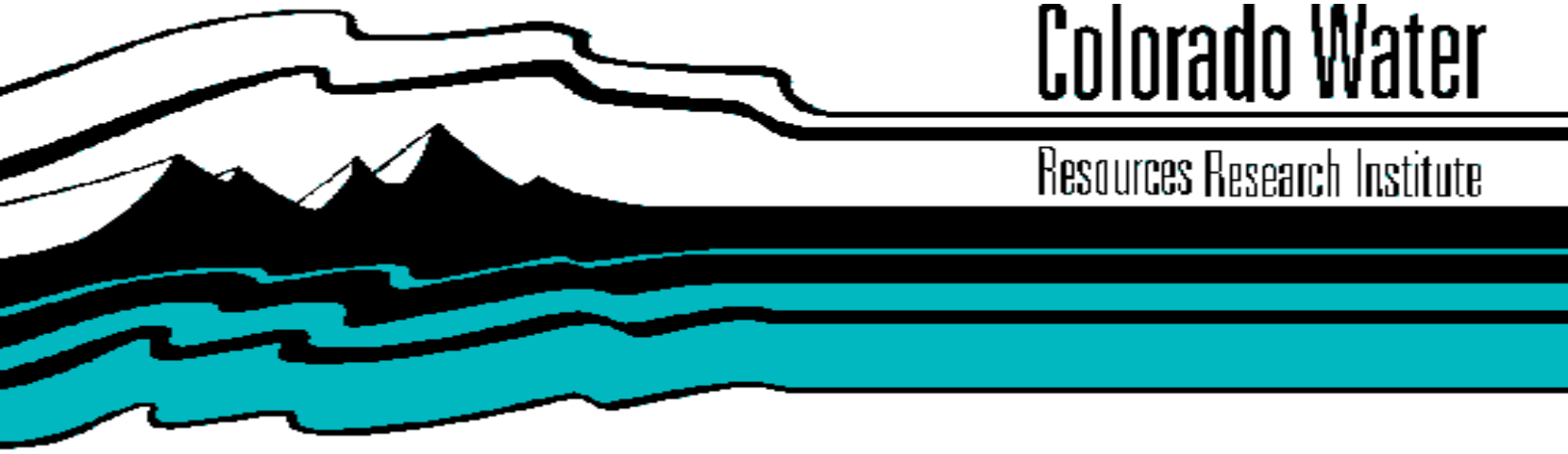
Proceedings, Third Workshop on Home Sewage Disposal in Colorado Community Management

By

Robert C. Ward



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Colorado State University

PROCEEDINGS

THIRD WORKSHOP ON HOME SEWAGE DISPOSAL IN COLORADO

Emphasizing

PROFESSIONAL MAINTENANCE OF ON-SITE SYSTEMS THROUGH "COMMUNITY MANAGEMENT"

Edited by

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Introduction to Proceedings

These proceedings record the presentations and comments made during a one-day workshop on home sewage disposal held on May 10, 1978. The workshop, sponsored by the Environmental Resources Center and Cooperative Extension Service at Colorado State University and the Colorado Department of Health, emphasized the emerging topic of professional maintenance of on-site systems through "community management."

The purpose of the workshop was to introduce and describe existing community management alternatives (institutional, technological, legal, etc. aspects) to consulting engineers, regulators, community leaders, homeowners, and industry representatives. By creating an early awareness and understanding of community management in Colorado, hopefully the concept can be rationally evaluated and successfully implemented.

OPENING REMARKS

by

Robert C. Ward
Workshop Chairman

I would like to thank all of you for coming. This is the third workshop on Home Sewage Disposal that we've had in Colorado, and today we are going to be emphasizing community management. Before we start, I think it would be beneficial for all of us if I review a little history of these workshops and the subject matter that is dealt with in each. This history will, hopefully, help you to better place this workshop in the perspective of the situation that surrounds home sewage disposal today.

In the 60s and early 70s Colorado was expanding at a very rapid rate in population and increased tourist traffic. During this time most of the solutions to the wastewater problem were dealt with by the conventional central system. Given the explosive nature of the population and where much of it was occurring (in very diversified areas - spread out over the mountains and plains) it was obvious that central systems were not going to economically meet all the wastewater treatment needs that we had. At the same time the traditional septic tank idea didn't seem to be working either. We, at that time, weren't quite sure why. There had been no research or emphasis in the area of septic tanks for years - research or emphasis that would assist in determining why on-site systems failed.

