

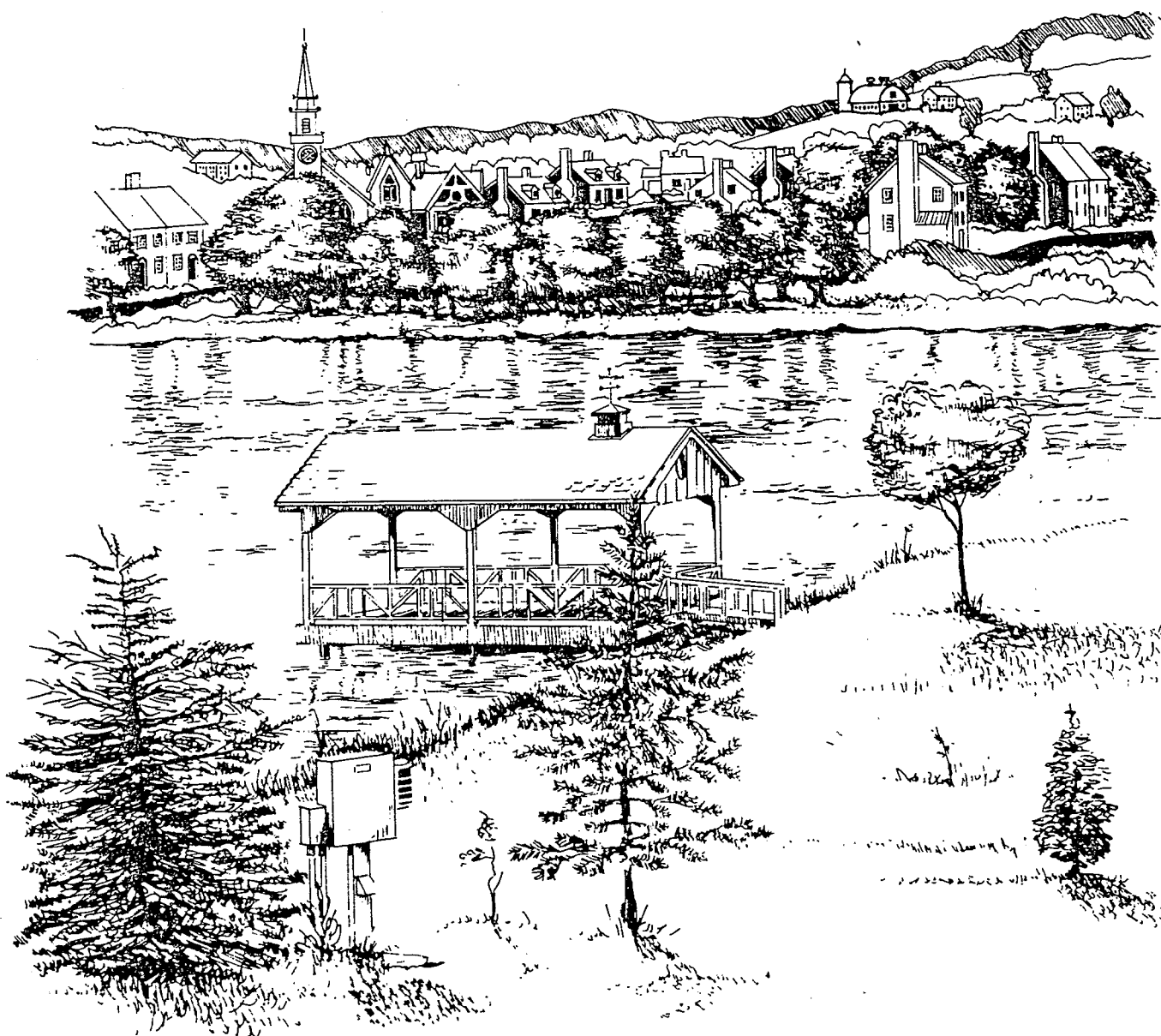
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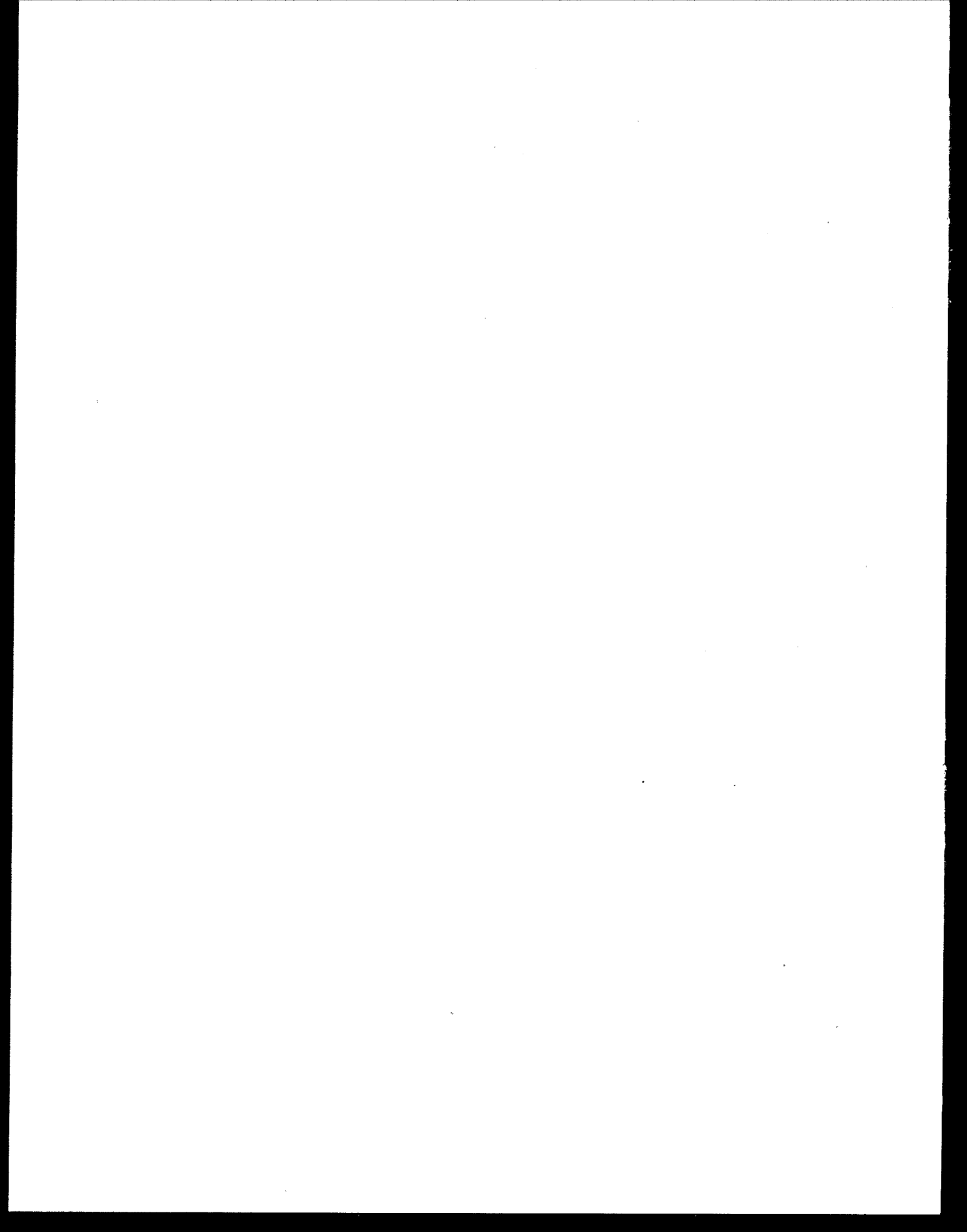
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United States Environmental Protection Agency
Municipal Environmental Research Laboratory
Cincinnati, Ohio

INTERIM STUDY REPORT

Management of On-Site and Small Community Wastewater Systems





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INTERIM STUDY REPORT

MANAGEMENT OF ON-SITE
AND SMALL COMMUNITY
WASTEWATER SYSTEMS

MANAGEMENT PRACTICES DOCUMENTATION:
GENERAL DISCUSSION AND
CASE STUDY SUMMARIES

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FOREWORD

With passage of the Water Pollution Control Act Amendments of 1977, greater emphasis has been placed on consideration of less costly, decentralized wastewater handling technologies for rural communities. Although widespread utilization and extensive research have demonstrated the technical and economic feasibility of such wastewater treatment and disposal alternatives, little guidance has been available to engineers, planners, and governmental agencies in implementing these technologies in small communities. This report represents partial documentation of an on-going research study, "Institutional Arrangements for the Management of On-Site and Alternative Wastewater Systems." Through proper management, the long-term operational performance of these alternative sewage disposal systems can be improved and enhanced. The political, economic, legal, and technical issues associated with on-site and alternative systems management are explored in this report and a guidance manual to follow. Eighteen case studies conducted for the research study are discussed in this report. The guidance manual will offer recommendations for formulating management programs, based on these case study experiences.

DISCLAIMER

This document is a draft report prepared by Roy F. Weston, Inc. for the U.S. Environmental Protection Agency, Municipal Environmental Research Laboratory (MERL), Cincinnati, Ohio.

A limited number of copies of a similar report (which contained 10 of the 18 case studies) have been published for distribution at the 1979 EPA Technology Transfer Seminars on Small Wastewater Treatment Systems.

This report has not been officially approved by EPA for publication and distribution. Detailed review and revision of this document and similar research study reports will continue, with an expected publication date of an EPA Guidance Manual in the summer of 1980.

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MANAGEMENT OF ON-SITE AND SMALL COMMUNITY WASTEWATER SYSTEMS

MANAGEMENT PRACTICES DOCUMENTATION: GENERAL DISCUSSION AND CASE STUDY SUMMARIES

INTRODUCTION

This report is divided into the following sections:

- Introduction
- Management Needs
- Management Functions
- Management Dimensions
- Case Study Summaries

After introducing the concept and history of on-site and alternative wastewater management systems in this first section, the presentation discusses the needs, functions, and dimensions of management programs in three separate sections. The discussion of management needs identifies the reasons for organizing a management program, and raises points to be considered in determining functional requirements. Management functions are presented to establish the range of services and responsibilities which can be related to the management of on-site and alternative systems, depending on program objectives. The section on management dimensions addresses the various institutional approaches which can be utilized to serve the specific program objectives and the range of management functions needed. Finally, summaries of case studies on on-site and alternative wastewater system management programs are provided.

Definition of On-Site and Alternative Systems

On-site and alternative wastewater treatment systems can be defined by a broad range of terminology referring to the various types of collection, treatment and/or disposal methods applied in lieu of conventional centralized sewerage systems. These methods, which are listed in Exhibit 1, include individual septic tanks with drainage fields, and alternate on-site systems such as sand mounds, as well as small community collection and treatment systems which typically utilize small diameter gravity or

EXHIBIT 1: ON-SITE AND ALTERNATIVE SYSTEMS

INDIVIDUAL SYSTEMS

- Standard septic tank and drainage field
- Alternate treatment methods
 - Aerobic tank
- Alternate disposal methods
 - Elevated sand mound
 - Evapo-transpiration bed
 - Alternating disposal areas
 - Electro-osmosis system
- Black water/grey water systems
 - Wastewater recycle units (e.g., mineral oil media)
 - Waterless toilets (e.g., compost toilets)
 - Reduced size disposal areas for grey water
- Accessory water-saving devices

COMMUNITY SYSTEMS

- Conventional gravity sewers
- Small diameter gravity sewers
- Small diameter pressure sewers
 - Individual grinder pumps
 - Individual effluent pumps
- Conventional noncentral treatment (i.e., package plant)
- Alternate treatment systems
 - Lagoon treatment
 - Community subsurface disposal (after septic tanks or other treatment)
 - Land application (after secondary level treatment)

pressure sewers. When a number of these independent, small community systems are used to serve an area instead of a centralized collection system, they may be referred to as cluster systems. In the case of small diameter pressure sewers (also referred to as low-pressure sewer systems), either grinder pumps or septic tank effluent pumps (STEP systems) may be used. Other on-site waste treatment methods include waterless or water-saving toilet devices, such as compost toilets and black water/grey water systems which may involve wastewater recycling and conservation.

Obviously, many different wastewater collection and treatment technologies can be involved in an on-site and alternative systems "management" program. It is not important to define all the various devices and combinations of devices that can be applied in the design of such systems. It is appropriate, however, to emphasize the basic approach to on-site and small community systems -- that of relying on relatively simple conveyance and treatment methods for serving individual (scattered or development) home sites or small communities.

This approach is generally offered as an "alternative" to centralized sewerage systems, when the centralized systems involve capital and operating costs beyond the financial capacity of the suburban and rural communities. Therefore, any reliable wastewater disposal system, which precludes the need for costly treatment facilities and complex operation and maintenance requirements, would probably qualify as an alternative system. Commonly, such systems rely on the use of on-site systems (either standard septic tank systems or one of several on-site treatment/disposal variations), or may utilize low cost collection systems, such as small diameter pressure or gravity sewers (i.e., small community systems).

In this report, both individual systems and small community systems are referred to as "noncentral" wastewater systems, that is, alternatives to centralized sewerage systems.

Relevant Course of Events

Legislation and guidance addressing noncentral systems include:

- PL 92-500
- 208 Areawide Studies
- PRM 76-3
- PRM 77-8
- PL 95-217
- PRM 78-9

Until recently, conventional centralized sewerage facilities were generally considered to be the most reliable direct and most logical means of dealing with a community's wastewater services needs. As centralized facilities have been constructed and operated over the years, it has been noted that large projects or traditional designs may not have been the most cost-effective solution. In fact, for many small rural and suburban communities, the necessary capital and operating costs for conventional systems can create undue financial burdens on individual homeowners.

This problem, in the limited range of solutions being employed, was recognized to some degree in the 1972 amendments to the Federal Water Pollution Control Act (PL 92-500), which charged the USEPA Administrator with investigating appropriate rural wastewater management alternatives. Subsequent areawide water quality management planning efforts (specified in Section 208 of PL 92-500) clearly identified the need for better managed individual on-site wastewater systems and lower cost small community systems. Certain 208 studies specifically proposed on-site and small community systems as alternatives to centralized treatment facilities. At this time EPA expanded its study of various aspects of on-site and small community treatment technology. Resulting research projects defined the state-of-the-art for different technologies related to this field. Independent research and study was also taking place, as evidenced by the proceedings of technical conferences dating back to 1974, sponsored by the National Sanitation Foundation, and the American Society of Agricultural Engineers, among others.

The impact of sewerage project costs on small communities was first officially recognized by the EPA Construction Grants Program in 1976 through a Program Requirements Memorandum (PRM 76-3) which called for disclosure of individual user costs. This issue was also addressed in several internal EPA memoranda dealing with the grant eligibility of individual systems, and the encouragement of less costly treatment systems for small communities. In 1977, PRM 77-8 called for a more thorough evaluation of nonconventional treatment alternatives for small communities and rural areas.

Individual and alternative systems were given further attention by certain provisions of PL 95-217, the 1977 Clean Water Act. Incentives for considering such systems were provided primarily through the funding of individual systems, and the allocation of state-level "set-aside" funds for alternative wastewater system construction grants.

Given these incentives, many states are actively encouraging the application of alternative wastewater management systems. A number of states had established programs dealing with individual and/or small community systems even prior to the Federal program incentive actions. However, even with these ongoing state programs and the Federal incentives, and even with the currently changing attitude toward alternative systems, the actual implementation of nonconventional wastewater management systems is occurring only gradually. As the related technologies and management techniques are further developed and demonstrated, these systems will become more widely acceptable.

Key Implementation Factors

The major factors affecting the implementation of alternative systems include:

- Technology Selected
- Available Funding
- Public Acceptance and Level of Support
- Institutional Arrangement Selected

Factors other than technology greatly influence the acceptability and implementability of alternative systems. Obviously, technical feasibility and cost are the most visible issues in facilities planning studies, where alternative systems are considered. Technical issues also include how well the system will perform in meeting treatment requirements, and how reliable the system will be to maintain that performance level. Furthermore, the cost issues relate not only to capital cost, but also to long-term operating and maintenance costs.

Although technical issues and initial and annual costs are the major determinants in evaluating system alternatives, the issues of public acceptance and institutional arrangements become more important in the actual implementation of a particular plan. This is especially true when considering alternative systems. As alternative technologies have become more established and their total costs have become better defined, the public has gradually accepted these systems, just as they have accepted the more traditional sewerage technologies.

Probably the most important element remaining, which needs to be addressed before alternative systems can be more fully implemented, is the management component. The different ways in which management requirements can be satisfied is the subject of this presentation.

Types of Management Programs

Management programs for alternate systems are evolving in at least three forms:

- On-Site Systems Management Programs (Local or Areawide)
- Small Community Systems Management (Local or Areawide)
- State Regulatory and Guidance Programs

This discussion is oriented towards local management programs (involving the actual operation of either on-site or small community systems), as well as state programs directed at the planning, regulation, and funding of on-site or alternative systems. Local on-site management programs usually provide numerous functions such as system design, installation supervision, and occasionally system operation and maintenance. Both public and private entities can assume administrative and regulatory responsibilities for on-site management. Similarly, small community system programs may involve a public or private entity; these programs are typically oriented toward the actual operation of collection and treatment facilities.

State programs related to on-site and alternative systems are very diverse. They range from loosely-structured regulatory programs (i.e., promulgation of design standards) to much more comprehensive facilities planning and technical assistance programs, providing funding for planning and demonstration projects. State programs are discussed later in relation to state case studies, and to implementation of local program case studies.

Purpose of Study

The issues previously raised, concerning the implementation of on-site and alternative systems, are being addressed by Roy F. Weston, Inc., as part of EPA's current Small Flows Projects Research Program. The "Study of Institutional Arrangements for the Management of On-Site and Alternative Wastewater Systems" has the following objectives:

- Inventory Existing Operating Management Experiences
- Describe History, Functional Effectiveness, and Cost of Case Study Programs
- Summarize Issues, Problems, Constraints, and Program Strengths
- Define and Evaluate a Range of Management Alternatives and Program Requirements
- Recommend Procedures for Selection and Implementation of Management Arrangements

This report provides information for the first two objectives, and touches upon the third. The other objectives will be addressed in a study report to be prepared in handbook format as a guide to local communities and state agencies interested in establishing such programs.

MANAGEMENT NEEDS

The reasons for considering on-site and alternative systems can include:

- Existing On-Site Systems Failures
- Conventional Sewer System Being Too Costly
- Conventional Sewer System Having Unwanted Secondary Impacts

On-site and alternative systems are usually considered in the facilities planning process after existing systems have failed, or in new applications when conventional methods prove too costly. Such situations are becoming more and more common, especially in small community and rural applications. In these situations, a complete assessment of technical feasibility, performance reliability, total costs, and management requirements should be performed to determine if alternative systems are appropriate.

Evaluation of Alternatives

In evaluating on-site and alternative system options, it is important to consider all viable solutions, and offer a fair assessment of their advantages and disadvantages. Too often, the evaluation of alternatives is incomplete due to one or more of the following conditions:

- True Extent and Cause of Failing Systems Not Identified
- Rehabilitation of Existing Systems Not Given Fair Consideration
- Full Range of Viable Alternatives Not Considered or Understood
- Limitations (or Opportunities) of Site and Planning Area Not Fully Assessed
- A Cluster of Small Systems Viewed as Unmanageable

The consulting professionals, local governments (grant applicants), and state regulatory agencies can all contribute in attempting to avoid such oversights. As on-site and alternative systems prove themselves as viable disposal methods, they will be given more attention in the evaluation of alternatives. The potential advantages in terms of smaller scale, reduced total costs, and simplified operational requirements definitely warrant their consideration.

Consequences of Not Providing Program Management

Without establishing effective management programs to assure proper planning, design, installation, and operation of on-site and alternative systems, adequate system performance will probably not be realized or maintained. Even properly designed and installed systems can and will fail due to misuse and/or insufficient attention. The relationships between different categories of system problems and specific contributing causes is shown by examples in Exhibit 2.

Key Management Functions

Management objectives often flag the critical management needs. The four primary management functions are:

- Planning
- Site Evaluation--Design
- Installation
- Operation and Maintenance

The various contributing causes of system failure listed in Exhibit 2 relate directly to deficiencies in planning, designing, installing, or operating a given wastewater system. These elements, therefore, define the key activities which must be addressed in formulating an effective management program. These and other supporting management functions are discussed in the following sections.

EXHIBIT 2: PROBLEMS RELATED TO IMPROPER DESIGN, INSTALLATION,
OR OPERATION

<u>Problem</u>	<u>Contributing Causes</u>
Overextended or Underutilized Central Collection Systems	<ul style="list-style-type: none"> • Lack of uniform sewer extension policy. • Inadequate consideration of viable treatment alternatives.
¹ Immediate System Failure	<ul style="list-style-type: none"> • Inadequate site evaluation. • Inadequate system design. • Improper installation practices.
¹ Long-Term System Failure	<ul style="list-style-type: none"> • Failure to recognize marginal site limitations. • Overloading systems beyond original design. • Ignoring operation and maintenance requirements.
² Pollutional Impact	<ul style="list-style-type: none"> • Inadequate site evaluation. • Failure to consider regional water supply requirements. • Failure to recognize cumulative impact of surrounding land use.

¹ System failure refers to a situation causing the system to be unusable (e.g., sewage backup or surface breakout).

² Pollutional impact refers to contamination of groundwater or nearby surfacewater, not necessarily implying system failure as defined above.

MANAGEMENT FUNCTIONS

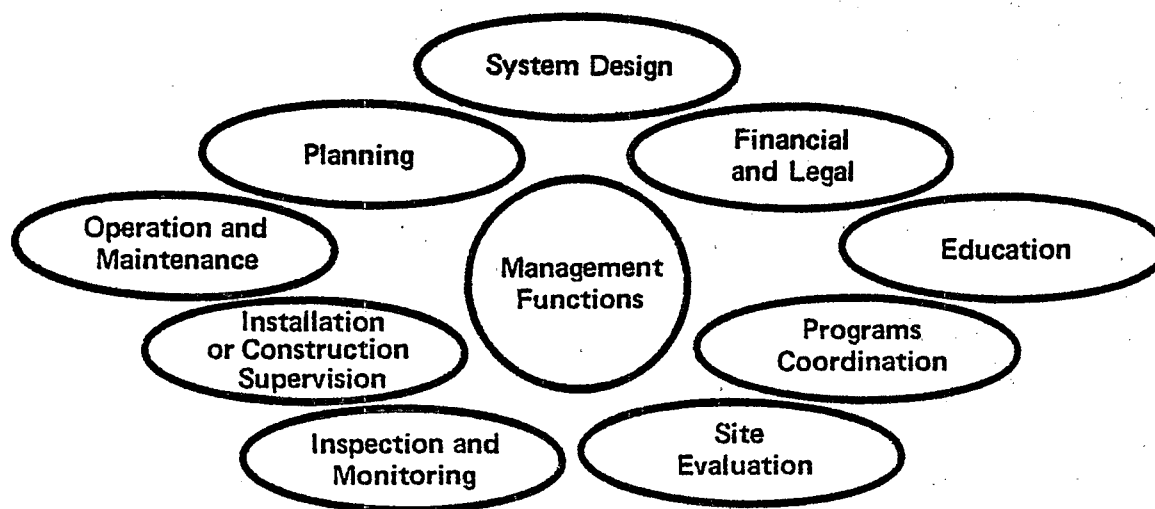
To properly manage noncentral wastewater systems, an implementation, administration, and operation program with sufficient technical, financial, and legal capabilities must be developed to perform selected functions. These functions are essentially actions or activities carried out through various institutional mechanisms to ensure adequate public service and performance of the noncentral system.

Specific Management Functions

Local management program functions typically include:

- Planning
- Site Evaluation
- System Design (or Guidance/Assistance)
- Installation or Construction Supervision
- Operation and Maintenance
- Financing
- Water Quality Monitoring and Wastewater Systems Inspection
- Public Education
- Environmental/Public Service Programs Coordination

Important functions are displayed in the following figure:



Planning, one of the first functions to be performed, involves preparation of a water quality control (and wastewater disposal) plan for the community, indicating the relative suitability and opportunities for on-site alternatives, and more traditional centralized wastewater collection and treatment systems. These plans can be prepared for the entire community as well as specific subareas, such as subdivisions and other development sites. Coordination of agencies and programs is also a part of the planning function.

System design activities involve the preparation of specifications, drawings, and layouts showing the size and type of system to be used at any given site. The design function is supported by various soil and site feasibility analyses (i.e., site evaluation activities) conducted to gain a better understanding of local conditions and limitations to noncentral system applications. Special plan review and approval procedures are a part of this function also. The review of subdivision plans, for example, is an integral part of the wastewater management planning and design functions.

Inspection during and after installation of on-site and alternative systems is another essential management function. Regulatory mechanisms to ensure proper installation include issuance of a certificate of final inspection, and licensing or registration of system installers.

The performance of routine and emergency maintenance of noncentral systems is a key functional requirement for proper wastewater system operation; however, it is a function that is not widely performed. Operation and maintenance activities can be carried out by a private firm, a public agency, and even the homeowner. Issuance of operating permits, based upon satisfactory completion of routine maintenance procedures, is one common regulatory tool used to encourage homeowners to fulfill this maintenance responsibility. Handling and disposal of septage is another component of the operation and maintenance functions.

System financing involves the application for Federal or state financial assistance to plan, design, and construct alternative wastewater systems. Major sources of financial aid (e.g., PL 95-217) are limited to repair or replacement of existing systems, rather than installation of new systems for private developments or small communities. User charges to cover system operation and maintenance (in the form of service fees and property assessments) are usually set and collected by the management entity.

Water quality monitoring of surface discharges and groundwater near non-central systems is conducted to check compliance with permit requirements, and observe overall system performance.

Public education (informing the public of available waste reduction, water conservation, and routine maintenance procedures) is also an important management function to be considered.

Functional Relationships

Exhibit 3 displays the management functions previously discussed in more detailed form. The presentation shows a series of specific functional activities to be conducted as part of the overall management responsibilities. These activities are further divided in a series of steps or actions to be implemented to meet administrative/technical management requirements, and regulatory/enforcement management requirements. As shown in Exhibit 3, each of the administrative/technical steps has an associated regulatory enforcement step or action.

The more detailed display of management functions is intended to demonstrate the relationship between administrative/technical actions (such as plan review) with regulatory/enforcement actions (such as issuing construction permits after plan approval). In this way, a full range of management functions, along with specific functional activities, management steps, and actions can be reviewed and evaluated. This range of functions should be considered and specific functions selected in forming a management program.

EXHIBIT 3: MANAGEMENT FUNCTIONS AND ACTIVITIES

Regulatory/Enforcement Activities

Administrative/Technical Activities

Planning

1. Conduct research on noncentral system costs, performance, and design criteria.
2. Conduct land use planning and areawide wastewater management planning for the community.

Assemble and maintain data on costs, performance and design criteria.

- a. Evaluate land development trends and identify location and density of noncentral systems and proposed utility extensions.

- b. Prepare wastewater facility plans.

- c. Coordinate planning activities on a community and small area basis.

Develop ordinances and other regulatory mechanisms to link wastewater facility planning to land use planning.

- c. Establish comprehensive plan preparation and review procedures to ensure coordination of areawide and site-specific planning. Establish service area boundaries.

Site Evaluation--System Design

1. Determine most feasible wastewater system to be applied on a community or case-by-case (e.g., individual lot or subdivision) basis.

- a. Conduct site suitability analysis by evaluating physical characteristics (soils, topography, hydrology, geology) of an area, lot or disposal site under consideration.

- b. Identify and evaluate alternative wastewater systems.

- a. Establish guidelines and procedures for soil suitability and site selection. Develop criteria for determining lot size.

- b. Develop cost-effectiveness guidelines and procedures.

EXHIBIT 3
(continued)

<u>Administrative/Technical Activities</u>	<u>Regulatory/Enforcement Activities</u>
c. Design selected alternative system according to construction specifications, design standards, construction methods, and performance requirements.	c. Establish performance standards, construction specifications, and design standards. Develop licensing, training or certification program for designers of noncentral systems.
2. Review site selection, site suitability, and designs for individual and small community systems.	a. Establish guidelines and procedures for performing reviews. Coordinate development review process.
a. Verify technical data used to prepare system configuration by consulting soil maps and/or conducting site inspections.	
b. Identify environmental, social, and economic impacts associated with the development plan.	b. Develop guidelines for conducting impact assessment.
c. Approve or disapprove plan based on review and assessment.	c. Issue permit for construction of system. Notify building department that wastewater system permit has been issued.
d. Develop mechanisms to ensure operational accountability of noncentral systems.	d. Require posting of performance bonds by manufacturer and/or installer.

EXHIBIT 3
(continued)

Administrative/Technical Activities

Regulatory/Enforcement Activities

Installation

1. Review/supervise construction of the noncentral system.
 - a. Perform site inspections and supervise system installation as required during various phases of the construction process, particularly initial site grading and pre-coverup stages.
 - b. Certify that system has been installed according to specifications.
 - c. Prepare as-built drawing showing location, size, and components of installed system.
- a. Develop guidelines and procedures for installation review. Establish licensing, training, and certification program for installers with provisions for renewal.
- b. Issue occupancy or final inspection permit.
- c. Record as-built drawing.

Operation and Maintenance

1. Perform periodic operation and maintenance activities to ensure satisfactory performance.
 - a. Develop policies toward operation and maintenance of noncentral systems. Identify maintenance procedures, frequency of maintenance, and maintenance responsibilities. Determine whether maintenance program is voluntary or compulsory.
 - b. Carry out maintenance program, such as periodic inspections and emergency maintenance procedures.
- a. Establish program to perform maintenance requirements. Issue operating permit (renewed periodically) and certification of replacement/repair activities. Attach operating permit to property deed.
- b. Develop system for notifying homeowner of inspection, pumping, or other special activity (e.g., turning diversion valve). Obtain legal authority for right of access to private property. Link maintenance functions to permit conditions (e.g., renewal of occupancy permit).

EXHIBIT 3
(continued)

Administrative/Technical Activities Regulatory/Enforcement Activities

2. Develop program for septage pumping, hauling, treatment, and disposal.
 - a. Develop policies toward regulating septage haulers and disposal sites.
 - a. License septage haulers and set standards for hauling equipment. Inspect pumping trucks. Regulate and inspect operations of septage treatment and disposal facilities and locations.
 - b. Record hauler activities as part of the operation and maintenance program.
 - b. Require septage hauler to record pumping activities as a condition of license or certification renewal.
3. Develop procedures for identifying and correcting system failures.
 - a. Provide opportunity to hear complaints concerning system malfunctions. Respond to complaints on a case-by-case basis.
 - a. Obtain legal authority to require system repair/replace-ment where malfunctions are discovered. Consider following regulatory mechanisms: liens on property, injunctions, and fines.
 - b. Define system failure, and initiate program to identify failing systems.
 - b. Incorporate system rehabilitation program as part of operation and maintenance effort. Issue violation and abatement notice.

Financing

1. Secure funds for the planning, design, construction, and operation of noncentral systems.
 - a. Obtain grants and loans from state, federal, and other sources.
 - a. Obtain legal authority to accept grants and incur debt.

Administrative/Technical Activities Regulatory/Enforcement Activities

- b. Set and collect equitable user fees to cover program administration, and system design, installation, maintenance, and repair/replacement costs. Outline specific fiscal responsibilities of homeowner and management entity.
- b. Set user fees based on number of units served, age of system, ability to pay, O & M required, service life, and debt costs. Collect fees through property assessments, permit fees, periodic service charges, costs of repairs, liens on property for repair costs, etc.

