

Summary Report of the  
**TECHNICAL ADVISORY COMMITTEE**  
**To the**  
**Agency of Natural Resources**  
**For the review of**  
**On-Site Wastewater Technology**

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**SUMMARY REPORT**  
**by the Technical Advisory Committee for the**  
**Review of On-Site Wastewater Technology**

***Introduction***

Vermont has been considering a thorough review and update of its Environmental Protection Rules, especially pertaining to on-site wastewater treatment and disposal. In March, 2001, a Technical Advisory Committee was formed by the Commissioner to assist the Agency of Natural Resources (ANR) in the development of new Rules, which are intended to become a “statewide” standard, replacing numerous former rules in use by individual communities. The following is a summary of the Committee’s findings and recommendations.

***Model Framework***

The Committee adopted a Model Framework document to guide future on-site wastewater management for Vermont. Key components, all based on performance, are:

1. Performance requirements to protect groundwater, surface water and drinking water (Rules)
2. Wastewater system management (O&M)
3. Compliance monitoring and enforcement
4. Technical requirements/options for site evaluation, design, construction, and operation
5. Continuing education/training for all practitioners, regulators, and owners
6. Certification/licensing for all practitioners
7. Ongoing program review
8. Funding program for replacement of failed/substandard disposal systems and/or water supplies (grants, low interest loans, deferred repayment)

The document was based on a model from the National On-site Wastewater Recycling Association.

***Performance vs. Prescriptive Standards***

Previous versions of Vermont’s rules have followed a “prescriptive” approach, providing strict standards, assuming minimum site conditions are satisfied. The draft rules provide for performance based designs, which:

- establish criteria for “General,” “Pilot” and “Experimental” systems;
- establish a maximum number of systems that may be approved; and
- provide for an “Application process for Innovative/Alternative Systems and Products”.

***Viral and Other Pathogens***

Viral and pathogen travel in groundwater, especially near drinking water sources, is a special concern; it is also a topic without conclusive scientific results or basis. Following are key findings regarding the isolation of the on-site disposal system from the groundwater table:

- Virus removal in soils is inversely related to the hydraulic loading rate.
- The maximum long-term removal obtained in leaching trenches with two feet of unsaturated soil was 2.6-log removal of a bacteriophage tracer used as a surrogate for viral contaminants.
- Although design practices have evolved to handle hydraulic loading issues, there is still a need to understand the fate and transport of pathogenic bacteria and viruses beneath the drain field and in the subsurface aquifer.
- In saturated soils viruses survive the longest and are the least retained by the soil, while dry soils are the opposite, with least survivability and greatest retention of the viruses.

This topic deserves ongoing review and application to future Rule updates.

## ***Soil Suitability for Soil Absorption Systems***

Soils can be an effective medium for treatment and dispersal of effluent from septic tanks and advanced wastewater systems. The suitability is generally characterized by depths to the seasonal high groundwater table, bedrock, and low permeable soils. The capacity of a soils based system is described as the “long term acceptance rate” (LTAR). Soil volume utilization is the synthesis of soil characteristics and system design.

Proper analysis of all these factors has been shown more effective than the traditional use of the percolation test as a means of site evaluation; however, adequate training of practitioners is required to adopt these methods.

## ***Minimum Depth to Groundwater Criteria for Siting Soil Absorption Systems***

Following is a summary of recommended practices, based on Vermont’s soils, climate, and experience:

1. Retain current siting conditions as defaults not requiring hydrogeologic analyses or investigations for systems with less than 1,000 gallon per day (gpd) design flow.
2. Minimum vertical separation to seasonal high groundwater should be 12 inches or the thickness of the A horizon plus four inches, whichever is greater; site must be drainable to 18 inches.
3. Minimum freeboard for groundwater mounding analyses for systems less than 1,000 gpd should be six inches.
4. The recommended minimum length of the system should be calculated by the available thickness of unsaturated material, estimated hydraulic conductivity based on soil morphology, ground surface slope (or hydraulic gradient, if available), and the wastewater design flow for the project.
5. Actual measurements of hydraulic conductivity in the field can be used to provide more accurate analyses.

