SECTION 800

ALTERNATIVE SYSTEMS

Adopted: May 6, 2008

801 GENERAL PROVISIONS

A. Alternative sewage disposal systems may be permitted by the Health Officer on sites where: (a) it is determined that sewage cannot be disposed of in a sanitary manner by a standard septic tank – drainfield system; or, (b) the Health Officer finds that an alternative system will protect the public health in a manner at least equal to that of the utilization of a standard system. Such alternative systems must comply with the specific requirements set forth in this section.

B. Alternative systems may be used to serve individual single family residences, multi-family residential structures, commercial establishments, and institutional and industrial facilities.

C. Alternative systems may be approved for use in County-established moratorium areas, Regional Water Quality Control Board (Regional Board) individual system prohibition areas, or areas affected by cease and desist orders which include prohibitions or limitations on new connections to a community sewer system. Such use may only be permitted with the approval of the Regional Board.

D. Types of alternative systems shall be categorized and their application shall be governed by the following:

1. **Category 1 - Repairs**. This category includes all viable alternative systems that have technical merit, but not necessarily documented performance history. These systems are hereinafter referred to as “innovative systems”. Alternative systems in this category may be used for system repair only.

2. **Category 2 - New Construction**. This category includes alternative systems that have substantial documented performance history under conditions representative of the proposed application, and for which the County has adopted specific technical standards that are incorporated in this section. Alternative systems in this category may be used for new construction on any parcel legally created prior to the adoption of these Regulations as well as for repair of existing systems.

3. **Category 3 - Subdivisions**. This category is restricted to alternative systems that have sufficient successful documented performance history and operating experience to allow them to be used for creation of new lots, and are so designated in this section. Category 3 alternative systems may also be used for repair of existing systems and for new construction on existing lots.

E. Notwithstanding any other provisions of these Regulations, final approval of alternative system proposals shall be at the discretion of the Health Officer.

F. The Department may require a homeowner who installs his or her own system to retain the services of a qualified special inspector. The special inspector shall observe, inspect and report on critical aspects of the system installation.

802 CONSTRUCTION PERMIT AND REVIEW REQUIREMENTS

A. Design plans and site data for alternative systems shall be submitted in accordance with standard sewage disposal application procedures outlined in Section 100 of these Regulations.

B. Site evaluations, including soil profile inspection and percolation testing, shall be conducted in accordance with standard procedures outlined in Section 500 of these Regulations.

C. Design plans for alternative systems shall be signed by a Registered Civil Engineer, Registered Environmental Health Specialist, Certified Engineering Geologist, Registered Geologist, or Certified Professional Soil Scientist knowledgeable and experienced in the field of on-site sewage disposal. The designer shall also be responsible for inspection of system installation to assure conformance with approved plans, and shall provide an "As-Built" drawing of the installation to the County and property owner. The construction inspection by the designer shall be in addition to standard County inspection work carried out in accordance with provisions of Section 703 of these Regulations.

D. In addition to site data and supporting engineering calculations, alternative system applications shall include:

1. A contingency plan which outlines specific actions to be taken to repair, expand or replace the system, should the need arise.

2. Construction inspection schedule which identifies critical points during construction at which time inspections will be made by the system designer.

3. Operation, maintenance and monitoring instruction which provide brief and simple guidelines to the system owner(s) regarding the operation of the system, his/her responsibilities and system monitoring needs.

4. An abstract or justification describing the particular site constraints and how the alternative system design can best address such constraints.

5. A written statement granting permission to the Health Officer to access the property in order to periodically assess system functioning.

E. Design Plans will be reviewed by the Health Officer and, as appropriate, Regional Board and external professional design consultant(s) selected by the Health Officer. At a minimum, the Regional Board will be notified of all proposals for the use of alternative systems for: (a) large systems (flows of 1,500 gpd, or more); (b) subdivisions; and, (c) cases where cumulative impacts are of special concern.

F. Permits issued for alternative systems will expire if building construction is not started within a period of two years. Applicants may submit a written request accompanied by an administrative fee for a one-year extension of this limit.

G. Applications for alternative systems shall be accompanied by application fees. The amount of the fees shall be established by the Board of Supervisors by ordinance or resolution and shall reflect the cost to the County of reviewing, approving and enforcing alternative system permits under these regulations.

803 OPERATING PERMITS

A. In addition to a construction permit, an operating permit is required for all alternative systems, with the exception of those installed solely for the repair of existing systems for single family residences. The Health Officer reserves the right to require an operating permit for repair systems where, in his/her judgment, such a permit is necessary to assure protection of water quality and public health. Also, an operating permit will be required for any repair utilizing a new alternative system which is not classified as a Category 2 or 3 system. The operating permit provisions outlined in this section also apply to any standard systems requiring operating permits, as determined by the Health Officer.

B. Operating permits shall be issued by the Health Officer at the time of initial construction of the system; and they are required to be renewed annually or as otherwise specified by the Health Officer on a case-by-case basis. The Health Officer may reduce the renewal frequency to once every two or three years after successful performance is demonstrated. Operating permits must also be renewed at the time of sale or, in the case of commercial properties, upon change of occupants.

C. Operating permits are intended to serve as the basis for verifying the adequacy of alternative system performance and maintenance. Permit conditions shall include monitoring and inspection requirements, permit duration, and other provisions deemed appropriate by the Health Officer.

D. Renewal of an operating permit requires the submission of an annual operating permit fee, written permission to allow access to the property by the Health Officer for periodic inspection of system operation during normal business hours with prior notice, and the results of required system inspection and monitoring (per Section 804 below).

E. Failure to submit the required fee or specified monitoring and inspection data, or failure to undertake any required corrective work specified by the Health Officer may be cause for non-renewal or revocation of the operating permit by the Health Officer.

804 PERFORMANCE MONITORING, MAINTENANCE, AND REPORTING

A. A monitoring program will be established individually for each alternative system at the time of issuance of the operating permit; it may be amended at the time of permit renewal. Said monitoring and maintenance shall be performed to ensure that the alternative system is functioning satisfactorily to protect public health and safety. The specific requirements will incorporate recommendations of the system designer along with general monitoring criteria developed by the Health Officer.

B. Monitoring and maintenance requirements will vary depending upon the specific type of alternative system; but, in general, they will include the following:

1. Recording of wastewater flow based on pump event counters, elapsed time meters, water meter readings and/or other approved methods;

2. Inspection and recording of water levels in monitoring wells in the disposal field;

3. Water quality testing of selected water samples taken from points in the treatment process, from monitoring wells, or from surface streams or drainages; typical water quality parameters to be analyzed for may include total and fecal coliform, nitrate, biochemical oxygen demand (BOD), suspended solids, and fats, oils and grease;

4. Inspection and observation of pump operation or other mechanical equipment; and,

5. General inspection of treatment and disposal area for evidence of seepage, effluent surfacing, erosion or other indicators of system malfunction.

6. Performing and recording required maintenance practices.

C. The required frequency of monitoring and maintenance for each installation and type of system will be established by the Health Officer. The frequency of inspection or monitoring shall be at least annual.

Monitoring frequency may be increased if system problems are experienced. Reduced monitoring frequency may be permitted based on historic performance of the type of system and at the discretion of the Health Officer.

D. Monitoring of alternative systems for the first two years shall be conducted by or under the supervision of one of the following:

1. Registered Civil Engineer
2. Registered Environmental Health Specialist
3. Registered Geologist
4. Certified Professional Soil Scientist
5. Certified Engineering Geologist

Monitoring of alternative systems for subsequent years that the Health Officer determines have demonstrated satisfactory operation shall be conducted by a qualified service provider or professional who has demonstrated knowledge and competence in monitoring of such systems.

The County may conduct spot-check inspections of alternative systems and may also be present to observe the performance of monitoring and maintenance activities by others. The County will inspect a representative sample of alternative systems each year. County inspections will be made as a quality control check and to assure County staff maintain personal familiarity with the operation of various types of alternative systems approved for use in the County. Additionally, the Health Officer reserves the right to require, on a case-by-case basis, "third party" or County inspection and monitoring of any alternative system where deemed necessary because of the complexity of the system or the sensitive nature of the site.

E. Unless otherwise specified, monitoring results shall be submitted to the Health Officer annually, by July 1st, for the preceding 12-month period ending on May 31st. Monitoring results shall be reported on a standard form approved by the Health Officer. The monitoring report shall be signed by the Registered Engineer, Registered Environmental Health Specialist, Registered Geologist, Certified Professional Soil Scientist, Certified Engineering Geologist, or other qualified service provider responsible for the monitoring. Notwithstanding the annual report, the County shall be notified immediately of any significant system problems observed during the inspection and monitoring or at any other time.

F. The Health Officer will compile all monitoring and inspection results and submit them in report form to the San Francisco Bay Regional Water Quality Control Board, along with appropriate summaries and discussion of special problems or issues. This report shall be prepared biennially and submitted by December 31st 2008 and once every two years thereafter.

G. In evaluating the performance of alternative systems, the Health Officer shall take into account such factors as:

- effluent quality from treatment units;
- wastewater acceptance rates within treatment units (e.g., sand filter beds) and disposal fields (e.g., sand trenches and mound beds);
- effluent surfacing or near-surface soil saturation;
- groundwater mounding;
- groundwater quality effects beneath and downgradient of the disposal system (e.g., bacteriological, nitrate, other);
- equipment malfunctions; and,
- difficulty or complexity of installation.

805 SYSTEM EVALUATION AND ADOPTION OF STANDARDS

A. A biennial performance review of alternative systems shall be made by the Health Officer. Technical evaluation of system performance shall be based primarily on monitoring results and shall consider the following:

1. Actual sewage flow in relation to design sewage flow;

2. Effluent level fluctuations in monitoring wells and evidence of seepage;

3. Groundwater and surface water quality impacts;

4. Influence of climatic conditions;

5. Operation of mechanical and electrical equipment; and,

6. Other pertinent findings.

B. The results of the Health Officer's biennial evaluation of alternative systems may serve as the basis for adopting or modifying siting and design criteria for specific types of alternative systems. Recommendations may also be made by the Health Officer concerning permitting, review or monitoring requirements, or other issues as appropriate. Any changes in criteria or procedures shall be submitted to the Regional Board for their review and concurrence.

C. As sufficient experience and data are obtained, Category 2 systems will be reviewed to determine the appropriateness of elevating the particular system to Category 3. A minimum of two to four years of successful operation would normally be expected to be demonstrated prior to elevating alternative systems from Category 2 to Category 3. Determination and recommendations regarding reclassifying alternative systems will be made by the Health Officer based on direct field experience and considering input from:

1. San Francisco Bay Regional Water Quality Control Board.

2. Local designers of onsite wastewater systems.

3. Local contractors.

4. Users and other affected parties.

5. External technical consultants and manufacturers, as appropriate.

6. Experience from other jurisdictions.

Written approval from the Regional Board Executive Officer is needed for elevation of any given type of alternative system from Category 2 to Category 3.

D. Proposals to add new alternative systems to Category 2 will be received and reviewed annually by the Health Officer. The required procedures are as follows:

1. Proposals shall set forth siting and design criteria in a format suitable for direct incorporation in these Regulations and consistent with that for existing alternative systems covered by these Regulations.

2. Proposals shall include supporting data and discussion of the rationale for the proposed alternative, and for all recommended siting and design standards.

3. Following internal review, the Health Officer will circulate the proposal for review by the local engineering community and will organize at least one workshop-meeting for discussion of the proposal.

4. If, in the judgment of the Health Officer, and based on input from the local onsite wastewater system design community, the proposal merits further consideration, the Health Officer will submit the proposal to the San Francisco Bay Regional Water Quality Control Board (Regional Board) for review.

5. Siting and design standards for the alternative system will be incorporated into these Regulations following acceptance by the Health Officer and written approval from the Executive Officer of the Regional Water Quality Control Board.

806 TYPES OF ALTERNATIVE SYSTEMS PERMITTED

A. **Category 1 - Repairs**. Alternative systems permitted to be used for the repair of existing systems include systems listed in Categories 2 and 3 below and all other reasonably viable innovative system alternatives. For systems other than Category 2 and 3 alternatives, the system designer shall furnish engineering rationale, including appropriate references, to substantiate the design source and applicability of the proposed system. Proposals that include designs that cannot be substantiated by suitable reference materials or field performance results will be classified as experimental research proposals and, as such, will not be permitted under these Regulations. The Health Officer reserves the right to establish special operating permit requirements for Category 1 systems as deemed necessary for protection of public health.

B. **Category 2 - New Construction**. Alternative systems permitted to be used for new construction on any existing lot of record include the following, plus systems listed under Category 3 below.

- Pressure-Dosed Sand Trenches
- Recirculating Sand Filters
- Subsurface Drip Dispersal
- Steep Slope Mounds
- Recirculating Media Filters

Limits on the number of each type of Category 2 alternative system that may be permitted shall be established in a Memorandum of Understanding (M.O.U.) between the Health Officer and the Executive Officer of the San Francisco Bay Regional Water Quality Control Board. These limits may be adjusted from time-to-time upon mutual agreement between the Health Officer and the Executive Officer.

C. **Category 3 - Subdivisions**. Alternative systems permitted to be used for the creation of new lots include the following:

- Standard Mounds
- Intermittent Sand Filters

807 CUMULATIVE IMPACT ASSESSMENT

A. **General Provisions**. In addition to meeting established siting and design criteria, proposals to use alternative systems must, in accordance with Paragraph D of this Section, also provide an assessment of potential cumulative impacts that could result from the installation of the alternative system(s). Such cumulative impact assessment shall be conducted in accordance with the requirements outlined in this section. The results of the assessment shall be submitted for review by the Health Officer and may be grounds for denial or revision of the alternative system proposal, regardless of compliance with other siting and design criteria.

B. **Cumulative Impact Issues**. Where required, the primary issues to be addressed in cumulative impact assessments include the following:

1. **Groundwater Mounding**. A rise in the water table, referred to as "groundwater mounding", may occur beneath or downgradient of sewage disposal systems as a result of the concentrated hydraulic loading from one or more systems in a given area.

2. **Groundwater Nitrate Loading**. Discharges from on-site sewage disposal systems contain high concentrations of nitrogen that may contribute to rises in the nitrate level of local and regional aquifers.

3. **303 (d) Listed Pollutants of Concern:** For waterbodies that have been placed on the federal Clean Water Act's 303(d) list for pollutants known to be discharged from on-site sewage disposal systems.

For individual cases, the Health Officer may identify and require analysis of cumulative impact issues other than those listed above which, in his/her judgment could pose potential public health or safety risks.

C. **Qualifications**. Cumulative impact assessments required for alternative system proposals shall be performed by or under the supervision of one of the following licensed professionals:

1. Registered Civil Engineer
2. Registered Environmental Health Specialist
3. Registered Geologist
4. Certified Engineering Geologist
5. Certified Professional Soil Scientist

Additionally, the licensed professional assuming responsibility for the cumulative impact assessment shall have training and experience in the fields of water quality and hydrology.

D. **Cases Requiring Cumulative Impact Assessment**. Cases where cumulative impact assessments shall be required are listed in **Table 8-1**, according to the type of installation, the type of alternative system and the type of cumulative impact issue of concern. Additionally, the Health Officer reserves the right to require the completion of a cumulative impact analysis in any case where, in his/her opinion, special circumstances related to the size, type, or location of the alternative system (or systems) warrant such analysis.

E. **Methods**

1. **Groundwater Mounding Analysis**

a. Analysis of groundwater mounding effects shall be conducted using accepted principles of groundwater hydraulics. The specific methodology shall be described and supported with accompanying literature references, as appropriate.

b. Assumptions and data used for the groundwater mounding analysis shall be stated along with supporting information. A map of the project siting showing the location and dimensions of the proposed system(s) and the location of other nearby septic systems, wells and relevant hydrogeologic features (e.g., site topography, streams, drainage channels, subsurface drains, etc.) shall be provided.

c. The wastewater flow used for groundwater mounding analyses shall be as follows:

(1) For individual residential systems: 100 gpd/bedroom.

(2) For multi-family and other non-residential systems: design sewage flow.

d. Groundwater mounding analyses shall be used to predict the highest rise of the water table and shall account for background groundwater conditions during the wet weather season.

e. All relevant calculations necessary for reviewing the groundwater mounding analysis shall accompany the submittal.

f. Any measures proposed to mitigate or reduce the groundwater mounding effects shall be presented and described as to their documented effectiveness elsewhere, special maintenance or monitoring requirements or other relevant factors.

2. **Nitrate Loading**

a. Analysis of nitrate loading effects shall, at a minimum be based upon construction of an annual chemical-water mass balance. The specific methodology shall be described and supported with accompanied literature references as appropriate.

b. Assumptions and data for the mass balance analysis shall be stated, along with supporting information. Such supporting information should include, at a minimum:

(1) climatic data;

(2) groundwater occurrence, depth and flow direction(s);

(3) background groundwater quality data, if available;

(4) soils and runoff conditions;

(5) wastewater characteristics (i.e., flow and sewage strength); and,

(6) other significant nitrogen sources.

c. A map of the project siting showing the location and dimensions of the proposed system(s) and the location of other nearby septic systems, wells and relevant hydrogeologic features (e.g., site topography, streams, drainage channels, subsurface drains, etc.) shall be provided.

d. The wastewater flow used for nitrate loading analyses shall be as follows:

(1) For individual residential systems: 100 gpd/bedroom.

(2) For multi-family residential systems and other non-residential systems: Average wastewater flow for the system; supporting data or other basis for the average flow determinations shall be provided.

e. Minimum values used for the total nitrogen concentration of septic tank effluent shall be as follows:

(1) Residential wastewater: 40 mg/l (for average flow conditions)

(2) Non-residential wastewater: as determined from sampling of comparable system(s) or from literature values.

The Health Officer may require the use of more conservative values than cited above if, in his/her opinion, the values are not likely to be representative of the proposed system(s).

f. All relevant calculations necessary for reviewing the nitrate loading analysis shall accompany the submittal.

g. Any measures proposed to mitigate or reduce the nitrate loading effects shall be presented and described as to their documented effectiveness elsewhere, special maintenance or monitoring requirements or other relevant factors.

F. **Evaluation Criteria**

1. **Groundwater Mounding**. The maximum acceptable rise of the water table for short periods of time during the wet weather season, as estimated from groundwater mounding analyses, shall be as follows:

a. **Mound Systems.**

(1) **For Level Sites (0 - 2% Slope)**. The seasonal water table shall not rise closer than 12 inches from the bottom of the sand fill for mounds having a sand fill depth of 12 inches for no longer than a one week period. If the sand fill depth is 24 inches or the mound is preceded by an intermittent sand filter, the seasonal water table shall not rise closer than 6 inches from the bottom of the sand fill.