During the early 70s, a large number of people were entering the field and exploring new ideas for handling on-site wastewater treatment. These newly proposed approaches were running counter to the prevailing regulatory practices at the time. This created quite a problem with respect to designing, regulating and managing the on-site system.

Our first workshop, held in 1972, was an attempt to look at that particular problem - look at the technology that was evolving, look at the regulations that we had, and try to have an open forum as a means of discussing or defining the problem at that time. This first workshop dealt with problems of geology in the mountains with respect to home sewage disposal, microbiology of on-site systems, regulatory approaches and attitudes at the time, drain field design, and the relationship of on-site wastewater disposal to land use planning.

During the next few years there were a number of regulations rewritten in Colorado, new technological advances, and development of an expanding philosophy on home sewage disposal. This led us, in 1975, to sponsor the Second Workshop on Home Sewage Disposal in Colorado. This workshop dealt with trying to bring to Colorado information on the latest technological advances. We brought in two speakers from the University of Wisconsin, where they, at that time, were beginning to get the results of a number of years of study. We reviewed the current research that was underway nationwide and in Colorado. We attempted to note the activities that were going on in Colorado at that time, and we brought in, thanks to Hancor, Inc., Timothy Winnieberger from California to expand upon the new philosophy that was evolving.

With the new advances in technology that were coming on line at that time, many felt that home sewage disposal had "arrived." We continued to have problems with the systems, however. They continued to fail and they continued to have an undesirable image. The question became, if you design on-site systems properly and you install on-site systems properly, why do they continue to fail? I think it has become

recognized over the last few years that the problem that we are now facing is the continued operation and maintenance of these systems. How do we provide professional maintenance of them once they are operating? How can we be assured that they are operating properly?

In 1975 we, here at CSU, initiated a study to look at some of the maintenance practices of the homeowners in communities around Colorado. This work was supported by the CSU Experiment Station. This project has developed some very interesting data which "guided" us, here at CSU, into developing the workshop we are having today. Steve Dix will report on more of the details of the study later. In general, results of the study pointed out that there is a lack of routine maintenance of the systems when it is the responsibility of the homeowner. Others have found the same results, and you see that in 1977 Congress recognized this fact in the 1977 Clean Water Act.

This has brought us to the point now where people are discussing the role of community management - a way to have a public or private organization with trained professionals maintaining on-site systems that are already installed. This is a new concept. It is not a fully developed concept nor is it widely accepted yet around the state or nation.

This brings us to the workshop today. Its purpose is to bring to you the latest information that we have on the area of community management of individual systems. Hopefully with such information when we do begin to install or establish community management systems in Colorado, we will be doing it in such a way that we minimize the problems and maximize the chance of success for these organizations.

With this background, I would like to thank the Environmental Resources Center at Colorado State University, the Cooperative Extension Service and the Water Quality Congrol Division of the Colorado Department of Health, who are the sponsors of this workshop today. I would also like to thank all the speakers who have devoted their time and travel money to attending this meeting and presenting papers today. We work on a very low budget for these workshops, and it takes the contributions of such individuals to make them work. I would also like to acknowledge the fine support we received from the Conferences and Institutes people here at CSU. It has been very helpful to have these people handling the details of organizing the workshop.

WELCOME

by

Norman A. Evans
Environmental Resources Center
Colorado State University

It is a pleasure for me to act as an official welcomer. I'm delighted that so many have come for this important workshop. Serving on the Colorado Water Quality Control Commission since it began in 1966, I have watched the evolution of wastewater treatment and water quality control. It has been obvious to me and everyone else that there isn't enough money in the universe to do the job that conceptionally was set out to be done by the Clean Water Acts which the Congress has determined to be the policy of the American people. There is not enough money to do that job fully in the way that I think we perceived at the outset it might be done through principally community collection and public treatment systems for most all of the waste. We know that for communities of less than 1,000 population the vast majority are not served by community systems even today, after here in Colorado we have spent substantially more than $100,000,000 in construction fund grants. The thought of a rational person has to turn to alternatives and has to begin to assess the cost versus the benefits - to public health, to quality of life, to quality of the environment.