## ***Design Flows***

Key points developed during review of Design Flow issues include:

- current residential standard is 150 gpd/bedroom, assuming double occupancy at 75 gpd per person;
- only credit is the 10% credit for low flow fixtures (when using an on-site system);
- average Vermont residence includes about 2.5 to 2.7 persons, not the six persons normally designed for;
- for community systems serving five or more units, the design value can be reduced; and
- elimination of the “low-flow” credit is recommended.

## ***Proposed Residential Design Flows***

Following are proposed standards for computing residential design flows, as in the draft Rules:

- residential design flow to be based on 70 gpd/person;
- normal residential design based on two persons/bedroom up to three per unit; then one person/bedroom over three;
- community systems over four units will have a graduated reduction in design flow up to 20 units; projects over 20 units to be based on 245 gpd/unit; and
- all single-family units connected to a municipal system to be based on 210 gpd/unit.

## ***Proposed Commercial and Institutional Flows***

Non-residential uses are eligible for flow reduction credits; future rule revisions should consider possible changes in unit design flows to reflect the experience of both flow and strength from various types of buildings.

## ***Pretreatment***

The Committee had the following recommendations with respect to pretreatment:

- All septic tanks should be watertight and structurally sound. Watertight testing should be performed to insure watertightness.
- All septic tanks should have watertight access at grade to facilitate the inspection and maintenance.
- All septic tanks should be equipped with an effluent filter.
- Sizing of septic tanks:
  - Minimum 1,500 gallons

- At least twice the daily design volume
- When used with an in-tank pumping system, the minimum liquid volume should be twice the daily design flow
- External grease interceptors should be installed on waste lines from commercial kitchens
- Use of garbage grinders is discouraged

### ***Treatment Level***

The use of performance standards is an approach that allows for the management of risk to public health and the environment associated with on-site wastewater treatment and reuse. Using treatment levels, corollary values for soil loading, isolation distances, and inspection and monitoring frequency can be developed. The Committee and ANR agreed to inclusion of this approach in the proposed draft Rules.

### ***Modified Well Isolation Zone Approach***

The concept of a modified well isolation zone for wastewater disposal for subsurface sites could be considered for some low permeability soil sites which are difficult or currently impossible to develop under present site requirements. This concept would provide a greater range of disposal options for clay soil sites. The use of this approach could occur where 1) the isolation distance to a seasonal high water table is less than 24", 2) it is demonstrated that the effluent plume would travel slowly enough on site such that a two-year TOT was satisfied before it moved off the property site or reached an on-site water withdrawal, and 3) the dispersed effluent would not rise to or above the ground surface at any time of the year. The concept is not in the draft Rules.

### ***Disinfection***

Utilization of disinfection by ultraviolet light, at least as a means of reducing the separation of the infiltrative surface to the seasonal high water table, was advocated by some members of the Committee as a viable means to further reduce the survival rate of pathogens and viruses. The proposed Rules do not allow for disinfection as a means for reduction of the separation vertical distances, due to concerns for reliability and maintenance needs.

### ***Licensed Designers and Installers***

The Committee discussed the need for competent designers and installers of potable water supply and wastewater systems. The Committee recommends that adequate training be provided for all practitioners, from designers to the system owners and operators, including individual homeowners. The proposal by ANR to expand the size and type of system that Site Technicians are allowed to design and review requires legislative action.

### ***Operation and Maintenance (O&M) of Wastewater Systems***

The Committee recognized the need for requiring a heightened level of operation and maintenance protocol, system redundancy and the frequency of regulatory oversight for the more advanced wastewater technologies. These administrative requirements also imply an increased need for agency staff and file space to check, maintain and enforce operational permit conditions. The formation of municipal waste management districts and maintenance contracts with private firms will be important factors to ensure that permittees maintain proper operation and maintenance of these systems for their entire operational life.

The Committee made numerous operation and maintenance recommendations for most on-site systems (see full text for detailed list).