Water Quality Monitoring

- 1. Monitor surface water and groundwater near noncentral systems for compliance with permit conditions.
 - a. Conduct periodic water quality sampling and analysis.
 - a. Define effluent standards, discharge limitations, performance requirements, and sampling frequency.
 - b. Investigate potential system failures.
 - b. Issue violation notice. Require replacement/repair of failing systems.

Public Education

- 1. Inform public of noncentral system maintenance requirements and homeowner responsibilities.
 - a. Provide information to public of water conservation methods, system inspections, maintenance procedures, and maintenance program requirements.
 - a. Disseminate booklets, pamphlets, etc., discussing maintenance practices and homeowner responsibilities.
 - b. Coordinate with agencies (e.g., public utilities, regulating agencies, etc.) and act as liaison between homeowners and agencies.
 - b. Establish communication mechanisms with homeowner to inform them of maintenance responsibilities and to help identify failing systems.

EXHIBIT 3
(continued)

<u>Administrative/Technical Activities</u>	<u>Regulatory/Enforcement Activities</u>
<p>c. Developer and property owner should be made aware of siting considerations and alternative wastewater management opportunities prior to development planning.</p>	<p>c. Prepare detailed guidelines (e.g., design examples) relating to planning review and permit approval processes. Initiate predevelopment planning sessions with developer/property owner.</p>
<p>2. Initiate training and certification programs for site evaluators, enforcement officials, installers, designers and haulers.</p>	<p>a. Sponsor workshops and training course for contractors, engineers, and regulatory staff on technical aspects of site evaluation, system design, and installation.</p> <p>a. Require and enforce certification of contractors, septage haulers, and inspectors, preferably with testing programs.</p>

Types of Institutional Arrangements

There are several types of agencies and forms of institutional arrangements available to carry out the wastewater management functions just described. They include:

1. Existing public agencies such as municipalities, counties, states, and soil and water conservation districts.
2. Special service agencies created solely for the purpose of wastewater management, such as special districts, sanitary districts, or public authorities.
3. Private sector entities, such as private contractors, private utilities, rural cooperatives, and property owner associations.

These agencies could be used singly or in combination to implement these wastewater management functions. The purpose of this discussion and the next section is to identify a number of institutional options that can be used to manage different types of wastewater systems using individual or small community applications. The authority and administrative structure of a particular management entity varies from community-to-community, and state-to-state; a sample of some of the possible types of institutional approaches to management are described as follows:

1. Municipal Government (such as a Township) -- Local unit of government typically involved in wastewater management, generally possessing a full range of financing powers: revenue and general obligation borrowing, taxation, use of special assessments; as well as regulatory authority, such as zoning, and sewer use ordinances, etc.
2. County Government -- Generally counties have some of the same broad-based authority to operate, finance, and manage sewerage services as a municipal government, and usually cover a much larger geographical area than the municipality.
3. Other Public (Governmental or Quasi-governmental) Agencies -- These include regional planning agencies, regional (multi-town or multicounty) boards of health, or other advisory/regulatory entities (excluding special districts or public authorities), as well as state governments and specialized state agencies (e.g., State Department of Health or Environmental Protection).

4. Special District (or Service District) -- An independent unit of government with limited powers to provide services (e.g., water supply and/or sewerage services) to an area within a municipality or county. In terms of wastewater services, a special district's powers are generally parallel to those of a municipality or county. (The extent of these powers is usually precisely defined by state enabling legislation.) Generally, a special district may issue general obligation and revenue bonds, establish rates and charges for services, and levy property taxes. Special districts are usually created to perform specific functions with costs incurred being paid only by those residing within the district. Special districts can appear as sanitary districts, sanitation districts, or utility districts, and can provide single or multiple services.
5. Authority -- One variation of a special district, that is, a special unit of government (or a special purpose type of government) authorized to perform specific functions (e.g., provide water and/or sewerage services). Its jurisdictional coverage is flexible; it can be comprised of a municipality, group of municipalities, county, or group of counties. Its revenues are limited to those derived from its water and sewerage operations, and from Federal or state grants for these purposes. It cannot issue general obligation bonds or levy property taxes like a municipality or special district. (Again, state enabling legislation defines the powers of an authority.)
6. Private (for Profit) -- A sole proprietorship or incorporated business such as a septage hauler, plumbing contractor, or private utility formed to provide sewerage services. Private utilities are usually regulated by the state public service or public utility commission.
7. Private (Nonprofit) -- A property owners' association or a privately-owned cooperative can finance and manage sewer services for a specific area. Depending on state legislation, these entities may also be regulated by a public service or public utility commission.

As indicated in the previous material, a critical review of state and local enabling legislation is necessary before a specific management approach can be selected. An equally important assessment to be made when selecting a specific institutional approach is the willingness and capability of certain types of institutions for performing specific functions. For example, it may be appropriate to create a special

district to set and collect user fees for the operation and maintenance of a wastewater system, but designate regulatory control over the location and design of the systems to another unit of government, such as the township, county, or state. Likewise, a private contractor may be employed to perform specific operation and maintenance functions, with administrative/regulatory/financing functions remaining with a public agency. The factors that should be considered when addressing these various combinations of institutional approaches are discussed in the section that follows.

MANAGEMENT DIMENSIONS

The initial assessment of institutional arrangements in selecting a particular management approach is one of the critical steps in formulating an alternative wastewater system management program. The assessment of institutional arrangements should include a discussion of broad management concepts, whose dimensions include:

- Time Frame
- Size
- Purpose
- Authority
- Staging
- Charter

Exhibit 4 displays these management dimensions and their characteristics. This graphic display points out the major components of an assessment of institutional arrangements for a particular area, and helps to highlight the significance of certain management constraints, including service area characteristics, type of wastewater system applied, and scope of management functions. These management constraints are summarized as follows:

1. Service Area Characteristics

- a. Land use, population, and distribution.
- b. Growth prospects.
- c. Governmental structure.
- d. Willingness of local agencies to accept new responsibilities.
- e. Responsiveness of private homeowners to assume certain responsibilities.
- f. Diversity of problems and wastewater disposal needs.

2. Type of Wastewater System Applied

- a. Individual versus community.
- b. Surface versus subsurface disposal.
- c. Traditional versus innovative.
- d. Degree of installation and operational complexity.

Dimensions	Range in Concepts
Time Frame	Interim (Short-Term) to Permanent (Long-Range) Solutions
Size	Single (Local) Jurisdiction to Multiple Jurisdictional and Countywide Levels
Purpose	Single-Function Arrangements to Comprehensive Management Approaches
Structure	Extension of Existing Entity Services to New Organization with Specific Management Powers
Authority	Planning and Coordination Services to Systems Ownership and Operation
Staging	Time-Sequenced Evaluation of Planned Size, Purpose, and Authority to the "One-Shot" Installation of All Jurisdictions and Powers
Charter	Private Arrangements Among Developments/Developers to Public (Government or Special District) Arrangement for Management

EXHIBIT 4: MANAGEMENT DIMENSIONS

3. Scope of Management Functions

- a. Short-term or long-term system approach.
- b. Remedial versus preventive solutions.
- c. System ownership and system operational responsibilities.
- d. Regulatory versus advisory perspective of management entity.

Translating these management constraints into management programs involves the integration of necessary management functions, selected institutional authority and capability, and physical system needs. These management considerations are illustrated by utilizing examples of actual wastewater management program applications (i.e., community and state case studies conducted as part of the aforementioned USEPA-sponsored study).

CASE STUDY SUMMARIES

As mentioned in the Introduction, the USEPA has sponsored a study in response to the growing awareness that institutional aspects of these wastewater programs need attention. This study is investigating alternative institutional arrangements (i.e., programs, agencies, methods for administration, planning, regulation, financing, and operation) based on case studies representing examples of existing local and state programs related to the management of on-site and alternative systems. The actual experiences of these local and state agencies are being analyzed to identify and evaluate successful implementation of these management programs.

The case study findings are intended to provide the following information:

1. Management features and innovations in selected existing small-community wastewater treatment systems employing on-site or alternative treatment, collection, and disposal technology.
2. Definition of the issues, problems, constraints, and opportunities bearing on the establishment and management of on-site or alternative wastewater systems, at both local and state government levels.
3. Evaluations of the range of institutional alternatives available for management of on-site and alternative wastewater systems.
4. Recommendations for procedures to select and implement management arrangements.

The completed case study summaries appear in this final section. The case studies themselves involve extended field trips by planners and engineers to the respective locations. These teams review actual program administrative and operational practices, the type of technology applied and observe performance, as well as compiling the enabling legislation, rules, regulations, and financial arrangements pertinent to each case study situation. The summaries that follow highlight the key aspects of the case studies by discussing the background objectives, scope, and purpose of each program, along with assessing the performance of the

particular institutional arrangement. Agencies and individuals contacted during the case study field trips, along with selected references, are noted.

Exhibits 5 and 6 list the community (local) and state case studies conducted as part of this USEPA-sponsored project. The community case studies can be organized according to their scope of management function (i.e., the dimension or comprehensiveness of the program). Community case studies are divided into the following three major groups, representing the different forms or approaches to noncentral wastewater management:

1. Management of on-site systems by emphasizing the evaluation of site suitability as a basis of system design.
2. Management of on-site systems through a more formal service area concept that incorporates operation and maintenance activities, along with site evaluation procedures.
3. Management of small community wastewater systems (pressure sewers, cluster systems, etc.) in various development settings such as lakes or rural-developing areas.

A brief description of each community program is included in Exhibit 5; the case study communities are organized by their type of management approach, as follows:

On-site Management through Site Evaluation and Design

1. On-Site Specialists, Vermont
2. Fairfax County, Virginia

On-site Management through Operation and Maintenance

3. Marin County, California
4. Georgetown Divide Public Utility District, California
5. Stinson Beach, California
6. Acton, Massachusetts

Management of Small Community Systems

7. Lake Meade, Pennsylvania
8. General Development Utilities, Florida
9. Otter Tail County, Minnesota

The state program summary, Exhibit 6, is organized in a different manner. The type of state/local approach, and program approach applied by each state is displayed. A distinction is made between state-level and local-level involvement in planning, design, and regulation of on-site systems, system designers, installers, and septage haulers. The display illustrates the manner in which these management activities vary within individual states, as well as among the nine states selected. The state case studies are also grouped according to their management approach, i.e., whether the state program is a strong state program, a strong local program, or a combination state/local program.

Strong State Program

1. New Hampshire

Combination State/Local Programs

- | | |
|-----------------|---------------|
| 2. Illinois | 5. Washington |
| 3. Maine | 6. Vermont |
| 4. Pennsylvania | |

Strong Local Programs

- | | |
|--------------|---------------|
| 7. Minnesota | 9. California |
| 8. Maryland | |

As indicated in the exhibits, a total of 18 case studies were conducted; nine community case studies, and nine state case studies.

EXHIBIT 5: SUMMARY

Name/Location	On-Site Specialists Program, VT	Fairfax County, VA	Marin County, CA	Georgetown Divide Public Utility District
Type of Management Agency	Soil and water conservation districts	County health department	County health department	Public utility district (GDPUD)
Program Description	Cooperative effort between state, municipality, and conservation districts in Vermont to provide site evaluation and system design services to homeowners.	County on-site system permitting program that applies comprehensive site evaluation, system design, and installation criteria.	County on-site management program, where periodic inspections of septic systems are made to check performance.	District manages on-site and alternative systems at one large subdivision through performing site evaluations, design systems, system inspection, and water quality monitoring.
Service Area	Rural towns	County	County	Auburn Lake Trails subdivision
Type of Collection and Treatment Systems Applied	Septic tank/drainfield	Septic tank/drainfield	Septic tank/drainfield	Mixed on-site
Number of Systems Existing Projected	3,000 ---	25,000 ---	450 ---	250 1,807
Year Program Established	1973	1954	1971	1971
Management Functions	Wastewater facility planning Site evaluation System design Design review Installation supervision Operation inspection (frequency) Tank pumping Valve switching System repair Monitoring Public education	Municipality Specialists Specialists Health officer Specialists Homeowner Private hauler --- Homeowner --- Specialists	County Department of Public Works (DPW) County health/soil scientists Engineer County health department County DPW County health department (2 years) Private hauler --- Homeowner County health department County health department	GDPUD GDPUD GDPUD/engineer GDPUD GDPUD/County health department GDPUD (1 year) Private hauler GDPUD Homeowner GDPUD GDPUD
Program Activities/Staffing	Number of permits issued (annually) Number of field staff Number of office staff	1,000 5 1	1,000 15 5	100 3 ² 2
User Charges	Service fee Connection fee Permit fee Operation fee Monitoring fee Hauler registration Billing method Annual budget (FY 1979) Federal/state grants	\$50 --- Application \$100,000 \$158,000 ¹¹	\$60 \$400/hauler/year Application \$274,000 \$137,000 ¹²	\$15/year/lot ⁴ \$50 \$10 --- Bimonthly bill \$34,000 \$90,000 (developer) ¹³
Enforcement Techniques	Deed restriction Access easement Special legislation Lien Health code Service agreement	X X	X X	X X

Notes:

1. Clusters range in size from 3 to 28 units apiece.
2. Includes staff-persons from two county agencies.
3. Includes treatment facility operator.
4. Service charged to all (1,800) lots regardless of development status.
5. Haulers purchase coupons (2 each) from town clerk to dispose of septage at treatment facility.
6. Property assessment fee of \$975 charged to all 600 lot owners.
7. Only service charge is for electricity to operate pumps.
8. Septic system inspection handled by several health department staff persons on a part-time basis. About 5 percent of available health department staff time is devoted to the inspections program.

OF COMMUNITY CASE STUDIES

Stinson Beach, CA	Acton, MA	Lake Meade, PA	General Development Utilities, Inc. (GDU), FL	Otter Tail County, MN
Water district (SBCWD)	Municipality	Municipal authority (LMMA)	Private utility company	Homeowners' association
District manages both new and old on-site and alternative systems for small communities.	Community septage management program using private haulers with public-owned and operated treatment facility.	Authority designs, installs, owns, and operates grinder pump-pressure sewer system around the lake.	A publicly-regulated private utility owns, designs, installs and maintains septic tank-effluent pump systems at two major developments.	Lake homeowners' association manages septic tank-effluent pump system around lakes. County Department of Land and Resource Management (LRM) coordinates and approves these local programs.
Town	Town	Lake community	Port St. Lucie and Port Charlotte, Florida	Numerous lake communities.
Mixed on-site	Septic tank/drainfield and septage treatment facility	Pressure sewer - grinder pump	Septic tank effluent pump	Cluster on-site systems with common absorption fields.
500 750	4,100 5,200	277 600	320 20,000	30 clusters ¹ ---
1978	1975 (lagoons built)	1977	1970	1974
SBCWD SBCWD Engineer SBCWD SBCWD SBCWD (2 years) Private hauler SBCWD Homeowner SBCWD SBCWD	Town Town health department Engineer Town health department Town health department Homeowner Private hauler --- Homeowner Town health department Town health department	LMMA LMMA LMMA LMMA LMMA (1 year) --- --- LMMA LMMA LMMA	GDU GDU GDU GDU GDU GDU GDU GDU GDU GDU GDU	County LRM County LRM Engineer/contractor County LRM County LRM Homeowners' association (6 months) Private hauler --- Homeowners' association/contractor County LRM County LRM
20-30 1 1/2	80-100 2 ³ 2	10-20 1 1/2 1	80-100 3 1	500 3 (LRM) 2 (LRM)
\$104/year \$10 \$10/visit --- Quarterly billing \$69,700 \$48,000 ¹⁴	\$2/septage truck ⁵ \$25/hauler/year Coupons purchased \$150,000 ⁹ None	\$268/year \$1,750 (\$975) ⁶ --- Quarterly billing \$138,000 \$1,015,000 ¹⁵	\$96/year \$650 --- Monthly billing \$150,000 None	Nominal charge ⁷ Based on const. costs \$10/hauler/year (\$1,000 bond) --- \$75,000 ¹⁰ None
X X X X	X	X X X	X X	X X

9. Includes town health department budget, plus treatment facility operator.

10. About 2 percent of County LRM staff time is devoted to small community systems management.

11. Grants from the Vermont State Legislature and State 208 Program received since 1976.

12. State of Virginia funds about half of each year's budget.

13. The developer is funding a special site evaluation study for the remaining undeveloped lots.

14. A two-year demonstration project was recently awarded to the SBCWD by the California Water Resources Control Board.

15. Construction grants from FmHA and Pennsylvania Department of Community Affairs.

EXHIBIT 6: SUMMARY OF STATE CASE STUDIES

State Case Studies	MANAGEMENT FUNCTIONS									
	Facility Plan Approvals/ Grants Administration	Promulgate Design Standards	Plan-Review -- Permit Issuance			Licensing/Certification				Unique Program Features
			Individual System	Large System	Subdivision Layout	Site Evaluators	System Designers	System Installers	System Pumps	
New Hampshire	State WSPCC	State WSPCC	State WSPCC	State WSPCC	State WSPCC	State WSPCC ¹	State WSPCC ¹	State WSPCC ¹	State health department	Small Community Wastewater Management Assistance Unit
Illinois	State EPA	State health department	Local health department	State health department/ state EPA	State/local health departments	---	---	State health department	Local health department	Interagency Facility Plan Review Committee
Maine	Maine DEP	State health department	State health department/ local agent	State health department	State DEP	State health department	State health department	---	State health department	State certified and trained site evaluators and local plumbing inspectors.
Pennsylvania	State DER	State DER	State DER/ local agent	Regional DER	State DER/ local agent	State DER	---	---	Local	State certified and trained local agents, sewage enforcement officers, planning legislation and grants.
Washington	State DOE	State health department	Local health department	State DOE/ state health department/ local health department	State DOE/ state health department/ local health department	---	Local health department	---	Local health department	State mandate for management of on-site systems in subdivisions.
Vermont	State AEC	State health department	Local health department	State AEC	State AEC	State AEC	---	---	State health department	On-Site Specialists Program (soil and water conservation districts)
Minnesota	State PCA	State PCA/ state DNR	Local health department	State PCA/ local health department	Local health department	Local health department	---	Local health department	Local health department	Strong state regulations governing on-site systems near lakes (Shoreline Management Act).
Maryland	State health department	State health department	Local health department	State health department/ local health department	State health department/ local health department	---	---	---	---	Maryland Environmental Service, a state wastewater management utility.
California	State WRCB	Local health department	Local health department	Regional WRCB/ local health department	Regional WRCB/ local health department	---	---	---	Local health department	State WRCB Alternative Wastewater Systems Assistance Unit

Notes

1. State WSPCC recently proposed licensing requirement for State Legislature approval.
2. No provisions for this function.

Abbreviations:

WSPCC--Water Supply and Pollution Control Commission (New Hampshire)
 DEP--Department of Environmental Protection (Maine)
 EPA--Environmental Protection Agency (Illinois)
 DER--Department of Environmental Resources (Pennsylvania)
 DOE--Department of Ecology (Washington)
 AEC--Agency of Environmental Conservation (Vermont)
 WRCB--Water Resources Control Board (California)
 PCA--Pollution Control Agency (Minnesota)
 DNR--Department of Natural Resources (Minnesota)

COMMUNITY CASE STUDIES

VERMONT ON-SITE SPECIALISTS PROGRAM

GENERAL DESCRIPTION

The Vermont Natural Resource Conservation District On-Site Specialists Program was initiated on a pilot program basis in June 1973 at the White River Natural Resources Conservation District in Vermont. The White River District is a county soil and water conservation district, and is one of 14 conservation districts in the State of Vermont.

The on-site specialists program is an effort to provide professional technical expertise to local governments and individual homeowners to assist in planning, design, and installation supervision of on-site systems for rural residences throughout the State of Vermont. This technical assistance is provided by on-site specialists who are trained technicians employed by the Vermont Association of Conservation Districts (VACD), and whose services are provided on a contract basis to town health boards. The specialist performs site evaluations, designs on-site systems, and conducts precover-up inspections. The town, through the town health officer, is responsible for assuring compliance with local health laws and regulations governing on-site systems. The on-site specialists are also authorized to provide information for the State's single-lot subdivision permit program, providing technical and site evaluation services to individual landowners.

The on-site specialists program now serves 60 out of about 247 towns, villages, and municipalities in the State (involving six of the 14 conservation districts). A stated goal of the Vermont Association of Conservation Districts is to expand the program Statewide by 1981.

The on-site specialists program is administered at the State level through the Association of Conservation Districts, and the District Conservationist (of the White River Valley Conservation District).

A Resource Development specialist from the Cooperative Extension Service, (CES) serves in an advisory capacity. Presently, five specialists, and a director, with technical backgrounds in fields related to soils and on-site wastewater disposal systems design, are employed by the program.

ORGANIZATIONAL HISTORY

The on-site specialists program was promoted primarily by members of the Vermont Association of Conservation Districts (VACD) program in the State (i.e., farmers, concerned citizens, and Cooperative Extension Service and Soil Conservation Service personnel) in response to the problem of malfunctioning on-site systems in scattered rural areas. Due to the lack of technical assistance and other reasons, local health officers had paid insufficient attention to administering these regulations. It was, therefore, felt by the conservation district representatives that local health officers needed assistance in administering State health regulations governing individual sewage systems.

State and Federal on-site management assistance offered to local health officers in the past was in the form of technical standards and guidelines, which could not readily be applied to site-specific situations. In addition, State legislation does not mandate adoption of local ordinances governing on-site systems. Thus, only a few towns had ordinances, and those that did, found them difficult to enforce without technical support. As a result, the homeowner and/or on-site system contractor usually installed a system they felt would work; however, system failures were common, a result of improper siting, design, construction, or maintenance.

The SCS and CES helped develop and implement this program through the conservation districts. Farmers, working with the districts, have long used SCS soil survey data as the technical basis for making land use and land treatment decisions. The districts believed these soil data,

and site evaluation procedures could be applied to the on-site sewage problem. Thus, the conservation districts (initially through the White River Natural Resources Conservation District) sought to provide local governments with the technical support needed to implement workable on-site management programs.

To help implement the program on a Statewide scale, a uniform on-site ordinance contract form was prepared, and the primary focus for program administration shifted to the Vermont Association of Conservation Districts (VACD). The VACD is currently lobbying to achieve complete Statewide implementation of the on-site specialists program, and attempting to become more involved in planning and design of alternative wastewater systems for small communities (e.g., through the 201 facilities grants program).

DESCRIPTION OF MANAGEMENT PROGRAM

Most towns participating in the on-site specialists program have become more involved through the efforts of the VACD, the local conservation districts, and the Cooperative Extension Service. Contact is made with the local board of health by a representative of the on-site specialists program. If the town has a local health ordinance (governing individual sewage systems), it is reviewed by the on-site specialist and compared to the model ordinance prepared through the on-site specialists program. (The model ordinance essentially adopts the standards for system design set forth by the Vermont Board of Health.) If the town does not have local health ordinances, or regulations requiring town approval of sewage system installation, an ordinance must first be adopted by the town officials before the on-site specialists can perform their work. Towns must request on-site specialist services from the local conservation district, and sign a working agreement with the district.

After the program is established, the procedure for reviewing and approving individual sewage systems is as follows:

1. Homeowner files an application and pays a fee to town officials (usually town clerk or zoning officer) for on-site program services. This fee, which is collected by the town, is then turned over to the district.

2. Town health officer requests on-site specialist services to evaluate a proposed site for suitability for an on-site sewage system. Specialist prepares a report with minimum criteria for system design based upon site evaluation results.
3. Specialist reports on-site conditions and design recommendations to town officials. SCS technicians and State agency (e.g., Agency of Environmental Conservation and Health Department) personnel are contacted for technical assistance when necessary.
4. Town officials (local health officer and/or board of health) approve, approve with modifications, or reject permit applications based on the recommendation of the on-site specialist. Town gives notification in writing of action to applicant and district.
5. If application is approved and a permit is issued by the town health officer, the property owner or contractor installs the sewage system following the design provided to him by the specialist. The installer or homeowner notifies the specialist of the proposed installation schedule.
6. Specialist inspects the installation (before covering), and prepares a completion report, noting any deviations from the proposed system design and modifications needed to town health officer.
7. Town officials certify proper installations, or take action to correct any deficiencies (e.g., if system was not installed according to the design specifications, an approved system may have to be installed in its place).
8. Specialist prepares a report describing soil suitability testing results, proposed system design, on-site system and well locations, and alterations to system performed by contractor, including as-built drawings. (This report becomes the official record of system installation, and is filed with the VACD, town, and homeowner.)
9. Maintenance of the on-site system is the responsibility of the homeowner. The specialist offers suggestions as to tank pumping frequency, or site modifications to improve long-term system performance, and is always available for consultation by homeowner and/or health officer should problems occur. Some followup is being done to check on system performance.

Responsibility for establishing the program at the local level rests with: a representative of Vermont Association of Conservation Districts,

the District Conservationist in the White River District, and a Cooperative Extension Service agent located at the State university. These principal program administrators are responsible for providing liaison with participating towns, expanding the program to new towns, and interacting with State agencies on matters such as State policy toward non-central wastewater management, State-adopted minimum design criteria, and State legislation governing the roles of State and local agencies in noncentral wastewater management.

Five on-site specialists conduct the field work, and work on an open schedule, enabling them to service as many requests as possible during the installation season (usually responding within 48 hours of a request).

In general, soils data and site evaluations are used to identify suitable disposal areas and to design the on-site system. Based upon review of the soils data, detailed soils tests (e.g., test pits) are conducted to identify specific profile characteristics. At problem sites, several test pits may be required to locate a suitable area on a particular site.

The main objective of the program is to determine the optimum location for a disposal system on a given site, and assure that the septic tank system is properly designed and installed. The on-site specialist makes every attempt to overcome site limitations through system design and location.

PROGRAM ASSESSMENT

The Vermont On-Site Specialists Program is a unique example of conservation district participation in an on-site management program. It represents an efficient and effective means of providing professional, technical expertise to local governments and homeowners in rural areas where such services are difficult to provide on a uniform basis. This is an extremely critical service in Vermont, where (according to State

legislation) all of the local health boards are responsible for administering ordinances that govern on-site system design and installation. The program is politically acceptable to local governments because it is sponsored by the soil and water conservation districts (an existing agency), rather than a governmental unit. Furthermore, local control and enforcement of on-site system regulations have been maintained. The on-site specialist only serves in a technical advisory role. In addition, the specialists' participation in the State's single lot subdivision program was found to be cheaper and faster than the pre-existing requirement of a report by a licensed engineer.

From a technical standpoint, the on-site specialists program encourages thorough evaluation of soil survey data supplemented by actual field inspections for a particular site. Thoroughness at the initial site evaluation phase provides a very sound basis for determining not only site suitability, but also the optimum location of a disposal area on a given site. The on-site specialists program appears to have been successful (based on the past six years) in minimizing the number of failed systems resulting from improper design, location, or construction. (Since inception of the program, the on-site specialists have prepared nearly 3,000 permit applications for new or replacement systems.)

Despite the apparent success of the program, the on-site specialists program has not been accepted Statewide. Many towns are unwilling to participate voluntarily, and as long as the State does not require local health ordinances governing individual sewage systems, this is likely to continue. Objections have been raised by professional engineers and system installers who feel that the on-site specialists encroach on their work. On the other hand, many installers and individual homeowners greatly appreciate the advice of the specialists. Other concerns relate to the adequacy of the specialists' background and training, and the potential conflict of interest that exists since the specialists are involved in designing individual sewage systems, as well as in administering local health regulations governing these systems.

One of the major constraints to continuing the program and expanding the program Statewide in Vermont is the availability of funding. Currently permit fees (\$50 per on-site permit, \$100 per single lot subdivision form) partially support the on-site program. (It is estimated that permit fees cover about half of the program costs.) Since 1975, the State legislature has contributed \$123,000 to the program, while the Vermont 208 Program has allocated \$26,000 to districts for conducting special technical studies. In 1978, \$73,000 was received in the form of a State grant. This grant was the first time State financial support was issued on a line item basis, and it is felt that the State legislature will continue to fund the program at its current level.

The present limitations of the program are that it is not implemented Statewide, and is not completely coordinated with other programs (i.e., State 201 Facilities Planning Program) directed at providing wastewater service in unsewered areas. The most important asset of the on-site specialists program is its ability to work cooperatively with local governments to implement uniform administration of local health ordinances governing individual sewage systems.

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KEY REFERENCES

"Management of Rural Septic Systems Utilizing the Natural Resource Conservation District Program," Stryker, Barry W., and Steele, William T., presented at the Fourth National Conference on Individual On-Site Wastewater Systems, National Science Foundation, October 1977.

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ON-SITE WASTEWATER MANAGEMENT PROGRAM
FAIRFAX COUNTY, VIRGINIA

GENERAL DESCRIPTION

Fairfax County, Virginia is a major suburban jurisdiction near Washington, D.C. The County has a population of about 600,000, with development generally concentrated in those parts of the County closest to the Washington urban area. Since 1950 the County has experienced rapid suburban growth associated with the growth of the Washington metropolitan area. The County provides an example of wastewater management in a rapidly growing suburban area.

The County has a council-manager form of government. The members of the Board of Supervisors are elected for four-year terms. The County Executive is appointed by the Board, and manages the day-to-day government operations. The County Health Department reports directly to the Board of Supervisors, through the County Executive, and to the Commonwealth of Virginia's Secretary of Health. The Health Department staff members are employees of the Commonwealth of Virginia. The Director of the Health Department is appointed by the Commonwealth's Secretary of Health, with approval by the County Board of Supervisors. The on-site management program is administered by the County Department of Health, through the Environmental Health Division.

The program for alternative/on-site wastewater management in Fairfax County is oriented directly to septic tank management. The principal components of this management program are planning, design, and construction review of septic tank systems (i.e., on-site systems) through a comprehensive permit program. Lesser emphasis is placed on operation and maintenance of septic tanks.

The County's service area for this program consists of the portion of the County not served by public sewers. Of a population of 600,000 about 80,000 people use septic tanks (approximately 25,000 systems), with approximately 1,000 septic tanks being added each year. The County's policy is not to extend sewer service at public expense. This places the burden on septic tanks for treating wastewater generated from growth in fringe areas. Consequently, the County views on-site systems as the permanent wastewater management method for a significant portion of the County, especially those areas which have yet to be developed.

Management of Fairfax County's on-site wastewater management program is characterized by interaction among public agencies and private developers, lenders, and homeowners. The Environmental Health Division (EHD) is charged by the Board of Supervisors with administering the program. The program emphasizes prevention of problems by stringent planning, design and construction, and permitting. At the heart of the program is site soils suitability. Initial analyses of plans are based on examination of County- and State-developed soils maps of the County. Design determinations are based on on-site borings made by private firms contracted by a developer, but overviewed by County employees. Satisfactory construction is determined by staff members examining the systems during the entire construction period. The subdivision plat, building permit, and occupancy permit approvals are not issued by the Environmental Health Division, but the issuing agencies must have EHD's approval before issuing the permits. An interesting aspect of the program comes from the financial lending industry. Before new mortgages are approved, the lending institutions request the EHD to inspect the size and operating condition of a home's on-site system. This inspection is not mandatory.

Operation and maintenance of the systems are the responsibility of each homeowner. Private firms provide pump-out services on a free-market basis, controlled by County licensing. The EHD provides literature to homeowners on proper maintenance practices, but does not actively intervene unless a system fails and a health hazard results.

Two branches of the EHD are involved in the on-site program. One branch reviews plans and designs, while the other handles inspection of testing and construction. There are 10 professional sanitarians employed by the program, who are employees of the Commonwealth of Virginia, but are responsible to the Board of Supervisors for conducting the program.