This workshop is very appropriate, and very timely in bringing attention to the possibilities of on-site treatment with some form of community maintenance and management. So, the innovative stimulation that you gather and that you supply will have some far-reaching impacts, I have no doubt. I am delighted to say on behalf of the Colorado Water

Quality Control Commission, first, that this workshop is very much on the right track and we will be looking forward in the Commission to recommendations that you can derive here toward exploring the realities of the community management approach. It seems to offer tremendous potential in low-density communities for improving the quality of wastewater effluent without the high capital investment of conventional collection treatment systems.

On behalf of the Environmental Resources Center, I do welcome you. The Environmental Resources Center is the home for the Colorado Water Resources Research Institute, a research and public service institute created by Congressional action and funded by Congress. The Institute has a primary function of stimulating problem-solving research. Since there may well be some researchable problems in connection with the community management question that you deal with today, I would welcome your perceptions of important research questions. The Institute allocates funds and manages research at CU and at Colorado School of Mines as well as CSU, so we do welcome your suggestions of needed research. Again, a cordial welcome to you on behalf of the Environmental Resources Center and Colorado State University.

SELECTING ON-SITE UTILITY MANAGEMENT SYSTEMS

by

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Introduction

Public health and environmental agencies have done a creditable job of structuring design and construction control systems for on-site rural utilities. Permit and inspection ordinances are normally adequate, if enforced, to insure that individual wells and on-site wastewater systems are sited and constructed to prevent health or environmental problems. Regulators have been unsuccessful, however, in developing systems that will insure that on-site systems are operated and maintained properly. The reason is that the management problem is more complex, involving political, economic, financial, technical and administrative components that must be structured to satisfy incompatible acceptance criteria established by homeowners, developers, regulatory agencies and bankers. In this environment, conflict situations normally develop which result in the rejection of management system proposals.

In the author's experience, anyone attempting to develop structured management entities should recognize that there will be strong opposition to any management proposal. This makes it absolutely mandatory that the proposed management system be developed and selected in an orderly, documented, "ducks in order" manner to insure that the proposal can withstand a critical review by opponents.

Organizing a management system study into the following components provides a logical approach that provides a good foundation for a proposal:

1. Preliminary study

2. Goals and objectives identification
3. Problem identification
4. Alternatives study
5. Alternative selection
6. Proposal presentation

Common problems and suggested procedures for each of the steps are presented in the following discussion.

Step 1 - Complete A Preliminary Analysis

Before any management system study is initiated it is important that the agency complete an objective preliminary analysis of problems caused by on-site systems. This analysis should:

1. Establish whether a new on-site management entity is really needed. When viewed objectively, the health and environmental problems associated with on-lot systems are often not serious enough (relative to other problems) to justify a major budget and staff commitment. An objective analysis may show that on-site system design and construction activities are adequately controlled by existing permit and inspection ordinances; that operation activities are being handled satisfactorily by licensed well drillers and septic tank pumpers; that the real problem is inadequate staffing to enforce existing regulations; or that on-site utility problems are associated primarily with older systems constructed before construction and planning standards were implemented.
2. Identify and document problems associated with on-site systems. If the problem cannot be documented, it probably isn't serious.
3. Determine whether or not existing agencies can, or wish, to assume additional management responsibilities. Many agencies are authorized or administratively organized only to provide support services or to regulate. Very seldom can a regulatory

agency effectively involve themselves with management because of the obvious conflict of interest.

4. Determine whether or not services provided by well drillers, septic tank pumpers and other private enterprise operations can possibly solve the identified problems.

Step 2 - Set Goals and Objectives

If the preliminary analysis shows that an on-site utility management system is needed, specific goals and objectives for the management entity should be identified.

The primary objective of any on-site utility management system should be to protect the public health. Secondary objectives will normally include ground and surface water quality maintenance, nuisance control, preservation of aesthetic values and utility cost reduction.

Public health problems associated with on-site utilities are often poorly understood or completely misrepresented. In reality, properly sited wells and wastewater units seldom produce serious public health problems. Nitrogen is the only constituent in the wastewater not removed by a properly constructed wastewater system. If the system is properly sited, the nitrogen problem is eliminated through the process of dilution.