Also, the Health Officer reserves the right to require, in individual cases, up to 24 inches of groundwater clearance where deemed necessary for protection of public health.

(2) **For Sloping Sites (> 2% Slope)**. The seasonal water table shall not rise closer than 12 inches to ground surface at the downslope toe of the mound.

b. **Pressure-Dosed Sand Trenches and Intermittent Sand Filters.** Groundwater mounding beneath the drainfield shall not result in more than a 50-percent reduction in the minimum depth to seasonally high groundwater as specified in **Tables PDST-1** and **SF-1**.

c. **Large Systems**. Notwithstanding **a** and **b** above, for all alternative systems with design flows of 1,500 gpd or more (i.e., "large systems"), the groundwater mounding analysis shall demonstrate that a minimum groundwater clearance of 24 inches will be maintained beneath the system.

2. **Nitrate Loading**. Criteria for evaluating the cumulative nitrate loading of alternative systems shall be as follows:

a. **For Areas Served by Water Wells**.

(1) Alternative systems, on existing lots or sub-divisions, shall not cause the groundwater nitrate-nitrogen concentration to exceed 7.5 mg/l (as N) at the nearest existing or potential point of groundwater withdrawal.

and

(2) The total loading of nitrate from new sub-divisions shall not result in an average groundwater nitrate-nitrogen concentration, over the geographical extent of the sub-division that exceeds 7.5 mg/l (as N).

b. **For Areas Not Served By Water Wells**.

(1) Alternative systems, on existing lots or sub-divisions, shall not cause the groundwater nitrate-nitrogen concentration to exceed 10.0 mg/l (as N) at the nearest existing or potential point of groundwater withdrawal.

and

(2) The total loading of nitrate from new sub-divisions shall not result in an average groundwater nitrate-nitrogen concentration, over the geographical extent of the sub-division that exceeds 10 mg/l (as N).

808 SITING AND DESIGN CRITERIA

Siting and design criteria for Category 2 and Category 3 alternative systems are set forth in **Appendix A**.

Table 8 – 1

CASES REQUIRING CUMLATIVE IMPACT ASSESSMENTS FOR ALTERNATIVE SYSTEMS

TYPE OF INSTALLATION	GROUNDWATER MOUNDING ANALYSIS		NITRATE LOADING ANALYSIS	
	MOUND SYSTEMS	OTHER ALTERNATIVE SYSTEMS	MOUND SYSTEMS	OTHER ALTERNATIVE SYSTEMS
REPAIR SFR[1]	• As required per Tables M-2 – M-7	Not Required	Not Required	Not Required
MFR[2], Commercial, Inst. or Indust.	• System design flow ≥ 1,000 gpd • As required per Tables M-2 – M-7	• System design flow ≥ 1,000 gpd[3]	• Existing domestic water well < 100' from system • Documented groundwater nitrate levels > 5.0 mg/l (as N)	• Existing domestic water well < 100' from system • Documented groundwater nitrate levels > 5.0 mg/l (as N)
NEW CONSTRUCTION SFR[1]	• As required per Tables M-2 – M-7 • If system located within 100' of another SFR system and combined flow of both is ≥ 1,500 gpd	• If system located within 100' of another SFR system and combined flow of both is ≥ 1,500 gpd	• If system located within 100' of another SFR system and combined flow of both is ≤ 1,500 gpd and • Existing or potential domestic water well <200' from system	• If system located within 100' of another SFR system and combined flow of both is > 1,500 gpd and • Existing or potential domestic water well <200' from system
MFR[2], Commercial, Inst., or Indust.	• System design flow ≥ 1,000 gpd • As required per Tables M-2 – M-7	• System design flow ≥ 1,000 gpd[3]	• Existing or potential domestic water well <200' from system • Documented groundwater nitrate levels > 5.0 mg/l (as N) • System design flow ≥ 1,000 gpd	• Existing or potential domestic water well <200' from system • Documented groundwater nitrate levels > 5.0 mg/l (as N) • System design flow ≥ 1,000 gpd
SUBDIVISIONS SFR[1]	• As required per Tables M-2 – M-7 • Any two systems closer than 100' upslope/downslope or 50' laterally	• Any two systems closer than 100' upslope/downslope or 50' laterally	• Density of mounds > 1 per acre[4] • Subdivision and/or surrounding areas served by domestic water wells; and existing or potential wells within 200' of any mound • Documented groundwater nitrate levels > 5.0 mg/l (as N)	• Density of alternative systems > 1 per acre[4] • Subdivision and/or surrounding areas served by domestic water wells; and existing or potential wells within 200' of any alternative system • Documented groundwater nitrate levels > 5.0 mg/l (as N)
MFR[2], Commercial, Inst., or Indust.	• As required per Tables M-2 – M-7 • Design flow for any system ≥1,000 gpd • Any two systems closer than 100' upslope/downslope or 50' laterally	• Design flow for any system ≥1,000 gpd • Any two systems closer than 100' upslope/downslope or 50' laterally	• Design flow > 500 gpd per acre[4] • Subdivision and/or surrounding areas served by domestic water wells; and existing or potential wells within 200' of any mound • Documented groundwater nitrate levels > 5.0 mg/l (as N)	• Design flow > 500 gpd per acre[4] • Subdivision and/or surrounding areas served by domestic water wells; and existing or potential wells within 200' of any alternative system • Documented groundwater nitrate levels > 5.0 mg/l (as N)

* Multiple conditions in this table are to be interpreted as "either/or", except as specifically noted. Also, notwithstanding this table, the Health Officer reserves the right to require the completion of a cumulative impact analysis in any case where, in his/her opinion, special circumstances related to the size, type, or location of the alternative system (or systems) warrant such analysis.

[1] SFR – Single Family Residential
[2] MFR – Multi-Family Residential
[3] Not required if percolation rate is faster than 5 MPI and depth to groundwater is below trench bottom is ≤10 feet.
[4] Density refers to the actual area within which the disposal systems are located, irrespective of lot sizes, property lines, etc.

A P P E N D I X A

SITING AND DESIGN CRITERIA

FOR

ALTERNATIVE SYSTEMS

I. SITING AND DESIGN CRITERIA FOR STANDARD MOUND SYSTEMS

(CATEGORY 3 SYSTEM)

A. PROBLEMS ADDRESSED:

1. High groundwater;
2. Shallow soil over fractured rock or coarse alluvium;
3. Shallow soil over impermeable soil or bedrock; and,
4. Slow percolation at standard leachfield depths.

B. SITE CRITERIA:

1. **Setbacks**. Horizontal setback requirements for mound systems shall be those applicable to standard drainfield systems, as contained in Section 400 of these Regulations, with the following exception: If the mound system is preceded by an intermittent sand filter, a recirculating sand filter, or a recirculating textile filter, the minimum depth to the anticipated highest seasonal level of groundwater below the bottom of the trench and corresponding setback distances to wells and waterbodies shall be as shown in **Table SF-1**.

2. **Depth to Groundwater**. Minimum depth to seasonal high groundwater shall be 2 feet below ground surface.

3. **Soil Depth**. Minimum depth of soil over bedrock or an impermeable soil layer shall be 2 to 3 feet, depending upon ground slope, percolation rate, and linear loading rate per **Tables M-2** through **M-4**.

4. **Depth to Fractured Rock**. Minimum depth of soil over fractured, permeable bedrock shall be 2 feet.

5. **Percolation Rate**. Percolation rate for mound systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined from testing at 1 to 2 feet depth.

6. **Slope**. Maximum ground slope for mound systems shall be as follows:

   a. for soils having a percolation rate of 1 to 60 MPI: 12%

   b. for soils having a percolation rate of 61 to 120 MPI: 6%

7. **Reserve Area**. A reserve area having suitable site conditions and sufficient area for full, 100% replacement of the primary mound shall be provided or a complete dual primary and secondary mound system shall be initially installed. In determining the required space for the reserve or secondary mound, the required basal area (per C.8.b) of the primary and secondary mound shall not overlap. For mounds positioned end-to-end the surplus sand run-out and soil fill may overlap if installed as a dual system. Otherwise, the surplus sand run-out may not overlap. For mounds positioned upslope/downslope of one another, the surplus sand run-out may overlap if the primary and secondary mounds are both installed as a dual system; otherwise the sand run-out from the upslope mound may not overlap the sand of the downslope mound.

C. DESIGN CRITERIA

1. **Pretreatment**. The mound system shall be preceded by a septic tank sized for the projected system sewage flow in accordance with Section 602 of these Regulations.

2. **Design Sewage Flow**. The mound system shall be designed on the basis of the estimated sewage flow, determined in accordance with Section 601 of these Regulations, subject to the following exceptions pertaining to water conservation design reductions:

   a. Up to 30-percent reduction in the design sewage flow and mound system sizing is permissible for:

      (1) existing lots of record; and,
      (2) where a dual mound system is installed or a supplemental treatment unit from a Category 2 or 3 system is included for treatment prior to discharge to the mound system.

   b. No water conservation-based reduction in mound system sizing shall be permitted for creation of new lots.

3. **Pressure Dosing**. Septic tank effluent shall be applied to the mound system by pressure dosing, utilizing either an automatic dosing siphon or pump system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

   a. Relatively uniform dosing of septic tank effluent over the surface application area of the mound distribution bed;

   b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

   c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

   d. Dosing volume to achieve 3 to 5 doses per day at design flow conditions; and,

   e. At least one distribution lateral for every 36 inches of bed width.

   f. The pressure line to the mound shall be buried at least 18 inches below grade.

4. **Sand Fill**.

a. **Sand Specifications**. The sand media shall be a medium to coarse sand which meets the following gradation specifications:

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

b. **Sand Depth**. The minimum depth of sand fill, below the gravel distribution bed, shall be 12 inches. The minimum depth of sand fill shall be increased to 24 inches for sites where all of the following conditions exist:

(1) Percolation rates are faster than 10 MPI;
(2) Groundwater immediately beneath the mound is hydraulically connected to a definable aquifer; and,
(3) Groundwater in the immediate project area is an existing or potential domestic water source.

c. **Lateral Dimensions**. The sand shall be placed as a continuous fill extending in lateral dimensions as necessary to meet the following minimum requirements:

(1) Top of the sand fill shall extend horizontally beyond the gravel distribution bed:

- 1 foot in the upslope direction
- 2 feet in the downslope direction
- 2 feet in the longitudinal (side) direction

(2) Maximum slope of the top of the sand surface shall be 3 horizontal to 1 vertical.

(3) Bottom of the sand fill shall be large enough to meet minimum mound sizing requirements based upon basal area and linear loading rate criteria per C.8.b below.

5. **Gravel Distribution Bed**

a. **Material**. The distribution bed shall consist of 3/8-inch washed pea gravel, free of fines.

b. **Depth**. Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping.

c. **Width**. Maximum width of the distribution bed shall be 10 feet. If a variance from this criterion is proposed, it must be supported by detailed groundwater mounding analysis carried out in accordance with guidelines contained in Section 807 of these Regulations.

d. **Level**. The bottom of the distribution bed shall be level; and the downslope side shall be parallel to the slope contour.

6. **Silt Barrier**. The gravel distribution bed shall be covered in its entirety with a geotextile ("filter fabric") silt barrier. Filter fabric shall be either polyester, nylon or polypropylene, or any combination

thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.

7. **Soil Cover**.

a. **Material**. A continuous soil cover shall be placed over the entire distribution bed and sand fill.

The soil cover shall consist of a medium, loamy-textured soil.

b. **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed. Soil cover over the distribution bed shall be crowned to promote rainfall runoff.

c. **Lateral Extension**. The soil cover shall extend a minimum of 3 feet beyond the perimeter edge of the sand fill in all directions.

8. **Wastewater Loading Rate**. The wastewater loading rates used for sizing the surface area of the distribution bed and the basal area of the sand fill shall be as follows:

a. **Distribution Bed**.

(1) 1.2 gpd/ft^2 for individual residential septic systems.

(2) 1.0 gpd/ft^2 for commercial, industrial, institutional and multi-residential septic systems.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the mound distribution bed may be required for high strength waste flows, such as from restaurants.

b. **Sand Basal Area**. The basal area of the sand fill shall be sized to meet maximum basal loading and linear loading requirements as follows:

(1) **Basal Loading Rates**.

- **Effective Application Area**.

  - For level sites (0 - 2% slope) the effective basal application area includes the entire sand fill basal area.

  - For sloping sites (>2% slope) the effective basal application area includes the sand basal area immediately below and directly downslope (at right angles to the natural slope contours) of the distribution bed.

- **Wastewater Flow**. The wastewater flow used for determining the basal loading rate shall be the design sewage flow for the system (e.g., 150 gpd/bedroom for standard residential system).

- **Loading Rates**. The maximum basal loading rate shall be based upon the demonstrated percolation rate of the upper 12 to 24 inches of soil depth as shown in **Table M-1**.

(2) **Linear Loading**

- **Effective Length**. The effective length (L) of the mound for determining the linear loading rate shall be the entire length of sand fill at the downslope edge of the mound. The effective length of the primary and secondary (reserve) mounds may overlap for purposes of determining the linear loading rate.

- **Wastewater Flow**. The wastewater flow used for determining the linear loading rate shall be as follows:

  - 100 gpd/bedroom for residential septic systems;

  - design sewage flow rate for commercial, institutional, industrial an multi-residential septic systems.

- **Loading Rate**. Maximum linear loading rates for mound system sizing shall vary according to ground slope, percolation rate and soil depths as indicated in **Tables M-2** through **M-4**. If a variance from these criteria is proposed, it must be supported by detailed groundwater mounding analysis carried out in accordance with the guidelines contained in Section 807 of these Regulations.

9. **Dual Mound Systems**.

a. **Dual System Requirement**. Dual mound systems shall be required in the following instances:

(1) For all commercial, institutional, industrial and multi-residential septic systems.

(2) For individual residential septic systems where system sizing is reduced based upon credit for water-saving plumbing.

(3) For any system where the sand fill run-out of the upslope mound overlaps the sand fill area of the downslope mound.

b. **Intermittent Sand Filter Substitute**. For existing lots, the use of an Intermittent Sand Filter, designed in accordance with applicable provisions of these Regulations, between the septic tank and mound system may be utilized in lieu of installing a dual mound system. In such cases, a 100% replacement area for the mound system, per B.7 above of these criteria, shall still be required.

c. **Distribution Bed Placement**. Dual mound systems shall have at least two distinctly separate distribution beds. The beds may be placed within one continuous mound or in separate mounds. The distribution beds may be placed end-to-end or upslope/downslope of one another subject to meeting minimum sizing requirements for basal and linear loading rates per 8b(2) above.

d. **Distribution Bed Separation**. The minimum lateral (i.e., end-to-end) separation between distribution beds in a dual mound system shall be six feet.

e. **Effective Basal Area**. For dual mound systems the effective basal area for sizing the two systems shall not overlap.

f. **Alternate Dosing**. The distribution beds for dual mound systems shall be designed and operated to provide alternate dosing and resting of the beds, in the same manner as required for other dual leachfield systems under these Regulations.

10. **Inspection Wells**. A minimum of six inspection wells shall be installed within and around mound systems as follows:

a. One shall be located near the center of the mound, extending from the mound surface to the bottom of the gravel distribution bed.

b. One shall be located within the sand fill, extending from the mound surface to 6 inches into the native soil.

c. Four shall be located respectively midway along each of the four sides of the mound, near the toe of the slope, extending from ground surface to a depth of 5 feet.

d. Inspection wells shall be constructed of 2" to 4" diameter pipe (or equivalent), equipped with a wrench-tight cap or pipe plug and a bottom cap. All wells shall be perforated beginning at a depth of 18 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing. Inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to prevent surface infiltration.

D. CONSTRUCTION:

Construction of mound systems shall be in accordance with guidelines contained in the following references:

1. "Design and Construction Manual for Wisconsin Mounds", Small Scale Waste Management Project, University of Wisconsin, Madison, January 2000 and as amended .

2. "Onsite Wastewater Treatment Systems Manual", U.S. Environmental Protection Agency, February 2002 and as amended.

Design Plans for mound systems shall contain specific step-by-step construction guidelines and notes for use by the installer.

II. SITING AND DESIGN CRITERIA FOR STEEP SLOPE MOUND SYSTEMS

(CATEGORY 2 SYSTEM)

Set forth here are criteria for "Steep Slope Mound Systems", which are classified as a Category 2 System. This alternative system may be used only for existing lots, and not for subdivision purposes. The problems addressed, siting and design criteria, and construction requirements are identical to those for "Standard Mound Systems", with the exception of the items noted here. The specific differences are to allow for: (a) the placement of mound systems on slopes up to 20%; and, (b) the use of tiered distribution beds within the mound.

A. PROBLEMS ADDRESSED Per Standard Mound Systems.

B. SITE CRITERIA

1. **Setbacks**. Per Standard Mound Systems.

2. **Depth to Groundwater**. Per Standard Mound Systems.

3. **Soil Depth**. Minimum depth of soil over bedrock or an impermeable soil layer shall be 2 to 3 feet, depending upon ground slope, percolation rate, and linear loading rate per **Tables M-5** through **M-7**.

4. **Depth to Fractured Rock**. Per Standard Mound Systems.

5. **Percolation Rate**. Per Standard Mound Systems.

6. **Slope**. Maximum ground slope for steep slope mound systems ~~is~~ shall be as follows:

   a. for soils having a percolation rate of 1 to 60 MPI: 20%

   b. for soils having a percolation rate of 61 to 120 MPI: 6%

7. **Reserve Area**. Per Standard Mound Systems.

C. DESIGN CRITERIA

1. **Pretreatment**. Per Standard Mound Systems.

2. **Design Sewage Flow**. Per Standard Mound Systems.

3. **Pressure Dosing**. Per Standard Mound Systems.

4. **Sand Fill**. Per Standard Mound Systems.

5. **Gravel Distribution Bed**

   a. **Material**. The distribution bed shall consist of 3/8-inch washed pea gravel, free of fines.

b. **Depth**. Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping.

c. **Width**. Maximum width of the distribution bed shall be as follows:

Slope (%)	Bed Width (Feet)
0 – 12	10
13	9
14	8
15- 16	7
17- 18	6
19 – 20	5

For slopes of 12 percent or less, if a variance from these criteria is proposed it must be supported by detailed groundwater mounding analysis carried out in accordance with guidelines contained in Section 807 of these Regulations. No variance from these criteria will be considered for slopes in excess of 12 percent.

d. **Level**. The bottom of the distribution bed shall be level; and the downslope side shall be parallel to the slope contour.

e. **Tiered Beds**. (Figures 6A and 7A) Tiered distribution beds, a maximum of two, may be installed within a single continuous mound provided that:

(1) the beds are separated by a minimum of 6 feet;
(2) the space between the beds is filled with sand;
(3) maximum basal and linear loading requirements are not exceeded; and,
(4) the effective basal area for sizing the two beds shall not overlap.