ORGANIZATIONAL HISTORY

The program began in 1954 in response to politically-unpopular capital expenses required for sewerage areas with failing septic tanks. In the early 1950's, the County experienced many septic tank failures due to inadequate planning, design, and construction. After issuing bonds to support the needed sewer extension, the Board of Supervisors directed the Health Department to develop a program that would prevent future failures. The Health Department agreed on soils suitability as the cornerstone of a prevention program. The soils extension service of Virginia Polytechnic Institute (VPI) mapped the entire County for soils (at a scale of 4 inches to a mile) to establish a data base. The EHD drafted legislation (which the Board of Supervisors enacted) to require a set of permits for a developer to install a septic tank.

The major difficulties in initiating the program concerned the adequacy of the soils maps. To address the problem, the EHD required further site specific samples (at least four per system) during the permitting process.

The EHD staff members, present during the successful development of the on-site program, attribute its success to:

1. The program had very strong support from top-level County management.
2. The program was technically and verifiably sound.

The Board of Supervisors backed the Health Department's initiation of the program, and provided funds and legislation when the program was starting. The vigorous support of the Director of the Health Department during the program's startup helped overcome the initial difficulties.

Another key ingredient for successful program development was a strong verifiable technical basis for day-to-day program decisions. Mapping the entire County for soils characteristics initiated this technical basis. Staff training in soils interpretation added to the technical strength of the program.

DESCRIPTION OF MANAGEMENT PROGRAM

The management program addresses the adequacy of individual septic tank systems by County regulation of the planning, design, and construction activities undertaken by private contractors. The Environmental Health Division administers the program by issuing permits to design, construct, and use individual septic tank systems (described in Chapter 68, "Individual Sewage Disposal Facilities" of the County Health Department which outlines the required permits and methods applicable to the provision of individual septic systems).

The Board of Supervisors and the EHD do not believe that alternative or small community systems are sufficiently proven for other than experimental use. Although the County is pursuing alternative systems (e.g., sand mounds and aerobic treatment units) for small areas, it does not expect to depart from individual system septic tanks as the alternative to sewer service in the immediate future.

The crucial part of the program is the soils suitability analysis. The subdivision plat must show the soils types, and location of the proposed on-site system. This information is supplemented by soil profile data based on at least four auger borings per lot to verify the soils characteristics and to locate a suitable site for a drainfield. These profiles are prepared by the developer's contractor (usually a soil scientist or geologist), and submitted for review by EHD staff who then verify the information through a site visit. After review of the soil profile data, EHD specifies the location and depth of percolation tests to be performed by the developer's contractor. The actual percolation test must be supervised by EHD staff.

A subdivision plat is only approved once it has been determined (via soil profiles and percolation test data) that each lot has a suitable site for a disposal field. The approved site (and locations of soil profile and percolation test holes) are identified on the preliminary subdivision plat. The construction of individual homes, roads, or other infrastructure is not allowed until the plat is approved and a "certificate of adequacy" is issued.

When the builder is ready to construct a home, a building permit application is submitted for review by the County building inspector and the County Health Department and others. The permit application must be accompanied by a plat and grading plan showing the location, size, and layout of the septic tank/drainfield, as well as existing and final grades. Upon comparing the individual system proposal to the approved subdivision plat and staking out the location of the tank and the drainfield at the lot, a permit to construct the on-site system is issued. A professional engineer or surveyor is required to prepare the plat and grading plan.

According to County design criteria (revised in May 1973), all drainage fields must be divided into two separate fields to allow the use of one drainage field (while one is "rested"), and provide for future expansion of the field. The system is equipped with a diversion valve to permit "alternate dosing." The septic tank size required depends on the number of bedrooms served. For instance, a four bedroom house must have a tank of at least 1,480 gallons capacity, and a liquid depth of 54 inches. The County expects systems built according to these standards to last more than 30 years.

A typical on-site system costs about \$5,000 (about \$300 for design, \$3,200 for the septic tank and drainage field, and up to \$1,500 for pumping equipment, which is applied to about 30 percent of all newly-installed systems).

The EHD conducts an elaborate construction inspection program for these individual on-site systems. Staff members inspect the system construction at least six separate times to ensure that all phases of construction are completed according to specifications. For more sophisticated systems (e.g., where pumps are involved), at least eight inspection visits are made to each system. A separate group in EHD is assigned the task of inspecting the construction. No occupancy permit is issued by the Department of Environmental Management without EHD approval of the system.

The County's direct involvement in on-site systems diminishes after the system commences operation. The EHD notifies the homeowner (via post-cards) when the "dual dosing" diversion valve should be turned. EHD also provides septic tank operation and maintenance pamphlets to homeowners. County policy requires that individual homeowners assume primary O&M responsibility of the systems. Private haulers are contracted by the individual homeowners and septage is disposed of at one of two County-approved disposal sites in the County (both involve septage treatment via the County-owned and operated treatment plant). The County pumper's license fee (\$400/year/firm) is used to cover the cost of septage treatment.

The costs of the sewage disposal program are estimated as follows:

1. 1978 (FY)	\$259,000
2. 1979 (FY)	273,900

The State Health Department financially supports about half of the costs of the program. The remainder of the costs are covered by the County General Fund. Permit fees are collected to raise part of the County's revenue share.

These fees include site evaluations, subdivision reviews, soil evaluations, new system permits, inspections, repair, and other miscellaneous expenses, and are summarized as follows:

1. Initial fee -- \$65/lot.
2. System relocation fee -- \$30.
3. On-site system evaluation -- \$25.
4. Septic tank installer license -- \$25/year.
5. Pumper license fee -- \$400/year.

About 30-40 percent of the total program costs are raised by the permit fee system. In addition to these fees, the County requires the installers to be bonded (to \$5,000).

County Health Department activities in on-site management include County and joint state/County-sponsored training seminars, which, up to now, have been oriented primarily to persons conducting soil evaluations. It has recently been proposed that a parallel training seminar be held for system installers. At present, installers are licensed, but there is no "formal" training or certification program (installers who apply for a license are interviewed by a Health Department representative before a license is issued).

PROGRAM ASSESSMENT

The County's program is a capital-intensive program aimed at preventing problems through construction of adequate on-site wastewater disposal facilities. The result is a failure rate which was approximately 6-8 percent during the early 1950's, and has dropped to zero since the mid-1960's.

The program is not explicitly covered in the County's master plan and zoning ordinances. The on-site program is a single objective program that does not overlap with other County programs.

The emphasis on satisfactory capital facilities stems from the County investing its efforts in the system design and installation phases. The EHD believes that a County-operated/sponsored operation and maintenance program could yield improvements, but the atmosphere for expanding local programs is not strong. Also, difficulties are foreseen in managing a program with over 20,000 component systems.

The preference, however, is to achieve a high quality program by rigorously regulating planning, design, and construction by the private sector. This preference for planning is reinforced by conducting detailed soils evaluations before a subdivision plat is approved. In this way, proper consideration of topography, soil characteristics, and subdivision design and layout can be conducted before any construction takes place.

The County's citizens have an average household income well above \$25,000 annually. Recent studies have identified the County as having the highest per capita income in the nation. The citizens are active participants in the governing process, and County performance on all programs is closely followed. This close monitoring serves as a stimulus for meeting program objectives. The EHD staff attributes citizen interest and participation as key factors in keeping the on-site program as an important item during annual budget decisions.

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ON-SITE SEWAGE SYSTEM INSPECTION PROGRAM
MARIN COUNTY, CALIFORNIA

GENERAL DESCRIPTION

Marin County, California, a suburban county located just north of the City of San Francisco, has operated an inspection program for on-site sewage systems installed pursuant to County Code 18.06 (since October 1971). This County code altered some of the previous County rules and regulations governing on-site system design, construction, and maintenance. The most significant and innovative changes in the ordinance concerned the requirement for a County-administered biennial on-site system inspection program. Associated with this inspection program is a Certificate of Inspection, which is issued when the system is built, and which must be renewed every two years. To facilitate this inspection, the County code requires that risers be installed above the access lids of the septic tanks. The cost of the renewal and inspection service is \$20 per year.

The inspection program is currently administered by the Marin County Department of Health and Human Services, Division of Environmental Health Services. The staff of about eight persons conducts the inspections in addition to other duties related to public health. (Some of the field inspectors are registered sanitarians.) The review and approval of applications for new on-site systems was the responsibility of the Health Department, but has recently been shifted to the Marin County Department of Public Works.

ORGANIZATIONAL HISTORY

In 1967, Marin County retained the services of a consultant to study the problem of individual disposal systems, and identify future sewerage facility needs. In the preceding 40-year period, the County experienced a growth in population from about 40,000 persons in 1930, to over 200,000 persons in 1970. This rapid rate of development was largely spurred by

the opening of the Golden Gate Bridge in 1937, connecting the County to San Francisco. The County became, and continues to be, a major residential area for commuters since it offers good highway access to a large metropolitan area, and has attractive topography and natural features.

The large demand for housing, the rugged topography, and the low population density have caused homebuilders to use on-site systems in many portions of the County. As of 1967, about 70 percent of the County residents were served by public sewers maintained by numerous special districts throughout the County. The continued use of on-site systems seemed to pose a threat to public health, most particularly in areas near existing or proposed water supply reservoirs. In 1963, the County upgraded its rules and regulations governing on-site systems to conform with the U.S. Public Health Service and Federal Housing Authority standards. Adoption of these criteria strengthened County control over the design and installation of on-site systems. The passage of County Code 18.06 expanded the approach to on-site system management in Marin County, since it not only further upgraded the standards for on-site system design and construction, but incorporated a periodic inspection program to monitor system performance.

DESCRIPTION OF THE MANAGEMENT PROGRAM

The Marin County Code requires that the County Health Department issue an occupancy permit (i.e., Certificate of Inspection) to any homeowner with an on-site wastewater system. The certificate is effective for two years from the time of installation, and must be renewed every two years thereafter. This inspection program only applies to on-site systems installed under the rules and regulations of County Code 18.06. There are about 500 homes included in the program at this time. It is estimated that 85 to 100 permits for new on-site systems (out of approximately 1,000 building permits for single family residences) are issued each year. There are approximately 9,000 homes served by on-site systems that were installed prior to the adoption of County Code 18.06. The Code, however, does not authorize the inspection of these on-site systems.

The present administration of the County Code is as follows:

1. The County Department of Public Works (DPW) receives applications for new on-site systems, reviews the designs, and percolation tests (performed by the private engineer or applicant), conducts necessary site inspections, and issues permits to construct or repair.
2. The County DPW inspects system installation, and issues a Certificate of Inspection.
3. Two years from the date of system installation (or from the previous biennial inspection), a letter is sent to the property owner from the County Health Department, informing the owner that an inspection is required.
4. Within a two-to three-week period, the owner is asked to schedule an inspection by a County Health Department field inspector, provide access to the septic tank manhole cover, and pay the renewal fee.
5. The on-site system inspection is conducted by the County field inspector. The homeowner is asked to remove the tank manhole cover, and the County official measures the scum and sludge levels in the tank. The homeowner has the option of having the inspection performed by a County-licensed septic tank pumper with supervision by a County field inspector.
6. The field inspector locates and inspects the leach field area for any noticeable signs of system malfunction (e.g., surfacewater breakout, wet ground, etc.).
7. If the inspection is satisfactory, the Certificate of Inspection is renewed (i.e., a new certificate is issued). This renewal is recorded with the homeowner's deed by the County Recorder. The date of the next inspection and renewal is noted on the certificate.
8. Should repair or pumping be required, the homeowner must submit proof of repair or pumping before the certificate is renewed. (A follow-up inspection of repair or pumping is usually not required. Septage haulers are required to submit quarterly reports to the County Health Department summarizing hauling activities and locations of septage disposal.)

The certificate is valid for two more years, regardless of any change in home ownership prior to the expiration date. Violations of these requirements are subject to nuisance abatement provisions of the County Code which authorizes judicial proceedings and fines against violators. Further enforcement is provided by requiring that the Certificate of Inspection be valid and current when home ownership is transferred, since the Certificate of Inspection is recorded on the deed to the property. If the biennial inspections have not been performed, the system must be inspected and the certificate renewed before the property is sold.

From January 1972 to December 1978, about 450 on-site systems had come due for biennial inspections. These included on-site systems installed according to County Code 18.06 from January 1972 to December 1976, for which the first biennial inspections had been performed, plus systems which had second biennial inspections (systems installed between 1972 and 1974) and third biennial inspections (systems installed in 1972) performed. Approximately 440 inspections were completed during this period by the Marin County Health Department. Of these inspections, about 115 systems needed pumping (26% of those inspected). Only four failures have been observed. The reasons for system malfunction have been attributed to the unique physical conditions at the individual sites.

PROGRAM ASSESSMENT

The Marin County biennial on-site system inspection program represents one of the few examples of a formal operation and maintenance program administered on a Countywide basis. The program offers several benefits to the County residents, namely:

1. It provides an opportunity to ensure adequate performance of on-site systems without the politically-unpopular approach of adopting rigid standards and procedures for system design and location.

2. The program seems to be financially self-supporting as far as the administrative costs to the County are concerned.
3. The County field inspectors are a vital source of information and assistance to homeowners regarding proper installation and use of on-site systems.

There are several aspects of the program that might be improved, however:

1. The County Code requires that the field inspector have the consent of the homeowner before an inspection can be made. Follow-up letters and telephone calls have been directed toward those who have failed to respond, but to date legal action has not been taken against them. The present response rate by owners for inspection services is 60 percent (which is a lower response rate than in previous years).
2. At present, the jurisdiction is limited to unincorporated areas. Some cities have adopted the County Code, others have not. (This does not appear to be a major problem since the majority of new on-site system construction appears to be situated in the unincorporated portion of the County.)
3. The inspection program is only applicable to new systems, which essentially ignores the vast majority of on-site systems currently in use throughout the County which were installed prior to County Code 18.06. The County consultant's report, however, suggested that the program should be gradually applied to existing systems by conducting an initial inspection of systems in certain "failure-prone" areas of the County.
4. Most of the inspection fees paid by the homeowner are collected by the field inspector at the time of inspection. This sometimes places the field inspector in an awkward position. It has been suggested that the fees be included as part of the County tax bill, which would provide a better basis for enforcement.

Perhaps one of the most pressing problems with the program, is the growing demands being placed on the County Health Department staff to conduct the inspections. Each year more inspections are required as initial and follow-up inspections accumulate, and as new systems are installed. The present inspections workload is shared by eight County Health Department personnel, each spending about 5 percent of his time on the program.

Prior to California's Proposition 13, the responsibility for conducting the inspections rested with only one or two of the County Health Department staff. These individuals were able to give the program greater attention which afforded the opportunity for discussing the program requirements with homeowners scheduled to have inspections completed. This personal interaction with the homeowner is difficult to achieve at present where numerous staff members share the program responsibilities on a limited basis. This appears to be a major reason for the decreasing response rate by homeowners in scheduling biennial inspections.

County Health Department personnel are considering the following alternative actions to alleviate this problem:

1. Lengthen the inspection interval from two to three years at the minimum, and possibly up to four or five years. (The extension of the time interval for inspections might be coupled with a public education program to inform homeowners of maintenance activities they could perform.)
2. Develop a computerized program for scheduling inspections. (This program will be incorporated into a current effort in the County to develop a computerized data retrieval system for other County Health Department activities.)
3. Gradually shift the responsibility for inspections to the private septage haulers and/or to local agencies (e.g., special districts such as Stinson Beach County Water District, and Bolinas Public Utility District which currently operate on-site maintenance programs within the County).

The Marin County experience with on-site management has shown that it is possible to incorporate an inspection program within an existing governmental framework. The relatively small number of households in the program, the restriction of the inspection program to only new systems, and the nominal publicity given to the program have helped it evolve into a well operating program. The future exercise of the right-of-entry and inspection capabilities of the County Health Department, along with the extension of the inspection program to pre-existing systems by the County supervisors can strengthen the program considerably.

ACKNOWLEDGEMENTS

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GEORGETOWN DIVIDE PUBLIC UTILITY DISTRICT
EL DORADO COUNTY, CALIFORNIA

GENERAL DESCRIPTION

The Georgetown Divide Public Utility District (GDPUD) located in El Dorado County, California, adopted Ordinance 71-3, "An Ordinance Establishing Rates and Charges for Sewage Disposal Service and Providing Procedures for its Enforcement--Auburn Lake Trails Area" in June 1971. This ordinance set forth the regulatory and administrative framework for an on-site management program in the Auburn Lake Trails Subdivision, a development of 1,807 lots ranging in size from 1/4 acre to 7 acres (250 lots are presently developed). Originally planned as a rural recreational subdivision, the development now mainly consists of permanent dwellings.

The GDPUD is responsible for managing wastewater systems within this subdivision, which involves site evaluation, design and inspection related to new system installation, as well as periodic operation and maintenance inspections. The district is also responsible for water quality monitoring, sewer feasibility studies, and providing centralized sewage facilities as needed within the subdivision, in addition to its duties as water purveyor for the subdivision. In order to extend these services to other subdivisions within GDPUD's jurisdiction, an improvement district is created, and appropriate rules and regulations are established for that special district. The Auburn Lake Trails Subdivision (which consists of Improvement Districts A and B) is, at present, the only area within the GDPUD jurisdiction that has an operational on-site management program.

The GDPUD has employed a full-time manager to develop the program at the Auburn Lake Trails Subdivision, and to provide overall program administration. A soils scientist/geologist and four field technicians (who are working on a temporary but intensive basis) are also involved in daily activities at the subdivision. In addition to the GDPUD employees, the developer, Transamerica Development Co., employs a sanitarian as assistant general manager for the development to coordinate land development activities with

the GDPUD's on-site management program. Overall management of the GDPUD is conducted through the Board of Directors (elected for four-year terms) and the District General Manager, who is responsible for all planning and operational activities of the District.

ORGANIZATIONAL HISTORY

TransLand, a copartnership between Transamerica Development Co. and LandTec, the original developer of Auburn Lake Trails, had prepared a series of site plans and detailed feasibility studies for the development (November 1969 to May 1971). The initial plan called for installation of a centralized water supply system with on-site septic tank systems for wastewater treatment and disposal. (The GDPUD now operates and maintains the water supply system.) Preliminary studies conducted during the construction of the Auburn Lake Trails Subdivision concluded that individual septic tanks with leach fields would be generally acceptable for treatment and disposal of wastewaters from individual houses. It was recognized that there were areas marginally suitable for septic tanks, however, it was felt that this could often be overcome by installation of more sophisticated individual treatment and disposal facilities, or by construction of a common leach field to serve a relatively large number of lots which were poorly suited for individual leach fields due to groundwater or soils conditions.

As the initial septic tanks and leach fields were constructed and put into operation in late 1970, the California Water Resources Control Board (WRCB), Central Valley Region, raised concern over soil depths, slopes, high water tables, etc. in the area being developed, and issued an order prohibiting on-site systems, and recommended central services instead. Estimated costs for installing a sanitary sewer system in the development were \$3.6 million, or nearly \$2,000 per lot for collector sewers and wastewater treatment facilities. The initial high capital cost, coupled with the anticipated low build-out rate for the subdivision (approximately 3% per year), made it infeasible to sewer the development at that time.

Subsequent discussions among individuals from the El Dorado County Health Department, the GDPUD, the Central Valley Region of the California WRCB, the developer and its consultant, along with several feasibility studies prepared by the developer's consultant helped to develop a framework for establishing an on-site management program within the subdivision. It was successfully argued by the County Health Department representative and the developer's consultant that the proper performance of on-site systems could be ensured through a management program. The WRCB then issued an order allowing the use of on-site systems on most lots. In addition, a requirement was initiated for a management program through the existing GDPUD to "assume responsibilities for the design, installation, maintenance, and repair of any sewage disposal system constructed within the subdivision" (Waste Discharge Requirements - WRCB 72-2).

As a result, a special sewer improvement district was created by resolution of the GDPUD Board of Directors in June 1971 (Ordinance 71-3), and a full-time wastewater program manager was hired by the GDPUD in the fall of 1971 to develop and administer the program. One of his first accomplishments was preparation of "Regulations for the Installation of Individual Waste Disposal Facilities -- Auburn Lake Trails Subdivision."

The on-site management program has evolved through the mutual efforts of the GDPUD wastewater manager, the developer's sanitarian (assistant general manager), and El Dorado County Health Department personnel. The result is a coordinated program where the GDPUD, the developers, and the County Health Department share on-site management responsibilities.

DESCRIPTION OF MANAGEMENT PROGRAM

The GDPUD on-site wastewater management program was required, by an order from the California Regional WRCB, to accept certain management responsibilities. In keeping with this requirement, the GDPUD provides the following services:

1. Conducts site evaluations for each lot to determine the suitability for on-site systems.

2. Designs a system for each site.
3. Ensures proper installation through inspection of system construction.
4. Inspects and maintains operating systems.
5. Assumes responsibility for the immediate correction of any system which does not function properly.
6. Monitors watershed water quality to evaluate any possible effects of the systems on the area's water resources.
7. Conducts feasibility studies, and operates and maintains "public" (i.e., centralized) wastewater systems where needed.
8. Sets and collects fees for wastewater management services.
9. Provides direct liaison and education to the homeowner concerning the maintenance of the individual on-site systems.

The procedure followed by the GDPUD and the County Division of Environmental Health in providing these services consists of numerous steps. When a lot is to be developed, a plot plan showing property location, dwelling location within the lot, and general topographic and physical features of the site (along with a \$10 permit fee), is submitted by the applicant to the GDPUD. The application also includes an agreement between the applicant and the GDPUD which allows the GDPUD to maintain, operate, and repair the waste disposal facility and obligates the homeowner to abide by all GDPUD rules, and to pay all district charges. Failure to do so may result in fines or liens against the property.

Upon receipt of the plot plan and agreement, the GDPUD will evaluate site conditions, conduct necessary tests, and design a sewage disposal system to serve the homesite. The homeowner (should he so desire) has the opportunity to contract with a professional engineer of his choice to conduct any necessary percolation tests and site evaluations, and to prepare an on-site system design which is then reviewed by the GDPUD. In this case, the engineer must conform to District rules and regulations, and his design must meet GDPUD approval prior to issuance of permits at the County level.

With some minor exceptions, County and GDPUD rules and regulations are consistent. In the case of special designs (given reasonable safeguards for the public's health and maintenance of environmental quality), the District rules and regulations are waived and each proposal is considered on an individual basis.

The application, along with the design recommendations of the GDPUD, are sent to the County Health Department (Division of Environmental Health) for review and approval. A building permit cannot be issued (by the County Building Department) until the GDPUD and County Health Department have issued final approvals for the sewage system construction.

At this time, inspections of each sewage system installation are conducted by the GDPUD during various phases of the construction process (initially this had been a reluctant function of the local building inspector). Only when the GDPUD is satisfied that the construction standards have been met can a final inspection be conducted. Any modifications to the system design must be approved by the GDPUD. A final inspection of the system installation is performed by the County Health Department upon GDPUD request.

Typical GDPUD operation and maintenance practices include inspection of observation pipes in disposal fields, turning diversion valves, and general site inspection at least twice a year. Replacement/repair of malfunctioning on-site systems is the responsibility of the homeowner. In the event of a malfunction, the County Health Department issues the order to repair or upgrade failing systems, with recommendations by the GDPUD. If the homeowner fails to perform the necessary repairs, the GDPUD will do so and bill the homeowner accordingly. These charges can also be added to the district tax roll, and consequently become liens.

The GDPUD was required to develop and implement a watershed monitoring program as a part of the State waste discharge requirements. The program was initiated in cooperation with the U.S. Geological Survey. The primary

intent of this program has been to develop baseline values for selected water quality parameters, and to periodically monitor the watershed to detect degradation, should it occur. In such an event, corrective measures can be initiated before a major water quality problem emerges.

The GDPUD is also currently involved in an extensive site evaluation study encompassing all remaining undeveloped lots. The 18-month effort (financed by the developer) will determine the suitability of each lot for on-site wastewater disposal. Detailed soil analyses (through test pit evaluation), percolation tests, along with information on lot size, slope, drainage, and groundwater presence are being collected. The study is being conducted by a soil scientist/geologist (assisted by several field technicians) employed by the GDPUD through the CETA program (a Federal assistance program).

In addition to this site evaluation study, other special studies have been conducted to assess the applicability of alternative systems such as sand mounds, evapotranspiration beds, aerobic tank systems, and pressure sewer systems within the subdivision. Alternative systems in use at present are:

1. Two sand mounds (two more have been designed and approved and are ready for construction).
2. Two evapotranspiration beds (one aerobic, one anaerobic).
3. Three electro-osmosis units (one of which is sealed with a liner).
4. A modified system which maximizes trench sidewall.
5. Three aerobic systems (two of which are under construction) incorporated into dwellings utilizing reduced-flow plumbing fixtures.
6. A gravity flow community disposal system which handles settled effluent.

In addition, there is a variety of other modified systems serving homes in the subdivision. It is the policy of GDPUD to apply innovative technology in as many situations as are applicable, given acceptable safeguards such as adjacent common areas, etc. The GDPUD also routinely recommends that water conservation devices such as low-volume flush toilets and low-pressure shower heads be installed in each home, as well as the liberal planting of various forms of vegetation to minimize erosion potential, and enhance the disposal processes through evapotranspiration.

Operating revenue for the on-site management program at Auburn Lake Trails is derived from four principal sources: 1) a monthly service charge, 2) a permit fee, 3) general tax revenues (raised within the district), and 4) a one-time assessment payable by the developer to support any future sewerage efforts. The basic program is funded by a monthly charge against each lot in the subdivision, regardless of its development status. In 1971, this charge was set at \$0.85. On 1 July 1975, the charge was increased to \$1.00 per month, and further increased to its present rate of \$1.30 on 1 July 1977. A second (and relatively minor) source of income has been the permit fee. This was \$5.00 in 1971, and was increased to \$10.00 in 1977.

A third source of revenue has been general tax funds which would be utilized to augment income derived from other sources. Prior to California's Proposition 13, the GDPUD had a general tax revenue of \$1.20 per \$100 of assessed valuation. The revenue was the basic subsidy for all District operations (irrigation water, treated water, engineering, administration, as well as sewage). With the passage of Proposition 13, this source of revenue has been severely curtailed.

A fourth, but restricted source of income, is a one-time \$50 per lot fee payable by the developer at the time a lot is initially sold. This fund has provided start-up money for feasibility studies (and monitoring), as required over the last eight years. It has been and will continue to be, an important source of revenue for special studies.

The GDPUD has found that homeowner interaction is one of the more important duties of the district personnel. Interaction and communication with the homeowner by GDPUD and developer representatives are encouraged in order to inform the homeowner of his/her responsibilities to ensure adequate system performance.

PROGRAM ASSESSMENT

The GDPUD on-site wastewater management program is a good example of a total management concept. The GDPUD is responsible for performing a broad range of functions involving all aspects of on-site system design, inspection, maintenance, and regulation. The GDPUD is limited only in not owning the individual systems, as far as the concept of total management is concerned.

One of the greatest assets of the program is its local orientation, i.e., accessibility to the specific needs of the subdivision residents, and close attention to individual site characteristics. Another important aspect of the GDPUD on-site management program is the overall program management and administration that has been conducted to date. The GDPUD has played an instrumental role in coordinating the efforts and interests of the California Regional WRCB, the El Dorado County Health Department, the developer, and the property owners' association (at Auburn Lake Trails).

As far as the performance of the existing on-site systems is concerned, the number of system failures has been small, given the physical conditions of the area. Of the approximately 250 systems currently installed in Auburn Lake Trails, 14 have shown operational deficiencies. In the documentation of these problem sites, the most prominent cause of failure was due to improper installation on the part of the contractor. The second most common cause was a significant change in on-site characteristics under different climatic conditions (e.g., perched water tables).

To correct these situations, the GDPUD has initiated two programs. The first involves close inspection of system installation by the GDPUD. Detailed as-built drawings are prepared by the GDPUD and preserved in an operation and maintenance file. Duplicate files are retained by both El Dorado County Health Department and Transamerica Development Co. The second program is a continuous and on-going collection of data relative to on-site conditions on a year-round basis. This has given the GDPUD a better appreciation for changing conditions, and has led to the recognition of selected indicators of potential problems. With this type of information, the District personnel can now design on-site systems with those limiting factors in mind.

The detailed individual site evaluations performed assure the proper application of septic tank systems, and other alternative systems. This is supplemented by periodic operation/maintenance inspection, and overall program administration by GDPUD. The program is well run and successful, primarily due to the full-time efforts and attention of GDPUD wastewater personnel and the cooperation of the developer.

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STINSON BEACH COUNTY WATER DISTRICT
STINSON BEACH, CALIFORNIA

GENERAL DESCRIPTION

The Stinson Beach County Water District established an on-site wastewater management program in November 1977 with the adoption of Ordinance WW-77-1, "Regulating the Use of Wastewater Disposal Systems and Facilities - Providing for Permits and Fees and Regulating the Discharge of Waste or Polluted Waters." The on-site management program at the community of Stinson Beach, California is one of the State's first on-site wastewater management district's (OSWMD) programs established within an existing community. The OSWMD manages about 500 on-site systems (mostly conventional septic tank-drainage field systems), and is currently cooperating with the State of California Water Resources Control Board (WRCB) in a demonstration project concerned with OSWMD administration and operation.

Stinson Beach is a small isolated, coastal community situated about 20 miles north of San Francisco in Marin County. The community is bounded by the Golden Gate National Recreation Area on the south and east, the Bolinas Lagoon to the north, and the Pacific Ocean to the west. The geography of the area (rather mountainous terrain), has helped to place a natural limit on the growth the community can accommodate, and currently is near saturation in terms of development potential. The present permanent population is approximately 1,200 persons, which expands to about 2,200 during the summer months.

The OSWMD at Stinson Beach is administered by the Stinson Beach County Water District. The District employs one wastewater supervisor and a part-time assistant who perform both administrative and field work activities in managing the onsite program. The activities of the supervisor and his assistant include inspection of system installation, checking system operation through routine inspection, water quality monitoring, and overall program administration.

ORGANIZATIONAL HISTORY

In 1961, the Marin County Health Department conducted a survey to determine the adequacy of wastewater disposal in the Stinson Beach area. The results of the survey showed that the use of on-site systems for wastewater disposal constituted a public health hazard, and that a public district should be formed to deal with the problem. The following year, the Stinson Beach County Water District was formed to act as the wastewater planning agency, and to provide sewerage services for the coastal community.

Subsequent water quality sampling of the community's water resources (conducted between 1961 and 1972) by the County and State Health Departments indicated that coliform counts exceeded the water quality standards established by the San Francisco Regional Water Quality Control Board (RWQCB). These findings led the San Francisco RWQCB to adopt Resolutions 73-13 and 73-18 (September 1973) which required phasing out all on-site wastewater systems in Stinson Beach by October 1977. The resolutions also placed a ban on new buildings with on-site wastewater systems.

Meanwhile, the Stinson Beach County Water District and its consultants had prepared several wastewater management plans and feasibility studies, investigating various alternative methods of handling the community wastewater disposal problem. The recommended wastewater management plan in many of these studies was replacement of existing on-site systems with a centralized sewage collection and treatment system for the entire community. The central treatment system plan recommendation was rejected by the residents. The high user costs, and the contention that alternative solutions were not adequately considered were reasons given for rejecting the proposal.

Prompted by these objections and the recognized need to investigate alternative solutions, the District and the State WRCB initiated another feasibility study in 1975 (through the 201 Program--Step 1 planning grant)

to survey existing on-site systems and document the extent of the problems associated with these systems. After conducting a house-to-house survey of on-site system performance of all the residences in the community (about 10% of the systems were determined to be failing), and evaluating a wide range of alternative solutions, both the wastewater management feasibility study and the environmental assessment (performed by a separate contractor) recommended the on-site alternative program as the "best" alternative. It was further recommended that the selected program be administered by an on-site system wastewater management district, and that a sampling and inspection program be instituted to monitor on-site system performance. The State Water Resources Control Board is presently reviewing the Step 1 facilities plan for Stinson Beach.