Proper construction and siting are achieved by enforcing permit and inspection ordinances and by planning regulations that control lot sizes. Management entities may be structured to cooperate with regulatory agencies, but they cannot be expected to enforce construction standards. The benefits produced by a new management unit will normally be limited to reductions in health-related problems associated with maintenance and operation. Health and environmental problem documentation

should establish how much of the problem is caused by poor management.

Step 3 - Identification of Problems and Restraints

Problems caused by on-site utility systems have been identified previously. The purpose of this step is to identify problems that will affect the acceptability or implementation of a proposed management system. This analysis makes it possible to structure the management unit so it is compatible with reality.

Homeowner opposition is one of the most common, and most difficult, problems that interferes with the implementation of management systems. Most problems caused by on-site systems are localized. Consequently, if the homeowners wish to live with the problem, there are seldom any legal remedies. The homeowners must finance any corrective program and this normally requires their approval. In the author's experience, if the homeowners don't want it - it won't happen. The only recourse is to do a selling job using documented data that shows how severe the problem is and how it affects the homeowner's health, living standards or property values.

In any attempt to sell a management system proposal to reluctant homeowners, it is important to recognize that people move to the country to assert their independence and to escape governmental control. They automatically reject any new level of government unless it can be clearly shown that the system will save them money or improve their living conditions. Convincing rural homeowners that an additional level of government will be beneficial to them requires a political capability and awareness that many health and environmental practitioners do not possess.

Another important factor that affects the acceptability of management system proposals is the conflicting acceptance criteria imposed by

homeowners, developers, regulatory agencies and bankers. No one management system can possibly satisfy all the requirements imposed by all entities that will interact with it. The need to compromise is a basic fact that must be recognized. However, there are fundamental requirements of any management system that cannot be compromised away. Any management system:

1. Must be perpetual.
2. Must be compatible with existing private and governmental entities with which it interfaces.
3. Must be cost effective.
4. Must be large enough to provide the multi-disciplined staff and services necessary for effective operation.
5. Must be capable of achieving and maintaining fiscal stability.

Step 4 - Identify Workable Alternatives

There are literally hundreds of alternative management systems for rural on-lot water and sewer facilities. Those that are considered to be practicable and implementable must be identified and analyzed in view of evaluation criteria that will be applied by homeowners, developers, regulatory agencies and bankers.

Local governmental systems which are commonly utilized include:

1. Quasi-municipal systems which perform the same services as a municipality but with authorities restricted to the design, construction and operation of water and sewer facilities. The sanitary district is the most common form of this type of governmental unit. One of the primary problems with this system is that homes must normally be present in a minimum number before the entity can be formed. Consequently, a temporary management system must be utilized during initial construction of larger developments. This alternative does

not solve problems with isolated systems unless a regional district is formed.

Sanitary districts normally have the power to tax property which is attractive to bankers and regulatory agencies because it implies strong fiscal capability and contributes to perpetuity. These units are often able to obtain federal financing to cover part of the construction costs which may result in a lower overall cost to the homeowner. They are usually rejected by the developer, however, because directors are elected and he loses control. Homeowners often reject sanitary districts because they have the capability to tax property and they are considered to be another level of government.

2. Cooperatives are quasi-municipal in nature but they normally lack the ability to tax property. Membership in a cooperative is normally obtained through lot ownership. Developers prefer cooperatives to sanitary districts because lot ownership entitles them to vote and to select directors. Consequently, they do not lose control until 50% of the development is sold out.

Regulatory agencies prefer sanitary districts to cooperatives because cooperatives are not as fiscally stable and control through statutory authorizations is normally more difficult.

3. Private utilities. Occasionally, private utilities are willing to design, construct and operate on-lot water and sewer facilities. Private or "stock" companies are subject to property and income taxes which are waived for sanitary districts and some cooperatives. Developers may prefer private ownership to other alternatives for tax and control reasons. Homeowners

are usually wary of such systems and regulatory agencies are normally concerned about the perpetuity and control. However, when operated by responsible owners, private utility systems can be an effective, flexible alternative.