Additionally, for tiered beds, the upslope horizontal sand fill extension requirement (per 4.c(1) above) shall apply only to the uppermost distribution bed; and the downslope sand fill extension requirement shall apply only to the most downslope distribution bed.

6. **Silt Barrier**. Per Standard Mound Systems.

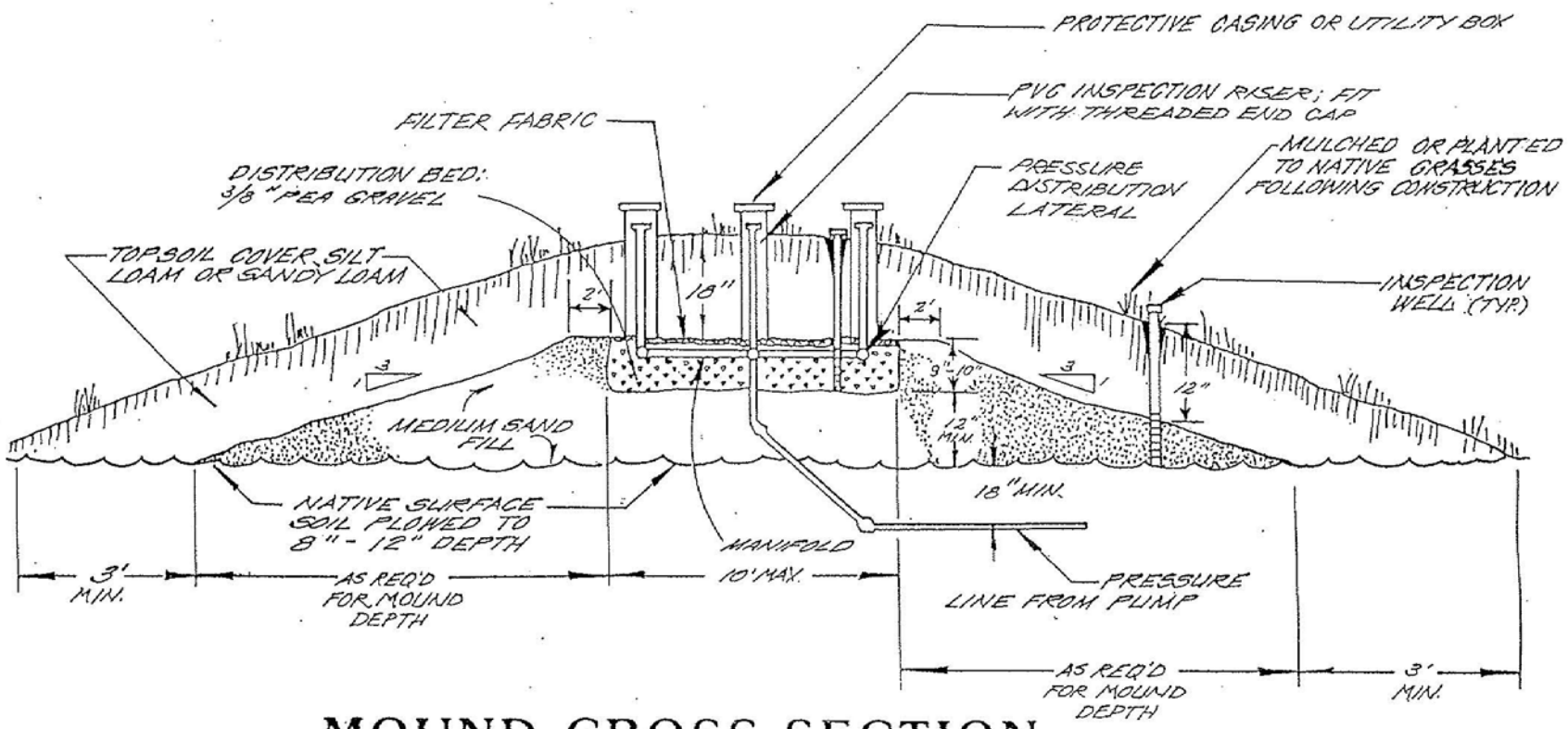
7. **Soil Cover**. Per Standard Mound Systems.

8. **Wastewater Loading Rate**. Per Standard Mound Systems, with the exception that Linear Loading Rate criteria are as provided in **Tables M-5** through **M-7**.

9. **Dual Mound Systems**. Per Standard Mound Systems.

10. **Inspection Wells**. Per Standard Mound Systems.

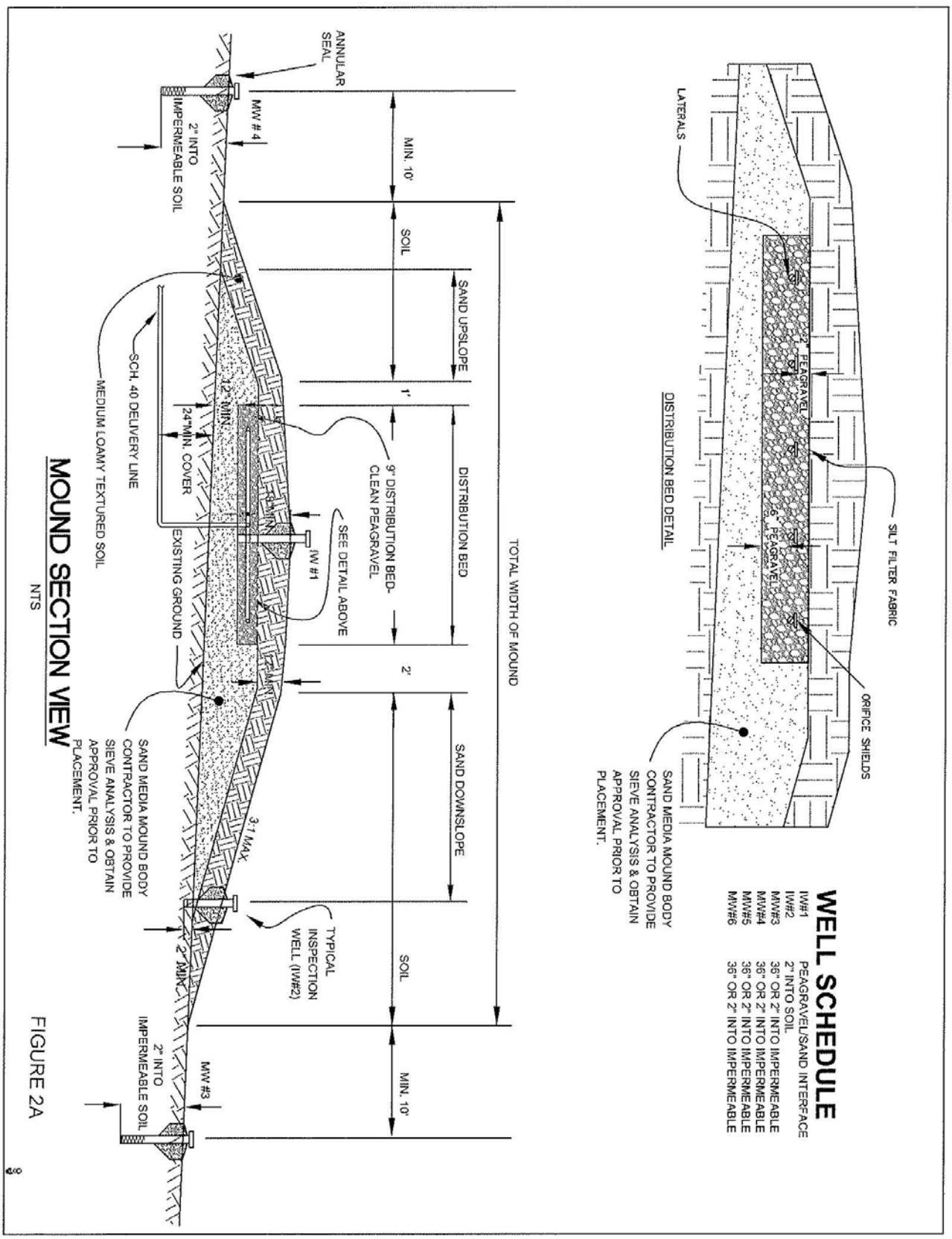
D. CONSTRUCTION Per Standard Mound Systems.



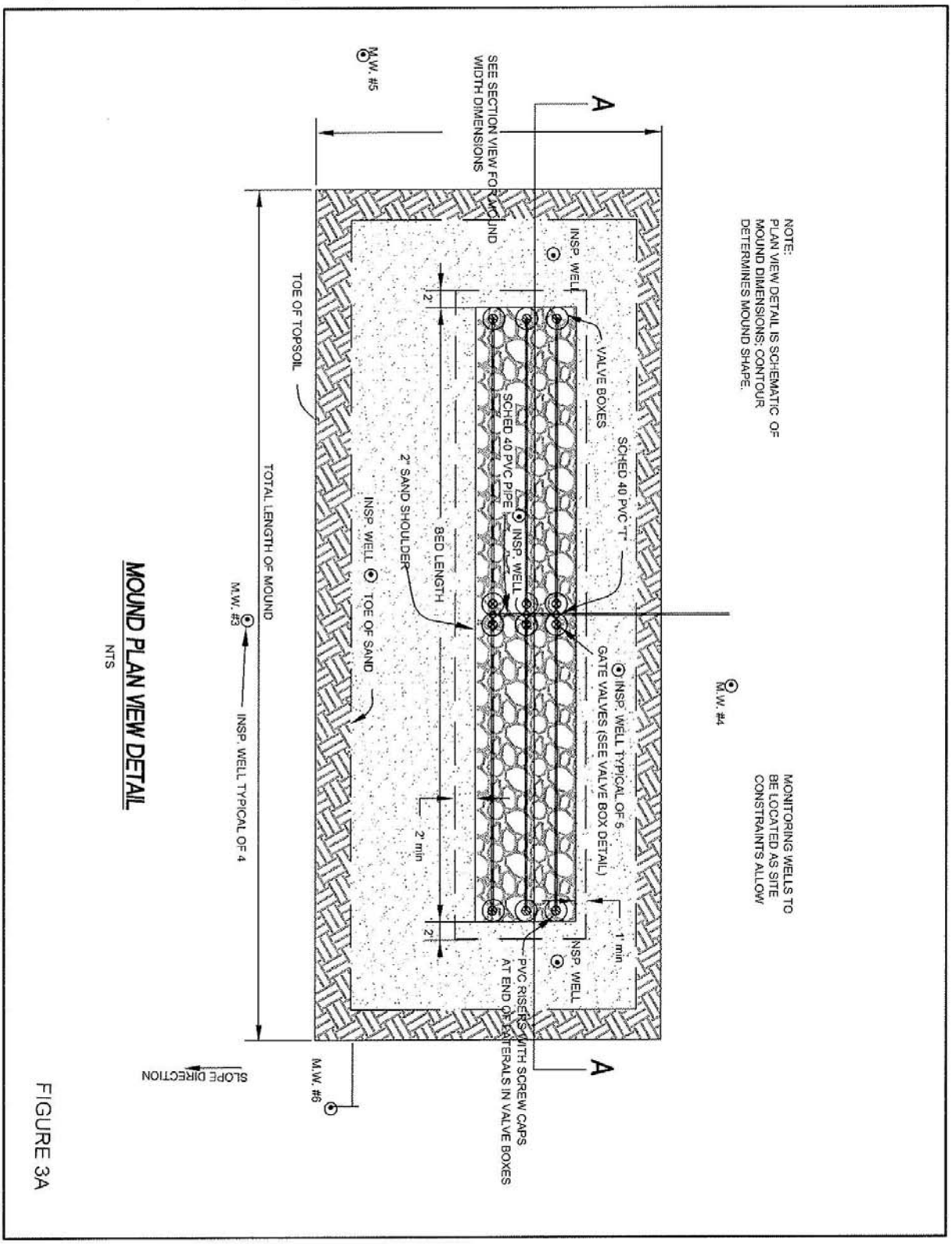
MOUND CROSS-SECTION

(LEVEL SITE)

FIGURE 1A


L:\2005-jobs\marinco\dwg\ACAD2000-mound profile1.dwg, 3/26/2007 12:51:29 PM
ANNULAR SEAL
MW # 4
2" INTO IMPERMEABLE SOIL
MIN. 10'
SOIL
SAND UPSLOPE
1'
9" DISTRIBUTION BED-CLEAN PEAGRAVEL
DISTRIBUTION BED
TOTAL WIDTH OF MOUND
SEE DETAIL ABOVE
IW #1
2'
SAND DOWNSLOPE
SOIL
MIN. 10'
MW #3
2" INTO IMPERMEABLE SOIL
TYPICAL INSPECTION WELL (IW#2)
SAND MEDIA MOUND BODY CONTRACTOR TO PROVIDE SIEVE ANALYSIS & OBTAIN APPROVAL PRIOR TO PLACEMENT.
3:1 MAX.
2' MIN.
12" MIN.
24" MIN. COVER
SCH. 40 DELIVERY LINE
MEDIUM LOAMY TEXTURED SOIL
EXISTING GROUND
MOUND SECTION VIEW
NTS
FIGURE 2A
LATERALS
2" PEAGRAVEL
5.6 PEAGRAVEL
SILT FILTER FABRIC
ORIFICE SHIELDS
DISTRIBUTION BED DETAIL
SAND MEDIA MOUND BODY CONTRACTOR TO PROVIDE SIEVE ANALYSIS & OBTAIN APPROVAL PRIOR TO PLACEMENT.
WELL SCHEDULE
IW#1 PEAGRAVEL/SAND INTERFACE
IW#2 2" INTO SOIL
MW#3 36" OR 2" INTO IMPERMEABLE
MW#4 36" OR 2" INTO IMPERMEABLE
MW#5 36" OR 2" INTO IMPERMEABLE
MW#6 36" OR 2" INTO IMPERMEABLE

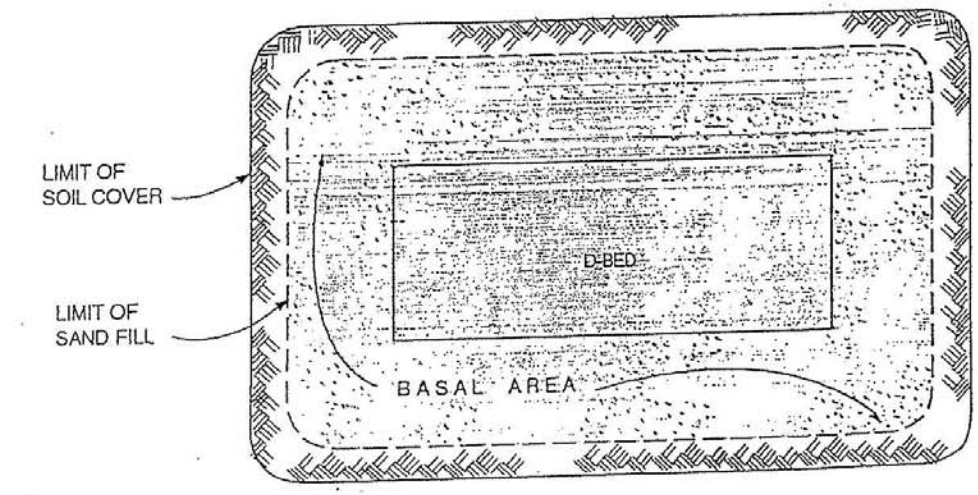
L:\2005-jobs\marinco\dwg\ACAD2000-mound planT.dwg, 3/26/2007 10:52:23 AM