Based upon this assessment, the RWQCB agreed to modify its previous resolutions which called for the abandonment of on-site systems as the principal method of wastewater disposal in Stinson Beach (via Resolution 77-2), as long as a local regulatory agency was created to assure the continued proper operation of on-site systems. State enabling legislation (SB 1902) was prepared and adopted (in 1976) which essentially gave the Stinson Beach County Water District the explicit authority to manage privately-owned on-site wastewater systems. This legislation was subsequently expanded to allow the creation of on-site wastewater management districts statewide.

DESCRIPTION OF THE MANAGEMENT PROGRAM

The district's rules and regulations specify the criteria to be used in issuing permits for new on-site systems, as well as for the repair or replacement of existing systems. For new on-site systems, the procedure followed is essentially the same as any other new installation in Marin County. The applicant initially contacts the County Department of Public Works (DPW) for permit information, and hires an engineer to prepare a system design. The design is reviewed by the District's

wastewater supervisor and the RWQCB (for certain cases where high groundwater conditions prevail). The District comments on the plans; however, the County is responsible for issuing the construction permit. (The California Coastal Commission also reviews the application for conformance with several coastal zone management policies.) A final inspection of system installation is then conducted by the County DPW, usually in the presence of the District wastewater supervisor.

For repair/replacement systems, the District has adopted its own set of design criteria which it enforces. The permitting procedure is different than the procedure for new installations. In this case, the District wastewater supervisor takes a more active role in developing a system design for a particular location, based on initial site inspection and verification of percolation tests, depth to groundwater, and other site condition measurements.

This information is used by a professional engineer (hired by the homeowner) to design a replacement system. The proposed design is reviewed and approved by the District's consulting engineer, subject to the District's regulations. (This engineer is also allowed to design replacement systems.) The Marin County DPW is not involved in the permit process for repair/replacement systems within the District. The inspection of system construction is also done by the District wastewater supervisor.

The wastewater supervisor and his assistant presently devote most of their time to inspecting existing systems. One of the District's objectives is to inspect every system in the community at least once by the end of 1979. About half of the systems in the community have been inspected thus far. Nearly all wastewater systems in the community, however, had been inspected as part of the initial feasibility study. Of the total number of systems (approximately 500), about 12 percent (61 systems) were found to be failing through the feasibility study

inspections. Forty-five of these failing systems have been corrected (as of December 1978). Only about six of the failing systems had to be completely replaced. The remainder had only partial system corrections performed, such as replacement or repair of a tank or drain field. Of the failing systems, about half were made up of deteriorated tanks and/or drain fields or cesspools which had to be replaced.

Most of the systems in the community including those corrected or replaced, are inspected once every two years. The systems operating only marginally, or those that require special monitoring, are inspected two or three times a year. Frequently-monitored systems include those installed in high water table areas, alternative waste disposal systems (e.g., waterless toilets), and grey water systems. There are about 35 of these specially-monitored systems in the community. Some of the systems in the community (about 40) fall under the jurisdiction of Marin County Code 18.06 which requires biennial inspections. The District has assumed the responsibility of inspecting these systems.

The District maintains card files on each home within its jurisdiction, and uses this system to notify the homeowner of an inspection (via a "Notice of Inspection" letter). The homeowner is required to provide tank access (through risers) at both the inlet and outlet ends.

During the inspection procedure, the septic tank dimensions, tank condition and construction, inlet/outlet height, scum thickness and sludge level, household size, and water consumption are recorded. Based on this information, usable tank volume and detention time is computed. The operation of the tank and drainage system is also checked during an inspection. The District supervisor simulates peak load usage by loading the system with water, and subsequently measures tank liquid levels, and inspects drainage field conditions. If the system is operating satisfactorily a two-year permit to operate is issued. Should the

system need pumping, the property owner is required to show proof of this action before an operating permit is issued.

Where the system is not operating properly, a "failed system investigation" is required. The failed system investigation, which can be done at the same time as the initial inspection, is a more extensive inspection performed to determine the causes of failure. It is then the homeowner's responsibility to repair the system.

In accordance with the RWQCB resolutions, the District also conducts an extensive water quality monitoring program of the community watershed. Surfacewater samples are collected on a weekly basis, and groundwater samples are collected on a biweekly basis. The monitoring results are reported to the RWQCB on a monthly and annual basis.

The total revenue raised by the District consists of an annual service charge (permit fee) of \$120 per household, but in 1979 the District received a two-year demonstration grant of \$48,000 from the State WRCB to partially cover salaries and support two annual technical reports to be prepared by the District. Due to the State grant and a revenue surplus from the previous year, the permit fee for FY 1980 was reduced to \$104/household/year. The State WRCB has also authorized a \$100,000 loan program (revolving fund) to provide low-interest loans for homeowners who are required to repair or replace their on-site systems, and can show financial need. The State loan will also be used to assist the District in purchasing private property for off-site correction of failing systems (e.g., via community drainage fields), or correcting failing systems when the homeowner refuses.

PROGRAM ASSESSMENT

Although the on-site wastewater management program at Stinson Beach has only been operating since January 1978, it has already done much to demonstrate the viability of on-site systems serving the wastewater

management needs of an existing community. The District, in its efforts to provide sewerage services for the community residents, has become a respected, visible, and active local service agency. It has established itself as a service organization by emphasizing public awareness and education regarding on-site system practices. The District's recently prepared "Homeowners and Users Guide for On-Site Wastewater Disposal Systems" is an example of the attention placed on homeowner involvement in the on-site management program.

The homeowner's willingness to participate in the OSWMD program is exemplified by the willingness of the homeowners to have their systems inspected, and to make necessary repairs or improvements. Even though the costs of these system corrections are borne entirely by the homeowner, a few homeowners have had to install new systems (under the direction and supervision of the District). An apparent inequity exists, however, since many homeowners have had to bear the costs of system rehabilitation on their own, despite the potential availability of Step 2/Step 3 grants in the near future. The District is currently pursuing these grants and expects to be awarded a construction grant, pending approval of the Step 1 Facilities Plan currently under review by the WRCB.

The District has, in addition, a complementary broad range of regulatory authority to perform on-site management functions. Its personnel can enter onto private property to perform inspections, it has established rules and regulations governing the design of on-site systems, it can force homeowners to upgrade and repair malfunctioning systems (by terminating water service or by placing liens on property), and it has the authority to set and collect user fees.

The Board of Directors thus far has been very supportive of the on-site management program, and has been willing to exercise enforcement authority in several cases to assure compliance with program regulations. It is not surprising that the majority of the community residents favored the continued use of on-site systems because of the results of the initial house-to-house survey, the relatively high cost of the central system

alternatives, and the public attitude toward maintaining the present rural character of the community.

The on-site program has also met with the approval of County and State agencies, which have emphasized the political attractiveness of local management of on-site systems. The District's voluntary participation in a demonstration program, sponsored by the State Health Department and Office of Appropriate Technology, for example, to evaluate the performance of alternative on-site systems has also been a positive feature of the Stinson Beach on-site management program. Under this program about nine waterless toilet/grey water systems have been installed, and their performance monitored on a monthly basis.

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ON-SITE WASTEWATER MANAGEMENT PROGRAM
ACTON, MASSACHUSETTS

GENERAL DESCRIPTION

Acton, Massachusetts is an affluent suburban community of 20,000 situated 25 miles west of Boston. Like many other New England towns, Acton has undergone a transformation in the last three decades from a rural sparsely-developed area to one which is predominantly residential. About 90 percent of the town is currently served by a central water system, and most developed lots are less than one acre. Despite this rapid rate of growth and rather compact development pattern, the Town continues to use on-site systems for wastewater treatment and disposal. Acton is set apart from neighboring towns with similar developmental characteristics by its vigorous on-lot wastewater management program. This program establishes well-defined procedures for site testing, design, installation, inspection, and approval of septic systems. An integral part of this program is a septic tank permit provision that calls for biennial pumping, and provision of a municipally-owned septage disposal facility which is used by private septage haulers to accommodate this maintenance requirement.

The on-site management program is administered by the Town Health Department, consisting of the Director of Public Health and his assistant, under the supervision of a three-member Board of Health. The Health Department is assisted by the Planning Board which administers Township zoning and subdivision ordinances, and by the Engineering Department which is responsible for review and inspection of subdivisions (for drainage improvements, road construction, etc.), and for various aspects of wastewater facilities engineering, including review of 201 and 208 planning. Acton has a town manager form of government.

A Wastewater Management Advisory Committee was established in 1964 to compile data and prepare recommendations for long-term wastewater manage-

ment programs. The Wastewater Management Advisory Committee, made up of interested citizens appointed by the Town Manager, is reviewing the findings of the Step 1 (201) Facility Plan being prepared by the Town's consulting engineers. The plan recommends formation of a Town on-site wastewater management program. The Massachusetts Division of Water Pollution Control (WPC) administers 201 funding in the State, and will be reviewing the 201 Facility Plan while the Massachusetts Department of Environmental Quality Engineering (DEQE) has reviewed and approved the plans for the Town's septage treatment facility.

ORGANIZATIONAL HISTORY

Seven major studies concerning wastewater management in Acton have been prepared over the past 15 years. The first two studies, completed in 1966 and 1972, recommended sewer construction, largely due to the fact that the Town was experiencing a rapid rate of growth, and soils were considered unsuitable for on-site systems. (Only 15 percent of the Town's land is considered suitable for on-site systems according to U.S. Department of Agriculture Soil Conservation Service (SCS) soils maps.) The 1966 wastewater management report, e.g., recommended an eight-phase sewer construction program for the Town with estimated collection and treatment facilities costs of nearly \$10,000,000 (in 1966). These recommendations were rejected by a town meeting vote as too costly and unnecessary, given the perceived adequacy of existing on-site systems.

Three subsequent studies, prepared in 1975 and 1976, questioned the need for sewers in the Town, and instead recommended that use of on-site systems be continued. On-site disposal appeared in these studies to be satisfactory from the viewpoint of public health, costs, density of development, and environmental impact. A preliminary study prepared in 1977 by the 208 areawide planning program concluded that sewers should be installed in parts of Acton (and neighboring communities) due to

soils and water table limitations. The final areawide 208 Plan (completed in late 1978) called for a number of nonstructural solutions for Acton area communities (e.g., management of existing septic systems) based upon regional septage management alternatives that had been investigated. Residents in the region preferred these nonstructural solutions, fearing the excessive costs and induced development associated with sewers.

To resolve the conflicts of previous studies, a 201 (Step 1 planning) study is being prepared. The current 201 Facility Plan supports the use of individual subsurface disposal systems on a Townwide basis, and recommends:

1. Continued reliance on on-site disposal as the most cost-effective alternative in view of the Town's present standards and surveillance program.
2. An educational campaign to encourage homeowners to maintain their systems properly.

An integral part of Acton's current reliance on subsurface disposal is its program for handling septic wastes. In the early 1960's, private haulers disposed of septage in a pit disposal area situated on Town forest land. The Town quickly outgrew this facility, and in 1968, constructed two septage lagoons. Within a few years, these lagoons were inadequate. In 1974-75, the Town began renovating and expanding the septage disposal facility. Layout and design of the facility were prepared by the Town's Engineering Department and approved by DEQE. A septage disposal system using settling lagoons in series with infiltration beds was envisioned. This proved an inexpensive solution (costing approximately \$47,000 to date for materials, financed completely by the Town with labor and equipment supplied by the Highway Department).

The septage handling facility is located on a 60-acre tract purchased by the Town in 1976. Approximately 15 acres are used for disposal of septage tank wastes, with the remainder set aside for sanitary landfill.

The Town Highway Department is responsible for maintaining the septage disposal facility, while the Health Department reviews and issues permits for on-site system construction and replacement.

DESCRIPTION OF MANAGEMENT PROGRAM

Acton maintains strict local regulations regarding design, installation, and operation of private subsurface disposal systems. These regulations are complemented by an active inspection and surveillance program, reinforced by careful record-keeping, so that subsurface systems are constructed according to approved designs. Each new septic system or system repair must have a construction permit and operational approval from the Board of Health. Permits and approvals are issued in the following manner:

1. Plans (i.e., designs) for individual systems are prepared by a professional engineer and submitted to the Board of Health for review.
2. Each subsurface disposal site is tested by an engineer or sanitarian hired by the homeowner in the presence of the Director of Public Health or his assistant.
3. If the site and design plans are acceptable, an installation permit is issued.
4. Once a system is in place, but prior to cover-up, a Board representative inspects the installation for compliance with the plans, and quality of workmanship.
5. Operational approval is issued for a correctly-installed system, subject to a flow limitation and a biennial pumping requirement. (This requirement is not enforced by the Town, but remains the owner's responsibility.)
6. To accommodate septic system maintenance and to insure safe disposal of septage, the Town owns and operates a septage disposal facility.

Acton uses Soil Conservation Service maps to determine general soil suitability of individual sites, but relies on specific site test data (e.g., percolation tests and observation pits) for actual evaluations and approvals. The Board's design requirements for septic systems include:

1. 1,000-gal septic tank (1,500-gal tank if a garbage disposal is used).
2. 4-foot minimum distance above seasonal high groundwater.
3. Percolation rate ≤ 20 min/in.
4. 800 sq ft minimum area for 3-bedroom house.
5. 900 sq ft minimum area for 4-bedroom house.

The average cost of a new subsurface disposal system having a 1,000-gal septic tank and a 900-sq ft leaching field in Acton is about \$1,500. A replacement system of the same size costs the homeowner about \$2,400. The increased cost for replacement systems is primarily due to factors such as lawn replacement, access to the installation site, etc.

Maintenance of an individual system is the owner's responsibility. The Board of Health takes action to correct system failures upon receipt of a complaint, or when a system failure is suspected. Problems with on-site systems can be determined by the health officer through the following means:

1. When frequent pumping is required (records of septage pumping are kept by the Health Department).
2. Through sanitary surveys conducted in conjunction with the State.
3. When a homeowner requests a permit to repair or enlarge a system.

Whenever possible, system repairs must meet the standards established for new systems. Private haulers pump out septic tanks at an average charge to the owner of about \$55. The average frequency of pumpout in Acton (determined through a homeowner questionnaire) is once every two years.

Septic wastes are trucked by private haulers to the municipal septage disposal facility, which is staffed by one full-time attendant, employed by the Acton Highway Department. Supplemental equipment and personnel

are supplied by the Acton Highway Department as required to maintain the facility.

Dumping septage from outside the Town is not allowed at the Acton site. (Massachusetts law delegates responsibility for septage disposal to municipalities. Most of the towns near Acton leave the responsibility of septage disposal to the private hauler.)

The septage disposal facility in Acton consists of eight settling lagoons (each measuring 40 ft x 80 ft), any six of which may be operating at one time. A large 500,000 gallon lagoon provides cold-weather storage during December, January, and February. The settling lagoons have a 20-day retention time and a 3-ft operating depth. Clarified liquid is discharged to infiltration beds with a design load rate of 1 gpd/sq ft. Sludge is allowed to accumulate to about one foot in the lagoons. When this level is reached, the liquid in the lagoon is allowed to flow into the infiltration beds, and the sludge which remains is exposed for air drying. The dried sludge is mixed with sawdust and scraped up by a front-end loader and stockpiled. Eventually, it is mixed with more sawdust, woodchips, or other bulking materials, and spread on adjacent land. Limited groundwater quality monitoring around the septage disposal facility has been conducted by the New England Interstate Water Pollution Control Commission. A 95 percent treatment effectiveness level at the two-ft depth has been shown.

The Board of Health licenses all septage haulers, and requires adherence to a prescribed system for disposing of septic wastes. The Town Treasurer sells coupons to licensed haulers at the rate of \$2 per 1,000 gallons of septage. These coupons entitle the haulers to use the Town's septage disposal facility, and are turned over to the gate attendant upon arrival. The \$2 per 1,000 gallon charge is approximately equal to the Town's cost of operating the facility. In addition, the haulers must fill out trip

tickets in triplicate for each septic system inspected and pumped out. The hauler keeps one copy, one goes to the system owner, and one to the gate attendant for transfer to the Town's files. The tickets give the hauler's name, location of the system serviced, quantity of septage pumped, and the date. This information is entered in daily logs and monthly summaries. The system of coupons and tickets enables the Town to effectively monitor the sources and volumes of septic wastes being handled at the disposal facility. Approximately 17,000 gallons are handled daily at the present time (July 1979). The total design capacity is approximately 18,600 gallons per day (based on the use of six lagoons on a 20-day retention time and liquid depth of 3 feet).

A key to Acton's wastewater management program is record-keeping on individual disposal systems. A file on each system is maintained to monitor the status of the installation and frequency of maintenance. The file contains:

1. Percolation test data.
2. A copy of the installation permit.
3. Design and record drawings.
4. Repair permits.
5. Pertinent correspondence.
6. Septage disposal trip tickets.

The file serves a variety of purposes, and can signal a potential problem if tickets accumulate at a faster than normal rate.

PROGRAM ASSESSMENT

Acton has an effective wastewater management program due mainly to the professional and technical staff which the Town employs. The Town residents are highly educated, and public involvement in the on-site wastewater management program is facilitated by the Town meeting form of government which encourages active citizen participation in community programs. The unique aspect of Acton's on-site management program is its concern for proper septage disposal. The provision of a septage

treatment facility, owned and operated by the Town, for the use of private haulers servicing community residents, is the key feature of this Town's program relative to other on-site management programs that may require or suggest periodic maintenance, but do not provide for treatment and disposal of septage.

While the hauler trip tickets do specify the location of the home served, a hauler could pump a system in a neighboring town, and then serve an Acton resident before disposal. One solution would be to require trucks to have meters to measure the quantity of septage disposed of in the lagoons. Thus, the volume of septage pumped at the home (via the invoice to the homeowner) could be compared to the volume disposed of at the treatment site. This metering requirement has been considered, but does not appear warranted at this time.

The Wastewater Management Advisory Committee is vigorously pursuing a study of long-term management policies and programs, and has recently requested 201 funding for this purpose. The Committee has outlined an ambitious 20-year program based on continued, extensive use of on-site disposal systems. The major program elements include:

1. Public education.
2. Wastewater volume reduction (including water conservation).
3. Wastewater source identification.
4. Water resources monitoring (including groundwater monitoring).
5. Optimization of management system.
6. Corrective program for faulty systems.

The Advisory Committee is not only concerned with establishing an on-site management program to ensure continued reliance on subsurface disposal systems within the Town, but recognizes a potential threat from the Town's long-term wastewater management policies on the quality of the aquifer which recharges the municipal water supply wells. A significant portion of the Committee's 201 funding proposal, therefore, is devoted to developing a program to monitor surface and groundwater resources to detect system failures and help establish a program for rehabilitating contaminated water resources. This proposal for 201

funding has recently been submitted by the Advisory Committee to the Town Manager, and will most likely be sent to the State Division of Water Pollution Control for review.

The Town has asked to be included on the State's priority list as an innovative and alternative program. It is the community's consensus that a decentralized approach to wastewater disposal, coupled with a strong management program, is the most cost-effective solution to the Town's future wastewater management needs.

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LAKE MEADE MUNICIPAL AUTHORITY
LAKE MEADE, PENNSYLVANIA

GENERAL DESCRIPTION

Lake Meade is a small community in south-central Pennsylvania, located in Adams County approximately midway between Harrisburg and Gettysburg. The man-made recreational lake is bisected by Reading and Latimore Townships. The community is currently made up of 277 single-family residential homes, with an expected potential of 600 when fully developed. Originally planned as a seasonal recreational community, the development is rapidly shifting to mostly permanent residences. Community sewerage services are now provided by the Lake Meade Municipal Authority (LMMA) which owns and operates a pressure sewer system around the lake. The LMMA is one of several municipal authorities established within the State to manage pressure sewer collection systems.

Lake Meade was developed in the late 1960's by Lake Meade, Inc., a subsidiary of the American Realty Company which is a major developer of lake community projects across the County. In 1969, the LMMA was created by the developer. The objective was promotional in nature, stemming from the needs of the developer to present an attractive development package to Latimore and Reading Townships in order to gain approval for the development plans. The development package included the creation of a Lake Meade Water Utility, provision of a 10-foot right-of-way around each Lake Meade property to permit installation and service of public utilities, and incorporation of the Lake Meade Municipal Authority under the Pennsylvania Municipality Authorities Act of 1945. Under the State enabling legislation, a municipal authority can acquire, own, operate, and maintain sewerage facilities within any defined service area.

After experiencing fairly widespread failures of existing septic tank drainage field systems, and studying the feasibility of several wastewater management alternatives, a combination grinder pump-pressure sewer/gravity sewer collection system with a package plant was installed

under the supervision of the LMMA and operation began in the summer of 1977. All 277 residents of the community are now served by the system (80 percent of the connections are to pressure sewers).

The LMMA employs one full-time and one part-time treatment plant operator to manage the sewerage system. They are responsible for operating and maintaining the pumps, collection system, and the treatment plant. Part-time secretarial and bookkeeping staff are also employed, and the services of engineers and legal specialists provided on retainer basis.

The LMMA charges \$268 per year for its sewerage services. It also collects initial connection and assessment fees from its customers to cover installation costs.

ORGANIZATIONAL HISTORY

In the early 1970's, septic systems around Lake Meade began to fail. The lake had shown early signs of eutrophication, necessitating a chemical treatment program for weed control. The community continued to develop, using holding tanks as an emergency method of wastewater management. New septic systems were not permitted by Pennsylvania regulations in soil conditions like those found near the lake. Eventually the sewage treatment plant near Gettysburg, where the pumpage from Lake Meade holding tanks was disposed of, refused to accept any more of Lake Meade's wastewater, and subsequently, the Department of Environmental Resources (DER) issued a moratorium on new construction in the community until the wastewater problem was resolved.

By September 1973 the LMMA initiated meetings to discuss alternative methods for resolving lake water quality problems from malfunctioning septic systems. As noted earlier, the LMMA was originally created by the developer (in 1969) to plan for, own, and maintain sewerage services for the community. It was not until 1976, however, that the LMMA was legally activated to provide wastewater disposal services (by resolution of Reading and Latimore Townships).

Between 1973 and 1975 the LMMA, with the assistance of a consultant, began to examine alternative wastewater management systems that could be installed in the community. Several alternative wastewater collection system configurations were considered, including vacuum systems, gravity sewer systems, and combination pressure/gravity systems, as well as several treatment options such as package plants (extended aeration, and rotating biological contactor), and connecting to a regional system. The combination pressure/gravity sewer collection system with a package plant (rotating biological contactor with discharge to a nearby stream) was chosen because of its relatively low cost and ease of operation.

During this time, the LMMA was also concerned with alternative methods of financing and implementing different engineering solutions. The Authority anticipated financing and implementing the wastewater management program through the authorization and low-interest bond capabilities of Reading and Latimore Townships. The Authority was particularly interested in a lease-back arrangement that would provide low-interest loans and regulatory authority in financing and managing the system. This approach, however, was not acceptable to the two townships.

Preliminary investigations into financing alternatives for the LMMA indicated that the community was probably not likely to receive a 75% grant under the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) because of the community's low position on the State priority list. As a result, attention was directed to local financing, and grants and loans from other Federal and State agencies. In 1976, the Authority received funds from the Farmers' Home Administration (FmHA), and a grant from the Department of Commerce, State of Pennsylvania. Over \$1 million in grants and \$528,000 in low-interest loans were secured by the LMMA.

To be eligible for these funds, the community had to provide a portion of the funds necessary to construct and acquire its proposed sewage collection, transportation, and treatment system. Funding for the community's share was arranged by the Authority's bond counsel with a local bank.

Numerous legal resolutions and agreements were also made to ensure the long-term capabilities of the Authority. Many of these agreements were required by the FmHA as prerequisites for a grant and loan. Others were written to assure rights-of-way on private property. Specific resolutions, agreements, and ordinances include those for the purpose of:

1. Providing FmHA funds and specifying security, and setting forth necessary agreements regarding receipts and values.
2. Setting tapping fee charges, manner of payment, and enforcement provisions.
3. Fixing and charging rental rates and charges for use of the sewer system, providing for collections and filing of liens; regulating the discharge of sanitary sewage and industrial wastes into the system; and permitting access to improved properties served by the sewer system.
4. Enforcing requirements for connection to and use of the sewer system, granting of certain easements, rights-of-way, rights, and privileges to the Authority.
5. Outlining the Authority's rights and privileges in, along, over, and under streets and roads.
6. Requiring connection to the system and the manner in which connection will be made, consideration of costs, and the abandonment of previously used septic tanks, etc.
7. Enforcing requirements for connection to and use of the sewer system, and granting certain easements.
8. Establishing an agreement with each property owner to protect the LMMA from damages to personal property resulting from flooding or stoppage of sewers or backwater from the system.
9. Permitting the LMMA to regulate, maintain, and inspect the system, and to otherwise release the LMMA from liability or responsibility for damages or injuries.

Once these resolutions were adopted, agreements obtained, and funds secured, the system was built and operation began in the summer of 1977.

DESCRIPTION OF MANAGEMENT PROGRAM

The LMMA owns, operates, and maintains all elements of the collection and treatment system, including the individual grinder pumps serving each home (in some cases, duplex grinder pump units service multiple dwellings), the pressure lateral sewers from each pump to the street, and all pressure sewer and gravity lines conveying wastewater from the individual residences to the treatment plant. The homeowner is responsible for installing a gravity discharge line from the home to the pump unit.

The LMMA employs one full-time technician to operate the treatment plant, conduct inspections and repair all collection lines and pump units. He is assisted by a part-time machinist, who specializes in pump repair and service operations.

The plant operator is responsible for daily monitoring of plant performance (laboratory tests), and routine facilities maintenance. In addition, he periodically surveys the collection system to insure its proper performance. All system users have an emergency telephone number to call if a significant malfunction occurs. The operator has been trained to do minor troubleshooting of the grinder pumps and other system components. The Authority keeps a supply of spare pumps and parts for emergency use. The Pennsylvania DER monitors water quality in the receiving waters of the treatment plant, and inspects plant performance on an annual basis.

Overall program administration is provided by the five LMMA members. Each member is appointed from the community for a five-year term, which overlaps to ensure experienced membership. Authority members are required to own property within the community, and are appointed to reflect the interests of the two townships (thus, two members reside in one township and three in the other, based upon the population distribution between the two towns).

Three different revenue-producing charges are used by the LMMA. These are:

1. Assessment \$975 (one-time assessment charged to all 600 lots within the community by the LMMA prior to system construction). (This assessment was designed to reflect the improvement in property values in the community due to the provision of a sewerage system).
2. Connection charge \$1,750 (one-time assessment charged to all improved lots where connection to the sewerage system is made).
3. Sewer rental and charges \$268 per annum (paid on a quarterly basis to cover operation, maintenance, and financing costs).

As a method for controlling the use of the sewer system by owners who are delinquent in making payments, or violate Authority discharge requirements, the LMMA has considered shutting off water and electricity to the home, and terminating wastewater services altogether. The most feasible approach, according to the Authority, is to shut off the wastewater line which connects each user to the system. (Valve boxes are available at each house.) This method may not be acceptable from a health viewpoint, but the threat of such action may achieve the Authority's objective.

PROGRAM ASSESSMENT

The Lake Meade Municipal Authority represents one method for managing a noncentral alternative approach to community wastewater disposal. The management approach is conventional in the sense that it is the primary method for organizing an ordinary sewer authority within the State of Pennsylvania. Several important factors can be considered key elements in the success of the Lake Meade arrangement. These include:

1. Concern by an educated group of citizens that timely and effective solutions were needed to preserve Lake Meade, and to provide an affordable wastewater disposal service to the area; leadership came from this group by way of specific individual effort.

2. Utilization of skilled professionals by the LMMA in establishing the Authority's approach with respect to legal and financial matters, the technical system, and in developing necessary agreements with other governing bodies and private interests.

Authority minutes document the process of developing the institutional framework, and developing the powers of the Authority to provide sewerage services. This documentation points out the active involvement of the Lake Meade Property Owners' Association. Because of the private nature of the Lake community, and the Property Owners' Association's responsibilities for providing municipal services to the community (including security, ambulance and fire service, trash removal, and road repairs), the early LMMA members were motivated to find an acceptable wastewater management solution. In addition, these concerned officials were professionals in the community. Although their backgrounds were not in engineering or planning, they knew when to utilize professionals in developing a management program. Members of the Authority included master plumbers who could assist in construction and installation of the system, as well as accountants and financial experts who could research the availability of grants, and were important in establishing the financial support needed in the early development stages of the Authority.

Aside from some initial minor startup problems, the Lake Meade system has performed well. Although some property owners are delinquent in paying the required bills, the majority of the residents, as well as State agency personnel, support the system and appreciate the benefits that have accrued to them (e.g., improvement in lake water quality, as evidenced by the reduction of algae blooms and other signs of eutrophic conditions). While it appears that the service charges to the homeowners are excessive (\$268 per year), the LMMA anticipates that these charges can be reduced once some of their major loans are repaid. (As pointed out earlier, the LMMA was not able to secure a 75% grant for construction from the EPA, but did manage to obtain other loans and grants to finance construction costs.)

ACKNOWLEDGEMENTS

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GENERAL DEVELOPMENT UTILITIES, INC.
PORT CHARLOTTE AND PORT ST. LUCIE, FLORIDA

GENERAL DESCRIPTION

General Development Utilities, Inc. (GDU), is a wholly-owned subsidiary of General Development Corporation (GDC), a major land development company in Florida. General Development Utilities provides all forms of water and sewer utilities to GDC land development projects, including over 200,000 acres on the Atlantic and Gulf Coasts in Florida. GDU is the topic of a community case study because of its application of pressure sewer technology in two GDC communities -- Port Charlotte and Port St. Lucie, Florida.

The form of pressure sewer technology used is a septic tank effluent pump-pressure sewer collection system (STEP system) presently serving about 320 residences in these two communities. There are approximately 10,000 households in Port Charlotte, and 3,000 in Port St. Lucie. The number of residences served by the STEP system obviously represents only a small portion of the total population within these two communities. The remaining households are served by conventional gravity sewer systems also maintained by GDU. The STEP system, called "Suburbanaer," has received conditional approval from the State of Florida, and the system is being tested at the Port Charlotte and Port St. Lucie sites.

The application of alternative technology (i.e., STEP systems) to serve GDC developments was encouraged primarily by the current president of General Development Utilities, Inc. As a result of his efforts, GDC agreed to financially support the utilization of STEP systems to serve some of their land development projects. This venture has grown (over a period of eight years) to the point where four people, besides the GDU president, are directly involved in the management, operation, and maintenance of STEP systems. GDU employs two people responsible for administering the "Suburbanaer" program and product development activities, and two full-time maintenance technicians.

GDU provides complete operation and maintenance of the collection and treatment systems, including the individual septic tank and effluent pump units. The system is entirely owned by GDU; access to private property is provided through a service agreement with the homeowner.

ORGANIZATIONAL HISTORY

During the 1960's, GDU was faced with a problem familiar to many land developers. Due to poor soil conditions, seasonal high water tables, and faulty installation by independent contractors, many difficulties were being encountered with conventional septic tank/drain field systems. GDU, through economic analysis and financial feasibility studies, realized that the cost of providing conventional gravity sewers to many sparsely populated, widely scattered communities was prohibitive. This scattered type of land development is typically associated with "home-site developments" where lots are sold in a parcel of land without immediate plans for building on those lots. Lots are developed at the lot owner's discretion, at some point in the future. The rate of development is slow, and the pattern of homes built is random.