4. County or state-wide districts provide the benefit of scale that is so necessary for strong utility management. Under these programs, the entire county or state is normally organized as a sanitary district. These systems are usually financed by forming special assessment districts for areas that desire to be included in the operational unit. Charges to districts are based on actual costs within that district and are adequate to cover amortization, operation, maintenance, repair and overhead costs incurred by the area-wide entity.
5. Contracts with municipal or existing sanitary and water districts can also be used in unorganized areas to obtain management services. The municipality or district usually charges a marked up rate to the users lying outside the district. This method is applicable to areas contiguous to organized units but is not workable for isolated homes and developments.
6. A combination of quasi-municipal, county-state districts and private enterprise often provides a flexible alternative which is suitable for both short and long-term problems. Under this system, a county-wide sanitary district, for instance, can provide the front-end financing necessary to serve scattered homeowners and developments to insure that all systems are designed, constructed and operated properly. To provide flexibility, the county sub-contracts for engineer-

ing, legal, county and other professional services. Subcontracts can also be utilized for septic tank maintenance, central water supply and wastewater disposal system operation, construction activities and other operation-related services. Through the use of industrial revenue bonds the county can construct central water and wastewater support facilities and lease those facilities to contracted operators. This lowers final costs because of interest and tax savings.

The joint effort of state, county, regional and municipal governmental units and private enterprise probably offers one of the most flexible and acceptable management alternatives. However, this approach has only been used in isolated situations.

Step 5 - Establish Evaluation Criteria and Select Alternative

After all workable alternatives have been identified, it is necessary to establish evaluation criteria which can be used to judge the various alternatives. Establishing these criteria is one of the more complicated aspects of rural utility system management system selection since there are several categories of user evaluation criteria and there are several users. The matrix system which is described may or may not be applicable to a given situation. However, individuals responsible for developing management system proposals may find that the methodology is useful to them.

There are four evaluation components and four categories of users which must be considered when evaluating alternatives. Evaluation components include:

1. Political-legal
2. Administrative

3. Financial
4. Physical-technical

User evaluation categories include:

1. Developers
2. Homeowners
3. Regulators
4. Bankers

Any proposal for a rural management system must satisfy the developer, homeowner, regulator and banker simultaneously. All users must find it politically and legally acceptable, financially acceptable, administratively workable and buildable. Many regulatory agencies fail to recognize the complex nature of the acceptance function. In the author's opinion, this is the primary reason regulatory agencies have been unable to establish workable management systems.

Placing evaluation criteria in a matrix form as shown in Figure 1 simplifies the evaluation process. The matrix is formed by asking developers, homeowners, regulatory agencies and financing agencies to identify the evaluation criteria they wish to apply to any given proposal. After all criteria have been established within each category (political, financial, administrative, physical) a weighting system is developed (with user approvals) and all alternatives are judged based on the relative acceptance score. This approach pulls together the diverse objectives of the four user categories and allows the users to focus on the important factors associated with any given management proposal. This approach also identifies direct conflicts between the interacting entities and allows compromises to be worked out.

Step 6 - Present The Proposal

There is no single recommended procedure that can be guaranteed to convince homeowners and developers that a given management system is either needed or best. A few recommendations are in order, however.

1. Never give the impression that the management system is being forced on the group.
2. Identify opinion leaders early in the process and convince them that the management system is needed.
3. Form a steering committee of local residents to work closely in selecting alternatives and formulating the final proposal.
4. Always present findings and recommendations as "drafts for review" until all users have had a chance to comment.
5. Be patient. Evolution is a good term to define the progress rate of management system proposals.
6. Be a salesman. The homeowner and the developer (if he is in control) must be convinced that the proposed management system will benefit them.