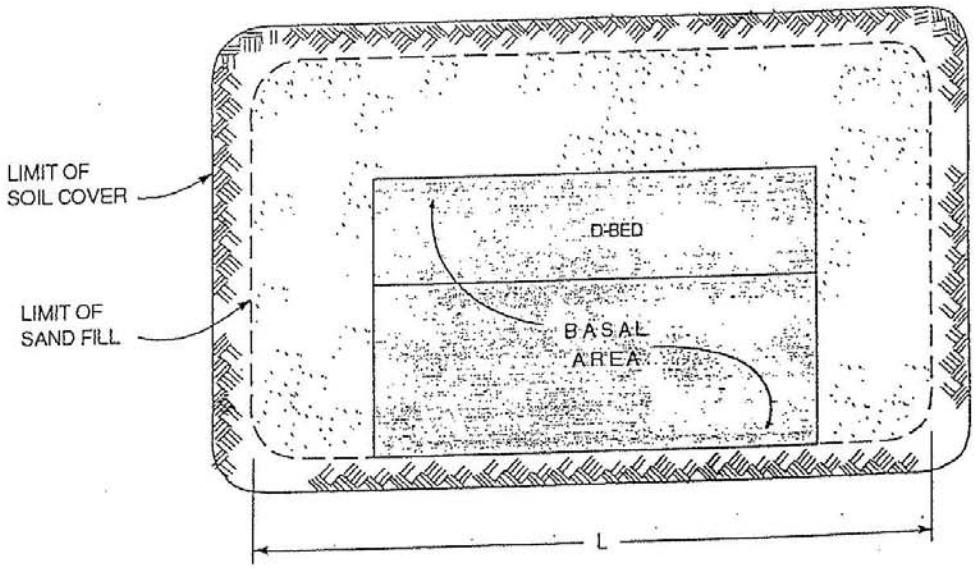
MOUND PLAN VIEW DETAIL

NTS

FIGURE 3A



LEVEL SITE

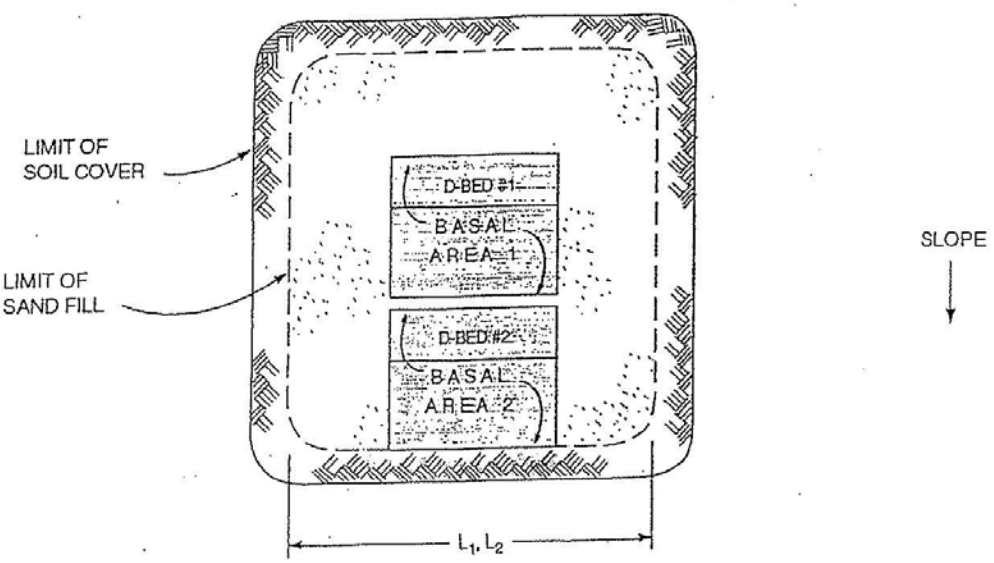


SLOPING SITE

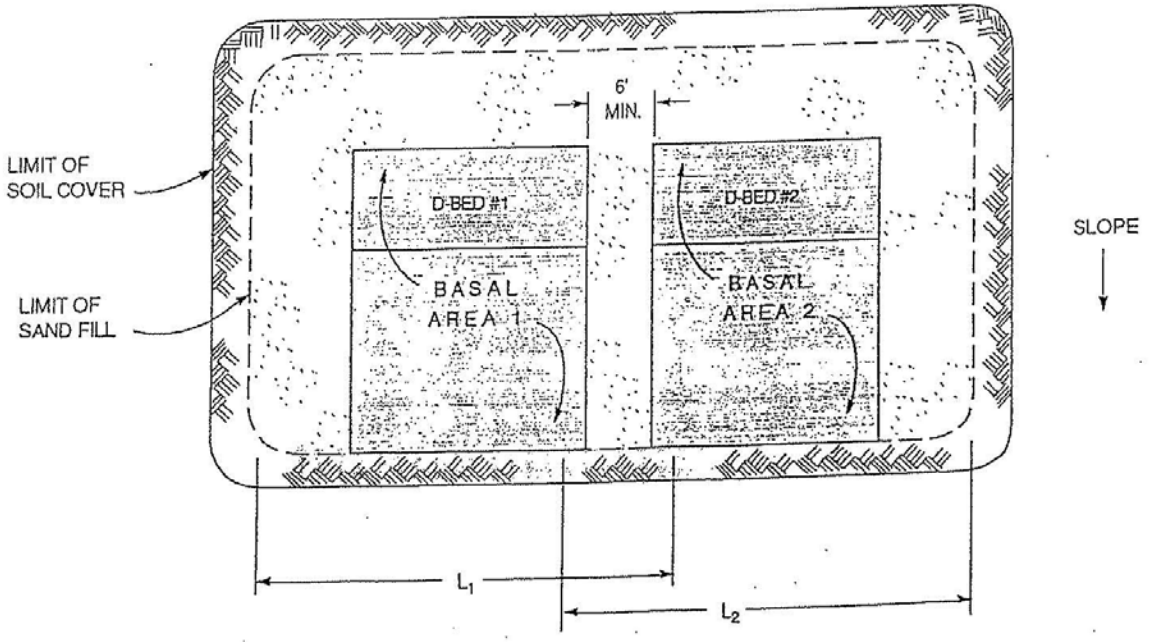
SINGLE MOUND

FIGURE 4A

BASAL AREA AND LINEAR LOADING CRITERIA



UPSLOPE-DOWNSLOPE MOUNDS

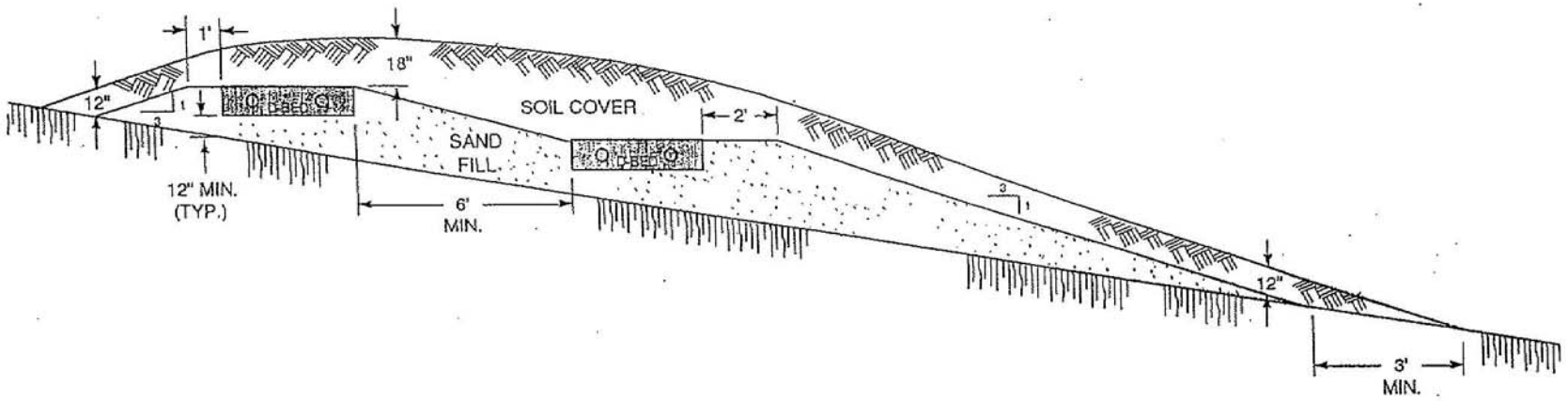


SIDE-BY-SIDE MOUNDS

DUAL MOUND

FIGURE 5A

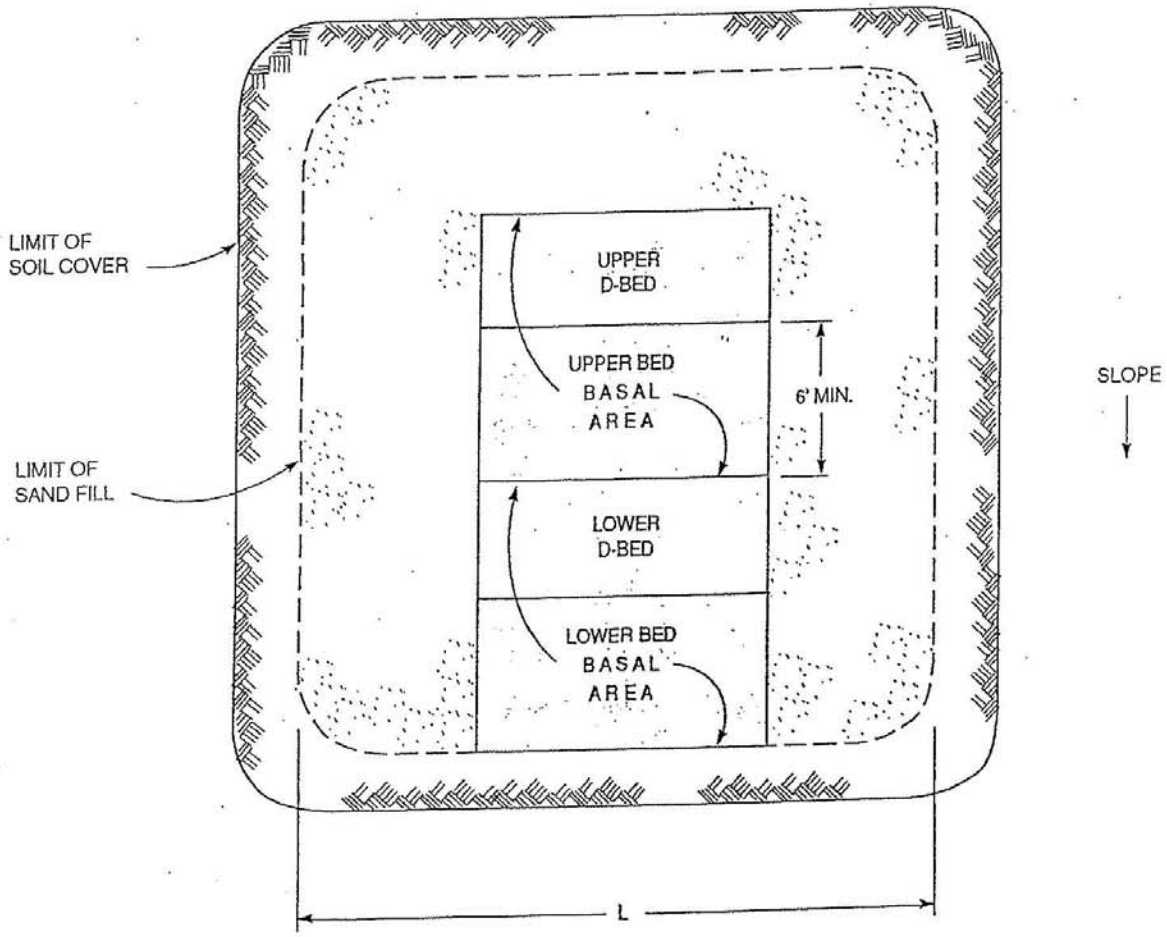
BASAL AREA AND LINEAR LOADING CRITERIA



TIERED BEDS

CROSS-SECTION

FIGURE 6A



TIERED BEDS

BASAL AREA AND LINEAR LOADING CRITERIA

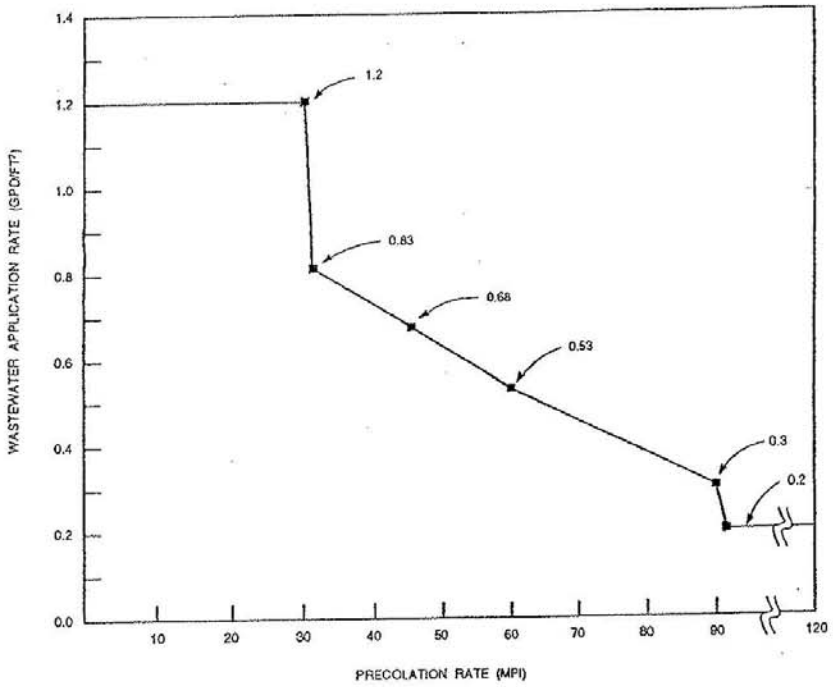
FIGURE 7A

TABLE M-1

WASTEWATER LOADING RATES FOR MOUND BASAL AREAS

PERCOLATION RATE (MPI)	WASTEWATER LOADING RATE (GPD/FT^2)
1 to 30	1.2
31 to 90	1.5 x STE*
91 to 120	0.2

* STE = Standard wastewater loading rate for septic tank effluent per Section 603B.



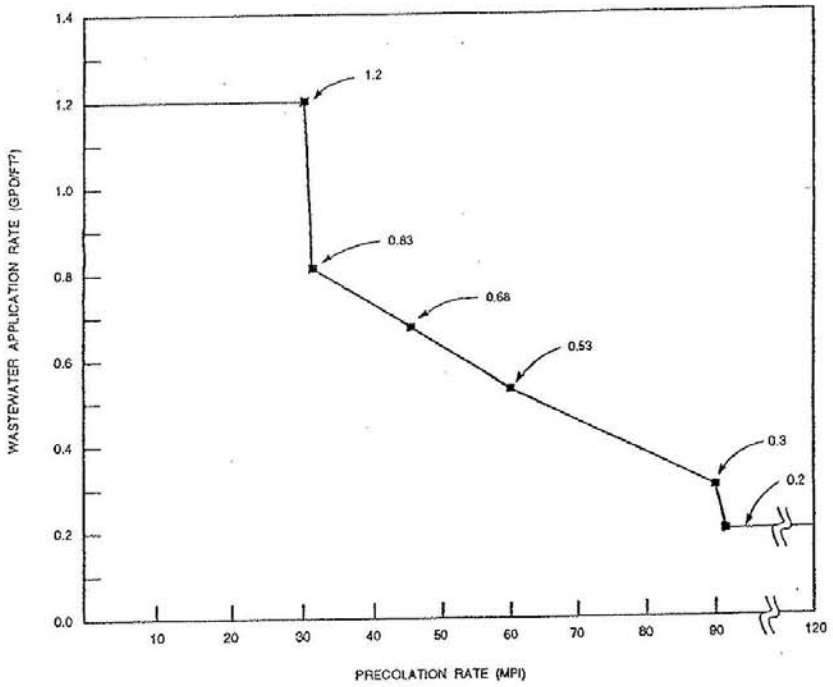
WASTEWATER APPLICATION RATES FOR PDST SYSTEMS

TABLE M-1

WASTEWATER LOADING RATES FOR MOUND BASAL AREAS

PERCOLATION RATE (MPI)	WASTEWATER LOADING RATE (GPD/FT^2)
1 to 30	1.2
31 to 90	1.5 x STE*
91 to 120	0.2

* STE = Standard wastewater loading rate for septic tank effluent per Section 603B.



WASTEWATER APPLICATION RATES FOR PDST SYSTEMS

TABLE M-2

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = 2.0 TO 2.5'

(STANDARD MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)					
	0 - 2%	3 - 5%	6%	7 - 8%	9 - 10%	11 - 12%
1 to 5	NA	9	10	11	12	12
6 to 10	NA	8	9	10	11	12
11 to 20	NA	7	8	9	10	11
21 to 30	NA	6	7	8	9	10
31 to 40	NA	5	6	7	8	9
41 to 50	NA	4	5	6	7	8
51 to 60	NA	3	4	5	6	7
61 to 90	NA	3	3	NP	NP	NP
91 to 120	NA	3	3	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

TABLE M-3

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = 2.5 TO 3.0'

(STANDARD MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)					
	0 - 2%	3 - 5%	6%	7 - 8%	9 - 10%	11 - 12%
1 to 5	NA	10	11	12	12	12
6 to 10	NA	9	10	11	12	12
11 to 20	NA	8	9	10	11	12
21 to 30	NA	7	8	9	10	11
31 to 40	NA	6	7	8	9	10
41 to 50	NA	5	6	7	8	9
51 to 60	NA	4	5	6	7	8
61 to 90	NA	NA	NA	NP	NP	NP
91 to 120	NA	NA	NA	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

TABLE M-4

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = > 3'

(STANDARD MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)					
	0 - 2%	3 - 5%	6%	7 - 8%	9 - 10%	11 - 12%
1 to 5	NA	11	12	12	12	12
6 to 10	NA	10	11	12	12	12
11 to 20	NA	9	10	11	12	12
21 to 30	NA	8	9	10	11	12
31 to 40	NA	7	8	9	10	11
41 to 50	NA	6	7	8	9	10
51 to 60	NA	5	6	7	8	9
61 to 90	NA	NA	NA	NP	NP	NP
91 to 120	NA	NA	NA	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

T A B L E M - 5

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = 2.0 TO 2.5'

(STEEP SLOPE MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)									
	0 - 2%	3 - 5%	6%	7-8%	9-10%	11-12%	13-14%	15-16%	17-18%	18-20%
1 to 5	NA	9	10	11	12	12	12	12	12	12
6 to 10	NA	8	9	10	11	12	12	12	12	12
11 to 20	NA	7	8	9	10	11	12	12	12	12
21 to 30	NA	6	7	8	9	10	11	12	12	12
31 to 40	NA	5	6	7	8	9	10	11	12	12
41 to 50	NA	4	5	6	7	8	9	10	11	12
51 to 60	NA	3	4	5	6	7	8	9	10	11
61 to 90	NA	3	3	NP	NP	NP	NP	NP	NP	NP
91 to 120	NA	3	3	NP	NP	NP	NP	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

T A B L E M - 6

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = 2.5 TO 3.0'

(STEEP SLOPE MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)									
	0 - 2%	3 - 5%	6%	7-8%	9-10%	11-12%	14%	16%	18%	20%
1 to 5	NA	10	11	12	12	12	12	12	12	12
6 to 10	NA	9	10	11	12	12	12	12	12	12
11 to 20	NA	8	9	10	11	12	12	12	12	12
21 to 30	NA	7	8	9	10	11	12	12	12	12
31 to 40	NA	6	7	8	9	10	11	12	12	12
41 to 50	NA	5	6	7	8	9	10	11	12	12
51 to 60	NA	4	5	6	7	8	9	10	11	12
61 to 90	NA	NA	NA	NP	NP	NP	NP	NP	NP	NP
91 to 120	NA	NA	NA	NP	NP	NP	NP	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

T A B L E M - 7

MAXIMUM MOUND LINEAR LOADING RATE (GPD/L.F.)

FOR

SOIL DEPTH = > 3'

(STEEP SLOPE MOUND SYSTEMS)

PERCOLATION RATE (MPI)	GROUND SLOPE (%)									
	0 - 2%	3 - 5%	6%	7-8%	9-10%	11-12%	13-14%	15-16%	17-18%	19-20%
1 to 5	NA	11	12	12	12	12	12	12	12	12
6 to 10	NA	10	11	12	12	12	12	12	12	12
11 to 20	NA	9	10	11	12	12	12	12	12	12
21 to 30	NA	8	9	10	11	12	12	12	12	12
31 to 40	NA	7	8	9	10	11	12	12	12	12
41 to 50	NA	6	7	8	9	10	11	12	12	12
51 to 60	NA	5	6	7	8	9	10	11	12	12
61 to 90	NA	NA	NA	NP	NP	NP	NP	NP	NP	NP
91 to 120	NA	NA	NA	NP	NP	NP	NP	NP	NP	NP

NA = Not Applicable; system design based on basal area sizing
NP = Not Permitted

III. SITING AND DESIGN CRITERIA

FOR

PRESSURE-DOSED SAND TRENCHES (PDST)

(CATEGORY 2 SYSTEM)

A. PROBLEMS ADDRESSED

1. Rapid percolation; and,
2. Groundwater separation.

B. SITING CRITERIA

All siting criteria for standard septic tank-leachfield systems apply for the use of PDST systems, with the following exceptions:

1. **Percolation Rates**. PDST systems may be used in soils having percolation rates of 1 to 120 MPI.

2. **Soil Depth**. Minimum depth of soil (below sand) for PDST systems shall be 2 feet.