The environmental and economic impacts of serving this type of development with conventional on-site systems or gravity collection systems, led GDU to design and install a STEP pressure sewer system in a section of Port Charlotte in 1970. The STEP systems were originally allowed to provide central wastewater collection in sparsely developed areas with poor soils as a temporary measure. In 1972, the system was extended to the Gulf Cove area in Port Charlotte, and this site became the official test area for expansion of the Suburbanaer pressure sewer system via a state demonstration project. GDU's Suburbanaer system has received "conditional" approval from the Florida DER, with final approval dependent upon the completion of the current demonstration program.

The terms and conditions of the demonstration project provide for a two-year study period during which a total of 230 individual STEP units can be installed. A monthly status report is submitted by GDU to DER

indicating the number of units installed, and number remaining within the approved demonstration program. In addition, GDU reports to DER documenting system installations, service calls, customer complaints, and preventive maintenance activities. GDU was also required to secure a substantial performance bond.

In spring 1977, after approximately 200 STEP systems were installed by GDU under conditional approval, the formal demonstration program was initiated. Basically the demonstration agreement constitutes the only permit necessary for installation of individual units, providing GDU notifies DER prior to installation of each unit.

DESCRIPTION OF MANAGEMENT PROGRAM

GDU's principal activities are in utilities operation, design and finance, and product development. The Suburbanaer system is administered predominantly through the product development branch of GDU, which employs two people responsible for the management and development of Suburbanaer systems. The utility design group with GDU works closely with the GDU engineering staff in preparing layouts and other plans for future land properties. Utility rates administration, accounting, and legal services are provided by the GDU Finance and Administration Division.

Suburbanaer systems maintenance personnel are drawn from existing utilities operations staff, and generally perform work for both Suburbanaer and conventional sewer systems. At present, one full-time technician is employed at Port Charlotte, and another at Port St. Lucie to perform general maintenance, repair, inspections, and supervision of new installations. (System installations at Port St. Lucie are performed by a private contractor, while in Port Charlotte the GDU-employed personnel install Suburbanaer systems.) In addition to these employees, a GDU plant operator has been assigned to the Port Charlotte demonstration septic tank effluent treatment plant. He inspects lift stations, operates the treatment plant, and assists with plant operation at another GDU plant located in Port Charlotte.

Maintenance activities consist of service calls (in response to customer complaints) as well as preventive maintenance checks. The GDU Suburbanaer operations people indicated that most service calls are minor in terms of the time and extent of repair required to correct the problem. Most service calls have been a result of poor installation practices. These problems have been significantly reduced by requiring a Suburbanaer maintenance staff person at each installation site when work is done by other contractors.

If the problem is severe, the entire pump can be replaced in less than one half hour. The GDU people have found it necessary to replace a pump in only a few cases over the past several years of operation (after replacing an earlier pump model which did not perform satisfactorily). Due to this experience, they do not maintain a large stock of spare pumps.

Aside from service calls, preventive maintenance calls are being instituted on an annual basis. In the older service areas, this will include retrofitting new valves and pipe connections in the pump chamber. This operation takes about 40 minutes. Service and preventive maintenance calls are usually handled by one person.

Pumping septage from septic tanks, when necessary, is also performed by GDU with their own equipment and manpower. The septage is disposed of at various GDU treatment facilities located within the two communities.

The costs of Suburbanaer systems presently in operation are supported by a monthly service charge of \$7.00 to \$8.50 per unit, and a \$650 connection fee. At present, customers on the Suburbanaer system are billed at the same rate and pay the same connection fee as GDU customers on the conventional sewer system.

PROGRAM ASSESSMENT

The Suburbanaer system is one of the many applications of STEP system technology in this country. The most distinguishing feature of this management program is private utility involvement. GDU has designed,

built, and is operating the Suburbanaer system without any public grants or incentives. Furthermore, it is doing so under a demonstration program/conditional grant approval by the Florida DER. Another unique feature of this program is that GDU maintains these STEP systems in conjunction with the conventional gravity sewer systems in its land developments.

The future of the Suburbanaer project, however, seems somewhat tentative. The Florida DER has been less than enthusiastic about the project even though pressure sewer systems have been installed elsewhere in the State. Perhaps a primary reason for DER's reluctant attitude toward the GDU project and the STEP system is the initial lack of cooperation between GDU, the county health department, and the Florida DER in applying the new technology. The initial STEP systems were installed with approval by county and State agencies without prior submittal of design specifications, projected number of units to be installed, maintenance requirements, etc. This lack of supporting information at the early stages of the project eventually led the Florida DER to establish the demonstration project.

It is felt that through the demonstration project, a better understanding and improved communication between GDU and the Florida DER can be achieved. Indications are that the two parties are moving in that direction. With approval of the STEP system by DER, it is likely that GDU will apply the Suburbanaer concept on a larger scale at its homesite development areas, which constitute a growing housing market for GDC.

The application of STEP systems has proved to be a successful venture for GDC in terms of their cost-effectiveness as compared to wastewater collection methods. GDU has shown (through several feasibility studies) that the Suburbanaer system costs much less to build and operate than the conventional system. According to the GDU studies, the average cost per unit (including capital and operation and maintenance costs) for the conventional system is about \$2,300, while the unit cost for a Suburbanaer system

is about \$870. Unlike the conventional gravity system, major portions of the capital investment required for the Suburbanaer system can be deferred until homes are actually built. GDU is currently refining their operation and maintenance cost estimates and will most likely adjust the service charges to residents served by the Suburbanaer system accordingly.

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ON-SITE WASTEWATER MANAGEMENT PROGRAM
OTTER TAIL COUNTY, MINNESOTA

GENERAL DESCRIPTION

Otter Tail County is a rural recreation-oriented county situated in central Minnesota. It is a large county (2,000 square miles) ranking sixth in geographic area and eleventh in population (with a permanent population of nearly 50,000 and a seasonal population of 200,000) in the state. The County has 1,048 lakes, one-tenth of Minnesota's 10,000 lakes.

The County Department of Land and Resource Management, and one small community within the County, are the focus of this case study. It is through this department that Otter Tail County implements its Shoreline Management Ordinance to control on-site and small-community wastewater disposal systems. Rothsay Camp, a small community on Lake Lida, represents one of many small lake communities within the County that have met the requirements of the County Shoreline Management Program through the implementation of a small community (cluster) wastewater system.

Otter Tail County was one of the first counties in the State to initiate a shoreline management program for regulating on-site and small community wastewater systems under the State's Shoreline Management Act of 1971. This legislation requires counties and municipalities to adopt and administer shoreline management ordinances according to the guidelines, standards, and criteria developed by the State Division of Waters. The Department of Natural Resources assists local governments in developing required ordinances, reviews the administration of programs, and takes direct regulatory action in certain situations.

The County Shoreline Management Ordinance establishes rules and regulations governing design and location of on-site systems within 1,000 feet

of lakes, and 300 feet of streams. The ordinance:

1. Establishes system design standards.
2. Establishes procedures for issuing building and wastewater system permits.
3. Conducts site inspections within the lake and stream shoreline areas.
4. Certifies on-site system installers Countywide.

Rothsay Camp is a small community in Otter Tail County that has worked closely with the County Department of Land and Resource Management to develop a small community wastewater management system, serving seasonal homes at the perimeter of a large lake. This small community wastewater system is typical of 20-30 other local county arrangements where community systems serve 10 or more residents or resort units, and an additional 20-30 cases where two or more neighbors (less than 10) have common wastewater disposal systems. The Rothsay Camp system was installed and is operated by a homeowners' association.

ORGANIZATIONAL HISTORY

With the adoption of the Shoreline Management Ordinance in October 1971, Otter Tail County became one of the first counties in the State of Minnesota to establish and adopt an administrative and regulatory program governing the use of on-site wastewater systems in lake communities. The statewide shoreline management program was established to:

1. Provide a comprehensive review of on-site systems located within sensitive shoreline areas.
2. Establish the regulatory framework for upgrading and/or rehabilitating failing systems, and address noncompliance within these shoreline areas.

The County has been innovative in finding collective solutions to existing failing or nonconforming on-site systems which must be remedied under the State act and County ordinance.

Although the State shoreline management program establishes the regulatory framework for these sensitive shoreline areas, individual counties are responsible for developing a local ordinance to administer the State guidelines. Since Otter Tail County's Shoreline Management Ordinance and Sewage Disposal Systems Cleaners Ordinance, were among the first to be developed in the State, the Department of Natural Resources used the County's administrative forms and permits as a guide for other counties to establish such programs.

Rothsay Camp was established as a small Swedish recreational community in the early 1900's. In 1915 it was incorporated as a nonprofit corporation. The association operates under formal Articles of Incorporation and has By-Laws. The purpose of the Association is to own and improve the lake-shore property for the benefit of its residents. The community occupies approximately 30 acres, mostly undeveloped. Twenty-three acres are used as a buffer and for open space. Some of this space is used for the community drainage field.

In a desire to conform to the County's Shoreline Management Ordinance, and with persuasion by the County Department of Land and Resource Management, the Association decided to construct a small community (i.e., cluster) wastewater system to meet their needs. The only legal agreement signed by the members was a Deed of Easement to permit construction, operation, and maintenance of a system that would cross the property of each member. The deed further stated that when a property was sold, the new owners would be obligated to comply with its requirements. Total cost to each homeowner for construction of the common system (includes the small diameter sewer lines, pumping units, pressure sewer lines, and drainage field) was \$481.17 (September 1974). Each resident was also responsible for having two septic tanks (375-gallon precast concrete) installed in series. Costs for installation of each of these units were borne by the resident.

Two Peabody Barnes submersible sewage ejector pumps were installed to pump effluent uphill to the drainage field. Both pumps were installed and wired to the household electrical system of one resident (it was cheaper to add the additional load to an existing system than to pay the minimum monthly rate for a separate meter). A large buffer lot located at one end of the development provides land for the common drainage field for final wastewater disposal.

DESCRIPTION OF MANAGEMENT PROGRAM

Two ordinances provide the basis for implementing the Otter Tail County on-site wastewater disposal program: the Shoreline Management Ordinance, and the Sewage Disposal Systems Cleaners Ordinance. These ordinances and the associated administrative procedures, are implemented through the Department of Land and Resource Management. The five-person office is staffed by a Director, two key technical personnel (one in Fergus Falls, the other in a regional office in Perham), and technical and administrative assistants.

The department is responsible for issuing building and sewage permits, and making necessary site inspections, as well as licensing installers and pumpers who service on-site systems. Land use planning activities of the County are relatively weak. The County Department of Land and Resource Management administers a subdivision ordinance, however, there is no zoning ordinance in the County.

The on-site wastewater disposal program services the following functions:

1. Disseminates information regarding on-site wastewater disposal requirements to prospective buyers.
2. Processes applications and issues permits to build and construct sewage systems.
3. Controls site evaluation and system installation.
4. Issues certificates of compliance and operating permits for on-site systems.
5. Issues abatement and violation notices.

The first element, information dissemination, is a key part of the program to ensure that new systems are installed and existing systems are upgraded to the requirements of the County Shoreline Management Ordinance. Prospective buyers are informed by realtors of the Shoreline Management Ordinance requirements, and the department's authority to issue building permits and septic system permits (for new installation and rehabilitation). The Department of Land and Resource Management staff work closely with installers (who are licensed and bonded) and residents to ensure satisfactory siting and installation of on-site systems.

The latter elements, issuing certificates of compliance and abatement and violation notices, are unique aspects of the County Shoreline Management Ordinance. Certificates of compliance are issued after a system has been installed according to the County regulations. A valid certificate is required upon sale of the property. Abatement and violation notices are issued by the Department of Land and Resource Management to property owners where systems are not in compliance. The County regulations require that homeowners within the jurisdiction of the shoreline ordinance upgrade nonconforming on-site sewage systems to meet elevation (four feet above high water table) and setback requirements from shorelines (50 to 75 feet, depending on type of structure).

The Shoreline Management Act provided a five-year grace period to accustom the state residents to the new law. During this period many residents have upgraded their systems on their own. Rothsay Camp was one of the communities in the County where members of the community collectively and voluntarily initiated compliance with the Shoreline Management Act. The community, with technical assistance from the County Department of Land and Resource Management, hired a local contractor and installed the central collection system pumping units and community absorption field. Installation of two septic tanks and individual hook-ups to the community collection system were the responsibility of each resident.

Operation and maintenance of the small community system at Rothsay Camp is the responsibility of the local residents. By resolution of the Board of Directors of the Rothsay Camp Association, the Board is responsible for operation and inspection of septic tanks, distribution lines, lifts, and disposal field. Periodically, individual residents (appointed by the Board) inspect effluent color. Where the effluent shows discoloration, the individual septic systems are checked and possibly pumped out. Septic tank pumping is the responsibility of the homeowner. If a pump should fail, the local hardware store (which was involved in installing the system) has spares available for installation. Pumps are easily replaced, and costs for such services are shared by the system residents on a service call basis. Aside from initial installation, service, and pumping, the only cost charged to the homeowner is a \$4 per year fee for electricity.

PROGRAM ASSESSMENT

The Rothsay Camp approach is a product of the Otter Tail County Shoreline Management Program. It is a good example of the common-sense/cost-effective approach of the County program. The County Shoreline Management Ordinance has helped to promote wastewater management planning through the sensitive shoreline areas of the County. The program is recognized for its environmental value, and is generally well received by elected officials and residents.

Several other important elements can also be identified in the County program that accounts for its success. Information dissemination is an important factor. Realtors, for example, report that potential purchasers of lakeshore properties recognize the benefits of such an environmental protection program to their future investments. Existing residents view the program as having the legal authority to correct system failures, yet administrative flexibility to work with homeowners to find effective preventive approaches to wastewater disposal problems.

Furthermore, the County septic system licensing program helps ensure that septage haulers, as well as system installers, are competent and reliable. This program also allows the County to keep track of pumpers and the disposal sites they use, as well as identify residents having problems with their systems, and the frequency residents have their systems pumped out.

Drawbacks to the County's Shoreline Management Ordinance are:

1. The ordinance controlling the design, construction, and location of on-site systems does not apply County-wide (only to shoreline areas and unincorporated parts of the County). This problem is relatively minor because of the large number of lakes and streams on which the majority of the people live. In addition, the incorporated communities can decide, individually, whether or not to adopt the County's shoreline ordinance.
2. Otter Tail County Department of Land and Resource Management personnel are limited to an advisory role in assisting local residents plan wastewater disposal systems. As such, County personnel cannot be involved in the design of on-site or cluster systems, even though they are technically capable of doing so. This limitation reflects the fact that County staff are not protected by professional malpractice.

A key to the Rothsay Camp program's success is the fact that the wastewater system is affordable (and less expensive than individual solutions), and can be easily managed and maintained by local residents. The successful implementation of this program is the product of the willingness of the individual homeowners to cooperate, and the ability of the County Department of Land and Resource Management (particularly its executive director) to provide an effective liaison between State agencies, County elected officials, and local permanent and seasonal residents. Most importantly, the Rothsay Camp Association's wastewater management program is typical of the voluntary participation-style utilized throughout the state, particularly in its rural recreation-oriented areas, and stems from a desire on the part of local residents to seek preventive solutions to wastewater disposal problems.

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1 April 1978.

"Sewage Disposal Systems Cleaners Ordinance, Otter Tail County, Minnesota,"
1 May 1973.

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STATE CASE STUDIES

NEW HAMPSHIRE NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

New Hampshire's approach to noncentral wastewater management is one in which the State government takes an active role in regulating small wastewater systems. This is realized through well-defined procedures for obtaining subdivision approvals, construction permits, and operating permits from appropriate State agencies. The broad responsibilities and authority of the State relative to local government are unique among State programs for noncentral wastewater management. To a large degree, this arrangement is the result of widespread concern for protection of New Hampshire's scenic and recreational water bodies, and the perceived inability of local government to protect water resources without direct State involvement.

Principal authority for water quality protection is the Water Supply and Pollution Control Commission (WSPCC). Its Small Systems Division is responsible for review and approval of subdivisions, individual septic systems, and other small-scale wastewater facilities for on-site disposal. Review and approval of larger facilities involving land application of wastewater is the joint responsibility of the Small Systems Division and the Design Review Division (a group involved with 201 Facility Planning). Land disposal of wastewater sludge and septic tank wastes, however, is regulated by the Division of Public Health of the Department of Health and Welfare. Consistency between Health Department policy toward septage disposal, and WSPCC policy toward noncentral wastewater management is being addressed by the New Hampshire 208 Program.

ORGANIZATIONAL HISTORY

Prior to 1967, noncentral wastewater management (primarily regulation of on-site septic systems) was controlled by the individual cities and towns under enabling legislation adopted by the State Board of Health.

There are about 234 cities and towns (i.e., local government units) in the State. About 90 percent of these communities have populations under 5,000. Localities, at their discretion, could adopt their own codes, design requirements, and enforcement procedures for individual wastewater disposal systems. In many cases, local regulations and enforcement were minimal or nonexistent, resulting in many failing septic systems. Lakes began to show the adverse effects of nutrient enrichment from inadequate subsurface disposal facilities serving shoreline homes.

These circumstances prompted the State legislature to transfer review authority to WSPCC for all subdivisions with lots smaller than five acres, and for all individual wastewater disposal systems. The law establishing this transfer of authority was passed in 1967, and is still in effect. As originally written, the law (the Shoreline Law) applied to all properties within 1,000 feet of surface water, and in 1971 was amended to include all of the land area of the State.

The 1967 legislation showed the increasing awareness of environmental pressures arising from rapid growth, particularly around lakes and ponds, and the need for better planning for and controls on residential development. The concept of home rule, however, is a cherished institution in New Hampshire, and all zoning and land use regulations are still the domain of the individual cities and towns. Proposals submitted to the State legislature to establish comprehensive or Statewide land use controls have consistently been defeated. New Hampshire has an Office of State Planning, as well as eight regional planning agencies. These agencies serve in advisory and assistance roles to local governmental units. The regional planning agencies assist member communities in preparing zoning ordinances and land use plans. They also serve as an A-95 review agency. The local orientation of land use planning contrasts sharply with the State's authority over wastewater management planning.

New Hampshire has two designated 208 regional planning agencies: the Lakes Region Planning Commission, serving approximately 20 towns in the central portion of the State; and the Southern Rockingham Regional Planning District Commission, serving seven towns in the State's southeast corner. Areawide 208 planning for the remainder of the State is conducted by WSPCC. Both the designated 208 agencies and the WSPCC have addressed the management of on-site and alternative wastewater systems through special studies in township and multitownship situations.

WSPCC has completed a delegation agreement with the U.S. Environmental Protection Agency to administer the Federal Construction Grants Program in New Hampshire, and channels Federal and State funds for wastewater management projects to participating local agencies. These funds are allocated according to a WSPCC priority list. Present cost-sharing for conventional systems (75 percent Federal share) is 20 percent State share and 5 percent local share. For innovative and alternative systems (85 percent Federal share), the State's share is 12 percent and the local share is 3 percent.

Administration of Federal and State funds is conducted by the Director of Municipal Services and Assistance, assisted by the Director of Small Community Assistance. The latter position was created in response to the recent amendments to the Clean Water Act, and to assist small municipalities with the financial and administrative aspects of complying with the Act.

DESCRIPTION OF THE MANAGEMENT PROGRAM

WSPCC performs most other functions related to wastewater management in New Hampshire, including:

1. Definition of 201 and 208 study areas and planning elements.
2. Plan review for subdivisions and individual lots.
3. Design standards for large and small treatment or disposal facilities.

4. Design review.
5. Surveillance of wastewater facilities installation and performance.
6. Issuance of permits for small systems construction and operation (operation permits).
7. Certification of treatment plant operators.
8. Water quality monitoring and surveillance.
9. Dissemination of public information.

The backbone of New Hampshire's overall program for decentralized wastewater management is its program for small systems and subdivisions. Most small systems installed in the State are conventional subsurface septic tank/leaching field systems. WSPCC also allows alternative methods such as privies, and incinerator and composting toilets, as long as segregated grey-water disposal systems are provided.

A three-step approval process must be followed to subdivide and/or construct an individual on-site disposal system:

1. Obtain WSPCC subdivision approval for any proposed subdivision of land into lots smaller than five acres. The agency determines whether the number and location of lots are generally suitable for their proposed use on the basis of soil, slope, and other property characteristics.
2. Obtain system design approval for each waste disposal system proposed. Individual system designs can be prepared by the homeowner or by a contractor. Individual systems installed in "ledge" lots,¹ as well as large systems (>2,500 gal/day) must be designed by a professional engineer.
3. Obtain system operational approval after system has been installed, but before it is covered over. Approval cannot be issued until site inspection by WSPCC or its local agent ² finds the system acceptable.

¹"Ledge" lots are areas where there is less than five feet of soil above ledge or bedrock.

²There are about 30-40 local agents in the State. These individuals are local health officers employed by municipalities, and are also recognized by the WSPCC via local agent status.

The State has published detailed guidelines for obtaining subdivision approval, and for designing and installing small wastewater disposal systems. WSPCC sets minimum lot sizes according to soil type, system size, etc. The smallest permissible lots are 30,000 square feet¹ where on-site water and waste disposal are to be provided, and 20,000 square feet where an external public water supply is available.

System design requirements are explicit, stating minimum distances above bedrock and seasonal high groundwater, minimum distances from wells and surface waters. These requirements are keyed to estimated flow or the number of bedrooms. WSPCC has no control over systems installed prior to 1967, unless a failure is reported or expansion or modification of a system (but not simple replacement) is undertaken, in which case the normal approval procedure must be followed. (Allowance is made for systems where occupancy is changing from seasonal to permanent.)

Special or unconventional systems, such as sand mounds or community systems, are not subject to rigid design guidelines, but are reviewed on an individual basis. Where a subsurface disposal system is proposed to handle only gray water from sinks and showers, etc., WSPCC will generally allow a 50 percent reduction in leachfield size.

These design standards are minimum requirements for all on-site systems installed in the State. About 50 municipalities have adopted local ordinances which contain more stringent standards than the State's. In these cases, the WSPCC reviews all system proposals according to the Statewide minimum criteria, while the municipality is responsible for enforcing the local requirements which are more stringent than the State minimum.

Several facility plans prepared through the 201 and 208 Programs have emphasized noncentral wastewater management alternatives. These plans (some were developed as pilot or model studies) have attempted to address wastewater management problems in a broad perspective, i.e., integrating

¹ A recent proposal by WSPCC increases the minimum lot size to 40,000 square feet.

nonpoint source controls, innovative and alternative wastewater management approaches, and active public participation.

One pilot study concerns the coastal town of Rye, which is examining alternative solutions, such as land use planning (plus other non-structural controls), and noncentral wastewater management approaches to develop an integrated facility plan addressing point and nonpoint pollution sources. A similar project which focuses on watershed and land management is the study of Little Lake Sunapee. This project investigates three possible growth scenarios and management alternatives for each, and is assisted by computer modeling of the lake and its drainage area.

Included as part of the 208 Water Quality Management Plan is land application of wastewater sludge near the Town of Somersworth, which focuses on heavy metals and leachate quality. Future studies will investigate nutrient migration in well-drained soils, and hydraulic testing to simulate conversion of septic systems from seasonal to year-round use. In the Lakes Region 208 Plan, a wastewater system maintenance precinct is being considered as a management agency to maintain individual disposal systems around Squam Lake. Such a precinct would involve lake property owners residing in five contiguous towns. (A precinct is a local governmental unit that has authority to own and maintain sewerage systems.)

New Hampshire has four 201 projects in the planning or design phase which propose using community subsurface disposal systems as alternatives to conventional treatment and discharge. The Step 1 study for the Town of Ossipee, e.g., is unique for the size of the system under consideration--a septic tank and leaching field to handle an average flow of 100,000 gpd. Water quality monitoring wells will be provided in conjunction with the subsurface disposal system. The Town of Dalton's Facilities Plan proposes a number of cluster systems, in addition to

management of individual on-site systems for this community of 230 residents. (Many smaller towns pursuing 201 projects are applying to HUD and FmHA for assistance in meeting those capital costs which are ineligible under the Construction Grants Program.)

The clustered on-site management approach has not been widely applied in New Hampshire. Presently only a few subsurface disposal systems serve multiple dwellings in the State. Most of these community systems are private facilities for condominiums. WSPCC requires that some legally recognized authority be responsible for maintenance of jointly-owned wastewater facilities--either a municipality, a precinct, or an incorporated body of property owners. Usually a condominium agreement with the managing entity is required.

With the increasing concern over noncentral management alternatives, problems with septage management have also been investigated in the State 208 and 201 Programs. According to State law, each municipality is required to arrange for safe disposal of septage, nevertheless, disposal is usually left to private haulers. Septage disposal firms and disposal sites must be licensed by the Department of Public Health, but there is little or no policing of disposal practices. New Hampshire currently has no written guidelines on septage disposal, however, a set of guidelines and regulations is currently being prepared by the State Health Department and WSPCC with assistance from the State's 208 Program.

Some 13 million gallons of septage are disposed of annually at wastewater treatment plants and land disposal sites approved by DPH. Thirty-four of 50 treatment plants in the State receive septage, but most are not designed for this purpose, offering little control against shock loading. Plant attendants can refuse septic waste dumping at their facilities. Where septage is accepted, the dumping fee typically ranges from \$5 to \$10 per 1,000 gallons. It is estimated that more septage

is disposed of on land than at wastewater treatment facilities, often because of lower cost to the hauler and easier access. There are at least 59 land disposal sites in the State, including seepage pits, trenches, and land-spreading operations, but a complete inventory of these sites is not available. The State is showing a greater interest in regional approaches to septage handling, and WSPCC now requires that new wastewater treatment plants built with State funds provide for treatment of septic wastes from towns outside the immediate service area.

PROGRAM ASSESSMENT

New Hampshire's on-site management program provides an interesting example of State and local participation in regulation and maintenance of on-site systems. Regulation of on-site systems is administered by WSPCC at its central (i.e., State capital) headquarters and four regional offices. The central office staff is responsible for reviewing plans, proposals, and system designs. The regional staff assist in this review, conduct site inspections of precoverup installations, and (occasionally) perform evaluations of the construction site, particularly at large subdivisions. About 83,000 on-site systems have been permitted since 1967, with about 10,000 construction approvals and 2,000 subdivision approvals issued annually.

Regional personnel also conduct sanitary surveys where water quality problems or on-site malfunctions are suspected. The physical limits of each survey are determined from the watershed characteristics (surveys can be performed for communities or watersheds), and generally involve house-by-house inspections of individual wastewater disposal systems. The manpower required is fairly significant, but the work force is small, thereby limiting staff involvement in conducting inspections of development sites and precoverup on-site system installations. This manpower problem has been recognized by WSPCC, and additional regional staff positions have been created to perform current program duties.

The State 208 Program has conducted a comparative study of on-site system performance prior to and after the adoption of current State regulations to assess the effectiveness of this program. Two field studies were completed: one in 1977, which investigated a sample of on-site systems installed according to present regulations; and another in 1979 which evaluated the performance of a sample of on-site systems installed prior to the regulations (adopted in 1967). The following conclusions and suggestions were made:

1. The failure rate (i.e., observed surface ponding or other signs of system malfunction) for year-round septic systems installed prior to 1967 was 31 percent, and only 12 percent for year-round systems installed after 1967.
2. Two-thirds of the subsurface disposal approvals issued for post-1967 systems did not have corresponding operational approvals. (Thus, up to two-thirds of the sampled systems did not have precoverup inspections performed.)
3. It was suggested that a soils manual be prepared, and a training and certification program for designers and installers be considered. (To this end, the WSPCC has initiated a series of seminars and workshops to help train persons performing soils evaluations and preparing system designs. Currently, a certification exam is being prepared. A sub-committee of State and local officials is also being assembled to review current design standards and approval procedures.)
4. The participation of local agents in the on-site system review and approval process should be reevaluated. (The WSPCC has recently located its regional offices to provide greater access to areas where frequent site inspections are required.)

The New Hampshire 208 Program has addressed noncentral wastewater management issues, including:

1. Community education regarding adoption of local ordinances, alternative wastewater management schemes, conversion of homes from seasonal to year-round occupancy.
2. Establishment of a comprehensive septage management program, including monitoring septic waste disposal facilities.
3. Dissemination of sludge disposal and utilization guidelines.

4. Distribution of information on solid waste management and best management practices.
5. Mapping groundwater and nonpoint wastewater sources to identify existing and potential locations of groundwater quality degradation from septic systems, wastewater impoundments, sludge disposal sites, etc.

The State 208 planning approach recognizes the key role of local governments in wastewater management planning, even though the primary authority for on-site system regulation lies with the State. The 208 Program has reviewed current on-site management enabling legislation and operating practices through numerous reports involving regional planning commissions and individual townships. The WSPCC, through its Division of Small Community Assistance, is further developing strong State/local cooperation in the area of noncentral wastewater systems planning.

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ILLINOIS NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

There are 880 incorporated communities with populations of less than 2,500 people in the State of Illinois. For this reason, Illinois agencies have been interested in the concept of noncentral wastewater management in small communities for some time. The Illinois Environmental Protection Agency (Illinois EPA) has for many years encouraged evaluation of noncentral wastewater systems (e.g., lagoons, community septic tank/drainage fields, and individual systems) for small communities. To facilitate the process of establishing noncentral wastewater management programs for small communities, the Illinois legislature (under sponsorship of the Illinois EPA and the Illinois Municipal League) passed legislation in August 1978 authorizing the creation of "Municipal Wastewater Disposal Zones." This legislation provides mechanism for a municipality to assume legal responsibility and authority to inspect, upgrade, and maintain private on-site systems within its jurisdiction, and to finance such programs through taxes, user charges, and the sale of bonds. The legislation also gives municipalities the authority to enter onto private property to perform system maintenance or repair services.

The Illinois Department of Health (DPH), in conjunction with local (i.e., county, multicounty, or municipal) health departments, is also involved in regulating noncentral systems in the State.

ORGANIZATIONAL HISTORY

The State of Illinois adopted the Illinois Environmental Protection Act in 1970 to "provide a unified Statewide program to restore, protect, and enhance the quality of the environment." The Environmental Protection Act established the Illinois Pollution Control Board (Board), the Institute of Natural Resources (Institute), and the Illinois Environmental Protection Agency (Illinois EPA). The Illinois EPA is the principal water pollution control agency

for the State. The Board establishes regulations, and serves in a judiciary capacity in enforcing Environmental Protection Act regulations. The third agency created by the 1970 Act, is the Institute of Natural Resources, which is charged with supporting the Board and the Illinois EPA in the form of applied research, data compilation, and policy recommendations.

In administering the Federal construction grants program under PL 92-500, the Illinois EPA realized the special needs of unsewered small communities were very low on the priority list for funding. Many small communities received funding through a separate State grants program which was identical to the Federal program, but provided funds to projects considered to have low priority on the Federal grants list. Some of these communities completed construction of facilities before similar small communities received Step 1 funding under the Federal program.

Although this State grants program was terminated in 1976, it made the Illinois EPA aware of the appropriateness of alternative wastewater management technology in small communities. The agency responded by developing a policy calling for "serious examination of the No Action alternative" for unsewered towns of less than 1,000 persons. Enforcement of this policy was initiated in the summer of 1976, and is still in force under the revised facilities planning guidelines issued in September 1977.

With passage of the Private Sewage Disposal Licensing Act and code by the Illinois General Assembly in 1974, the Illinois DPH was in charge of administering a Statewide regulatory program governing individual (residential) on-site systems. Prior to 1974, there were no Statewide minimum design criteria for on-site systems. Regulation, where it existed, was exercised by local governments, but lacked uniformity. About 20 county and municipal health departments had ordinances governing design and installation of on-site systems. Involvement of the Illinois DPH was limited to preparation of technical bulletins offering specific design criteria recommendations to local health departments.