COMPONENT	USER EVALUATION CRITERIA																	
	DEVELOPER WANTS:				HOMEOWNER WANTS:				REGULATOR WANTS.				BANKER WANTS:					
	Component Wt.		Criteria Wt.	Score	Component Wt.		Criteria Wt.	Score	Component Wt.		Criteria Wt.	Score	Component Wt.		Criteria Wt.	Score		
Political-Legal	15	Control through sellout	0	0	10	Democratic control	150	15	40	Strong governmental entity	150	60	30	Homeowner control	200	60		
		Saleability	20	3		Minimum regulation	0	0		Compatability with existing agencies	150	60		Regulatory agency approvals	100	30		
		Legal format	20	3														
		Minimum regulation	0	0														
Financial	50	Low first cost	50	25	40	Lowest possible hook-up & monthly charges	30	12	10	Reasonable costs	100	10	50	Fiscal stability	200	100		
		Ability to recover costs & maintain a competitive price	0	0		Revenue vs tax financing	0	0						Marketable mortgages	100	50		
		Phaseability	0	0														
Administrative	30	Minimum involvement during build-out	150	45	30	Simple operation	50	15	30	Good operation and maintenance	100	30	10	Homeowner control	100	10		
		Transfer of responsibility for OM & R as soon as possible	150	45		Minimum involvement	20	6		Adherance to regulations	100	30		Perpetuity	100	10		
										Perpetuity	100	30						
Physical-Technical	5	Flexibility	0	0	20	Permanency	150	30	20	Safe, reliable, nuisance free system	100	20	10	Adequacy	100	10		
		Low Cost	0	0		Reliability	50	10						Conventional systems	50	5		
		Phaseability	20	1		Adequacy	50	10		Minimum water consumption	0	0						
		Simple Operation	20	1		Low OM & R Costs	0	0		Minimum environmental impact	0	0						
										Proven technologies	50	10						
TOTALS	100			123	100			98	100			250	100			275		

ALTERNATIVE 1. SANITARY DISTRICT. (A separate matrix is used for each alternative)

TOTAL-ALL 746

EXAMPLE - Typical method for evaluating proposed management alternatives using the evaluation matrix.

1. Identify alternatives (sanitary district, homeowner association, private management, regional system, etc.).

2. For each alternative, assign 100 points to each component. Assume for this example that there are three practical alternatives to be evaluated by each user. 3 x 100 = 300 points will be assigned to each component (political-legal, financial, administrative, physical-technical).

3. Have each user (developer, homeowner, regulator, banker) assign weights to each component. The weights represent per cent allocation. Each user can use his own weighting system, but the same weight must be used for each component for all alternatives. (For this example, assume the weights shown on the flip side were selected.)

4. Have each user develop his own criteria for each component and distribute 300 points among the alternatives for each component. The total points assigned to all alternatives, by component, cannot exceed 100 times the number of alternatives - which in this example is 3 x 100 = 300. In this example, assume the matrix on the filp side of this sheet is for the sanitary district alternative. Note that the developer is rating this alternative relatively low (only 40 of 300 points assigned to the political-legal category, 50 of 300 to the financial component, etc. However, the banker prefers this alternative, politically, and has assigned all of his 300 points to the political-legal and financial components. This leaves the banker with a zero allocation for these two components on the other two alternatives.

5. Multiply by the component weights and total all evaluation "scores" for each alternative. If done correctly, the total of each user's score for all alternatives will be 100 times the number of alternatives and the total score for all users will be the number of users times the number of alternatives times 100 - in this example all evaluation scores will add up to 1,200. (4 x 3 x 100). The total evaluation weight for Alternative 1 - Sanitary District - was 746 which means it ranks high in comparison (62% of all evaluation points were awarded to this alternative) to the other two alternatives.

6. In this example, scores for Alternatives 2 and 3 are not shown since this format requires separate forms for each alternative. In actual practice, the example form is expanded to show the alternative scores on one sheet.

Question: Are you saying that it is possible to have several organizations such as yours (consulting services) plugging into one county government agency?

Answer: Yes, however, the biggest problem with a management system is trying to achieve enough scale to provide accountants, lawyers, operators, engineers, etc. We tie together a number of small systems that share a common overhead. Our company maintains a design staff, people to do rate studies, accountants, construction services, operators, managers (and it takes a unique individual to manage one of these systems - one that is politically aware). Thus we achieve a scale factor by tying a number of these systems together - this makes it possible for us to operate.

Question: How are you documenting the water quality problem in these communities?

Answer: First you go back and statistically analyze the results of your "bac-t" testing program. This, hopefully, includes nitrogen. "Bac-t" and nitrogen are the best means of documenting problems. Any poor water quality-caused illnesses in the community also serve as documentation - dramatic documentation!

Question: Have you been successful in getting federal funding for these operations?

Answer: Only to buy them out! In these situations we were successful in getting the homeowners a loan from FHA to buy the systems. We actually hold these systems in

a state of trust under our contracts. No help has been obtained for operating the systems and I do not know where you would get much help.