3. **Depth to Groundwater and Well Setback Distances**. For PDST systems, the minimum depth to the anticipated highest seasonal level of groundwater below the bottom of the trench and corresponding well setback distances shall be as shown in **Table PDST-1**.

4. **Soil Characteristics**. PDST systems shall be permissible in areas having soil conditions that are normally suitable for standard leachfields under these Regulations.

C. DESIGN CRITERIA

1. **Pretreatment**. PDST systems may receive either primary (septic tank) or secondary effluent, treated in accordance with applicable Marin County Regulations, respectively, for septic tanks and Intermittent Sand Filters, or other approved supplemental treatment units that are allowed under these Regulations.

2. **Dual System Required**. All PDST systems shall be installed as dual systems, with each half sized to accommodate 100-percent of the design wastewater flow.

3. **Trench Width**. Trench width shall be a minimum of 12 inches and a maximum of 36 inches. Trench widths in excess of 36 inches are considered to constitute absorption beds and may be permissible for soils having percolation rates of 30 MPI or faster and if the design proposal is supported by an appropriate analysis of potential groundwater mounding effects and suitable construction specifications for absorption beds. Trench widths in excess of 36 inches shall require more than one distribution lateral per C8e.

4. **Trench Spacing**. Minimum spacing between trench sidewalls shall be 6 feet, plus an additional one (1) foot for each 5% drainfield area slope over 20%. Greater trench spacing may be required for systems with trench widths in excess of 36 inches, as determined by groundwater monitoring analysis per C3 above.

5. **Required Trench Application Area**. The required ("effective") application area for system sizing shall be the trench bottom area or the drain rock-sand interface, whichever is more restrictive.

6. **Wastewater Loading Rates**. Maximum wastewater loading rates for system sizing shall be as follows, whichever is more restrictive:

   a. **Drain Rock - Sand Interface**

      (1) 1.2 gpd/ft^2 for individual residential septic systems.

      (2) 1.0 gpd/ft^2 for commercial, industrial, institutional and multi-residential septic systems.

      Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the PDST may be required for high strength waste flows, such as from restaurants.

   b. **Sand - Soil Interface**. The wastewater loading rate at the sand-soil interface (considering bottom area only) shall be according to percolation rate as shown **Table PDST-2**. These rates apply for PDST systems receiving septic tank effluent. For PDST systems receiving sand filter effluent, the loading rate shall be as specified in **Table SF-1** for Intermittent Sand Filters.

7. **Drainrock**

   a. **Material**. The distribution bed shall consist of 3/8-inch washed pea gravel, free of fines.

   b. **Depth of Rock.** Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping.

8. **Pressure Distribution System**. PDST systems require the use of a pressure distribution system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

   a. Uniform dosing of effluent per lineal foot of leaching trench;

   b. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

   c. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

   d. Dosing volume to achieve 3 to 5 doses per day at design flow conditions; and,

   e. At least one distribution lateral for every 36 inches of trench width.

   f. A purge valve assembly will need to be provided at the end of each trench for flushing \ pressure lateral.

9. **Sand Fill**.

a. **Sand Specifications**. The sand media shall be a medium to coarse sand that meets the following gradation specifications:

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

b. **Depth of Sand**. The minimum depth of sand below the drain rock shall be as follows:

(1) For septic tank effluent: 12"

(2) For supplementally treated effluent: 6"

For PDST systems receiving septic tank effluent, the depth of sand fill shall be increased to 24 inches where deemed necessary by the Health Officer for protection of public health, including sites where all of the following conditions exist:

- Percolation rates are faster than 10 MPI;
- Groundwater immediately beneath the system is hydraulically connected to a aquifer; and,
- Groundwater in the immediate project area is an existing or potential domestic source.

10. **Silt Barrier**. The gravel and distribution piping shall be covered (over the top) in its entirety with textile ("filter fabric") silt barrier. Filter fabric shall be either polyester, nylon or polypropylene, or combination thereof, and shall be suitable for underdrain applications. Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable.

11. **Soil Cover**. The minimum required soil cover (i.e., trench backfill) above the drain rock shall be based upon ground slope and percolation rate as shown in **Table PDST-3**.

12. **Fill**. PDST systems may be installed in conjunction with fill (to meet trench backfill requirements)

installed in accordance with Section 604A of these Regulations, with the following additional provisions:

- PDST systems with fill may be used on slopes up to 20 percent where the percolation rate is 60 MPI or faster;
- PDST systems with fill may be used where the percolation rate is between 60 and 120 MPI on slopes up to a maximum of 12½ percent.

13. **Inspection Wells**. Two inspection wells shall be installed in each individual trench section as follows:

- One inspection well shall extend from finished grade to the pea gravel –sand interface. It shall be perforated in the pea gravel zone only.

- One inspection well shall extend from finished grade to the sand-soil interface. It shall be perforated in the sand zone only.

Inspection wells shall be 2" to 4" diameter plastic pipe and fitted with a wrench-tight cap or pipe plug and a bottom cap. Perforations shall consist of hacksaw slots at nominal 1" spacing. Inspection wells shall be sealed against surface infiltration with a bentonite or concrete annular seal through the soil backfill zone.

The Health Officer may require the installation of additional inspection wells in areas up gradient, between or downgradient of disposal trenches for the purpose of monitoring groundwater levels or for water quality sampling. The location and depth of such additional inspection wells shall be determined on a case-by-case basis, and shall be specified in the permit.

14. **Inspection Wells.** A minimum of six inspection wells shall be installed to the depth of two feet below design trench depth as follows:

a. One shall be located in each drainfield.

b. One shall be located approximately 10’ upgradient from each drainfield.

c. One shall be located approximately 20- 25’ downgradient from each drainfield.

TABLE PDST – 1

SITING CRITERIA FOR PDST SYSTEMS

PERCOLATION RATE * (MPI)	PERCENT FINES** (SILT + CLAY)	MINIMUM DEPTH TO SEASONALLY HIGH GROUNDWATER (FT)	WELL SETBACK (FT)
Slower than 5	N/A	2	100
1 to 5	> 15	2	100
1 to 5	10 to 15	5	100
1 to 5	> 10	10	100

* Percolation rate of soils at the proposed trench bottom depth or within two feet below trench bottom.

** Percent by weight for the soil fraction, exclusive of coarse fragments larger than 2mm in size; applies to soil from either within the trench zone or within the two fee of soil below the trench bottom.

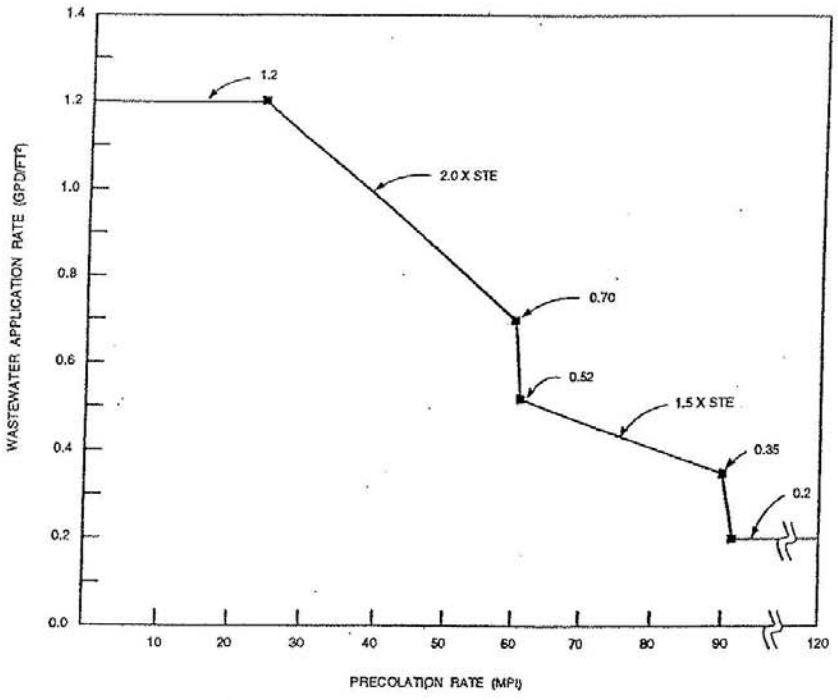
TABLE PDST – 2

WASTEWATER APPLICATION RATES FOR PDST SYSTEMS

PERCOLATION RATE (MPI)[1]	WASTEWATER LOADING RATE (GPD/FT ^{2})
1 to 5	1.2
6 to 24	1.2
25 to 60	2.0 x STE[2]
61 to 90	1.5 x STE[2]
91 to 120	0.2

[1] Percolation rates of soils at the proposed trench bottom depth or within two fee below trench bottom.

[2] STE – Standard wastewater loading rate for septic tank effluent per Section 603 of these regulations.

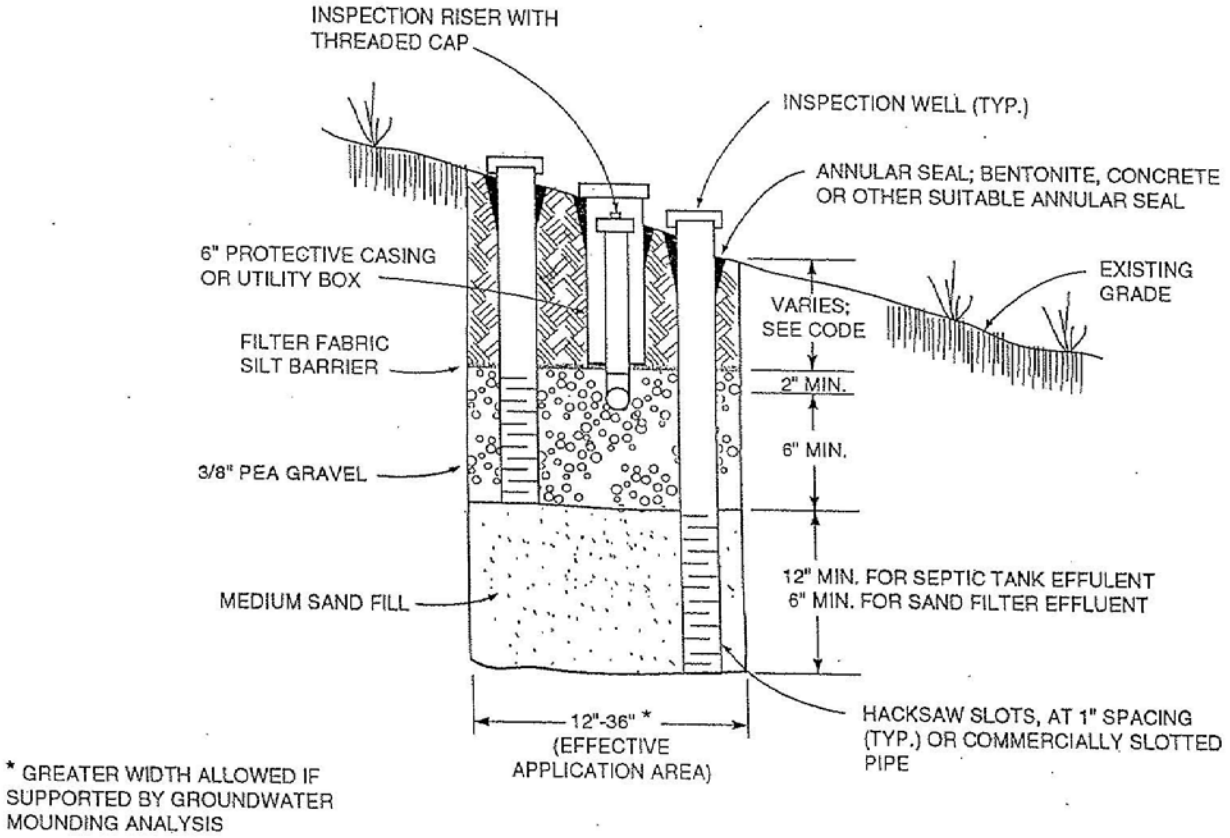


WASTEWATER APPLICATION RATES FOR PDST SYSTEMS

TABLE PDST – 3

SOIL COVER REQUIREMENTS FOR PDST SYSTEMS

GROUND SLOPE (%)	DEPTH OF BACKFILL (inches)	
	1 – 30 MPI	31 – 120 MPI
0 – 20	12	12
21 – 30	15	18
31 – 40	18	24
> 40	24	30



CROSS-SECTION

PRESSURE-DOSED SAND TRENCH

FIGURE 8A

IV. SITING AND DESIGN CRITERIA

FOR

SUBSURFACE DRIP DISPERSAL (CATEGORY 2 SYSTEM)

Drip Dispersal: A method of underground wastewater dispersal capable of delivering small precise volumes of wastewater effluent to the infiltration surface through flexible polyethylene tubing with in-line emitters. Prior to dispersal the effluent shall be pretreated by a supplemental treatment system. (e.g. textile filter, intermittent sandfilter, or recirculatng sand filter)

This alternative means of dispersing secondary treated effluent shall be used only for existing legal lots of record, and not for the purpose of subdividing land.

A. PROBLEMS ADDRESSED

1. High groundwater;
2. Shallow soil over fractured rock or coarse alluvium;
3. Shallow soil over impermeable soil or bedrock;
4. Steep slopes;
5. Slow percolation at standard leachfield depths;
6. Rapid percolation at standard leachfield depths; and
7. Required tree preservation;
8. Water shortage

B. SITE CRITERIA

1. **Horizontal Setbacks** for subsurface drip dispersal systems shall be the same as for standard drainfield systems. The setback requirements are contained in Section 400 of these Regulations.

2. **Vertical Setbacks:**
    a. **Depth to Groundwater**. Minimum depth to seasonal high groundwater shall be 2 feet below design dripline depth.
    b. **Soil Depth**. Minimum depth to bedrock or an impermeable soil layer shall be 2 feet below design dripline depth.
    c. **Depth to Fractured Rock**. Minimum depth of soil over fractured, permeable bedrock shall be 2 feet below design dripline depth.

3. **Percolation Rate**. Percolation rates for subsurface drip dispersal systems shall be within the range of 1 to 120 minutes per inch (MPI), as determined by testing at depths of 12” to 24”, with a minimum of three (3) tests conducted at a depth of 24”. Percolation rates shall be determined in accordance with testing procedures outlined in Sections 503.

C. DESIGN CRITERIA

1. **Effluent Quality**: Subsurface drip dispersal systems shall be preceded by:

    a. A septic tank sized for the projected system sewage flow in accordance with Section 602 of these Regulations.
    b. A means of providing supplemental treatment of effluent
    c. A filtering device capable of filtering particles larger than 100 microns.

A means of providing supplemental disinfection shall be required by the Health Officer in cases where vertical separation to groundwater, fractured bedrock, or an impervious layer is less than 2 feet.

2. **Design Sewage Flow**: Subsurface drip dispersal system shall be designed on the basis of the estimated sewage flow, determined in accordance with Section 601 of these Regulations, including water conservation design reductions of up to 30-percent reduction in the design sewage flow.

3. **Wastewater Loading Rate:** Dripfields shall be sized according to the minimum absorption area calculated from the following table on the basis of observed percolation rates and the design sewage flow.

1-10 MPI:	0.8 g/ft^2/day
10-24 MPI:	0.6 g/ft^2/day
24-52 MPI:	0.4 g/ft^2/day
52-60 MPI:	0.3 g/ft^2/day
60-120 MPI:	0.1 g/ft^2/day

4. **Pressure Dosing**: Secondary-treated effluent shall be delivered to the dripfield by pressure, employing a pump system and timed dosing. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

   a. Uniform dosing of treated effluent;
   b. An adequate dosing volume to pressurize each zone.
   c. Adequate flow rate, a final filtering of effluent and suitable piping network to preclude solids accumulation in the pipes and driplines or clogging of discharge emitters;
   d. A means of automatically flushing the filter and driplines at regular intervals.
   e. Suitable access provisions for inspection, testing and adjustment of the pressure distribution system and all dripfield components.

5**.** **Dripline material:** Dripline shall be manufactured for primary and/or secondary wastewater quality with minimum 45 mil tubing wall thickness, bacterial growth inhibitors, and means of protection against root intrusion.

6. **Dripfield Layout:** To the extent practical, the bottom of the dripline trenches shall be level and parallel to the slope contour.

7**.** **Dripline Depth**: The dripline depth shall be installed at a depth between **eight** inches and twelve inches below existing grade.

8. **Length of individual driplines**: The maximum dripline length shall be designed in accordance with accepted engineering practices and shall not exceed the manufacturer's maximum lengths allowed for the design pressure.

9. **Line and Emitter Spacing:** Line and emitter spacing shall be designed as appropriate for soil conditions, slope, and contour. Emitters shall be located no less than 12" from the supply and return manifolds. Dripfield area shall be increased proportionately for dripline spacing greater than 24".

10. **Dual Subsurface Drip Dispersal Systems**:

    a. Dual (200%) subsurface drip dispersal systems shall be installed.

    b. Doses shall be automatically distributed to each zone in both the primary and reserve areas, or all zones may be dosed simultaneously with the ability to manually isolate any zone. Contingency plans for the latter design shall include alternate control panel programming.

11. **Inspection Wells**. A minimum of six to eight inspection wells at depths of 24” to 36” shall be installed for the purpose of monitoring groundwater levels or for water quality sampling within and around subsurface drip dispersal systems as follows:

    a. One or two wells shall be located in each dripfield.

    b. One well shall be located fifteen (15) feet up gradient of each dripfield.

    c. One well shall be located twenty (20) feet downgradient of each dripfield.

    d. Inspection wells shall be constructed of 4" diameter pipe (or equivalent), equipped with a wrench-tight cap. All wells shall be perforated beginning at a depth of 12 inches below grade and extending to the bottom of the pipe. Perforations shall consist of hacksaw slots at nominal 1" spacing. Inspection wells shall be sealed with a bentonite or concrete annular seal (or equivalent) to prevent surface infiltration.

    e. All exposed pipe must be ABS or inspection wells may terminate in a valve box.

12. **Designs for subsurface drip dispersal systems shall include:**

    a. All relevant elevation data and hydraulic calculations.

    b. Specific step-by-step construction guidelines and notes for use by the installer.

