

To: All Local Approving Authorities and Environmental Health Directors

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Subject: Sand Mound Guidance

Copies: Regional Consultants

Attachments: Cylinder Infiltrometer Method (1994), Pressure Distribution Memo (1997),  
Alternative Sand Memo (2003)

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The number of sites approved for the installation of sand mound onsite sewage disposal systems in Maryland continues to grow as does the number of both conventional and nonconventional mounds installed. As a result of the increasing number of sand mound installations, and the many sand mounds in Maryland that have been in operation for more than 20 years, the Maryland Department of the Environment (MDE) and local approving authorities have gained more experience with these systems. The intent of this memorandum is to share the results of this experience with local approving authorities and to reinforce guidance previously provided.

### **Site Evaluation**

The 4<sup>th</sup> Edition of the "Design and Construction Manual for Sand Mound Systems" (Mound Manual), published in 2003 states a detailed site evaluation must be performed at each site to determine suitability. The evaluator must have a thorough knowledge of the principles and practices associated with proper soils evaluation, as well as an understanding of the design and function of sand mounds. Evaluation techniques from the *Site Evaluation Training Manual for On-Site Sewage Treatment and Disposal Systems* should be employed. This includes the "Cylinder Infiltrometer Test Method" described in Appendix J of the site evaluation manual." (See attached)

As part of the evaluation, a minimum of three tests should be conducted within the proposed sewage disposal area per the *Site Evaluation Training Manual for On-Site Sewage Treatment and Disposal Systems* (Site Evaluation Manual). Concave landscape positions, depressions and footslopes should be avoided. It is recommended that these tests include three observation pits excavated to a minimum depth of 4-5 feet below original grade.

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The functions of these excavations are:

- To properly identify the most restrictive soil horizon for testing within the profile's upper 24 inches for conventional mounds and 30 inches for alternative mounds; and,
- To determine the presence or absence of a restrictive layer<sup>1</sup> within 5 ft of the ground surface. (See table 2.1, p 11 of the Sand Mound Manual: *Depth to impermeable barrier*).

If a restrictive horizon exists, especially on level sites, the site may be unsuitable unless an acceptable linear loading rate can be established relative to the soil characteristics and site conditions. Sufficient area must be available to construct a properly-sized mound conforming to the requirements of the linear loading rate considerations. COMAR 26.04.02.05 Q (2), which gives the authority to require greater depths to a water table than 2 ft., is relevant when perched water tables occur on restrictive horizons. The linear loading rate concept for mounds is discussed in a publication by James Converse and Jerry Tyler titled “*Wisconsin Mound Soil Absorption System: SITING, DESIGN AND CONSTRUCTION MANUAL*”. It is available for download at: [http://www.soils.wisc.edu/sswmp/SSWMP\\_15.24.pdf](http://www.soils.wisc.edu/sswmp/SSWMP_15.24.pdf). The linear loading rate concept is also discussed by Jerry Tyler and Laura Kuns in a publication called “*Designing with Soil: Development and Use of a Wastewater Hydraulic Linear and Infiltration Loading Rate Table*”. This document can be downloaded from the Small Scale Waste Management Project at [http://www.soils.wisc.edu/sswmp/online\\_publications.htm](http://www.soils.wisc.edu/sswmp/online_publications.htm) (Publication number 4.42) It is recommended all staff performing field evaluations read these documents and browse the available literature.

### **Mound Geometry**

A linear loading rate of 6 gallons per linear foot or less is required by the 1994 *Alternative Systems Policy* in the case of alternative mounds (60-120 minutes per inch percolation rate). This linear loading rate results in long and narrow mounds and is preferred for all mounds including conventional mounds (2-60 minutes per inch). Where restrictive horizons are present within or just below the upper soil profile, conventional mounds may malfunction if the linear loading rate is too high.

### **Landscape Position/Placement of Mound**

A convex slope is the preferred landscape position shape for mounds. Linear slopes and level sites are also acceptable. Concave slopes or depressions are to be avoided. The toe of a mound must always be designed and installed on contour. On a convex landscape, proper design will necessarily result in a curved (boomerang shaped) mound toe.

### **Sand Specification**

Proposals using sand meeting the conventional sand specification from COMAR 26.04.02 should have a material certification and recent sieve analysis.

If alternative sand is proposed to be used, a material certification and recent sieve analysis must be provided with the proposed sand. The specification for alternative sand includes allowable sample percentages for fine particles less than 0.053 mm and coarse particles greater than 2 mm. A sand mound constructed in Maryland utilizing the alternative sand specification and meeting the requirements of the 2003 “Alternative Sand for Mounds” memo (see attached), is:

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- Classified as an alternative (non-conventional) onsite sewage disposal system;
- Required to utilize a bed loading rate of 1.0 gpd/ft<sup>2</sup> or less. When using this bed loading rate, the bed width will equal the linear loading rate. Beds as long and narrow as possible are preferred.
- Required to have properly constructed observation ports installed so that causes of malfunctions can be easily assessed; and,

### **Observation Ports**

The location of the observation ports within the sand mound can be found on page 14 of the Sand Mound Design and Construction Manual (Figure 3.1). Options for properly anchoring the observation ports in the bed (OP1) can be found in the document called “*Wisconsin Mound Soil Absorption System: SITING, DESIGN AND CONSTRUCTION MANUAL*” by Jerry Tyler and James Converse at [http://www.soils.wisc.edu/sswmp/SSWMP\\_15.24.pdf](http://www.soils.wisc.edu/sswmp/SSWMP_15.24.pdf) on Page 18.