CONSTRUCTION GRANTS FOR INDIVIDUAL TREATMENT SYSTEMS

by

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Introduction

On October 18, 1972, the "Federal Water Pollution Control Act Amendments of 1972" was passed by Congress. This act established national goals and policies for programs for water pollution control. Title II of this Law provided a wastewater treatment works construction grant program whereby the Federal government enters a contractual agreement to pay seventy-five (75) percent of eligible project costs for the construction of wastewater treatment facilities. States receive an allotment of funds which varies depending on the amount of money authorized by Congress for any given fiscal year. Grants to municipalities and other legal entities are made in accordance with an approved state priority system which must be designed to achieve optimum water quality improvement consistent with the goals and requirements of the Act.

In order to assure that treatment facilities constructed under this program are environmentally sound and cost effective, an orderly three-step granting process is defined by the rules and regulations which govern the program. Therefore, construction of federally-assisted wastewater treatment facilities is generally accomplished in three steps:

Step 1 - Facilities plans and studies required to establish the most economical and environmentally sound project.

Step 2 - Preparation of construction drawings and specifications.

Step 3 - Construction activities.

This phased-program approach is directed at producing wastewater

treatment projects which are not only cost effective and environmentally sound but can achieve operational objectives quickly.

The Clean Water Act of 1977 (Public Law 95-217) provided significant amendments to the FWPCA Amendments of 1972 but did not change the grants process of steps except in the case of small projects, it provided for a combined Step 2/3.

Eligibility of Small Treatment Systems Prior to Clean Water Act of 1977

As the funding program progressed, it became evident that many wastewater treatment facilities planned and funded were too expensive for the local population. This was especially true in cases involving small communities. In review of facility plans it was found that alternatives such as new or renovated septic systems and holding tanks, for individual homes and small clusters of homes has not been considered. These alternatives to collection and treatment systems could be far more cost effective and environmentally sound. In August 1967, all EPA Regions were instructed to ensure that facility plans provide a complete and careful cost effective analysis of treatment systems for individual families and small clusters of families, wherever these alternatives were feasible in the planning area. A draft Program Requirements Memorandum (PRM) was issued to represent Agency policy and provide guidance on the eligibility of small treatment systems.

If cost effective, small systems serving small clusters of homes were eligible for funding if approved by the state and certified as meeting the following minimum standards:

1. Must provide the most cost effective method treatment required to meet local conditions and satisfy state and federal requirements.
2. Must be owned, operated, and maintained by a public body

eligible for federal assistance.

3. Must be located in public rights-of-way or on public property.
4. System must meet minimum treatment required to meet secondary or more stringent level required by water quality standards.
5. Systems discharging to leach fields or utilizing other land disposal techniques must meet local, state and federal groundwater and public health criteria.
6. Vehicles and associated capital equipment required for maintenance of the system are grant eligible.
7. Systems serving individual homes are not eligible.

Provisions in the Clean Water Act of 1977 Relative to Funding Small or Individual Systems

Section 14 of the Clean Water Act of 1977 authorizes grants for privately owned treatment works serving one or more principal residences or commercial establishments. This section amends Section 201 of Public Law 92-500 by adding 201(h) as follows:

"(h) A grant may be made under this section to construct a privately owned treatment works serving one or more principal residences or small commercial establishments constructed prior to, and inhabited on the date of enactment of this subsection where the Administrator finds that -

(1) a public body otherwise eligible for a grant under subsection (g) of this section has applied on behalf of a number of such units and certified that public ownership of such works is not feasible;

(2) such public body has entered into an agreement with the Administrator which guarantees that such treatment works will be properly operated and maintained and will comply with all other requirements of section 204 of this Act and includes

a system of charges to assure that each recipient of waste treatment services under such a grant will pay its proportionate share of the cost of operation and maintenance (including replacement); and

(3) the total cost and environmental impact of providing waste treatment services to such residences or commercial establishments will be less than the cost of providing a system of collection and central treatment of such wastes.

In the case of any treatment works assisted under this subsection serving commercial users, any such agreement under paragraph (2) shall make provision for the payment to the United States by the commercial users of the treatment works which is applicable to the treatment of commercial wastes to the extent attributable to the federal share of the cost of construction."

Proposed changes to the regulations governing construction grants were published in the Federal Register on April 25, 1978, to implement certain amendments to the FWPCA contained in the Clean Water Act (Public Law 95-217). The regulatory changes relating to individual systems are as follows:

By revising § 35.905-23 to read as follows:

§ 35.905-23 Treatment works.