The 1974 Licensing Act authorized the Illinois DPH to promulgate rules and regulations, and set minimum standards for design, installation, and maintenance of these systems across the State. Essentially the Act authorized the Illinois DPH to perform the following services:

1. To license (or otherwise regulate) septic system contractors and septage haulers throughout the State (a \$50 license fee is charged to contractors).
2. To govern design, installation, and maintenance of all domestic on-site systems of less than 1,500 gpd.
3. To review plans and specifications for systems greater than 1,500 gpd using subsurface disposal methods. (All systems with surface discharges greater than 1,500 gpd are governed by Illinois EPA.)
4. To delegate responsibility for administering on-site wastewater disposal ordinances to county and municipal health departments.
5. To prepare community needs surveys upon request.
6. To monitor the performance of septic system contractors, and to remove or suspend licenses if installers fail to adhere to the State code.
7. To respond to complaints of system failures or potential health hazards associated with on-site system malfunctions.
8. To give technical advice to county health departments, and review plans for subdivisions or larger on-site systems submitted to county health departments and the Illinois EPA.
9. To update and refine technical criteria for on-site system design and installation.
10. To hold symposiums and training sessions at the State and regional level on private sewage disposal systems for installers and sanitarians.
11. To allocate State funds to local health departments to administer on-site sewage programs.

About half of the Illinois counties have state-approved ordinances governing on-site disposal systems. It is Illinois DPH policy to encourage all counties in the State to adopt and implement on-site disposal regulations.

DESCRIPTION OF MANAGEMENT PROGRAM

The Illinois noncentral wastewater management program is divided among the Illinois EPA, the Illinois DPH, and local health departments. The Illinois EPA conducts and coordinates various water pollution control programs, including NPDES permits, 201 facilities planning and construction grants programs, and 208 areawide water quality management planning. This agency also conducts a water quality monitoring and surveillance program, and assists in training and certification of wastewater treatment operators.

The Division of Water Pollution Control is the principal group within the Illinois EPA involved with noncentral wastewater management issues; it includes:

1. Planning and standards.
2. Grant administration.
3. Permits.
4. Field operations.

The first section, Planning and Standards, is responsible for 208 Management Planning and 201 Facility Planning. The section consists of:

1. Facilities planning.
2. Planning support.
3. Standards.
4. Water quality planning.
5. Technical planning.

The Facilities Planning Unit, which is particularly involved in noncentral wastewater planning, develops guidelines for preparing Facilities Plans, and reviews such plans for technical reliability and comprehensiveness.¹ Two individuals in the unit are normally assigned to review facility plans where noncentral wastewater systems are recommended.

The "Guidelines for the Preparation of Facilities Plans for Unsewered Communities" was developed and issued by the Facilities Planning Unit in 1977.

¹The Facilities Planning Unit has recently been transferred from the Planning and Standards Section to the Grants Administration Section.

The guidelines, which are similar to the requirements of the USEPA PRM 77-8, provide for:

1. Establishment of a community's "needs" for sewerage improvement.
2. Documentation and evaluation of the study area and sewerage system characteristics.
3. Selection of alternatives for cost-effectiveness analysis based upon survey and physical evaluation of the community.
4. Evaluation of a "no action" alternative, which considers retaining existing private septic tank systems, with necessary improvements being carried out by the individual homeowners or through any on-site management program.

The Grants Administration section of the Division of Water Pollution Control is responsible for facility plan review and maintenance of the State's priority list for planning and construction grants. About 1,200 projects are currently included on the priority list, representing about 900 communities Statewide.

A recent revision to the priority list system, affecting some facility plan applicants, is the incentive given to grant applicants having Step 1 plans who are interested in obtaining Step 2-3 funding for rehabilitation and replacement of individual on-site disposal systems. Where this wastewater management approach is shown to be cost-effective and is selected for Step 2 design, the applicant can proceed from Step 1 immediately to Steps 2 and 3, regardless of priority. Such "priority breaking" measures obviously provide an opportunity for the small community, which may be fairly low in the overall priority list rankings, to obtain the 85 percent funding available to individual systems rehabilitation.

The Permits Section of the Division of Water Pollution Control handles a wide variety of activities affecting design and implementation of

noncentral wastewater management systems. These activities include facility plan review (particularly for technical system reliability and design), issuing discharge permits, and setting design standards for wastewater treatment facilities.

One of the Permits Section units, the Facility/Process Unit, reviews the technical design portions of facilities plans, and assists in development of standards for wastewater treatment system design. These standards, currently in draft form, contain detailed discussions of technical criteria for various treatment methods such as conventional wastewater treatment, land application of wastewater effluent, waste stabilization ponds and aerated lagoons, and septic tank/drainfield systems, intermittent and recirculating sand filters, as well as sewer collection systems.

The Permits Section also issues construction and operating permits for publicly-owned septic systems serving clustered homes. These types of septic systems fall under Illinois EPA permits requirements, and are regulated by the Illinois EPA, rather than the Illinois Department of Public Health under its "Private Sewage Disposal Licensing Act." Operator certification requirements for these systems are also developed by the Illinois EPA. (For privately-owned septic tank/leachfield systems, appropriate Illinois DPH or county design criteria are used when reviewing plans calling for system rehabilitation.)

The Field Operations Section is the final section within the Division of Water Pollution Control. The field operations personnel, located at seven regional offices Statewide, perform water quality sampling, inspect wastewater treatment facilities, and occasionally assist or verify community needs surveys prepared at the local level.

Recently, an Innovative and Alternative Technology Design Standards and Review Panel was created within the Illinois EPA to develop design

standards for nonconventional wastewater systems. The committee, made up of representatives of various units within the Division of Water Pollution Control, also serves to review facilities plans where innovative and alternative technology may be appropriate.

The Illinois DPH also has major responsibilities in the State's on-site wastewater management program. It administers the program through its central office and seven regional offices. Illinois DPH policy in administering this program is to work in conjunction with local health departments to encourage active local participation in regulation of on-site systems. The Illinois DPH intends to promote local involvement by encouraging local health departments (i.e., county, multi-county or municipal health departments) to:

1. Adopt local health ordinances governing on-site systems.
2. Become "agents" of the State in administering local on-site ordinances.
3. Place greater control over performance of system installers.

According to the 1974 Licensing Act, all powers given to the Illinois DPH for on-site regulation can be delegated to the local health departments. The local health department, therefore, performs the same functions as the Illinois DPH, i.e.:

1. Sets standards for system design, installation, and maintenance (these standards must satisfy the minimum criteria of the Illinois DPH).
2. Performs and reviews community needs surveys.
3. Reviews plans for on-site system construction.
4. Inspects system performance and follows up on complaints of malfunctioning systems.
5. Monitors system installer and septage hauler performance (local departments generally waive this program to the State).
6. Conducts research into performance and design requirements of various on-site system options.

There are presently about 38 local health departments in the State (serving 30 counties) which have State-approved on-site disposal system ordinance and permit programs. An additional 17 county health departments have been designated "agents" of the State. This designation allows these health departments to perform on-site management duties in lieu of the Illinois DPH. On-site regulations in the remaining 56 counties within the State are administered by the State DPH through its regional offices.

The approach taken by the Illinois DPH in enforcing on-site regulations is much different from that taken by the approved local health departments. The Illinois DPH relies predominantly on licensing control of system installers as the primary vehicle for on-site system regulations. The procedure utilized by Illinois DPH regional office personnel to control design, installation, and maintenance of on-site systems is as follows:

1. Establish a working relationship with the system installers.
2. Review plans for on-site system design and site evaluations prepared by consulting engineers or system installers, subject to the State minimum standards.
3. Occasionally inspect system installations.
4. Occasionally inspect system performance in response to complaints.

As indicated, the Illinois DPH does not issue permits for newly constructed systems, but reviews the performance of installers, and relies on the competence and reputation of the installer to comply with minimum standards.

Local health departments can be formed in two ways: through a referendum of the local population (i.e., within the municipality or county), or by resolution of the county board of supervisors (or commissioners).

A referendum-type health department can finance its operations by levying a property tax (or special assessment) within its jurisdiction. Resolution-type health department financing is limited to the general funds of the locality. Both resolution and referendum health departments receive financial assistance from Illinois DPH.

The Illinois Department of Local Governmental Affairs (DLGA) is a technical advisory agency created to provide professional expertise and advice to local governments throughout the State. It is currently involved in on-site management activities in the State. Through its technical assistance advisory capacity, this agency has been performing pilot studies on specific wastewater management topics. It has also assisted in funding and technical direction of local planning projects and educational workshops, and prepares and disseminates technical documents on various issues to local officials. The Illinois DLGA and the Illinois EPA are currently conducting a pilot study program in several Illinois communities to determine the effectiveness and feasibility of local water conservation programs. A specific study goal is to determine whether water conservation programs can improve on-site systems operation.

PROGRAM ASSESSMENT

Illinois State and local agencies have shown much interest and been involved in noncentral management for many years. Illinois had conducted research investigations as early as 1976 to demonstrate that capital investment and maintenance costs for central systems would be prohibitive for small communities. It supplemented this initial investigation with a series of technical memoranda explaining State and Federal policy toward noncentral systems, passed legislation to create municipal wastewater disposal zones, and modified 201 planning priority test procedures to facilitate implementation of noncentral systems within small communities. Furthermore, the Illinois EPA has established a special Innovative

and Alternatives Review Panel, composed of various sections of the Illinois EPA Water Pollution Control Division to review facility plans proposing noncentral wastewater management systems. These activities fall under the normal facilities plan review and grant administration responsibilities of the Division of Water Pollution Control. Certain units in this division, however, particularly the Facilities Planning Unit, have been especially concerned with innovative and alternative system applications in small communities.

The Illinois DPH has established an installer and septage hauler licensing program to promote better design and installation of on-site systems in the State. While the Illinois DPH supports the concept of a construction permit program, it does not believe that an effective permit program can be carried out at the State or regional level. Its reliance on installer licensing, however, has created numerous problems, which the Illinois DPH recognizes. First, there is no competency or performance testing involved, consequently many licenses are issued throughout the State (approximately 1,800), creating obvious problems to the Illinois DPH in monitoring and evaluating installer performance. Second, there has been a fairly high turnover among Illinois DPH regional personnel, creating major difficulties in developing a rapport with on-site system installers. The Illinois DPH hopes to correct these problems through greater surveillance of installer performance and mandatory testing of installers as a licensing requirement. The Statewide 208 Plan has suggested that a curriculum for training sanitarians, on-site system installers and maintenance personnel be developed with the Environmental Research Training Center (ERTC) at Southern Illinois University. This program would involve DPA and ERTC personnel in training sessions held at community colleges throughout the State.

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MAINE NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

Maine depends largely on decentralized wastewater management methods to protect its extensive marine and freshwater environments. The principal feature of Maine's noncentral wastewater management program is the State Plumbing Code, which contains regulations and minimum standards for on-site wastewater disposal. These standards are applicable Statewide, however, municipalities can adopt more restrictive measures with State Health Department approval. Disposal sites are selected based on the findings and recommendations of independent site evaluators hired by individual property owners. System inspection surveillance, and code enforcement are carried out by local plumbing inspectors (LPI) employed by individual cities and towns. The LPI's act as local State agents, and have legal authority to enforce the Plumbing Code.

The Division of Health Engineering (DHE) of the Maine Department of Human Services, is responsible for the minimum code for small subsurface disposal systems (except publicly-owned systems). Systems larger than 2,000 gpd are reviewed by the DHE. The Maine Department of Environmental Protection (DEP) regulates land disposal of residual materials, including sewage sludge and septage, and has authority over subdivisions larger than 20 acres. The Land Use Regulation Commission has adopted the Plumbing Code and enforces lot size for unorganized townships (i.e., townships without local governing bodies). Some unorganized townships, however, have a local plumbing inspector.

DEP administers the State's 201 Construction Grants Program, and coordinates the State's areawide 208 water quality management planning efforts. Five regional planning commissions are active in 208 planning.

ORGANIZATIONAL HISTORY

The Plumbing Code approach to on-site wastewater management originated in the 1920's, but the present code was not adopted until 1974. This code defines the roles of the site evaluator and local plumbing inspector and sets minimum Statewide standards for siting and design of subsurface disposal systems. Maine's first plumbing code, approved in 1926, did not address sewage disposal but concerned itself primarily with interior plumbing. In 1946, the plumbing code referenced "approved sewage works" specifying lengths of trench for certain soils. This was later supplemented with an appendix which discussed the percolation test. With expanded home development and an increasing number of reported malfunctions, the State Department of Human Services, Division of Health Engineering, conducted an extensive literature survey of on-site system codes and site evaluation procedures, and in 1973 restructured the statutes and regulations governing on-site system siting and design. The new statutes eliminated use of the percolation test in favor of a field test to identify soil suitability, and set up a certification program for local plumbing inspectors in individual towns. The soil evaluations, according to the statutes, are to be conducted by registered professional engineers and certified geologists with knowledge and background in soils, and soils scientists. This new code, which became effective in July 1974, separated the plumbing code into two parts: Part I, an interior plumbing code; and Part II, an exterior plumbing code for private sewage disposal systems.

Other Statewide legislation important to the overall noncentral wastewater management program includes:

1. Mandatory Shoreline Zoning -- Requires all land within 250 feet of surfacewater to be subject to minimum zoning and subdivision control by the individual municipality. The State Planning Office establishes shoreline zoning for communities without their own ordinances. Approximately 99 percent of all towns in the State have adopted ordinances equal to or more stringent than the State's Model Shoreline Zoning Ordinance.

2. Subdivision Law -- Establishes municipal review authority over all parcels of land to be subdivided into three more lots.
3. Minimum Lot Size Law -- Requires a minimum lot size of 20,000 square feet where wastewater is disposed of by a subsurface disposal system, and requires a minimum 100-foot frontage for any waterfront lot.
4. Conversion of Seasonal Dwellings in Shoreland Areas -- Requires that dwellings which are to be converted to year-round use have a conversion permit issued by the local plumbing inspector. The converted dwelling must also comply with the Plumbing Code.
5. Site Location Act -- Establishes the authority of DEP to regulate major land development and development in environmentally-sensitive areas, including all subdivisions in excess of 20 acres.
6. Septic Tank and Cesspool Waste -- Mandates that each municipality provide for the disposal of all sludge, septage, and cesspool wastes originating within the municipality.
7. Sanitary District Enabling Act -- Allows municipalities or residents of unorganized townships to form sanitary districts for waste management and public health protection. A unique type of sanitary district was created by a special legislative act in 1972 for the Cobbossee watershed. The district has broad authority for wastewater management on a multimunicipality basis. It can, e.g., build, own, and operate wastewater systems as well as be involved in managing existing on-site systems (through the adoption of local regulations for on-site system design and maintenance). The district also has the authority to levy property taxes and eminent domain.

DESCRIPTION OF MANAGEMENT PROGRAM

The Maine DHE establishes guidelines for issuing on-site system permits at the local level through the State Plumbing Code. Anyone proposing to construct an on-site disposal system must contract with a private site evaluator to analyze the suitability of a lot for a disposal system. The site evaluator is a State-certified soil scientist, geologist, or licensed professional engineer. The site evaluator uses observation pits to record soil data, and recommends an appropriate design for the site to the local plumbing inspector (LPI). A typical site evaluation

costs between \$100 and \$200, including \$30 to \$40 for a backhoe. The site evaluator uses DHE procedures (presented in a State-prepared technical manual) for analyzing individual sites. According to the State statute, a soils evaluator must have an educational background and experience in soils to qualify him to design on-site systems. Qualified individuals are allowed to take an exam to verify their familiarity and understanding of the rules and regulations contained in the Plumbing Code. A field examination in conducting soil profile descriptions supplements the written exam. A training guide for site evaluators has recently been prepared by the DHE.

When a suitable site for an on-lot disposal system has been located, the property owner files a permit application (DHE-200 form) with the local plumbing inspector accompanying the owner's design plans and specifications. If these documents comply with local and State regulations (including the State Plumbing Code), a plumbing (i.e., construction) permit is issued upon receipt of the appropriate fee as follows:

Administrative Fee	\$ 3.00
System (each)	\$ 25.00 ¹
Engineered system (each)	\$100.00
The fee schedule below shall apply if single components are replaced or altered:	
Replacement, expansion, alteration, and/or installation of:	
Treatment tank (each)	\$ 10.00
Holding tank (each)	\$ 20.00
Waterless toilets (each)	\$ 10.00
Disposal area	\$ 20.00
Engineered disposal area	\$ 50.00
Laundry waste system	\$ 10.00
Conversion permit	\$ 20.00

After installation, but before cover-up, the inspector visits the site to determine whether it is in compliance with the prevailing requirements. If it is satisfactory, the inspector issues a certificate of approval and the system may be covered over and placed in operation.

¹ May include a maximum of two waterless toilets.

The local plumbing inspector enforces all applicable codes and standards.¹ The State Plumbing Code establishes minimum requirements for siting and design of individual wastewater disposal systems, but local codes may be more stringent (about 12 municipalities have local codes more restrictive than those of the State). The State code provides minimum standards for design of nonconventional systems such as aerobic units, composting toilets, holding tanks, and privies. Although the local plumbing inspector is an official employed by the locality, he must pass a qualifying exam administered by DHE for State certification. The State holds seminars, and has published a training manual to assist candidates. Local plumbing inspectors and site evaluators can have their licenses revoked by DHE through a judicial process. System installers, however, are not licensed.

Statewide, there are about 160 evaluators, and 350 to 375 inspectors registered with DHE. In some communities, the local plumbing inspector also acts as the building inspector and zoning code enforcement officer. Some inspectors serve more than one community.

Permit fees collected by the local plumbing inspector are turned over to the municipality. Seventy-five percent stays with the local government, while the remaining 25 percent goes to the State to cover administrative costs. Originally, the fee structure was to make the permitting system self-supporting. This goal has not been realized to date, and supplemental monies are provided out of the State budget. Consideration has been given by DHE to increase the permit fees to help cover the increased costs of the LPI program.

DHE employs 10 regional sanitarians at various locations around the State. They investigate complaints, system malfunctions, and code violations, and assist local plumbing inspectors with special problems (in addition to other public health-related duties). The procedure

¹ An LPI may also serve as zoning officer, building inspector, or in another capacity for a municipality. Often small towns have a part-time LPI.

for local plumbing inspectors in taking action against the owner of a malfunctioning wastewater disposal system is as follows:

1. Oral notification to the system's owner that a malfunction has been found in violation of the State code, and that the situation must be corrected.
2. Letter if the violation has not been corrected within a reasonable time, stating a date by which the situation must be corrected; failure to comply may result in civil action or a special tax assessed on the land by the municipal officers (e.g., councilman or selectman).
3. Abatement order issued by the municipal officers if the violation is still uncorrected by the date specified in the letter.
4. Service of abatement order hand delivered to the owner by a municipal officer, county sheriff, or constable.
5. Return of Service Order form filled out by the municipal officer who delivered the Abatement Order and filed with the District Court.
6. Entry on Land by Municipal Officers to Correct Violation if the terms of the Abatement Order are not met within the specified 10-day period.

In addition to the regional sanitarians, about seven professionals are employed in DHE headquarters (in Augusta, the State capital). These professionals, made up of sanitarians, engineers, and a licensed plumber, are involved in the review of system plans for those systems which require State approval prior to local approval by an LPI. Systems which involve active State review are domestic and commercial systems with flows over 2,000 gpd, as well as conventional on-site systems where the limiting factor criteria for drainage fields cannot be met. For these systems (referred to as engineered systems), a professional engineer must design the system, and DHE must review and approve the plan. The LPI cannot issue a construction permit without prior approval of DHE.

For large developments (such as residential subdivisions in excess of 20 acres), a special impact evaluation is required by the State Site Location Development Act (effective September 1971). According to the

Act, the DEP Bureau of Land Quality Control (Division of Review and Planning) is responsible for reviewing subdivision plan applications which are usually prepared by a site evaluator, professional engineer, or planner. The following items must be evaluated by the developer:

1. Soil type (including use of observation or test pits on individual lots).
2. Road system.
3. Drainage improvements.
4. Proposed wastewater system.
5. Water supply distribution system.

The Division of Health Engineering will make a general preliminary assessment of the suitability of the land for its intended use.

DEP is responsible for Statewide management of septage and wastewater sludge, and has published regulations and guidelines for disposal of these residuals on land. DEP also prepares a newsletter for independent septic tank pumpers in the State. The Municipal Services Division evaluates septage disposal alternatives submitted during 201 planning, while DEP's Bureau of Land Quality Control reviews all septage disposal sites. Individual towns are required by law to provide for disposal of their septic wastes, and several communities have agreements for septage disposal at municipal wastewater treatment plants. Most septage disposal, however, is left to private haulers, with relatively little control or record of septage volumes and septage disposal locations. At present, DEP has no program to license private septage haulers.

PROGRAM ASSESSMENT

Maine's overall noncentral wastewater management program derives its strength from the 1974 State Plumbing Code. The program involves participation of experienced professionals (site evaluators) in conjunction with a certified local plumbing inspector, familiar with unique physical

conditions of the locale. The involvement of the LPI and site evaluator provides some assurance of dependability and validity of site test results. In addition, technical manuals prepared by DHE provide detailed step-by-step procedures for enforcement and site analysis which increase the efficiency of the site evaluator and LPI.

The Code's standards and regulations are generally regarded by DHE as having a significant impact on water quality. Prior to adoption of the current State Plumbing Code, 30 to 50 percent of individual systems, according to a DHE study, were failing. DHE reports a failure rate of less than one percent annually since the 1974 Code was established. One of the principal features of the code, which DHE feels has contributed to its positive impact on assuring satisfactory on-site system performance, is the use of the site evaluation to observe soil profiles.

Some apparent weaknesses exist, however, in the present on-lot management system. The most significant is the lack of uniform surveillance and enforcement by local plumbing inspectors across the State. Shortcut procedures and relaxation of State standards occur from time-to-time with the number of individual inspectors involved in the permitting process. The State DHE lacks the manpower and resources required to police the LPI's individual practices. Regional DHE staff, e.g., have a wide range of public health-related responsibilities, with sewage disposal system permitting and inspection representing only a part of their total activity. Participation by local municipal officials who hire (and fire) LPI's is an indispensable part of the overall program. To date, municipal involvement and interest in the program varies across the State, further reducing the effectiveness and uniform enforcement activity of the LPI.

Another problem in enforcing the Plumbing Code rests with the flexibility of the site evaluator and LPI in performing their duties. Many LPI's frequently allow departures from the code because of unique local circumstances. In most cases, the LPI is unaware of the seriousness of

the variation issued. Some evaluators are more lenient in interpreting site limitations than others, thereby not providing incentives to perform a thorough analysis of site conditions. DEP has suggested, e.g., that the training level for site evaluators and LPI's be increased to improve the performance of the locally-administered program. Another method of improving local enforcement is for municipalities to pool their resources and hire a qualified fulltime LPI, who could assure that site evaluations are performed correctly. In an effort to assess the performance of both the site evaluator and the LPI, DHE is developing a computerized cataloging system to record all on-site system permits that have been issued by LPI's, copies of system plans, and construction inspection reports. (DHE is currently recording about 8,000-10,000 permit applications per year.)

In conversion of seasonal residences to year-round occupancy, the State requires that the existing on-lot disposal system meet new system standards as defined in the Plumbing Code, or that the existing system be rebuilt or replaced to comply with those standards. DHE feels that there is confusion with the present wording of the Code, and amendments are under consideration.

The costs of correcting a malfunctioning system can be a serious burden to people with fixed or low incomes, as is the case in many of the rural towns in the State. Thus, the Council of Governments in Portland, one of the five 208 regional planning agencies, proposed the creation of a revolving loan fund to assist low income persons to repair or replace failed septic systems. This involves establishing about a half-million dollar fund made up of contributions from participating communities which would be administered on a regional basis, with a five-year turn-over time. A similar proposal by DEP (made prior to PL 95-217) to establish a Statewide loan fund to finance system rehabilitation was defeated by the State legislature.

DEP admits that present controls over septage handling and disposal are very inadequate. Septage haulers are unlicensed and DEP is understaffed

for monitoring the performance of municipalities in dealing with septic wastes. Land disposal in the winter is a major problem, resulting in actual or potential nonpoint source pollution of lakes and streams.

A 208 study prepared by the North Kennebec Regional Planning Commission addressed septage disposal, and made recommendations which have implications for the entire State. These include:

1. Providing incentives for the private hauler to dispose of septage properly by increasing penalties for illicit dumping; strengthening DEP's enforcement capability; and instituting a training and licensing program for private septage haulers.
2. Increasing the number and capacity of septage treatment facilities at wastewater treatment plants under the Construction Grants Program.
3. Reducing the volume of septage which must be pumped by encouraging the use of composting toilets in conjunction with separate gray water systems.
4. Improving the siting and operating procedures of land disposal sites by strengthening DHE's review and inspection activities.

DEP views septage primarily as a regional problem, and future developments in residual materials management will probably include regional septage disposal facilities. DEP is currently initiating on-site wastewater management studies addressing septage management and facility planning methodologies through its 208 and 201 programs.

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PENNSYLVANIA NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

The Commonwealth of Pennsylvania ranks first in the nation in total rural population (approximately 3.4 million people in the 1970 census), and has a long history of interest and involvement in small wastewater systems. The Department of Environmental Resources (DER) is the focal point of Pennsylvania's on-site and small community systems program. It undertakes and supports research, regulatory, planning, and public education activities.

DER has a central office and regional offices. The State's management program is administered at the State, regional, county, and township levels. The five primary DER entities, or levels of activity, in the State's program are:

1. Office of the Secretary (in Harrisburg, the State capital).
2. Bureau of Community Environmental Control (in Harrisburg).
3. Bureau of Water Quality Management (in Harrisburg).
4. Regional offices throughout the State.
5. Sanitarian county offices throughout the State.

The Department Administration, centered around the Office of the Secretary, sets program priorities and direction for DER, and also serves as the Department's link to the State Legislature. The Bureau of Community Environmental Control (BCEC) has had primary responsibility for on-site and community subsurface disposal systems. The Bureau of Water Quality Management (BWQM) is involved in construction grants, 201 and 208 planning, and regulation of all facilities with surface water discharges, including "package plants." DER's seven regional offices provide the primary contact among the Department, local governments, and the public. DER county sanitarians have the responsibility for monitoring the performance of sewage enforcement officers within their jurisdiction, and for keeping DER records on malfunctioning systems.

Major factors and legislation that have contributed to Pennsylvania's program are:

1. History of interest and involvement.
2. Sewage Facilities Act (Act 537).
3. Sewage Advisory Committee (SAC).
4. Sewage Enforcement Officer (SEO) Program.
5. Acceptance of and research on alternative systems.

Of these items, the Sewage Facilities Act, enacted in 1966, has had the greatest impact on small systems by creating and enhancing the mechanisms for regulation, planning, and innovative aspects of Pennsylvania's community wastewater management programs.

ORGANIZATIONAL HISTORY

The Department of Environmental Resources was created by Act 275 of the General Assembly of Pennsylvania, adopted on 30 December 1970. The intent of Act 275 was to consolidate the State's environmental programs into one agency. Prior to that time, the majority of Pennsylvania's small systems management activities were carried out by the Department of Health. Act 275 transferred these responsibilities to the new DER.

Pennsylvania's small systems regulatory activities date back many years. In the early 1960's, the State was sponsoring related research at the Pennsylvania State University. The on-site management program took a major leap forward in 1966 with passage of the Pennsylvania Sewage Facilities Act (Act 537). This one law contains comprehensive provisions, enhancing the State's role in research, funding, planning, and regulation of on-site and community systems. Act 537 has enabled the State to furnish funds to local municipalities for planning activities to identify and resolve sewage disposal problems. In addition, the law created the Sewage Advisory Committee to guide the state's design criteria, regulation procedures, and technology transfer.

The second key year in the State's program history was when Pennsylvania Act 208 was signed into law. This Act, an amendment to Act 537, created the Sewage Enforcement Officer (SEO) Program. This represented a

dramatic shift in DER's on-site program by requiring that each municipality in the State retain a certified sewage enforcement officer to issue permits for installing subsurface disposal systems. SEO's are municipal employees, but their certification and performance evaluation is DER's responsibility.

By the mid-1970's, DER's role had become more leadership-oriented, providing more technical guidance, regulatory reviews, and planning guidance services rather than direct involvement in local problems assessment. Local governments had inherited inspection and permitting functions from Act 537 amendments. Within DER, BCEC emerged as the focal point for on-site systems. BCEC has administered the Act 537 requirements, and provided technical guidance and assistance to individuals and communities on subsurface disposal systems. BWQM has supported BCEC in reviewing "Act 537" plans by municipalities. BWQM has responsibility for Pennsylvania's 201 construction grants programs, the Statewide planning under Section 208 of PL 92-500, and for surface disposal facility plan reviews and approvals. COWAMP, the State's Comprehensive Water Quality Management Planning Program, from its beginnings in 1973-1974 through its evolution into the State's 208 Program, has highlighted the rural wastewater management needs and options in the Commonwealth, and identified ways in which the 201 and Act 537 planning programs could collectively address on-site and small community systems applications.

The current evolution of Pennsylvania's program is toward:

1. Decentralization of DER activities where regional offices can best serve plan review and grant administration needs.
2. Merging the complementary BCEC and BWQM central office activities for on-site and small community systems.

As an example, an important reorganizational effort is occurring within DER to coordinate the overlapping facilities planning aspects of Act 537 and Section 201 requirements, specifically as they pertain to planning

guidance and reviews by DER and to grant eligible projects. (It is important to note that every municipality in Pennsylvania must have an Act 537 plan, while Section 201 activities are oriented to certain local wastewater projects and grants.)

DESCRIPTION OF MANAGEMENT PROGRAM

Pennsylvania's program was chosen as a case study because of its long standing and innovative nature. The State's management efforts are a combination of:

1. Regulatory policy-making and enforcement procedures.
2. Research and technical guidance.
3. Grants for planning.
4. Assistance to local governments.
5. Integrated and comprehensive planning (both for policy and for Statewide information development).
6. Strong regional office role.

Based on Act 537, DER developed Chapters 71 and 73 of its Rules and Regulations as key regulatory features. Chapter 71, "Administration of Sewer Facilities Program," established:

1. Guidelines for preparation and approval of Act 537 plans.
2. Permit requirements for on-site systems.
3. Procedures for SEO inspection and permitting of such systems.

Chapter 73, "Standards for Sewage Disposal Facilities," regulates design and installation of on-site systems. A noteworthy provision of Chapter 73 is the allowance for alternative (to the conventional drainfield) systems under specified site conditions.

Act 537 requires each municipality to prepare and regularly update a plan for resolution of community sewage disposal needs. DER, through BCEC, has provided 50 percent funding for 537 plan development. Act 537 plans can serve as the vehicle through which local governments can

identify areas that are unsuitable for conventional or alternative on-site systems, can study small community system options, and can explore the potential benefits from managing these small flow systems.

State-level interest in effective planning and policy-making is exemplified by DER's Comprehensive Water Quality Management Program (COWAMP). Initiated by BWQM, COWAMP is an ongoing study of Pennsylvania's surface- and groundwater quality control, and wastewater disposal needs from both regional (county and basin) and Statewide perspectives. Although initially funded entirely by the State, DER has more recently emphasized full integration of the nine major COWAMP studies around the State, and State-level 208 planning program objectives. DER is using COWAMP findings and recommendations to develop and modify policies and program guidelines, some of which affect the technical, implementation, and environmental management aspects of on-site and community wastewater systems.

DER's central office staff is primarily responsible for state program and policy decisions. The Department obtains input on small systems application in Pennsylvania from the Sewage Advisory Committee (SAC) established by Act 537. The SAC is composed of representatives from State, county, and local government, Federal agencies, trade associations, public and professional societies, and other interested organizations. SAC provides comments and recommendations on regulations, procedures, policy, and technology to DER for consideration.