### **Lateral Turn ups**

MDE recommends that all distribution system laterals be constructed with accessible, protected turn ups. This applies to distribution networks in systems such as sand mounds, subsurface LPDs, pressure dosed beds, and at-grade mounds. Each turn up should be cut off at, or slightly below grade and sleeved in a larger diameter pipe (SCH 40 PVC or equivalent) fitted with a screw cap for inspection and routine maintenance access. The installation of these serves three purposes:

- It makes the mound more aesthetically pleasing to the property owner;
- It prevents damage to the turn ups from lawnmowers and other equipment; and,
- It provides a way to properly flush the laterals while ensuring that the effluent doesn't flow across the land surface and has a way to travel back into the aggregate.

Lateral head pressure should be monitored on a regular basis by the homeowner, and laterals should be flushed whenever a significant increase in distal head pressure is observed.

### **Bed Aggregate**

The bed aggregate shall be between ¾ and 2 inches in diameter and be free of fines. The Mound Manual states that crushed limestone should not be used, however dolomitic limestone with sufficient magnesium content to give the rock a hardness greater than 4 on the Moh's scale may be allowed if it is also free of fines. Prior to its use, review of professional industry certification of its hardness is required and this is the responsibility of the approving authority. Allowing poor quality bed aggregate to be used can result in premature clogging of the sand/gravel interface and limit repair options to removal and replacement of the gravel and the clogged sand interface. Advanced pretreatment units have been successfully employed to remediate systems that have been determined to have biological clogging and not clogging due to fines.

### **Cap Material:**

In Section 5.7.1 (Page 54) of the Mound Manual, we specify the use of a “finer textured soil material such as sandy clay loam, clay loam, silt loam or loam on top of the fabric over the bed” At this time our recommendation is to not encourage the use of a clay, sandy clay loam or clay loam cap. We prefer the use of more loamy textured soils, including non-clayey sub-soils. Experience has shown that clogging of the bed can be slowed if oxygen transfer into the bed is enhanced. The use of a silt loam or loamy cap seems to optimize that transfer while at the same time having some moisture storing capacity to promote vegetative growth. Cap material shall be soil relatively free of coarse fragments.

**Protection of the Receiving Environment and Sewage Reserve Area:**

According to section 3.2.16 (page 28) of the Mound Manual, “A minimum 25 feet wide area downslope of the mound should be designated on a site plan as an area to be protected from compaction and free of structures such as buildings and driveways. Its purpose is to protect the underground flow path the sewage takes upon exiting the mounds perimeter. When limiting zones are shallow beneath the mound, this distance should be increased accordingly.” Experience has shown that this concept is important in the long-term performance of a sand mound. This downslope area should be protected before, during and after construction of the mound. It is also highly recommended prior to building permit approval, that the entire sewage reserve area and the 25 foot receiving environment is fenced off so as to avoid any site disturbance over these critical areas.

**Site Drainage**

The sewage reserve area, tankage and sand mound system should be protected from overloading caused by infiltration of surface runoff. Sand mounds are particularly sensitive to the impacts of site drainage.

**Certified Installers**

Individuals installing the mound must be certified. The certification does not apply to companies. Questions or complaints regarding an individual’s certification should be directed to MDE’s Onsite Systems Division..

**Non Standard Mounds**

The Sand Mound Manual is intended for residential systems of 5 bedrooms (750 gpd) or less. It states, “Larger sand mound systems and systems receiving non-domestic sewage may require more detailed soil-hydrogeologic investigations, different sizing criteria and additional pretreatment”

**General Recommendations:**

We offer the following in addition to the above guidance:

- Require the installation and proper maintenance of an effluent filter in the final chamber of the multi-compartment septic tank, unless the mound is served by an advanced pretreatment unit; and
- Use the inspection checklist provided on page 57 of the Mound Manual to determine that all aspects of the mound construction are done correctly.

MDE continues to encourage the use of sand mound systems. They have proven to be an effective means of treatment and dispersal to overcome certain site limitations that prohibit the use of conventional trench sewage disposal systems. Please contact your Regional Consultant. with any questions.

<sup>1</sup>Restrictive layer is defined in the 1994 MDE Site Evaluation Manual as: “consolidated rock, fragipans, ironstone layers, substratum layers or soil conditions that effectively limit downward movement of water. Includes horizons and layers with moderate or strong platy structure, moist consistence stronger than firm or cemented, or soil material with textures of sandy clay, clay or silty clay with weak or massive soil structure, or horizons or layers with saturated hydraulic conductivity estimates less than 0.14 inches per hour.”