13. **Designs for subsurface drip dispersal systems shall specify:**

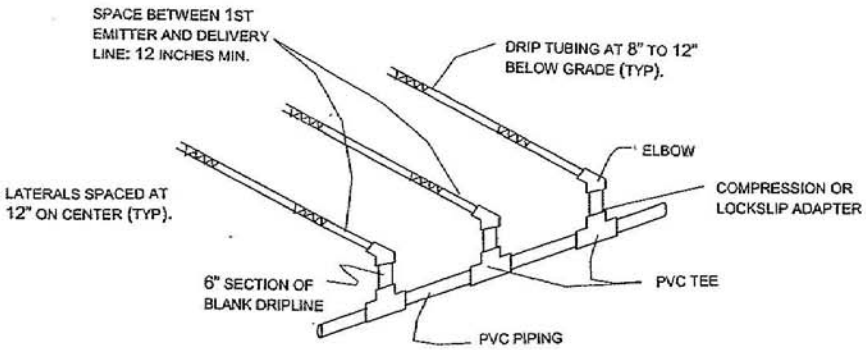
    a. Recommended make and model of all components;

    b. Recommended tank and sump with cut-sheet depicting float settings;

    c. Control panel programming;

    d. An inspection schedule listing critical control points.

14. Specifications given in these rules for subsurface drip dispersal systems are minimal and may not be sufficient for all applications. Other design information beyond the scope of these rules may be required to properly design subsurface drip dispersal systems.



TYPICAL HEADER CONNECTION

FIGURE 9A

V. SITING AND DESIGN CRITERIA FOR

INTERMITTENT SAND FILTER SYSTEMS

(CATEGORY 3 SYSTEM)

AND RECIRCULATING SAND FILTERS (CATEGORY 2 SYSTEM)

A. PROBLEMS ADDRESSED

Intermittent Sand Filters:

1. Rapid percolation;
2. Groundwater separation; and,
3. Stream setbacks.

Recirculating Sand Filters:

1. Rapid percolation;
2. Groundwater separation;
3. Stream setbacks; and,
4. Nitrogen Removal

B. SITING CRITERIA

1. **Sand Filter Treatment Unit**. All siting criteria for septic tanks apply equally to intermittent and recirculating sand filters and associated pumping equipment.

2. **Leachfield Systems**. Leachfield systems receiving sand filter effluent are subject to all siting, design and construction criteria for standard septic tank-leachfield systems except as modified by the minimum requirements shown in **Table SF-1** pertaining to: (a) percolation rate; (b) wastewater application rates; (c) depth to groundwater; and, (d) well and stream setbacks. Additionally, sand filter effluent may be applied to Pressure-Dosed Sand Trench (PDST) leachfield systems or to Mound systems, subject to the siting, design, monitoring wells, and construction criteria specified in these Regulations for PDST and Mound systems.

C. DESIGN CRITERIA

1. **Sand Filter Treatment Unit**.

   a. **Pretreatment**. Sand filter treatment units shall be preceded by a septic tank, sized for the projected system sewage flow in accordance with Section 602 of these Regulations.

   b. **Pressure Dosing**. Septic tank effluent shall be applied to the sand filter treatment unit by pressure dosing, utilizing either an automatic dosing siphon (intermittent filter only) or pump

   system. The pressure distribution system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

      (1) Relatively uniform dosing of septic tank effluent over the surface application area

      of sand filter;

(2) Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

(3) Suitable access provisions for inspection, testing and adjustment of the pressure distribution system;

(4) Dosing volume as follows:

(a) Intermittent Filters: Dosing volume to achieve a minimum of 3 to 5 doses per day at design flow conditions; and,

(b) Recirculating Filters: Timed dosing to achieve a recirculation rate of approximately 5:1 at design flow conditions.

(5) At least one distribution lateral for every 36 inches of bed width.

c. **Wastewater Loading Rate**. The wastewater loading rate used for sizing the surface area of the sand filter shall be as follows:

(1) Intermittent Sand Filters:

(a) 1.2 gpd/ft^2 for individual residential septic systems

(b) 1.0 gpd/ft^2 for all commercial, industrial, institutional, and multi-residential septic systems.

(2) Recirculating Sand Filters:

(a) Maximum of 5.0 gpd/ft^2 for individual residential wastewater systems.

(b) Maximum of 4.0 gpd/ft^2 for all commercial, industrial, institutional, and multi-residential septic systems.

Reduction in the above wastewater loading rates or other provisions to insure the long-term integrity and performance of the sand filter may be required for high strength waste flows, such as those from restaurants.

d. **Containment Liner**. The sand filter shall be provided with an impermeable containment liner to prevent leakage out of or into the filter. The liner shall consist of either: (a) 30 mil plastic; or (b) reinforced, poured-in-placed concrete or (c) an equivalent impermeable structure.

e. **Finished Grade**. The finished grade of the sand filter shall be at or above the surrounding ground elevation. Above-ground installation shall be structurally supported with retaining wall(s), as required.

f. **Shape**. The sand filter shall not be restricted as to its shape in plan view.

g. **Multiple Units**. The sand filter may be divided into compartments or multiple units.

h. **Sand Filter Media**

(1) **Sand Specification**. The sand media shall be a medium to coarse sand that meets the following gradation specifications:

Intermittent Sand Filter

Sieve Size	Percent Passing
3/8	100
#4	90 – 100
#10	62 – 100
#16	45 – 82
#30	25 – 55
#50	5 – 20
#60	0 – 10
#100	0 – 4
#200	0 – 2

Recirculating Sand Filter

- Effective size of sand/gravel: approximately 2.0 mm;
- Uniformity coefficient of less than 2.5;
- Clean, washed and free of fines

(2) **Sand Depth**. The minimum sand depth below the gravel distribution bed shall be 24 inches.

i. **Gravel Distribution Bed**

(1) **Material**. The distribution bed shall consist of 3/8-inch washed pea gravel, free of fines.

(2) **Depth**. Pea gravel shall extend a minimum of 6 inches below the invert and 2 inches above the top of the distribution piping. If the distribution piping is installed with chambers, the pea gravel depth below the distribution pipe may be reduced from 6 inches to 4 inches, and the 2-inch pea gravel cover may be eliminated.

j. **Silt Barrier**. For an intermittent sand filter, the gravel distribution bed shall be covered in its entirety with a geotextile ("filter fabric") silt barrier. Filter fabric shall be either polyester, nylon or polypropylene, or any combination thereof, and shall be suitable for underdrain applications.

Filter fabric shall be non-woven, shall not act as a wicking agent and shall be permeable. Recirculating sand filters do not require a silt barrier.

k. **Cover**.

(1) **Intermittent Sand Filters:**

(a) **Material**. A soil cover shall be placed over the distribution bed, consisting of a medium, loamy-textured soil.

(b) **Depth**. Soil cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed. Soil cover shall be crowned or sloped to promote rainfall runoff.

(2) **Recirculating Sand Filters:**

(a) **Material**. Material. A granular media cover shall be placed over the distribution bed, consisting of clean gravel that may range in size from 3/8-inch pea gravel to 2 1/2 –inch rounded rock.

(b) **Depth**. Cover depth shall be a minimum of 12 inches and a maximum of 18 inches over the top of the distribution bed.

l. **Underdrain**

(1) **Material**. The underdrain beneath the sand media shall consist of 3/8" washed pea gravel with 3 or 4-inch diameter perforated drain pipe; perforations in the drain pipe shall be no greater than 1/8" in width or diameter.

(2) **Depth**. The pea gravel underdrain shall have a minimum depth of 9 inches.

(3) **Grade**. The underdrain shall be constructed and the drain pipe laid with a minimum grade of 1% toward the outlet point.

(4) **Watertight Outlet "Boot"**. The sand filter underdrain shall be equipped with watertight outlet "boot" for connection of piping to the leachfield or the leachfield dosing chamber. Testing of the "boot" for watertightness shall be required during construction (Note: Intermittent sand filters equipped with an internal pump system shall not require the installation of an outlet boot.

m. **Clean-out Riser**. For clean-out and inspection purposes the upslope end of the perforated drain pipe in the underdrain shall be equipped with a vertical riser constructed of non-perforated pipe of equal diameter. The riser shall extend to finished grade of the sand filter.

n. **Inspection Wells**. An inspection well shall be installed in the gravel distribution bed of each sand filter compartment. The inspection well shall extend from finished grade to the pea gravel-sand interface and shall be perforated in the pea gravel zone only. Inspection wells shall be 2" to 4" diameter plastic pipe and fitted with a wrench-tight cap

or pipe plug. Perforations shall consist of hacksaw slots at nominal 1" spacing **or** commercially slotted pipe may be used. For Intermittent Filters, inspection wells shall be sealed against surface infiltration with a bentonite or concrete annular seal through the soil backfill zone.

o. **Internal Pump System**. (for Intermittent Filters only) In lieu of gravity flow from the sand filter to the leachfield (or leachfield dosing system), an internal pump system may be installed within the intermittent sand filter for dosing directly to the leachfield. In such applications: (1) the pump chamber must be seated at or below the bottom of the underdrain; (2) the pump operating depth must be entirely within the depth of the underdrain; and, (3) storage volume equal to 50 percent of the leachfield dose volume must be provided in the network of perforated drain pipe within the underdrain.

2. **Drainfields**. Sand filter effluent may be discharged to standard drainfields, mounds, pressure dosed sand trench systems, or subsurface drip dispersal systems. Design of these leachfield systems shall in accordance with applicable criteria specified elsewhere in these Regulations (Section 603 for Standard Drainfields, and **Appendix A** for Pressure-Dosed Sand Trenches and Mound Systems), except that leachfield sizing shall be in accordance with the wastewater loading rates specified in **Table SF-1**. Dripfields shall be sized in accordance with wastewater loading rates specified in Section 800, Appendix A-IV

D. CONSTRUCTION

Engineering plans for Intermittent Sand Filter Systems shall contain specific step-by-step construction guidelines and notes for use by the installer.

VI. SITING AND DESIGN CRITERIA

FOR

PROPRIETARY RECIRCULATING TEXTILE FILTER SYSTEMS (RTF)

(CATEGORY 2 SYSTEM)

A. PROBLEMS ADDRESSED

1. Rapid percolation;
2. Groundwater separation;
3. Stream setbacks; and,
4. Nitrogen Removal

B. SITING CRITERIA

1. All siting criteria for septic tanks apply equally to RTFs, associated recirculation tanks and pumping equipment.

2. Leachfield Systems. Leachfield systems receiving RTF-treated effluent are subject to all siting, design and construction criteria for standard septic tank-leachfield systems in accordance with applicable criteria specified elsewhere in these Regulations (Section 603 for Standard Drainfields), except as modified by the minimum requirements shown in Table SF-1 pertaining to: (a) percolation rate; (b) wastewater application rates; (c) depth to groundwater; and, (d) well and stream setbacks.

3. Dripfield Systems: Dripfield Systems receiving RTF-treated effluent are subject to all siting, design and construction criteria specified in these Regulations for Subsurface Drip Dispersal.

C. SYSTEM DESIGN CRITERIA

1. Pretreatment. RTFs shall be preceded by a septic tank, sized for the projected system sewage flow in accordance with Section 602 of these Regulations.

2. Sizing: The number of RTF units required for each system shall be based upon the design flow; effluent strength, and the proprietary manufacturer's specifications.

3. Pressure Dosing: Septic tank effluent shall be applied to the RTF by pressure dosing, utilizing a pump system. The pressured system shall be designed in accordance with accepted engineering practices to achieve, at a minimum:

    a. Adequate flow rate, screening of effluent and suitable piping network to preclude solids accumulation in the pipes or clogging of discharge orifices;

    b. Recirculation rate of approximately 4:1 at design flow conditions, as achieved by timed dosing.

4. Recirculation Tank: The minimum liquid capacity of the recirculation tank shall be as prescribed by the manufacturer of the proprietary supplemental treatment RTF unit

5. Control Panels: RTF system control panels shall be designed and equipped in such a manner that if the RTF system should cease to function properly, the alarm system will activate and both the recirculation pump and the dosing pump will automatically deactivate.

6. Drainfields: RTF-treated effluent may be applied to standard leachfield systems, pressure dosed sand trench (PDST), mound systems, or to subsurface drip dispersal systems subject to the siting, design and construction criteria specified in these Regulations for each type of system.

7. Monitoring Wells for drainfields receiving RTF treated effluent shall be located as specified in these regulations for PDST (III, C, 14).

8. Construction: Plans for RSF systems shall contain specific step-by-step construction guidelines and notes for use by the installer. The installer must be trained and certified by the manufacturer of the proprietary supplemental treatment RSF unit.

D. All proprietary recirculating textile filter treatment units proposed for Category 2 systems shall have been evaluated by the procedures set forth in Section 805.D of these Regulations.

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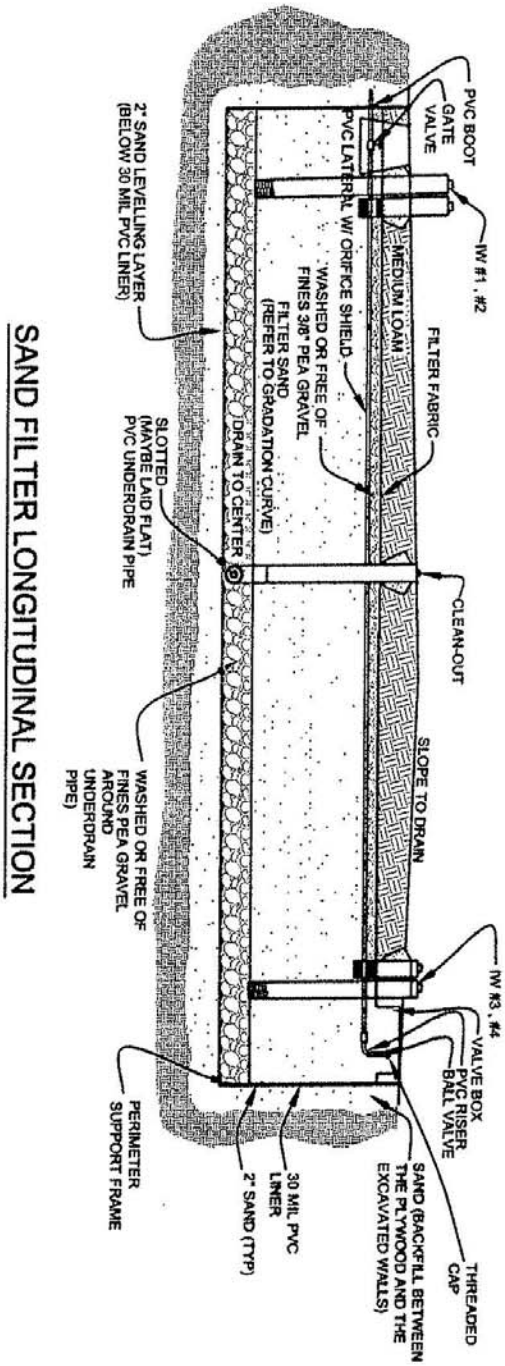

SAND FILTER LONGITUDINAL SECTION

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FIGURE 10A

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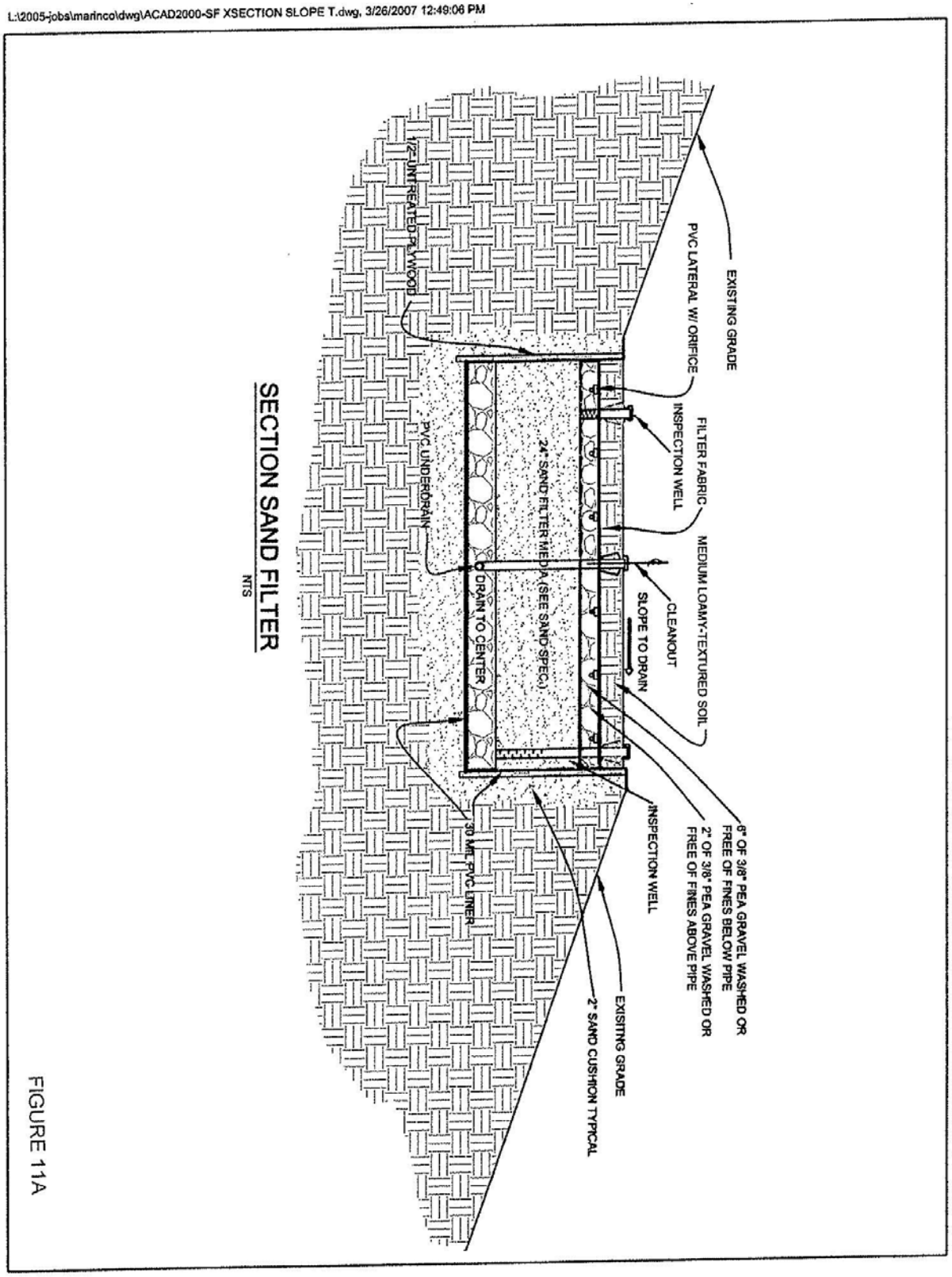