Certain responsibilities for program implementation are exercised by DER's regional offices. Each regional office has BCEC and BWQM staff working in small systems application. These offices interface with local governments through specific plan reviews and permit enforcement actions. In addition, regional office personnel can act as consultants to public and private groups on wastewater management problems. The BCEC regional sanitarian supervises Act 537 plan reviews and the DER

sanitarians stationed in the counties. BWQM facilities planning and grants sections deal with 201 project reviews and approvals.

At the local level, site-by-site implementation of Pennsylvania's program is the responsibility of the sewage enforcement officers. To become certified, a prospective officer must pass an examination covering:

1. Administration of State and local programs.
2. Technical options and operations.
3. Planning and design.
4. Soils and other physiographic characteristics.

There are no formal educational or experience requirements for becoming an SEO, although DER encourages participation in a six-day training course given by DER staff. Most SEO's have an educational background in engineering, soils, or geology.

All new subsurface disposal systems must receive a permit issued by an SEO. DER monitors SEO performance through the county-level sanitarians. These sanitarians are responsible for collecting data on on-site system failures, and reviewing the work of SEO's in their county. The sanitarians form an important informational bridge between the regional offices and local governments.

A homeowner (or developer) chooses a contractor for system design and installation; contractors (i.e., installers) are not licensed. The permit application is reviewed and the site is inspected by the SEO. The SEO issues or denies a permit based on the available facts. State guidelines and procedures are used in site evaluations (involving physiographic data review, test pits, and percolation tests). During construction final inspection by the SEO is required before the subsurface system can be backfilled and before use. Legal options are available to the SEO to bring systems into conformance with standards and plans, or to stop unpermitted construction. System failures are reported and rectified in numerous ways. The builder, SEO, municipality,

DER sanitarian and/or county health department (in four of 67 counties) may be involved with malfunction reports and problems. Permit and related correspondence record-keeping is the SEO's basic responsibility (the county-level has copies). Failure records are normally compiled at the county level by the Health Department or DER sanitarian. Complaints to DER and related follow-up are recorded by the sanitarian. Failures are also recorded on the permits which an SEO must issue for system rehabilitation or replacement.

Larger subsurface disposal systems (for subdivisions or mobile home parks, for example) are handled both by the CEC and the SEO's. The BCEC regional office staff reviews and approves the facility plans for all systems over 10,000-gpd before the SEO issues a permit. DER can become involved in plan reviews for smaller systems on a case-by-case basis.

Other important elements of Pennsylvania's management programs are:

1. Current DER-sponsored research at Pennsylvania State University (PSU); primarily on alternative on-site systems design and construction, and land application of wastewaters.
2. Public information programs and literature prepared by BCEC; including video tapes on small system options, construction and use, training materials, homeowner and local government informational booklets, PSU technical documents, DER speakers for local organizations, and mass mailings of public educational materials through COWAMP.
3. Provisions for small communities and local public health problems to have better recognition for 201 funding by being assigned special points in the Pennsylvania grants priority rating system, and by the maintenance of a separate small community projects list.

In response to prior program needs to provide funding to small projects and to the grant money set-aside provision of PL 95-217, DER has recently revised Chapter 103, "Financial Assistance--Federal Grants for Construction of Sewage Facilities," of its rules and regulations. In addition to

formalizing the arrangement of a separate priority listing for small municipality projects, the procedures (specifically, the assignment of rating points) has been modified to place more weight on public health problems. In the public health categories, the maximum number of points is given to areas where the majority of on-site disposal systems are rated as malfunctioning or otherwise inadequate.

DER works with the Department of Community Affairs (DCA) to integrate wastewater and community development planning efforts where possible. DCA administers the Municipal Planning Act 247 of 1968 which enables municipalities to develop ordinances and comprehensive plans that guide community growth. DER has demonstrated a concern that Act 537 plans and 201 projects recognize and consider local community planning efforts and growth objectives (although formalities between these laws and plan review processes do not exist now).

Regarding public management of small flow systems, DER has assumed a passive rather than leadership role. DER's attitude toward management districts is progressive, but guidelines and special assistance have not been arranged. DER encourages local governments to investigate their management options through use of Act 537 planning processes and grants.

PROGRAM ASSESSMENT

Overall, Pennsylvania has a very well established and comprehensive on-site and small community wastewater systems program. The major features of Pennsylvania's program are:

1. Long-standing involvement in on-site systems performance.
2. Act 537 provisions governing small systems planning.
3. Consistent position on regulations enforcement.
4. SEO program for local inspection and all on-site systems permitting.

5. BCEC and BWQM rules which both govern and guide small systems applications.
6. Regional office structures which provide a more local presence and contact point for DER.
7. State-level planning (COWAMP) that has highlighted rural wastewater management needs on a Statewide basis.
8. Sewage Advisory Committee (SAC) inputs to DER as a legal requirement.

Act 537 is recognized as a powerful tool, but its planning effectiveness has been somewhat hindered by local government interpretations that apply its provisions only to areas where conventional sewerage systems were needed. Only in the past few years has DER fully explained that the Act 537 planning requirements are as equally useful in supporting programs for on-site and small community systems management. Also, there has been local confusion over the role of Act 537 planning with respect to Federally-funded 201 plans. Currently, DER is acting to better coordinate and utilize Act 537 and Step-1 201 planning activities to avoid duplication of effort and provide better use of State and Federal planning grants.

In its five year history, the SEO program has, for the most part, gained local acceptance and proven to be effective. DER has not had the resources, however, to thoroughly monitor and review the capabilities and performance of all SEO's. Recently, BCEC has addressed this issue through investigating the criticisms of specific SEO's and investigating ways to strengthen DER's monitoring procedures. The sanitarians at the County level can fulfill the technical review and coordination roles which are necessary to ensure uniform administration and a positive attitude toward Sewerage Facilities Act provisions.

DER has had an "image" problem in Pennsylvania, being seen as a large agency distant from local needs, and more interested in regulation than in problem solving. Compounding this problem has been communication difficulties between DER's various levels. Many times this has led to

both Department and local government frustration and confusion concerning programs implementation. To counteract this, action has been taken within DER to further streamline State-level programs effectiveness. Further decentralization and increasing the public service aspects of DER operations are examples. The regional office role, notably in 201 grant application reviews and ratings, is being intensified so that local governments and residents are aware that DER representatives within their area are sensitive to local needs. DER is also adjusting itself to be a more service-oriented and locally-responsive agency by formally increasing the attention given local problems that are brought to the Central Office's attention, and by the increased use of demonstration projects.

This fairly recent decision to pursue demonstration projects can be used to test and refine optional technologies and management concepts. Both the increased attention to immediate problems and demonstration activities are limited to some extent by available staff time and the DER budget.

The various features of DER's program comprise a strong and innovative approach to on-site and small community wastewater management. Expanded DER activities for better coordination and communications would greatly enhance the program's effectiveness. A State-level contact point or person, such as that which California provides to answer questions, for any State resident or entity, could reduce concerns about not being able to reach within DER for program answers. An optional arrangement would be the establishment of a visible contact person in each DER regional office.

Over time, COWAMP may have a large positive impact on Pennsylvania's program in terms of visibility and public education on small wastewater systems. By involving local public and governments during plan preparation, COWAMP's recommendations and policy guidance has represented local views concerning Pennsylvania's environmental programs. In the

final phases of COWAMP, DER will attempt to pull together the various Statewide findings and recommendations for revising State policies and guidelines. Enhancing State rural wastewater management should be a high priority in these future COWAMP efforts of DER.

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WASHINGTON NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

Both State and local agencies are involved in regulation of on-site and small community systems in the State of Washington. At the State level, on-site wastewater disposal control is shared between the Department of Ecology (DOE) and the Department of Social and Health Services (DSHS). There are 31 local health departments that administer local on-site disposal ordinances in the State's 39 counties.

Under recently revised State policy toward noncentral system regulations, local (county and district) health departments are responsible for regulating on-site systems of less than 3,500 gpd (through an agreement with DSHS) and small community systems with flows less than 14,500 gpd. DSHS is primarily responsible for regulating systems between 3,500 gpd and 14,500 gpd (unless a waiver is granted to a local health department). DSHS also acts as a technical advisor to local health departments. DOE's plan review and permitting responsibilities cover:

1. Small community or cluster septic tank systems with flows exceeding 14,500 gpd, and/or serving 50 or more housing units.
2. Mechanical treatment systems or lagoons with subsurface disposal serving 10 or more housing units, or flows exceeding 3,500 gpd.
3. All noncentral wastewater systems that discharge to surface-water.

State Board of Health regulations presently provide for the local health department approvals mentioned above, and DSHS review and approval (along with local health department input) for all systems exceeding 14,500 gpd. Certain overlaps in plan review and regulation authorities are now being addressed by the State legislature, DOE, DSHS, and local health departments, through special sessions of the State House Committee on Ecology.

State Board of Health on-site system regulations, adopted in 1974, establish a framework for developing local regulations consistent with unique conditions in the locality. This legislation authorizes DSHS to perform the following:

1. Review and approve local on-site disposal ordinances.
2. Mandate the use of Statewide regulations where localities fail to adopt local ordinances.
3. Require permanent system maintenance programs for certain subdivisions using on-site systems.
4. Act as a coordinator and technical assistant to local health departments in on-site wastewater disposal issues.

For the third activity, DSHS has adopted "Guidelines for the Formation and Operation of On-site Waste Management Systems." The guidelines describe maintenance requirements and applicable management agency options in conjunction with DSHS regulations that require permanent maintenance of on-site systems in subdivisions with gross densities greater than 3.5 housing units or 12 persons/acre, or flows of 1,200 gallons/acre/day.

ORGANIZATIONAL HISTORY

The DSHS (formerly the State Health Department) was, until the mid-1940's, the principal agency in charge of water pollution control programs in the State. After the Water Pollution Control Commission was established, and subsequently the DOE in 1970, the role of DSHS in water pollution control activities diminished. As the Commission and DOE gradually acquired staff and environmental programs responsibility, the role of DSHS became one of:

1. Providing input on certain health related issues, such as wastewater reuse and discharge of treated effluent in shellfish harvestery and recreational areas.
2. Promulgating and administering regulations such as the protection of drinking water supplies, and shellfish harvesting areas.

The regulatory and advisory roles have been maintained and formalized by interagency agreements among DSHS, DOE, and other State agencies.

The process of developing current DSHS on-site system regulations involved joint efforts of DSHS and local health departments. Prior to adopting the DSHS regulations in 1974, local health departments issued and administered locally-adopted on-site system rules and regulations exclusively on a county and district basis. The regulations applied by the local health departments varied considerably Statewide. The lack of uniformity led to problems (and complaints) for residents, developers, and local health departments throughout the State. Local health departments were confronted with added responsibilities when the State Platting Law (RCW58.17) was revised in 1969, requiring that local health departments review preliminary wastewater facilities plans (i.e., plats) for subdivisions. This responsibility, coupled with the increasing number of proposed subdivisions and complaints by developers, consumers, and local health officers concerning inadequate on-site sewage disposal, prompted involvement of DSHS in investigating and coordinating local health department functions.

DSHS conducted surveys of local health departments between 1969 and 1971, and made the following observations:

1. Approximately 1.2 million persons utilized some form of on-site sewage disposal.
2. U.S. Census data for the State disclosed a total of 403,000 septic tanks in use in 1970. (A more recent survey estimates 650,000 systems currently in use Statewide.)
3. Approximately 25,000 new systems were being installed annually, and 7,000 systems were reported as failing each year.
4. The level of control in county-level on-site programs varied widely Statewide, and ranged from no restrictions to overly stringent requirements with inconsistent design criteria.
5. Standard criteria for preliminary plat review and approval concerning sewage disposal was needed.

6. On-site systems were consistently being utilized on lots with unacceptable soils and/or with high water table conditions.
7. Failing on-site systems were causing health hazards, decreasing land values, and increasing consumer costs for more permanent and adequate sewage disposal.
8. Program models, guidance, and evaluations were absent.

Based upon the survey and input from public and private interests in the State, adoption of minimum State standards for on-site disposal programs was advocated. DSHS, along with local health departments (in 1972-1973), conducted several additional surveys to analyze on-site system performance in the State. To further assist in formulating minimum standards and State regulations, an ad hoc committee representing public and private groups was appointed by DSHS. In June 1974, the State Board of Health passed the present standards, requiring adoption of local variations in soils and climate, and establishing a formal DSHS review and approval process for local regulations to help insure consistency and compliance with minimum State requirements.

Historically, the Department of Ecology has dealt with water quality and other environmentally-oriented issues. Like many sister regulatory agencies around the country, DOE has been heavily involved in urban and industrial aspects of wastewater management. The facilities plan review and related construction grants programs have recently complemented the delegation of NPDES responsibilities by the U.S. EPA. Past attention given noncentral systems has been through the 208 Program, through regional office reviews, permitting small community projects, and through assessing relevant technology for application in Washington. DOE is now looking at options for handling noncentral system reviews, ranking eligible projects, and dispersal of available grant funds (such as the "4 percent set aside") in a way which is compatible with similar activities for larger projects.

DSHS and DOE are now modifying their interagency agreement for on-site management. DOE has recently adopted regulations governing the design of on-site sewage systems larger than 14,500 gpd. (DSHS has current authority over these large systems as well.) The issue and overlapping responsibility, along with other related problems of State wastewater program administration, are under review by the State House Committee on Ecology.

DESCRIPTION OF MANAGEMENT PROGRAMS

DOE, DSHS, and local health departments have statutory responsibilities for regulating on-site systems in Washington. The DSHS role in on-site sewage disposal is one of coordination, assistance, and support to local health jurisdictions. Two full-time professionals are involved in a wide range of DSHS activities, including:

1. Review and approval of local health ordinances -- Of the 31 existing State health departments, 18 departments apply locally-adopted State-approved regulations, while the remaining 13 apply State standards directly. DSHS also conducts periodic evaluations of local health department programs to assist them in improving the structure and orientation of their programs.
2. Investigation and evaluation of alternative wastewater system technologies -- Under the 1974 regulations, a technical review committee was established to review new technology and develop guidelines for its application. Guidelines have already been developed for aerobic treatment, soil evaluation, evapotranspiration systems, mound systems, and composting toilets. Management guidelines for ensuring continuing operation and maintenance of systems in subdivisions have also been developed. DSHS has also been instrumental in organizing the Northwest States Task Force for On-Site Disposal. (Oregon, Idaho, Washington, Montana, Alaska, and the Province of British Columbia are represented on this Task Force.) This organization acts as a forum to discuss applied technology and management experiences at both State and local levels.
3. Development and implementation of training courses for designers, installers, and local health department personnel -- Several regional workshops are held each year.
4. DSHS is involved in research projects -- These projects examine failing on-site systems, and develop on-site management programs.

5. DSHS personnel at the State capital and four regional offices provide technical assistance to local health departments --
Much of the regional effort is oriented toward protection of drinking water, and review and approval of larger on-site systems.

DSHS works closely with local health departments in administering on-site regulations. Each of the 31 health departments Statewide has an active on-site management program. Collectively these local agencies employ between 125 to 150 full-time employees who are involved in a variety of environmental health program activities, such as:

1. Review and approval of individual system designs and small community systems.
2. Supervision of individual system installations.
3. Review of preliminary subdivision plats.
4. Issuance of permits for community on-site systems.
5. Licensing of septic tank pumpers, designers, and installers.
6. Inspection and correction of failing systems.

Almost all of the 25,000 new systems installed each year are individual units serving single family homes. There is a growing awareness, however, of the need to formulate uniform policy toward application of larger on-site systems by State and local officials.

DOE's activities in the State's noncentral wastewater management program rest with the construction grants and 208 areawide planning programs, as well as waste discharge permit programs. The State's 208 program funds studies for watershed management investigations and pilot studies for establishing on-site management programs to complement designated area 208 agency efforts.

In addition to State and area 208 program activities in rural wastewater management, State law requires that governmental entities involved in developing and operating sewer facilities (such as cities, counties,

sewer districts, water districts, public utility districts, and port districts) must prepare comprehensive sewer plans. These plans are subject to review and approval by DOE and DSHS. The plans must incorporate existing governmental comprehensive plans, and be consistent with Step 1 Facilities Planning.

DOE's structure for administering the construction grants program is undergoing considerable changes at the present time. Plan review is now conducted at the regional level through four offices, while the State's priority list is being handled at DOE headquarters. This arrangement will soon be altered through gradual phasing out of regional office plan reviews, priority lists, and policy-making activities, and added to the administration activities in the Olympia Central Office.

The Projects Priority List preparation and maintenance system and related construction grants funding policies, which will affect implementation of noncentral wastewater alternatives, are being revised. A separate priority list exclusively for projects eligible for innovative and alternative funds is under consideration by DOE's Water Quality Management Division (Municipal Section). Diversion of the traditional 15 percent State share for construction grant funding to a separate 50/50 matching grant program to apply to smaller (primarily lower priority) projects is being considered also. It is felt that this shift in State funds will help promote consideration of lower cost wastewater facilities for projects eligible for 75 percent Federal grants, and provide some funding for smaller projects without a high priority ranking, but that have demonstrated needs.

A final key element of the State management program is the State DSHS mandate for perpetual maintenance and management of noncentral wastewater systems applied in large subdivisions. According to the DSHS regulations, when subdivisions or multiple housing units have gross densities exceeding 3.5 housing units or 12 people/acre, or waste flows of 1,200 gallons/acre/day, noncentral systems will not be permitted unless perpetual

maintenance is provided. Eligible management agencies include: an existing sewer utility; county government agency; a sewer district; or a water or public utility district operating a sewer service. If no municipal agency is able or willing to operate a management program of this type, a special management corporation may be organized to serve as the management agency. DSHS currently promotes the use of municipal agencies to manage noncentral systems, and is pursuing the concept of "satellite support systems" to manage scattered community systems.

State guidelines outline the requirements of a management agency, if the subdivision is outside the service jurisdiction of a functioning municipal agency. In this situation, if a private corporation (i.e., special management corporation) is proposed as the management agency, the permanency of the special corporation must be guaranteed by a public agency through a third-party trust. A totally private management corporation may not be formed unless the developer first exhausts all public agency possibilities directly, or establishes a third-party trust.

There are many examples of community on-site management programs throughout the State. County and city departments of public works are the most common institutional approach to systems management. Several county and city departments of public works in the State are maintaining large community septic systems. The State is currently promoting this concept of "satellite support systems" to manage scattered large community systems, as is currently practiced in several parts of the State.

DSHS and DOE 208 programs are now involved in conducting pilot-program studies to develop comprehensive and model on-site wastewater management programs. One study is a cooperative effort among the DOE (208 Program), DSHS, and the Cowlitz County Department of Public Works. This detailed analysis of a community of approximately 300 homes will determine the most feasible technical and institutional wastewater management options, as a model for similar developments. Another on-going study includes an investigation of on-site system management needs in the Seattle Metropolitan area.

PROGRAM ASSESSMENT

The State of Washington is a recognized leader in developing on-site management programs. This distinction is a result of its regulatory requirements for managing subdivision on-site systems, its relationship with and support of local managing agencies, and its use of a State-level technical review committee. This committee concept has been applied in other states, and is an effective mechanism to aid the successful implementation and updating of regulations governing on-site and alternative systems.

One of the major current problems with the State's management program is the overlapping and duplication of effort among DSHS, local health departments, and DOE. This has been noted as a major problem by private interests and public agencies. Testimony submitted to the State House Committee on Ecology by the State Office of the Attorney General points out, e.g., that:

1. DSHS regulations require a permit from the local health officer for any new on-site sewage system. Larger systems (over 14,500 gpd) must have State DSHS approval. These authorizations overlap those of DOE. For larger systems, an on-site system may require approval from the local health department, DSHS, and DOE.
2. Three different design and review criteria may then be applied to the same system. If DOE begins to require State waste discharge permits for on-site systems, then a fourth governmental approval would be added.
3. In addition, there is duplication in review of comprehensive sewer plans. Some legislation requires that county plans be approved by both DSHS and DOE. Other statutes require that plans be approved by local health officers when DOE approval is also required.

These items of possible duplication and conflict are being addressed by the House Committee. While proposals for transfer of on-site management activities from DSHS to DOE have been made, it appears that many duplication problems can be resolved through interagency agreements. Furthermore, an important State/local communication and working

linkage may be lost or damaged by removing DSHS involvement in local health department on-site programs. The State/EPA agreement outlines some of these recommendations:

1. DOE will work with DSHS and local health departments to delineate division of review responsibilities for larger subsurface disposal systems.
2. DSHS will work with local health departments to delineate division of review responsibilities for smaller subsurface disposal systems.
3. DOE will clarify its responsibilities for issuing waste discharge permits for domestic wastewater systems.
4. DOE will work with DSHS and local health departments to update and finalize design criteria for larger systems.

Despite these current problems, Washington's involvement in preparing guidelines for noncentral system operation and maintenance, establishing technical review of wastewater system alternatives through DSHS research, Technical Review Committee involvement, conducting educational workshops for local health offices, designers and installers, and pumpers, and initiating pilot programs to demonstrate on-site management programs help to place its program at the forefront of State noncentral management programs.

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VERMONT NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

The administration of the noncentral wastewater management program in Vermont is shared by numerous agencies at State, regional, and local levels of government. Vermont's program involves agencies at the State level, local governments, and, indirectly, the Natural Resource Conservation Districts (NRCDD) program. The seven principal agencies involved in management of on-site and alternative systems in the State are:

1. Vermont Department of Health.
2. Vermont Agency of Environmental Conservation (AEC).
3. State Environmental Board.
4. State Planning Office.
5. Municipalities (including towns, incorporated municipalities, and villages).
6. Vermont Natural Resource Conservation Districts (NRCDD).
7. Regional Planning Commissions.

All Vermont health regulations dealing with noncentral wastewater systems are administered and enforced by the Vermont Agency of Environmental Conservation (AEC), or local municipalities through their local board of health and local health officer (in conjunction with the State Department of Health).

The most important State law regarding sewage disposal (promulgated by the State Health Department, but administered by the AEC) is the State subdivision regulations. These regulations govern the water supply and sewage disposal in subdivisions where the lots are less than 10 acres. No new subdivision may be created, nor any existing subdivision modified or extended without a permit stating that these regulations have been

satisfied. The Division of Environmental Protection of the AEC administers these regulations. Local governments, if they choose, may regulate individual on-site systems through Vermont Health Regulations, Part II.

Act 250, Vermont's Land Use and Development Law (adopted in 1976), as a result of significant second home development in the State, is another key State law which governs noncentral systems. Projects which fall under Act 250 review (e.g., subdivisions of 10 or more lots) are subject to examination for potential air and water pollution.

ORGANIZATIONAL HISTORY

The wastewater management program in Vermont, as it presently exists, has evolved through a piecemeal change in priorities, laws, and regulations addressing public health and water pollution control needs. The Agency of Environmental Conservation (AEC) was established in 1970, replacing the Water Pollution Control Agency, and expanding State involvement in environmental management. The Vermont Department of Health (a part of the Vermont Agency of Human Services) participates in the program by advising and giving technical support to local health departments.

Specific legislation promulgated in the State governing design and installation of on-site and alternative systems include:

1. State Health Regulations, Part II (Vermont Health Regulations, Chapter 5, Subchapter 10, Part II) -- Set guidelines for design and installation of individual on-site sewage systems. (It is not mandatory for a town to adopt these regulations.)
2. State Subdivision Regulations (Vermont Health Regulations, Chapter 5, Subchapter 10, Part I) -- Governs subdivision planning (i.e., a new lot of less than 10 acres). The subdivision regulations assure that there is a potential location for an on-site disposal system.

3. Public Building, Mobile Home Park, Trailer Camp, and Tent Site Regulations (Vermont Health Regulations, Chapter 5, Subchapter 1; Vermont Environmental Protection Regulations, Chapter 2; and Vermont Regulations for Trailer Camp and Tent Sites, Chapter 5) -- Deal with developments of these types.
4. State Health Regulations, Part III (Vermont Health Regulations, Chapter 5, Subchapter 10, Part III, Wastewater Treatment, Disposal by Land Application) -- Set standards for the disposal of sewage effluent on or under the land surface.
5. Act 250, Vermont Land Use and Development Law (Chapter 151 of Title 10, Vermont Statutes Annotated) -- Requires people who wish to develop or subdivide land to obtain an Act 250 permit first. The Act 250 permit requires an assessment of potential environmental and economic impacts of major land developments.
6. Vermont Water Pollution Control Act (Chapter 47 of Title 10 Vermont Statutes Annotated) -- Controls discharge of wastewater effluent from any home, industry, or municipality to a surfacewater body.
7. Vermont Water Quality Standards -- Authorize the Vermont Water Resources Board to classify all public waters.

Under current legislation, some applications of on-site and alternative systems are governed by State regulations, and some by local regulations. A State task force has been established to address the institutional issues, particularly legislative and regulatory requirements, involved with management of on-site and alternative systems.

DESCRIPTION OF MANAGEMENT PROGRAM

According to the enabling legislation, the Vermont AEC is the principal enforcement and administrative agency for State rules and regulations governing noncentral wastewater systems. The AEC, through its Division of Environmental Protection, is responsible for administering the State Subdivision Regulations (Part I and III), Regulations for Public Buildings, Mobile Home Parks, and Trailer Tent Campsites, as well as portions of Act 250.

The Protection Division reviews both single and multilot subdivision applications to fulfill Act 250 and State Subdivision Regulations requirements. A single lot subdivision is a lot of less than 10 acres in size. The seller of the lot must submit the application when the land ownership is being transferred. The application can be completed by State-certified plumbers, system installers, soil scientists, Natural Resource Conservation District technicians, health officers, or professional engineers. The application contains a site report requiring the applicant to evaluate the suitability of the lot for on-site sewage disposal. This is done by reviewing soil survey data, at a minimum, and then (under certain circumstances) conducting percolation tests and/or digging test pits at the proposed sewage disposal area. The single lot subdivision application, therefore, serves as a method of assuring that site conditions are suitable for on-site sewage disposal; it does not, however, serve as a permit to build a system. A frequently cited shortcoming of this program, is the lack of follow-up after permit approval, to check the actual location and design of the on-site system, based upon the findings and data reported in the single lot application.

The multilot subdivision plan, which must be prepared by professional engineers, essentially follows the same requirements of the single lot subdivision application. Many of the larger multilot subdivisions (50+ units) tend to provide sewage disposal through connection to municipal sewage treatment facilities. Clustered systems (e.g., community septic tank-disposal fields or spray irrigation) are common methods for sewage disposal at larger subdivisions. The Protection Division, which administers the single lot and multilot subdivision permit program, operates from the state capital (Montpelier) and five district offices.

The Division of Environmental Engineering (AEC) is in charge of wastewater facilities planning, including 201 Facility Planning, and administers the NPDES program. The Water Resources Department (AEC) conducts

303e, 208, and other water resources planning activities, as well as water pollution investigations (i.e., sanitary surveys) associated with surfacewater contamination.

Nearly 10 communities in Vermont are preparing 201 Plans which consider the use of noncentral wastewater systems. Albany is investigating the utilization of individual on-site systems instead of a conventional collection and treatment system. In East Fairfield, a pilot project investigating alternative wastewater management techniques (including aerated lagoons, community septic tank/leachfield, and extended aeration) has been initiated and funded through the Vermont 201 Program. Arlington Township has been involved in a Vermont 201-sponsored feasibility study of alternative wastewater systems. This study and the East Fairfield report, are intended to illustrate alternatives to be considered when preparing 201 Facility Plans in the future.

The Vermont 208 Program has been very active in addressing noncentral wastewater management issues, including:

1. Septage management.
2. Sewage treatment legislation.
3. Criteria for on-site wastewater system design.
4. Wastewater facility planning for small communities (methods and case histories).
5. Model ordinances governing design, construction, and maintenance of on-site wastewater systems.

The Vermont 208 Program staff is currently working with AEC officials in reevaluating current agency responsibilities in noncentral wastewater management.

The State Department of Health (through its Sanitary Engineering Division) is primarily responsible for setting and revising standards, and estab-

lishing minimum criteria for design and installation of on-site and small community systems (as provided by State Health Regulations, Parts I, II and III). The State Health Department does not enforce its regulations, but merely acts in an advisory and assistance capacity to the State AEC and local governments.

A township may adopt the State Health Regulations, and therefore govern on-site systems. Township zoning ordinances, health ordinances, subdivision regulations, or building codes may be used to enforce State minimum criteria. About 100 of the 247 towns in Vermont have adopted local ordinances which control on-site system design and installation. Of these, approximately 60 have joined the Natural Resource Conservation District (NRCD) program which provides technical services to assist local health officers in planning, designing, and supervising installation of on-site systems. In addition, the NRCD program has developed a model ordinance for adoption by participating municipalities. The model ordinance is basically compatible with State health regulations. (The Vermont On-Site Specialists Program discussion explains the program aspects in more detail.)

Regional Planning Commissions are technical advisory agencies organized on a township or multitownship basis. These agencies provide technical assistance to local planning officials primarily relating to zoning, comprehensive planning, and most recently, wastewater management planning issues. The State Planning Office, serves as the A-95 clearinghouse, and acts as the coordinator of regional planning commissions throughout the State.

The most recently organized Vermont agency dealing with noncentral wastewater management is the State Environmental Board. The Board and its nine district commissions were established by Act 250 in 1970. The Environmental Board's primary responsibilities are:

1. To issue Act 250 permits.
2. To adopt an interim land capability and development plan.
3. To prepare and adopt rules and regulations to carry out Act 250 requirements.

PROGRAM ASSESSMENT

Vermont's on-site wastewater management program can be characterized as "confusing," "lacking comprehensiveness," and "inflexible" (as pointed out by one Vermont 208 report). The program appears to have several major shortcomings since the program is shared by several agencies at both the State and local governmental levels, with little coordination among their respective activities.

The small community systems program, with the multilot subdivision review and 201 Facility Planning programs, has had considerable experience in encouraging noncentral wastewater management solutions to sewage disposal problems. With initiation of the Federal Construction Grants Program (PL 92-500), it has been AEC policy to encourage the use of septic tanks/drainfield systems and other noncentral systems in small communities. The Vermont AEC, Division of Environmental Engineering, studied (in 1976) user costs for wastewater treatment facilities in small communities, which recommended that alternatives such as community septic tank/leach-field systems, lagoons, and other types of land treatment systems be considered in facility planning. This attitude toward investigating all feasible alternatives in small community situations still prevails in AEC construction grants program policy.

The Vermont 208 Program, along with AEC officials, the Vermont Health Department, the NRCD, and the State legislature, is reevaluating the responsibilities and functions of various agencies in the noncentral wastewater management program in an effort to overcome the shortcomings identified. This group has recently completed a draft "Regulation of the Subdivision of Land and Individual On-Site Treatment and Disposal

Systems," which modifies some of the current State institutional arrangements. The draft regulations contain the following significant proposals:

1. The responsibility for promulgating regulations governing on-site systems should be transferred from the State Health Department to the AEC.
2. The AEC would review and approve local municipal health ordinances governing individual on-site systems (now done by the Health Department).
3. The AEC would set standards for on-site systems, which municipalities can adopt as minimum regulations.
4. Municipalities can (at their discretion) administer the present State subdivision program.
5. A sewage disposal advisory committee will be established to investigate innovative and alternative systems.

The Vermont 208 Program recommendations (currently in draft form) add the following program changes:

1. The on-site program regulations should be rewritten in a straightforward style.
2. The regulations should be more flexible to include alternative on-site systems.
3. The regulations should identify specific procedures for design, installation, and maintenance of on-site systems.
4. The regulations should be applicable Statewide.
5. Vermont communities should adopt sewage disposal plans prior to or during Step 1 201 Facility Plan preparation.
6. Towns need technical assistance in rural planning. This should be coordinated with local sewage disposal planning.
7. Institutional arrangements for management of on-site systems should be formulated.
8. A Statewide septage management strategy should be formulated.

