W.E. 29-1

Appendix XIV
Suggested Design and Construction Criteria for Prestressed and Poured in Place Concrete Septic Tanks

XIV-1

Suggested Design and Construction Criteria for Prestressed and Poured in Place Concrete Septic Tanks

Precast Concrete Septic Tanks—The sidewalls and bottom of tanks up to 1500 gallons shall be at least 2½ inches in thickness; the top shall have a minimum thickness of 3½ inches. Such tanks shall have reinforcing of at least 6 inches × 6 inches mesh, #12 welded wire fabric. Minimum compressive strength of the concrete shall be 3000 lbs per square inch. Aggregate used in the concrete shall be no larger than #68 stone (Virginia Highway Designation), (¾ inches) size. Concrete shall be vibrated or well rodded to minimize honeycombing and to assure reasonable watertightness. All joints shall be watertight. The joining surfaces between sections or components of the tank shall be designed so as not to slip e.g. tongue and groove interlock.

Poured in Place Septic Tanks—For poured in place septic tanks up to four feet in width, the reinforcing for the cover slab shall consist of welded wire mesh reinforced with 4 inches × 4 inches spacing made of #4 gauge wire. For tanks wider than four feet, the cover slab shall be reinforced with ½ inch rods spaced 6 inches center to center both ways. Single piece poured in place septic tanks up to and including 1000 gallons capacity shall have walls and bottom at least 6 inches thick. The tops of such tanks shall be at least 4 inches thick. Poured in place tanks with capacities greater than 1000 gallons but less than 1500 gallons in capacity shall have walls and bottom at least 6 inches thick; poured in place tanks with capacities 1500 gallons or greater shall have walls at least 8 inches thick and bottom 6 inches thick. All poured in place tanks with capacity in excess of 1000 gallons shall have tops at least 5 inches thick. The concrete in all septic tanks shall be vibrated to prevent honeycombing, and to assure reasonable watertightness.

Appendix XV
Record of Inspection-Nonpublic Drinking Water Systems

Record Of Inspection—Nonpublic Drinking Water Supply System

Commonwealth of Virginia
Department of Health

Health Department
I.D. Number _____

_____
F.H.A. or V.A. Case Number
If Applicable

Map Reference

Date _____ Local Health Department _____

Owner _____ Address _____ Phone _____

_____

Exact Location of Premises _____

_____

Subdivision _____ Section/Block _____ Lot _____

Class of nonpublic drinking water well.

1) Class III	A. (drilled well)	☐
2) Class III	B. (bored well)	☐
3) Class III	C. (jetted well)	☐
4) Class III	D. (dug well)	☐
5) Other	E. _____	☐

Date of installation _____

CONSTRUCTION INFORMATION

If information in any item below is secured from other sources (i.e.) well log, etc., so note.

1. Water well completion report filed as required by 18.02.07. Yes ☐ No ☐
2. Well Location: Distances from sources of pollution (see Table 12.1, Minimum Separation Distances) and Sec... 10.04.01 and 18.02.02.
   Building Sewer _____ Pretreatment Unit _____ Conveyance System _____ Subsurface Soil Absorption System _____ (nearest point). Property Line _____ Other _____.
   Site graded where necessary to divert water away from well? Yes ☐ ☐ No n.a. ☐
3. Construction, General: (see Section 18.02.05, and 18.02.02)
   Total depth of well _____ feet. Type of casing _____. Depth of casing _____ feet. Diameter of casing _____ inches. Casing extends inches above ground _____. Exterior space around casing sealed with neat cement grout to a depth of _____ feet. Screens constructed of _____ free of rough edges and irregularities, with positive watertight seal between screen and casing? yes ☐ no ☐ n.a. ☐ Well head and opening to the interior protected? yes ☐ no ☐ Type of well seal _____
   Pitless adapter used? yes ☐ no ☐ n.a. ☐ Properly installed? yes ☐ no ☐ n.a. ☐ Proper venting? yes ☐ no ☐ n.a. ☐
4. Quantity: Yield and drawdown determined by continuous pumping of _____ hours. Drawdown _____ feet. Yield _____ GPM. Type of storage _____.
5. Quality: Sample tap provided at entry into system? yes ☐ no ☐ Sample(s) collected? yes ☐ no ☐
   Results of samples. Satisfactory ☐ Unsatisfactory ☐ (attach copy of results to this form)

_____

Based on the inspection of this water supply system and the information contained on the water well completion report attached, this water supply is approved. ☐

Remarks: _____

_____

_____

Date _____ Signed _____
Sanitarian

Date _____ Signed _____
Supervisory Sanitarian

Date _____ Signed _____
Regional Sanitarian (If V.A. or F.H.A.)

B.W.E. 31-1