SECTION SAND FILTER

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FIGURE 11A

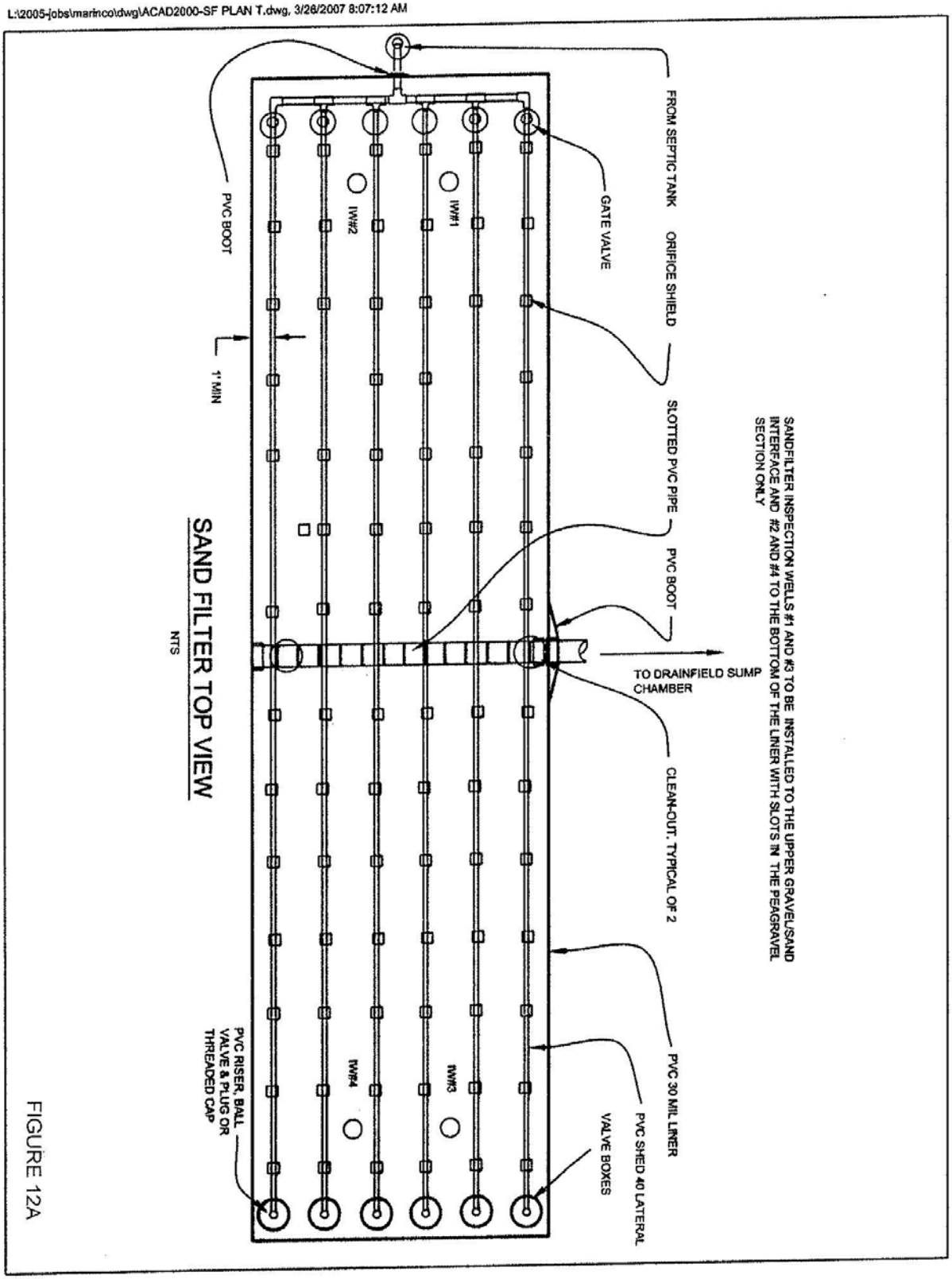
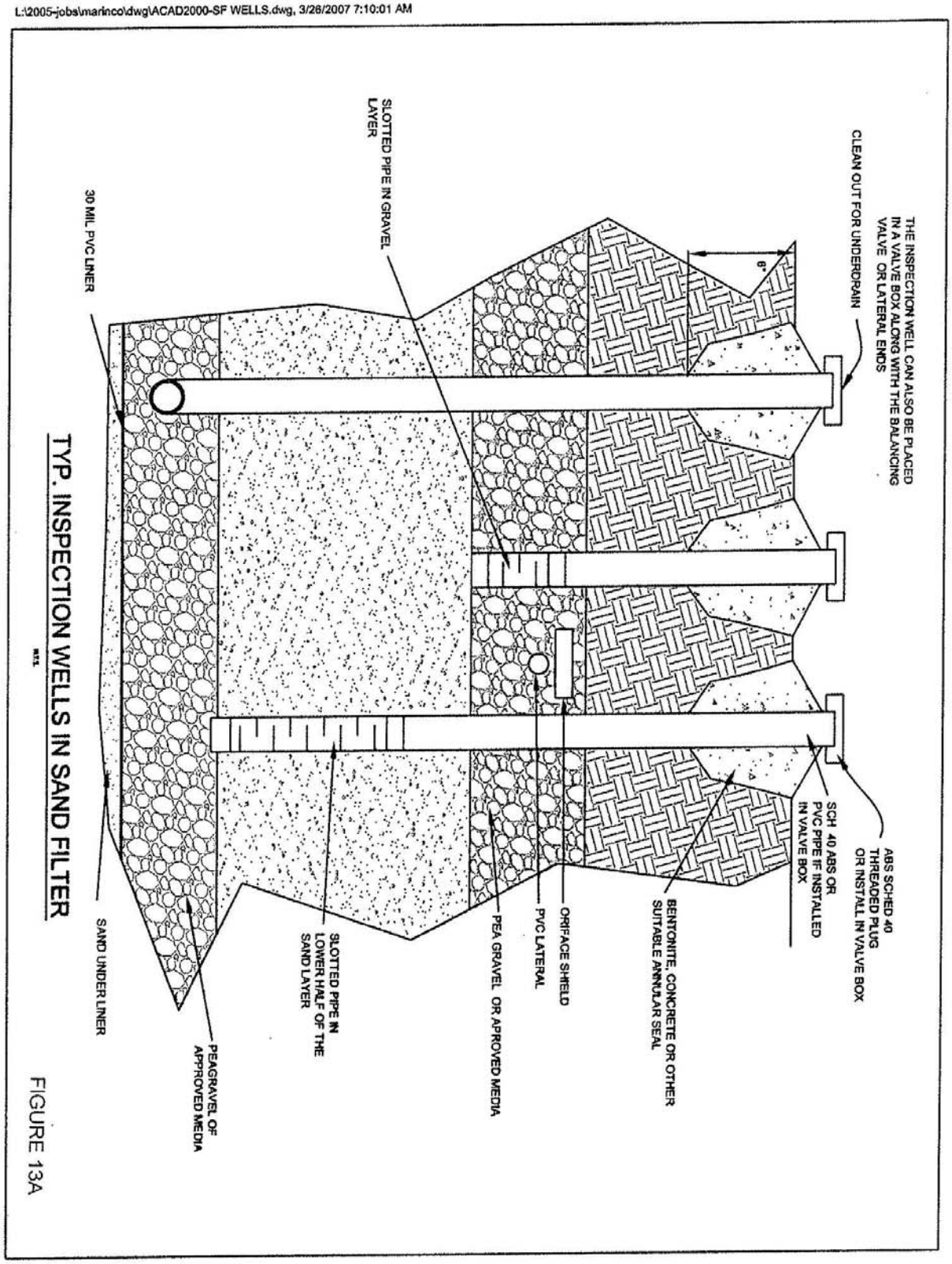
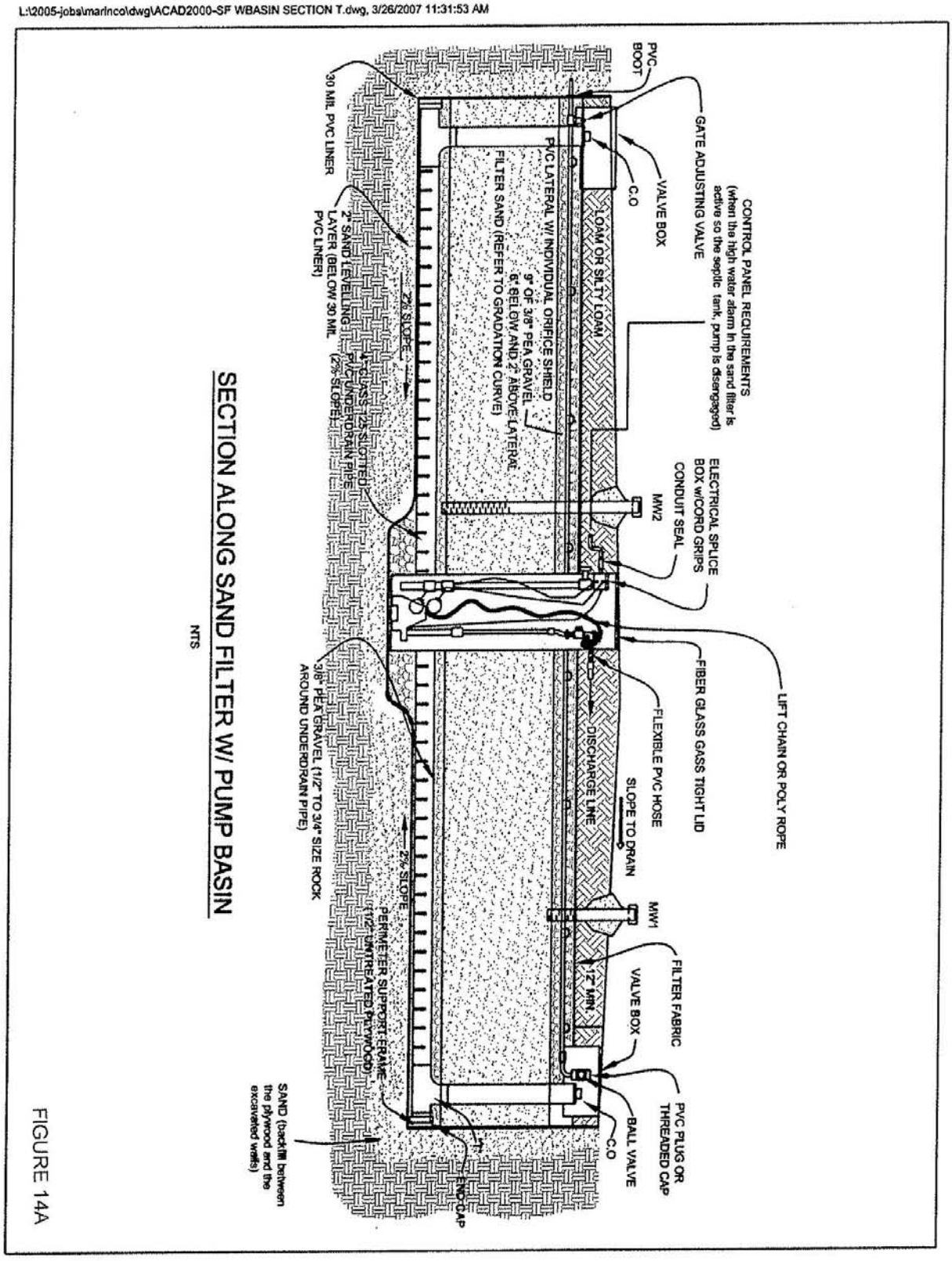

L:\2005-jobs\marinco\dwg\ACAD2000-SF PLAN T.dwg, 3/26/2007 8:07:12 AM
FROM SEPTIC TANK
ORIFICE SHIELD
GATE VALVE
PVC BOOT
1' MIN
IW#2
IW#1
SLOTTED PVC PIPE
PVC BOOT
TO DRAINFIELD SUMP CHAMBER
SANDFILTER INSPECTION WELLS #1 AND #3 TO BE INSTALLED TO THE UPPER GRAVEL/SAND INTERFACE AND #2 AND #4 TO THE BOTTOM OF THE LINER WITH SLOTS IN THE PEAGRAVEL SECTION ONLY
CLEAN-OUT, TYPICAL OF 2
PVC 30 MIL LINER
PVC SHED 40 LATERAL
VALVE BOXES
IW#4
IW#3
PVC RISER, BALL VALVE & PLUG OR THREADED CAP
SAND FILTER TOP VIEW
NTS

FIGURE 12A


L:\2005-jobs\marinco\dwg\ACAD2000-SF WELLS.dwg, 3/26/2007 7:10:01 AM
THE INSPECTION WELL CAN ALSO BE PLACED IN A VALVE BOX ALONG WITH THE BALANCING VALVE OR LATERAL ENDS
CLEAN OUT FOR UNDERDRAIN
6"
SLOTTED PIPE IN GRAVEL LAYER
30 MIL PVC LINER
ABS SCHED 40 THREADED PLUG OR INSTALL IN VALVE BOX
SCH 40 ABS OR PVC PIPE IF INSTALLED IN VALVE BOX
BENTONITE, CONCRETE OR OTHER SUITABLE ANNULAR SEAL
ORIFACE SHIELD
PVC LATERAL
PEA GRAVEL OR APROVED MEDIA
SLOTTED PIPE IN LOWER HALF OF THE SAND LAYER
PEAGRAVEL OF APPROVED MEDIA
SAND UNDER LINER
TYP. INSPECTION WELLS IN SAND FILTER
NTS
FIGURE 13A


L:\2005-jobs\marinco\dwg\ACAD2000-SF WBASIN SECTION T.dwg, 3/26/2007 11:31:53 AM
CONTROL PANEL REQUIREMENTS
(when the high water alarm in the sand filter is active so the septic tank, pump is disengaged)
PVC BOOT
GATE ADJUSTING VALVE
VALVE BOX
C.O
LOAM OR SILTY LOAM
PVC LATERAL W/ INDIVIDUAL ORIFICE SHIELD
9" OF 3/8" PEA GRAVEL
6" BELOW AND 2" ABOVE LATERAL
FILTER SAND (REFER TO GRADATION CURVE)
30 MIL PVC LINER
2" SAND LEVELLING LAYER (BELOW 30 MIL PVC LINER)
2% SLOPE
4" CLASS 125 SLOTTED PVC UNDERDRAIN PIPE (2% SLOPE)
3/8" PEA GRAVEL (1/2" TO 3/4" SIZE ROCK AROUND UNDERDRAIN PIPE)
ELECTRICAL SPLICE BOX w/CORD GRIPS
CONDUIT SEAL
MW2
LIFT CHAIN OR POLY ROPE
FIBER GLASS GASS TIGHT LID
FLEXIBLE PVC HOSE
SLOPE TO DRAIN
DISCHARGE LINE
MW1
FILTER FABRIC
12" MIN
VALVE BOX
PVC PLUG OR THREADED CAP
BALL VALVE
C.O
2% SLOPE
PERIMETER SUPPORT FRAME (1/2" UNTREATED PLYWOOD)
END CAP
SAND (backfill between the plywood and the excavated walls)
SECTION ALONG SAND FILTER W/ PUMP BASIN
NTS
FIGURE 14A

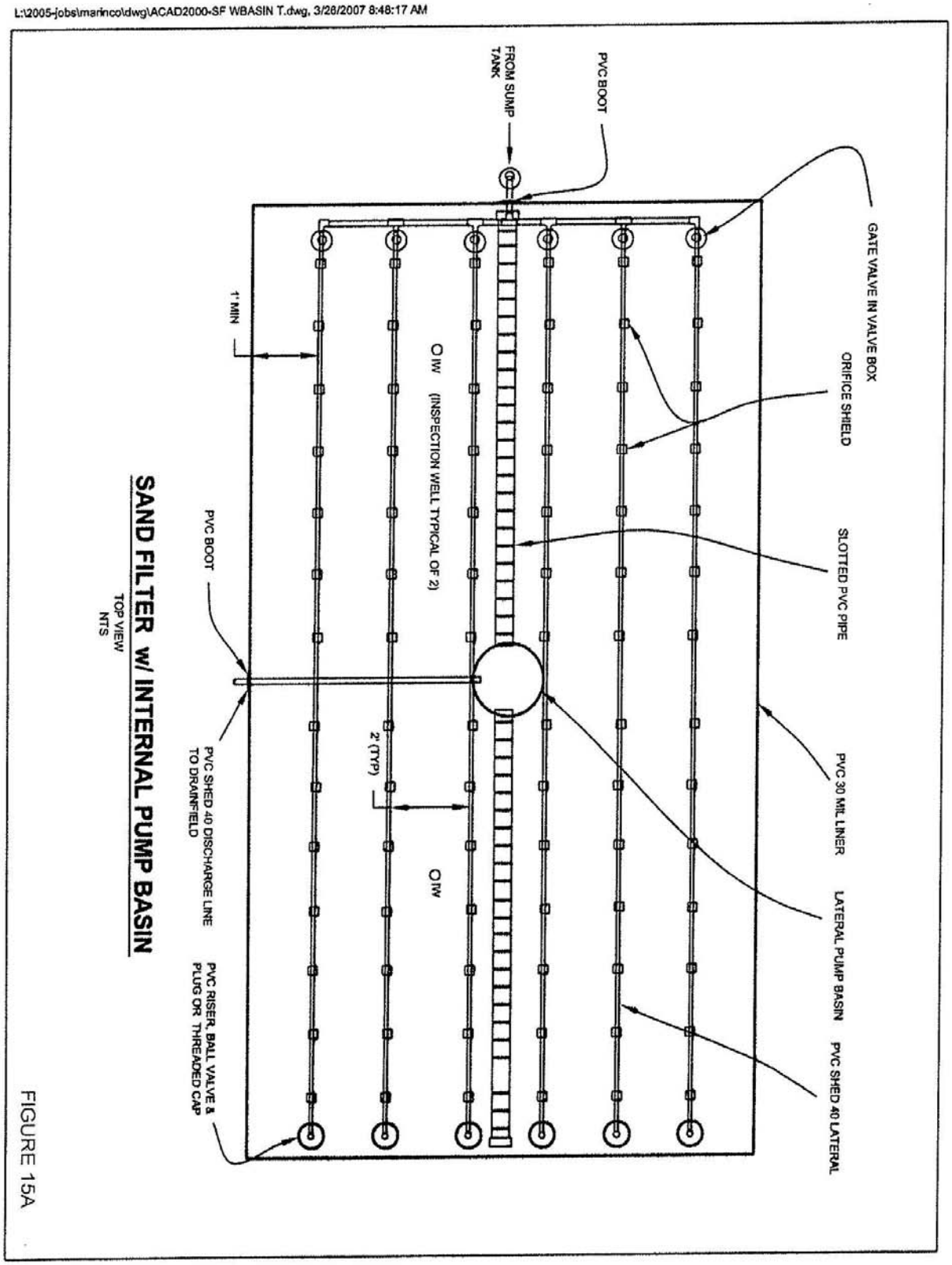

L:\2005-jobs\marinco\dwg\ACAD2000-SF WBASIN T.dwg, 3/28/2007 8:48:17 AM
FROM SUMP TANK
PVC BOOT
GATE VALVE IN VALVE BOX
ORIFICE SHIELD
SLOTTED PVC PIPE
PVC 30 MIL LINER
LATERAL PUMP BASIN
PVC SHED 40 LATERAL
1' MIN
IW (INSPECTION WELL TYPICAL OF 2)
2' (TYP)
IW
PVC BOOT
PVC SHED 40 DISCHARGE LINE TO DRAINFIELD
PVC RISER, BALL VALVE & PLUG OR THREADED CAP
SAND FILTER w/ INTERNAL PUMP BASIN
TOP VIEW
NTS