As implied by the Vermont 208 Program recommendations and the draft regulations for on-site systems, local governments should continue to

have a major role in on-site wastewater management. Therefore, the involvement of the NRCD Program in local and State government activities in noncentral wastewater management will likely increase in the future, as local officials continue to utilize their professional technical services. Initiation of the steps previously outlined should help to overcome some of the confusing aspects of current noncentral system legislation in Vermont.

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MINNESOTA NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

The Minnesota Noncentral Wastewater Management Program is motivated primarily by local concern for environmental protection, especially protection of lakes which are the key to the State's recreational industry. Maintenance of these lake environments has been recognized as an important objective for an effective State and local program.

Noncentral wastewater management programs in Minnesota are characterized as follows:

1. Established through the Minnesota Shoreline Management Act by the Department of Natural Resources (DNR).
2. Guided by advisory inputs (WPC-40) from the Minnesota Pollution Control Agency (PCA).
3. Administered and enforced by county and local ordinances.
4. Dependent on voluntary, loosely-structured private institutional arrangements.

ORGANIZATIONAL HISTORY

The heart of the program is the Minnesota Shoreline Management Program, created in 1971. This program is carried out by the counties and incorporated municipalities that implement land regulations (zoning ordinances, subdivision regulations and sanitary codes). The program involves State guidance and local implementation which is an effective solution for an area with strong local home rule interests.

The State Shoreline Management Program reflects the importance of Minnesota lakes. The law required each county to adopt by 1 July 1972, a shoreline management ordinance to limit uses of private property which are detrimental to the public interest through local planning and zoning.

Although the scope of this legislation is limited (shoreline areas), approximately one-third of the State's 87 counties have, at their discretion, adopted countywide ordinances for on-site systems.

In 1978, WPC-40 was developed by the Citizens' Advisory Committee, and adopted by the PCA. These standards set minimum parameters for the proper design, location, installation, use, and maintenance of individual sewage treatment systems. Individual sewage treatment systems regulated include:

1. Single facilities generating more than 15,000 gallons per day.
2. Collector systems which serve 15 dwellings or 5,000 gallons per day.
3. Facilities licensed or otherwise regulated by the State of Minnesota.

WPC-40 was piggy-backed onto the Shoreline Management Act for implementing authority within shoreline areas to provide specifications for all wastewater disposal systems, including:

1. Site evaluation.
2. Sewage tanks (septic tanks).
3. Distribution and dosing of effluent.
4. Final treatment and disposal.
5. Alternative systems.

A county may adopt these minimum (or more stringent) standards for application to their shoreline management areas or other outside areas.

Adoption is not required unless a county decides to modify or amend a portion of an existing shoreline management ordinance. At such time, WPC-40 provides a minimum standard that can be adopted.

DESCRIPTION OF MANAGEMENT PROGRAM

Two State agencies have key roles in on-site wastewater management -- the Department of Natural Resources, and the Pollution Control Agency.

The Division of Waters (DOW) is an operating unit of the Minnesota Department of Natural Resources (DNR) that administers programs regulating the use of public waters and land use activities in flood plain and shoreline areas. The major DOW program related to on-site wastewater management is the Shoreline Management Program. Minimum development standards for natural environment, recreational development, and general development lakes include:

1. Minimum lot areas.
2. Minimum lot water frontage.
3. Building setback from high water mark.
4. Building setback from roads and highways.
5. Building height limitation.
6. Maximum lot impervious surface cover.
7. Sewage system setback from ordinary high water mark.
8. Sewage system elevation above highest groundwater level or bedrock.

Regarding on-site systems, the last two standards are important. Minimum sewage system setback is 150 feet from a natural environment lake, 75 feet from a recreation development lake, and 50 feet from a general development lake. On-site systems must be at least 4 feet above the highest groundwater level or bedrock.

The program requires counties and municipalities to adopt and administer shoreline management ordinances according to the guidelines, standards, and criteria developed by DOW. If the county or municipality fails to adopt an ordinance, or adopts one which fails to comply with the DOW standards and criteria, the DNR can impose a model shoreline management ordinance on the county or municipality. The DNR assists county and municipal programs on a day-to-day basis through eight professionals in six DNR regions.

The Minnesota Pollution Control Agency (PCA) was created in 1967, and encompasses five regional offices. The PCA addresses problems relating to water, air, and land pollution. The Division of Water Quality (DWQ) is an operating division of the PCA, and administers the PCA water quality programs, such as 208 and 201 Programs.

The DWQ is concerned with establishing minimum standards for design, location, installation, use, and maintenance of individual sewage treatment systems (WPC-40); reviewing facility studies which consider on-site alternatives; and educating (with the University of Minnesota) local officials and system installers.

State and Federal funds for noncentral wastewater management are controlled by the State's priority system. Following identification of "needs," communities are ranked on a single priority list for eligibility of Step 1 planning grants. These grants are distributed either from Section 201 allocations, or from 4% set-aside funds according to the potential for using conventional wastewater collection and treatment technology or noncentral techniques.

There are 87 counties in Minnesota, most of which are rural and oriented to farming and lake recreation. With the exception of the Metro area (seven-county area around Minneapolis and St. Paul), county government is the unit of local power and authority, although municipalities have the authority to plan and zone. Every county has adopted a shoreline management program, and is enforcing a program to control detrimental impacts on lakes and streams in the unincorporated municipalities. Incorporated municipalities have the same authority, and can implement their own programs.

Typically, a county's noncentral system management program involves notifying residents that their on-site systems are not in conformance with the county's shoreline management ordinance. For example, the Pope County Planning and Zoning Office recently announced that it would issue 174 notices to owners of nonconforming individual sewage systems (i.e., setback, elevation of wastewater system above lake level, straight pipes to lakes, etc.). These notices (sometimes referred to as "red tags") are specific to four priority lakes which are being emphasized in the Polk County program.

Generally, these nonconforming systems are identified by siting elevations of the nearby lake surface (an estimate of highest groundwater level) and the on-site system location. These elevations can be used to determine if the existing system complies with the minimum development standard which requires a four-foot clearance between the system and high groundwater level. Large stretches of lake-shore property are inspected in this manner, and red tags are distributed to each owner of a nonconforming system.

Similar approaches are used in other counties. Where individuals fail to comply with county notices to correct pollution hazards, enforcement by county officials may be initiated through local courts.

The University of Minnesota Agricultural Extension Service has an important role in formulating some of the important program concepts and procedures: educating the program officials, designers, installers, and system service people; and providing a level of intellectualism which has been helpful in program acceptability. The University of Minnesota works with the PCA in conducting workshops around the State. These home sewage treatment workshops have been conducted since 1972. In 1979, nine three-day workshops were conducted.

The workshop program is popular and provides a good vehicle for bringing the State's on-site wastewater disposal programs to local government and the public.

The Metropolitan Council is an agency with responsibilities and powers specified under the Metropolitan Reorganization Act for the seven-county area around Minneapolis and St. Paul which contains more than 50 percent of the State's population. The Council is unusually strong and exceeds the responsibilities of typical regional planning commissions.

The Council is required to prepare policy plans related to the long-range development of the area. Unless development programs are consistent with these policy plans, they will be disapproved by the Council.

The objective is to identify areas that will be served by conventional sewerage, and other areas that will rely on on-site systems. By proper planning, siting, and management (utilizing WPC-40), these systems will provide a long-term wastewater disposal solution, and will preclude future capital outlays to extend and expand conventional systems for these areas.

The Metro Council provides the planning basis for developing the area. These plans are implemented through the Metropolitan Waste Control Commission, which was also created under the Metropolitan Reorganization Act.

In some cases, the Metro area appears to be a testing ground for new State policies, and helps establish programs that eventually are implemented Statewide. For example, the Council has adopted WPC-40 for the seven-county region, and will require certification of on-site system administrators, inspectors, site evaluators, and installers, which is a Statewide objective of PCA.

PROGRAM ASSESSMENT

Generally, the Minnesota On-Site Wastewater Management Program can be considered effective. The voluntary aspects of the program (i.e., adoption of WPC-40 by counties and by the application of the Shoreline Management Act countywide) are key factors in establishing the program. The voluntary approach allows the introduction of a state regulation that can be initially perceived as authoritative by county and local governments and local individuals, which might be defeated if introduced as mandatory

State regulations. It also encourages more variation in the implementation procedures especially in the development of very informal institutional arrangements for solution of localized wastewater disposal problems.

Because action on the program is not mandatory, it requires individuals who are motivated to initiate local programs, and guide their implementation. In almost every instance, an individual or a few individuals can be identified as the reason for a successful program. Although they are assisted by enabling legislation, regulations, and procedures, these individuals are the major reason for the acceptance and success of a program in local areas.

The State itself has responsibility for on-site and small community systems overlapping the Pollution Control Agency and the Department of Natural Resources. Because of the reluctance of the State legislature to create a single "powerful" agency, the program is somewhat fragmented. This structure reflects the local control interests of the people in the State, and their interest in minimizing State powers. For this reason, the counties remain influential in terms of regulating noncentral systems.

All counties under the Shoreline Management Act are required to adopt a county ordinance to achieve the objectives specified by the State legislature. This requirement has been initiated by all counties. The willingness to enforce these county ordinances, and the degree to which they are enforced, however, is not uniform. Even within counties, incorporated municipalities in some areas are dragging their feet.

The Shoreline Management Act has limited geographical jurisdiction. Unless a county voluntarily adopts an ordinance to address the remaining portions of the county, failing on-site systems outside the regulatory coverage of the ordinance may not be addressed. Uniformity of program enforcement is also fragmented within a county if incorporated municipalities decide to develop individual land use controls and zoning ordinances.

Aside from regulating on-site systems and requiring system upgrading, the State program provides no financial incentives for correcting on-site systems failures, other than the apparent cost savings of installing a community collector system and common disposal field as an alternative to individual systems for each residence. In addition, the program is deficient in identifying maintenance needs and responsibilities of small community systems where individual homeowners voluntarily establish a collective solution to their wastewater disposal problems. Complications in such arrangements (i.e., feuds and possible lawsuits over poorly-specified individual responsibilities, maintenance, and repair costs) could lead to problems. Administrative guidelines or procedures for structuring on-site and small community institutional arrangements are necessary.

The Minnesota Pollution Control Agency is in a position where it has to prove itself to county and local governments. As a result of poor coordination with local government in the early stages of developing WPC-40, the Agency has developed a reputation where local governments resist PCA programs.

Despite the apparent drawbacks and problems with the State programs for noncentral wastewater management, the State appears to have recognized its limitations and potential for implementing comprehensive programs. It has established Statewide priorities that recognize these limitations, while at the same time support local initiatives and needs. For example, the requirements of the Shoreline Management Act (i.e., forcing the upgrading of existing nonconforming on-site systems) is rather unique. Many State and local programs toward on-site management have omitted existing systems in favor of addressing only new system installations. Perhaps the evolutionary nature of the political process is the major asset of the State's approach to noncentral system management.

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MARYLAND NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

In Maryland, the State's program for on-site and small community wastewater management represents a multiagency approach. Most technical and support activities are vested in the Environmental Health Administration (EHA) of the Department of Health and Mental Hygiene (DHMH). However, management and implementation of on-site and alternative disposal systems programs are delegated to county governments, which have a wide range of powers. The EHA relies on the county governments to carry out review and permit functions for all innovative and on-site programs through county health departments, public works departments, or local sanitary districts.

At the county level, local health officers work out of county offices solely for the benefit of county residents, but are State employees governed by the Secretary of the Department of Health and Mental Hygiene. Liaison between county health departments and EHA is on an as-needed basis. No direct, regular reporting process between the counties and EHA has been established; however, EHA does have overall review authority with regard to county actions.

At the State level, two other agencies have a role in small community wastewater management: the Water Resources Administration (WRA), and the Maryland Environmental Service (MES). Both of these agencies are under the direction of the Department of Natural Resources (DNR). The WRA has broad planning responsibilities for the State, being involved in the administration of PL 92-500 (Sections 208 and 303e) programs. MES is unique among State agencies. It is a corporate agency which functions as a waste management utility. MES provides direct management of State-owned wastewater facilities, and is authorized to provide similar services to local governments, private businesses, and to other state (Maryland and non-Maryland) agencies as needed.

The Department of Health and Mental Hygiene (DHMH), through the EHA, has developed specific guidelines concerning the construction and usage of on-site and small community systems. DHMH Regulation 10.03.27 (revised in 1978) defines acceptable practices for on-site sewage disposal pertaining to site suitability and system design.

ORGANIZATIONAL HISTORY

In 1972, the Maryland Environmental Service Law created MES under the Department of Natural Resources, and gave this nonprofit corporate utility a broad range of powers for dealing with and resolving wastewater problems. The intent of this legislation was "to provide for dependable, effective, and efficient water supply...and disposal of liquid and solid wastes...with safeguards to protect the autonomy of the political subdivisions and the rights of the private entities it serves."

Few substantive changes are currently planned concerning Maryland's practices relative to on-site and small community systems. The recently completed legislative session (1978-1979), however, produced two bills which will affect project financing using alternative systems. Both bills (House Bills Nos. 1497 and 1498) were enacted as amendments to existing acts. Both acts concern state financial assistance to various "innovative or alternative projects."

Under this legislation, the State will provide a grant for one-half the remaining costs of a project for which a Federal grant offer is made. For "innovative or alternative projects," the State will fund up to three-fourths of the remaining costs if the Federal grant is greater than 75 percent. Other parts of these bills will provide for State grants up to 87-1/2 percent for a project having immediate need, but for which timely and sufficient funds are not available. These actions (effective 1 July 1979) will help Maryland promote the objectives of Federal PL 95-217, as well as boost consideration of innovative projects.

DESCRIPTION OF MANAGEMENT PROGRAMS

EHA is the major State agency involved in the on-site management programs. EHA administers the construction grant program, as well as all regulations relating to the sanitary disposal of wastes. State policies are formulated by EHA and implemented by the county governments. The county governments exercise a great deal of discretion in implementing these regulations.

The on-site wastewater management program is a descendant of the public health program. Consequently, the Department of Health and Mental Hygiene's Environmental Health Administration manages the program with a distinct orientation towards the protection of public health. EHA has responsibility for administering the development of county Ten-Year Water Supply and Sewerage Systems Plans as required by the State Code. This plan must contain the facility location, size, and characteristics before a permit can be issued for any community system. The counties, with input from the State, use this plan as the means for regulating the use of innovative methods. Proposed wastewater facilities must satisfy the requirements of county/State health department sanitary disposal permits and be consistent with the Ten-Year Water Supply and Sewerage Systems Plans.

EHA relies on the counties to offer an initial decision regarding alternative system applications. This occurs through the application for sanitary disposal permits, and Ten-Year Water Supply and Sewerage System Plan amendments. The county Health Departments must approve and issue a permit for any application to install sanitary facilities in that county. This permit is reviewed by EHA. EHA rarely makes a decision to award a permit if the county recommends that the permit be denied. On the other hand, EHA, during its review, can choose to override an affirmative permitting action by the county if there is doubt about the proposed system's reliability or capability.

The county Ten-Year Water Supply and Sewerage System Plan provides the other mechanism for regulating the application of alternative systems. No sanitary facility can be permitted in a county unless the county's legislative body amends the plan to expressly authorize it. The EHA has review and approval/disapproval authority with regard to the county plans, but cannot itself amend the plan without county action. Obviously, by these arrangements the counties greatly influence the degree to which alternative wastewater management systems are applied. The actual operation of public wastewater facilities is administered by county public works departments, or local sanitary districts which may include all, or part of a county.

Long-range planning programs, such as 208 areawide wastewater management planning and 303e basin planning, are executed at the State level by WRA. WRA solicits and receives EHA review of these plans. Similarly, EHA incorporates WRA review of Ten-Year Water Supply and Sewerage Systems Plans and construction grants priority lists. WRA issues NPDES permits for the State in coordination with the EHA.

The Maryland Environmental Service provides direct management of the State-owned facilities for waste management, and is also authorized to operate facilities for local governments when requested. The service to local governments can extend over county boundaries, or be limited to a portion of a county. The application of these aspects of MES' charter has been secondary to the primary emphasis of operating all State waste facilities. MES can issue bonds to construct necessary waste facilities.

The unique aspects of MES, as a State-sponsored organization, are noteworthy. Although under the direction of DNR, the MES functions as a private nonprofit corporation. MES provides its service to a broad range of clients on a competitive, actual cost basis. Any public agency, private concern, or individual can utilize MES, but only through a specific request can MES become involved in operating facilities not owned by the State.

PROGRAM ASSESSMENT

The State of Maryland adequately provides for the regulation of individual on-site wastewater systems, although the enforcement of these regulations is delegated to the county level of government. Since this authority is delegated to the counties, the effectiveness of this regulatory program varies from one county to another. Most of the counties presently administer programs effective in assuring proper on-site system applications. Nonetheless, more direct State (EHA) involvement in county on-site system regulatory programs would assure more uniform enforcement of State regulations.

The counties also play a major role in determining the extent to which on-site and alternative systems are applied in lieu of conventional, centralized sewerage facilities in the State. Although EHA must review and approve sanitary disposal permits and county Ten-Year Water Supply and Sewerage System Plans, the State will generally follow the direction of a county in approving or denying an application to install alternative wastewater systems. Alternative systems are generally approved only when conventional methods are clearly shown to be ineffective or too costly. This approach is reinforced by EHA's inherent reluctance to accept non-proven wastewater treatment methods because of the concern for public health. EHA requires verification of system performance, preferably by example of similar systems in the State, before approving innovative methods.

As a result of prevailing State and county attitudes toward on-site and alternative systems, few such applications have been considered in facility planning studies unless specifically requested by USEPA in relation to Federally-funded projects. To date no large-scale alternative wastewater systems have been approved in the State. Such alternatives, however, are receiving more attention in current facility planning efforts. One reason for this is related to the specific provision for considering alternative systems in the evaluation of collector sewer proposals as stated in the Delegation Agreement between the State of Maryland and USEPA Region III (dated 10 January 1979).

From a systems operation standpoint, MES offers unique potential as a management entity for alternative wastewater systems. Although it has not actually provided such services to a community, its charter specifically allows MES to offer these services to any local government (county or incorporated area) or private entity. To date, MES has not actively pursued opportunities for operating alternative systems, but is very much interested in becoming involved in such programs.

In order to accomplish this, it would be necessary for local communities and/or private entities (e.g., developers, homeowner associations, etc.) to specifically express interest in having MES manage their wastewater systems. It would also be necessary for MES to develop a working relationship with individual counties to avoid any potential conflict in service area jurisdiction. In the past, counties have inherently been reluctant to have a State agency become involved in wastewater management, in any form, within their jurisdictions. Nonetheless, it could easily be demonstrated that an agency such as MES offers a service to nonsewered areas that complements county wastewater programs, and as such does not conflict with county jurisdiction. If MES is to become more active in planning and operating alternative systems, they must demonstrate their capabilities to the counties as well as to the local communities they hope to serve.

In summary, fragmented State programs (i.e., the division of responsibilities between Department of Health, Department of Natural Resources, and MES) and strong county-level programs have tended to inhibit the application of on-site and alternative systems in place of conventional sewerage facilities in Maryland. The State, through EHA, has the authority to encourage alternative systems, but in the past has generally supported the counties, which have been reluctant to accept such systems.

The MES has the authority and capability to manage on-site and alternative systems, but has not had county support, or the interest of local communities. As a result, MES does not currently provide these services to any community, and has no specific plans to implement such a program.

The regulatory and construction grant programs of EHA and the operation services program of MES give the State of Maryland ample authority and capability to encourage and implement alternative approaches to wastewater management. The predominant role of county-level programs, however, inhibits the implementation of such programs. To date, the State has not fully asserted its authority and administrative capability in these areas through either EHA or MES. Current Federal policies (under the USEPA construction grants program), and public interest related to alternative systems are causing both agencies to consider more assertive programs in this area.

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CALIFORNIA NONCENTRAL WASTEWATER MANAGEMENT PROGRAM

GENERAL DESCRIPTION

California's approach to noncentral wastewater management involves agencies at State, regional, county, and local governmental levels. The State Water Resources Control Board (State Board) administers the Federal sewage treatment facilities construction grants program, and parallel State wastewater facility construction grants program. Along with nine Regional Water Quality Control Boards (Regional Boards), the State Board has the primary responsibility for water quality-related environmental protection. The Regional Boards and counties share responsibility for regulating noncentral systems. All Regional Boards have delegated regulatory control over individual disposal systems, for developments of five or less units, to the counties. The counties must have on-site disposal ordinances acceptable to the appropriate Regional Board. The Regional Board, however, may retain jurisdiction over any waste treatment and disposal system which may, in its judgment, result in water pollution, nuisance, and/or health hazard.

In addition, several special districts have been formed throughout the State to provide local management of individual on-site and small community systems. The enactment of enabling legislation (effective 1 January 1978) makes it possible for public agencies to manage on-site wastewater systems. The legislation (SB430, the Behr Bill) enables public agencies that manage conventional sewer systems, to form on-site wastewater management zones for collection, treatment, and disposal of wastewater without using conventional sewerage systems. Formation of local community noncentral wastewater management programs in California is a major feature of this State's approach to wastewater management.

ORGANIZATIONAL HISTORY

The Porter-Cologne Water Quality Control Act, effective 1 January 1970, completely revised the State's water pollution and water quality control law. The Act enabled the State Water Resources Control Board to implement water resource protection programs in a comprehensive manner. Prior to this Act, lack of enforcement was the most frequently cited criticism of California's water quality law. The Porter-Cologne Act helped initiate major changes in State environmental policy and enforcement capability, resulting in formulation and implementation of comprehensive regional water quality control plans (i.e., basin plans). Under the Act, the State Board was to adopt broader State policy for water quality control. This policy must be complied with by all other government entities, including the Regional Boards. The State Board is also responsible for developing a public education program, determining needs for research, and conducting State water quality research programs.

Interest in on-site management in California began in the late 1960's in response to the potential water quality problems in rapidly developing rural areas. The Georgetown Divide Public Utility District on-site management program at a rural recreational subdivision was one of the first State attempts at on-site management. More recently, the Federal Construction Grants Program, and recognition of the prohibitive costs of conventional sewerage treatment in small communities led to consideration of on-site management for existing unsewered communities.

In November 1976, the State Board issued its first Clean Water Grant Program policy statement on noncentral wastewater systems, which required:

1. Evaluation of noncentral wastewater systems and management programs in rural facility planning.
2. State Board review and approval of any facility plan showing high user costs for conventional sewerage approaches.
3. An "alternative systems advocate" within the grants program to assure proper consideration of noncentral wastewater systems in facility plans, and to identify research needs for small flow systems.

An alternative systems unit (two full-time engineers) has been established to perform the duties specified by the State Board, and has:

1. Compiled an extensive library on alternative systems.
2. Prepared newsletters and reports explaining State and Federal policy toward these systems.
3. Supported demonstration projects and literature reviews on specific alternative wastewater system technologies (e.g., pressure and vacuum sewers, small diameter gravity sewers, and waterless toilets).

The State's policies and alternative systems program objectives are outlined in an action plan adopted by the Board in March 1978. The action plan outlines the following major elements:

1. Testing and certification of alternative systems performance, and evaluation criteria for system design. (This activity has been postponed since local agencies would probably not be able to fund the effort with the financial restrictions imposed by Proposition 13.)
2. Research demonstration projects for on-site management districts and small community systems, including the promotion of SB430.
3. Development of guidelines for systems design, construction, operation, and maintenance.
4. Public information and education through the State Board's Office of Public Affairs.
5. Policy development concerning research and demonstration needs.

DESCRIPTION OF MANAGEMENT PROGRAM

The Porter-Cologne Act authorizes the State to regulate wastewater discharges through the State Water Resources Control Board (State Board) and Regional Water Quality Control Boards (Regional Boards). The Division of Water Quality which administers the California Clean Water Grant Program is situated at the State's central offices and reports to the State Board. This division maintains the State's wastewater facility grant priority list, and helps coordinate Regional Board

activities in reviewing facility plans. The Alternative Systems Unit, also within this Division, assists in facility plan review for small communities, and acts as an alternative systems advocate in rural applications.

The Planning and Research Division is a parallel group within the State Water Resources Control Board. This division is currently providing funds to partially finance the on-site management program at Stinson Beach, and has prepared a comprehensive alternative systems guidance manual. The Division now has a full-time engineer working on alternative systems research and demonstration projects.

The California 208 water quality management program is also administered through the Planning and Research Division. Four 208-sponsored studies, the Monterey Area Water Quality Management (208) Plan, the Amador County 208 Plan, the North Coastal Region 208 Plan, and the Siskiyou County 208 Plan, have directly addressed noncentral wastewater systems management. The Monterey 208 Program developed a septic tank manual, and list of criteria for forming an on-site management district. The North Coastal Region 208 Plan revised various on-site disposal system design criteria applied by counties within its jurisdiction. The Amador County Plan conducted facility plan-type case studies for two selected areas within the county to serve as model wastewater management approaches for the county as a whole. The Siskiyou County Plan addressed septage management strategies on a county level.

The State Board, through the Alternative System Unit and the Planning and Research Division, is sponsoring several noncentral wastewater system demonstration projects in small communities. The projects will serve as models for low-density communities interested in alternative approaches to wastewater management. These projects include:

1. Low pressure sewers -- STEP systems (Manila, Humboldt Co.) -- A community of 350 residences has received 201 construction grants, and is scheduled to begin operation in late 1979. The two-year demonstration project is being funded by the State Board (which is financing most of the study period operation and maintenance costs) to obtain data on operation and maintenance practices, costs, etc. for the STEP system.
2. On-site wastewater management district (Stinson Beach, Marin County) -- A community of 500 residences where the State Board is financing partial operation and maintenance costs for the first two years of operation. (An on-site management program for another community, Three Rivers, is also applying for construction funds through the 201 grants program.)
3. Overland flow (University of California, Davis) -- Designed to test the results of this type of treatment alternative.
4. Vacuum sewer (Big Bear, San Bernardino County) -- To test this type of collection system currently under construction, a Step III construction grant has been awarded.
5. Small diameter gravity sewers (Miranda, Humboldt County) -- May become a demonstration project in the near future.

There are about 20 additional small community facility plans that consider alternative systems, which are being reviewed by the Alternative System Unit.

There are also many examples of various on-site management programs that are operating in the State, primarily through local initiatives. These communities include Santa Cruz, Kern, Mendocino, Marin, and El Dorado Counties, which mostly administer on-site management programs in developing areas.

The Regional Boards which are fairly autonomous, having their own boards of directors (appointed by the governor) and staff, play an important enforcement role in noncentral wastewater systems management.

The Boards are responsible for a wide variety of water pollution control functions, including:

1. Formulating and adopting water quality control plans.
2. Establishing waste discharge requirements consistent with objectives of the regional water quality control plans.
3. Enforcing waste discharge requirements.

Regional water quality control plans and other water quality control requirements are subject to State Board review and approval.

The cease and desist order which prohibits further use of on-site systems is a frequently-used enforcement tool of the Regional Board. It is applied in cases where a serious pollution threat exists. (Case study summaries for Georgetown Divide PUD and Stinson Beach County Water District refer to such orders issued by the Regional Boards.) A major problem in applying an on-site system prohibition is the difficulty of accurately documenting and demonstrating the relationship between subsurface disposal systems and surface- and groundwater contamination. Some Regional Boards have initiated studies of "cumulative impact" for county and subcounty areas to determine the carrying capacity of soils to accept effluent from subsurface systems, and to recommend lot-sizing guidelines for future development. The cumulative impact studies are also being used to identify feasible treatment methods in water quality problem areas.

Each Regional Board must review and approve on-site disposal ordinances for counties within its jurisdiction. The regional basin plan specifies minimum requirements for design of individual systems with which counties must comply. These requirements vary among the Regional Boards, as well as among counties within a particular region. A survey of county health

departments conducted in February 1977, indicated that of 55 county health departments contacted, seven counties followed the Uniform Plumbing Code; 18 followed the Plumbing Code with their own modifications; 29 counties followed a mixture of the Plumbing Code, the U.S. Public Health Service Manual of Septic Tank Practice and their own modifications; and one county followed the manual and its own modifications. The variation in design requirements among counties and regions reflects the State policy of establishing regulations according to unique local conditions.

Local county health departments work with the State Health Department on some matters concerning on-site disposal. The State Health Department acts in an advisory capacity to those counties having a health department (46 out of California's 58 counties). For the 12 counties without health departments (rural counties with relatively low populations), the counties contract with the State Health Department to implement county-adopted on-site disposal ordinances. Ten State district health offices have environmental health units which provide technical support to counties on request or by contract.

In conjunction with county health department and Regional Board involvement in on-site systems regulation, the State Coastal Zone Commission has permit review and approval authority over construction of systems within the coastal zone. The Coastal Zone Commission staff works closely with county health departments in conducting these reviews. The Commission is also involved in mapping and identifying sensitive areas within the coastal zone, and has authority to revoke locally-approved permits if water quality problems result due to placement and operation of on-site disposal systems. The Office of Appropriate Technology (OAT) and Department of Housing and Community Development (HCD) are also involved in California's noncentral management program. OAT was established in 1976 by State Executive Order,

and is located in the Planning and Research Division of the Governor's office. OAT is charged to "assist and advise the Governor and all State agencies in developing and implementing less costly and less energy-intensive technologies." OAT was responsible for preparing reports on wastewater disposal alternatives, and was instrumental in encouraging the State Board to look more closely at alternative wastewater systems. OAT is currently involved in a demonstration-research project with the SWRCB, State Health Department, and EPA on performance and health effects of alternative on-site systems (including waterless toilets).

The State HCD writes and administers State housing codes which address sanitary facilities (i.e., alternative rural sanitation systems) in rural construction.

PROGRAM ASSESSMENT

California became involved in noncentral management long before many other states, prompted by a combination of complex issues, including:

1. The environmental movement of the past decade.
2. Increasing costs of conventional sewerage projects.
3. The prohibitive costs of central sewer systems in small communities.
4. Limited financial resources of local governments (Proposition 13).
5. Concern over the drinking water supply (i.e., the threat of groundwater contamination).
6. The initiative and performance of on-site wastewater management programs in several communities within the State.

The impetus behind the State's involvement was complex, but serves as an excellent example of the administrative needs, legal and financial requirements, and research efforts necessary to implement noncentral wastewater management programs at State and local levels.

Creation of the Alternative Systems Unit by the State Board and formation of on-site management programs (through local efforts) in rural subdivisions a decade before, were probably the key factors in California's active involvement in this program. It is important to note that this program requires the full-time efforts of two people in the Alternative Systems Unit. Most of their efforts are devoted to working with local communities and their engineers to acquaint them with the benefits to be gained by applying alternative systems. By requiring a special review of any facility plan projecting user costs greater than \$150 per year, the SWRCB at least insures that the communities are made aware of more cost-effective alternatives. Nonetheless, many times communities refuse lower cost alternatives in favor of conventional methods with which they are more familiar.

The research and demonstration programs being sponsored through SWRCB, OAT, and various other State institutions contribute greatly to the gradually-spreading acceptance of noncentral wastewater treatment methods throughout the State (and nation). The State's initiative in research and demonstration has put the State in a much better position to administer regulatory programs affecting alternative systems (e.g., construction grants program). The fact that the State legislature passed specific enabling legislation, providing for the management of such systems, illustrates how the State has responded to implementation needs identified through research and demonstration efforts.

As a result of initiatives by various State agencies, particularly SWRCB and OAT, many new wastewater management ideas and concepts are being tested, and actually implemented in California. Thus, California appears to represent one of the most progressive State programs for alternative systems.

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