FIGURE 15A

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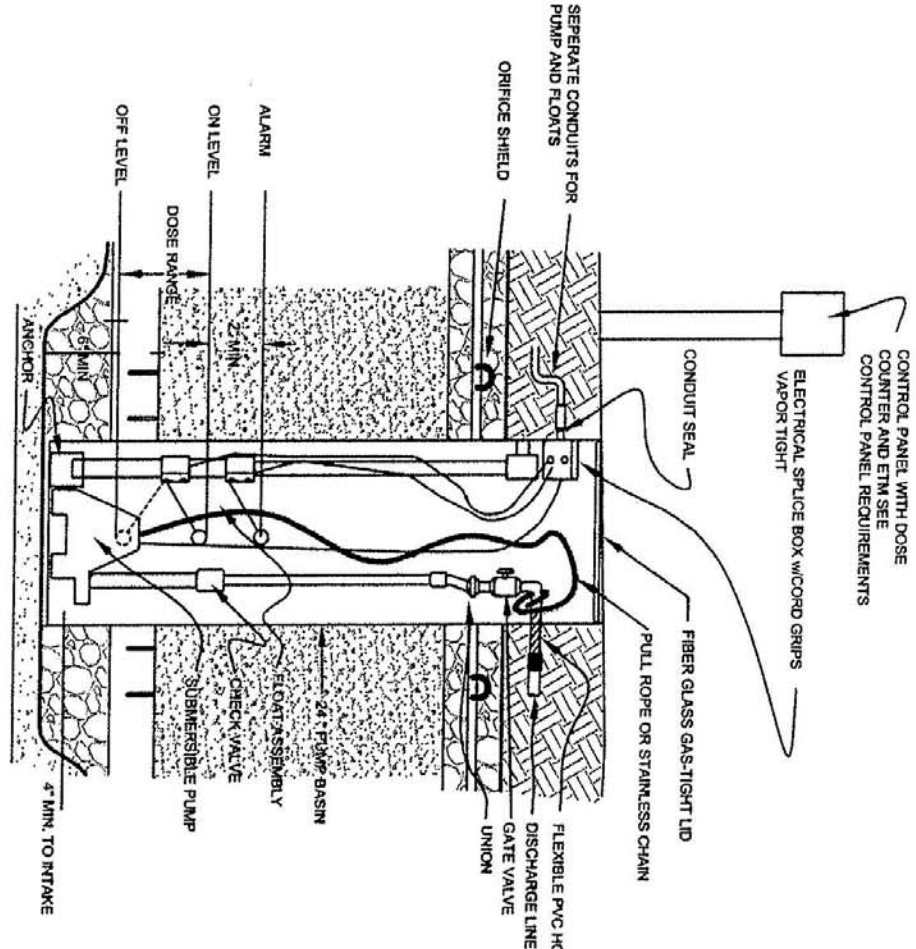
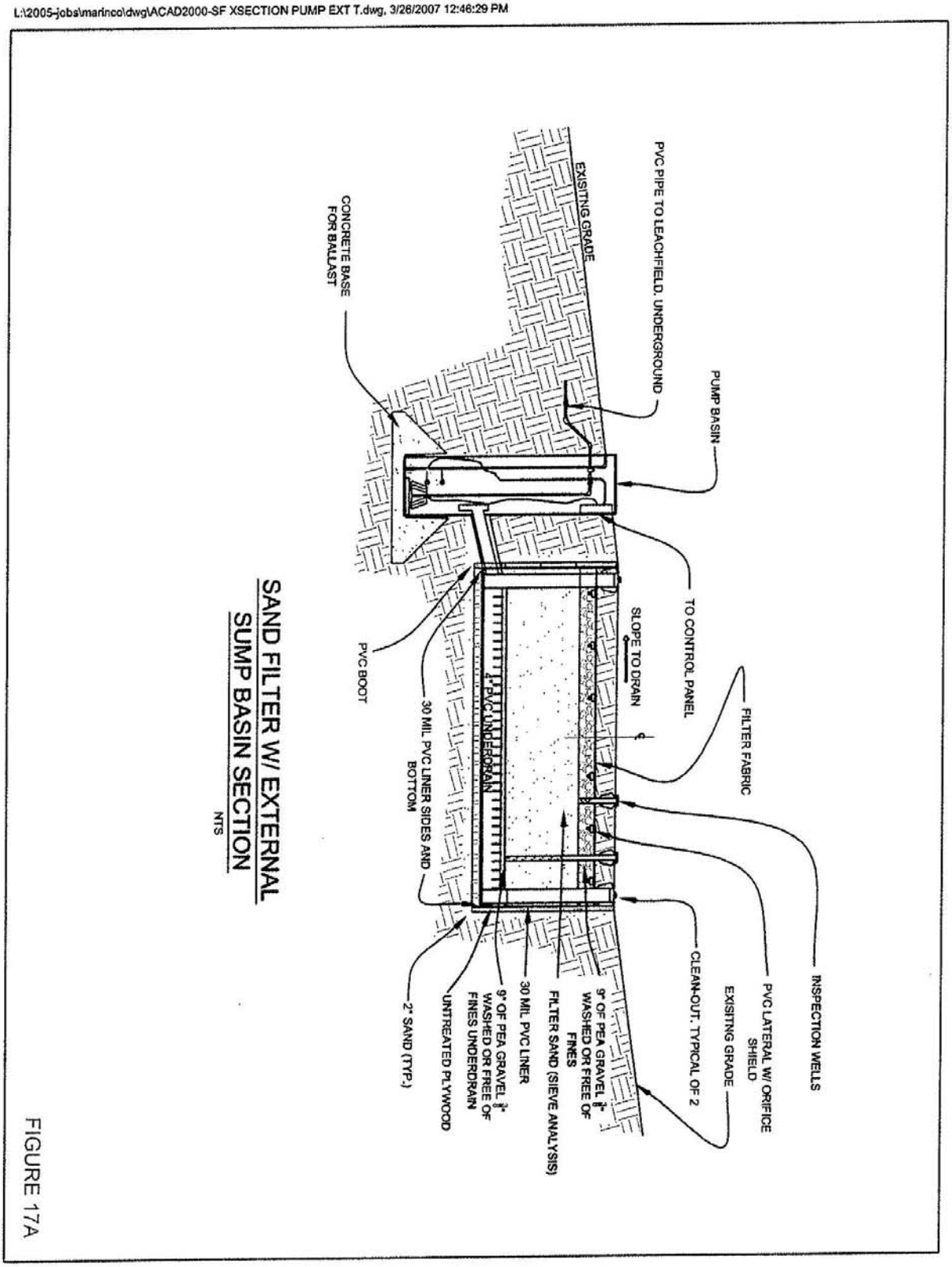


INTERNAL PUMP BASIN FROM SANDFILTER TO DISPERSAL FIELD

N.T.S.

FIGURE 16A

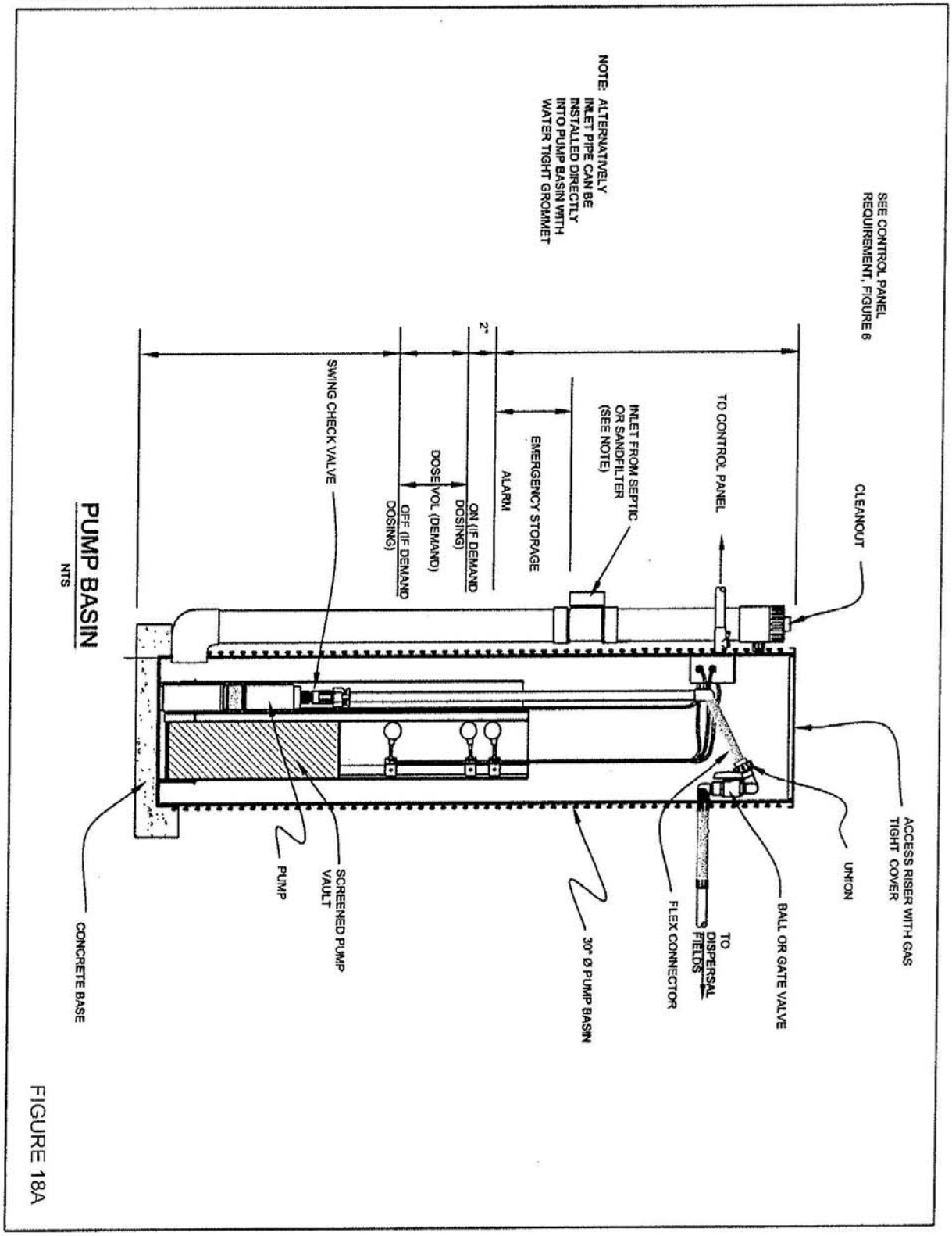
L:\2005-jobs\marinco\dwg\ACAD2000-SF XSECTION PUMP EXT T.dwg, 3/26/2007 12:46:29 PM



SAND FILTER W/ EXTERNAL SUMP BASIN SECTION

NTS

FIGURE 17A


L:\2005-jobs\marinco\dwg\ACAD2000-PUMPBASIN T.dwg, 3/26/2007 9:00:40 AM
SEE CONTROL PANEL REQUIREMENT, FIGURE 6
NOTE: ALTERNATIVELY INLET PIPE CAN BE INSTALLED DIRECTLY INTO PUMP BASIN WITH WATER TIGHT GROMMET
TO CONTROL PANEL
CLEANOUT
INLET FROM SEPTIC OR SANDFILTER (SEE NOTE)
EMERGENCY STORAGE
ALARM
2"
ON (IF DEMAND DOSING)
DOSE VOL (DEMAND)
OFF (IF DEMAND DOSING)
SWING CHECK VALVE
ACCESS RISER WITH GAS TIGHT COVER
UNION
BALL OR GATE VALVE
TO DISPERSAL FIELDS
FLEX CONNECTOR
30" Ø PUMP BASIN
PUMP
SCREENED PUMP VAULT
CONCRETE BASE
PUMP BASIN
NTS
FIGURE 18A

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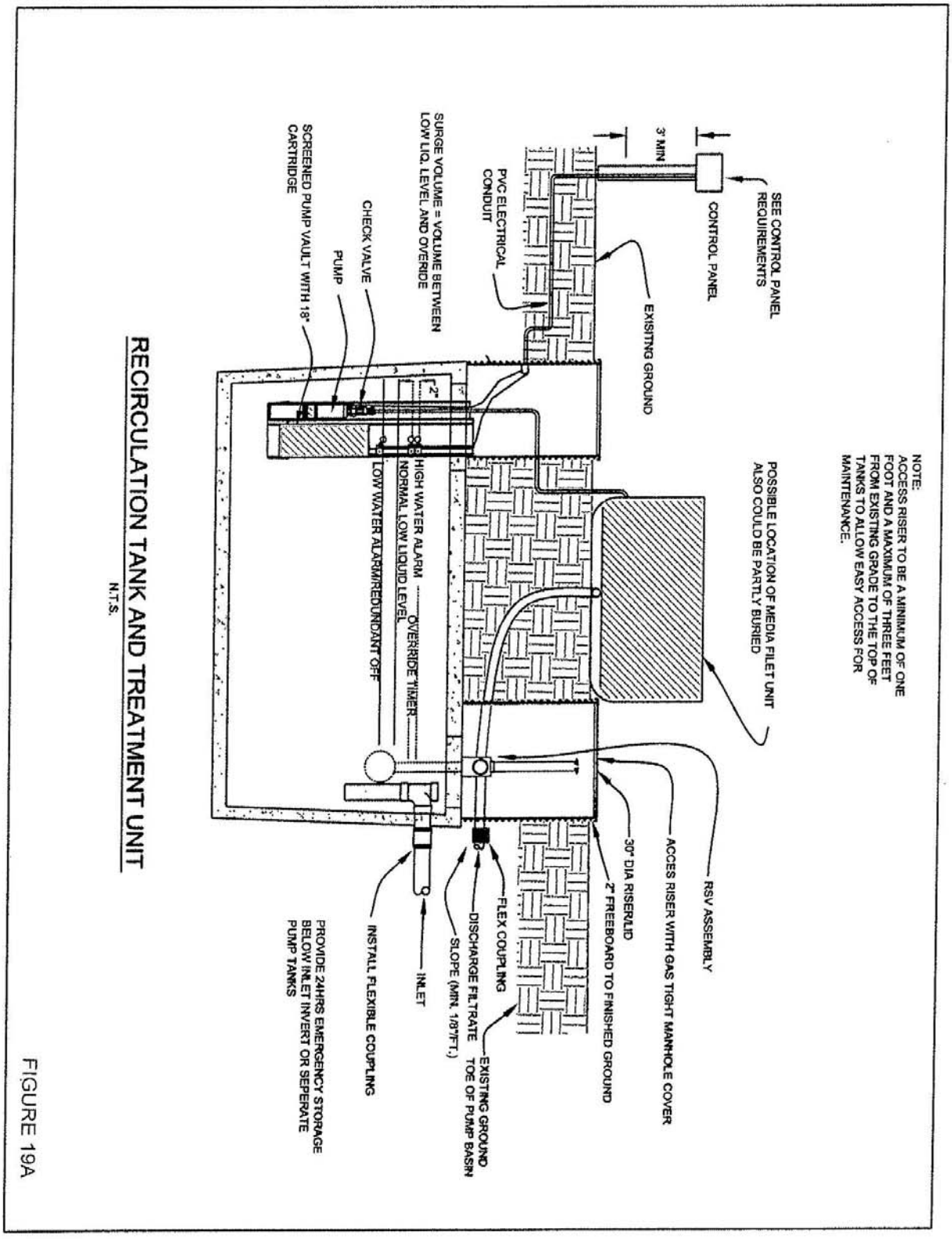

RECIRCULATION TANK AND TREATMENT UNIT

N.T.S.

FIGURE 19A

TABLE SF-1

LEACHFIELD REQUIREMENTS FOR INTERMITTENT SAND FILTER, RECIRCULATING SAND FILTER, OR RECIRCULATING TEXTILE FILTER EFFLUENT

Percolation Rate (MPI)[1]	Percent Fines (silt & clay)	Leachfield Design	Wastewater Loading Rate (GPD/Ft^2)	Minimum Depth to Groundwater (Feet)[2]	Minimum Well Setback (Feet)	Minimum Setback to Water Bodies (Feet)	
						Intermittent Stream or Wetland	Perennial Stream or Lake
1 to 5 MPI	> 15%	Standard Gravity or Pressurized (PD)[3]	1.8	2	100	75	100
			2.4	3	100	75	100
			1.2	3	100	50	75
		PD Sand Trench[4]	2.4	2	100	75	100
		Standard Mound	1.2	3	100	50	75
	10 to 15%	Std Gravity or PD[3]	1.2	5	100	75	100
		PD Sand Trench[4]	1.8	5	100	75	100
			1.2	3	100	75	100
		Standard Mound	1.2	10	100	50	75
	< 10%	Standard Gravity or PD[3]	0.6	10	150	75	100
			0.6	5	200	75	100
		PD Sand Trench[4]	1.2	10	100	75	100
			1.2	5	150	75	100
		Standard Mound	0.6	3	200	75	100
			1.2	20	100	50	75
5 to 90 MPI	N/A	Standard Gravity or PD[3]	2.0 x STE[5]	3	100	75	100
			1.5 x STE[5]	2	100	75	100
			1.0 x STE[5]	3	100	50	75
		PD Sand Trench[4]	2.0 x STE[5]	2	100	75	100
		Standard Mound	1.5 x STE[5]	3	100	50	75
90 to 120 MPI	N/A	Standard Gravity or PD[3]	0.3	2	100	75	100
			0.2	3	100	50	75
		PD Sand Trench[4]	0.4	2	100	75	100
			0.3	3	100	50	75

1 Percolation rate of soils at the proposed trench bottom depth or within two feet below trench bottom.

2 Below trench bottom. For mounds: below native grade.

3 Standard gravity drainfield trenches per Section 603 of these Regulations or pressure distribution of effluent to drainfield trenches per Section 604 of these Regulations, with the exception that trench width may be reduced to 12 inch minimum.

4 Pressure-Dosed Sand Trench per Appendix A of these Regulations.

5 STE = Standard wastewater loading rate for septic tank effluent per Section 603B.