Any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage, domestic sewage, or industrial wastes of a liquid nature to implement section 201 of the Act, or necessary to recycle or reuse water at the most economical cost over the useful life of the works including intercepting sewers, outfall sewers, sewage collection systems, individual systems, pumping, power, and other equipment and their appurtenances; extensions, improvement, remodeling, additions, and alterations thereof; elements essential to provide a reliable recycled supply such as standby treatment units and clear well facilities; and any works, including site acquisition of the land that will be an integral part of the treatment process, or is used for ultimate disposal of residues resulting from such treatment (including land for composting sludge, temporary storage of such compost and land used for the storage of treated wastewater in land treatment systems prior to land application); or any other method or system for preventing, abating, reducing, storing, treating, separating, or disposing of municipal waste or industrial waste, including waste in combined storm water and sanitary sewer systems.

By amending § 35.917-1 by revising paragraph (b) in its entirety and by adding a new subparagraph (d)(5)(iv) to read as follows:

§ 35.917-1 Content of facilities plan.

* * * *

(b) A description of the selected complete waste treatment system(s) of which the proposed treatment works is a part. The description shall cover all elements of the system, from the service area and collection sewers, through treatment, to the ultimate discharge of treated wastewaters and management disposal of sludge. Planning area maps must include major components of existing and proposed treatment works. For individual systems, planning area maps must include those individual systems which are proposed for funding under § 35.918.

(a) * * *

(4) Where individual systems are likely to be cost-effective delineate a planning area large enough to take advantage of economies of scale and efficiencies in planning and management.

* * * * *

By adding new §§ 35.918 through 35.918-3 to read as follows:

§ 35.918 Individual systems.

(a) For purposes of this section and other references to individual systems, the following definitions apply:

(1) *Individual systems.* Privately owned alternative wastewater treatment works (including dual waterless/graywater systems) serving one or more principal residences or small commercial establishments which are neither connected into nor a part of any conventional treatment works. Normally, these are on-site systems with localized treatment and disposal of wastewater with minimal or no conveyance of untreated wastewater. Limited conveyance of treated or partially treated effluents to further treatment or disposal sites can be a function of individual systems where cost-effective.

§ 35.918-1 Additional limitations on awards for individual systems.

In addition to those limitations set forth in § 35.925, the grant applicant shall:

(a) Certify that the principal residence or small commercial establishment was constructed prior to December 27, 1977, and inhabited or in use on or before that date;

(b) Demonstrate in the facility plan that the solution chosen is cost-effective and selected in accordance with the cost-effectiveness guidelines for the construction grants program (See Appendix A to this subpart);

(c) Apply on behalf of a number of individual units located in the facility planning area;

(d) Certify that public ownership of such works is not feasible and list the reasons in support of such certification;

(2) *Principal residence.* Normally the voting residence, the habitation of the family or household occuping the space for at least 51 percent of the time annually. Not included in this are second homes, vacation or recreation residences. Commercial establishments with wastewater flow equal to or smaller than one user equivalent (generally 300 gallons per day dry weather flows) are included.

(3) *Small commercial establishments.* Private establishments normally found in small communities such as restaurant, hotels, stores, filling stations, recreational facilities, etc., with dry weather wastewater flows less than 25,000 gallons per day. Private, non-profit entities such as churches, schools, hospitals, charitable organizations, etc., are considered small commercial establishments. Commercial establishments with wastewater flow equal to or smaller than one user equivalent (generally 300 gallons per day dry weather flow) shall be treated as residences.

(4) *Conventional system.* A collection and treatment system consisting of minimum size (six or eight inch) gravity collector sewers normally with manholes, force mains, pumping and lift stations, and interceptors leading to a central treatment plant.

(5) *Alternative wastewater treatment works.* A wastewater conveyance and/or treatment system other than a conventional system. Includes small diameter pressure and vacuum sewers and small diameter gravity sewers carrying partially or fully treated wastewater.

(b) A public body otherwise eligible for a grant under § 35.920–1, is eligible for a grant to construct privately owned treatment works serving one or more principal residences or small commercial establishments if the requirements of §§ 35.918–1, 35.918–2, and 35.918–3 are met.

(c) All individual systems qualify as alternative systems under § 35.908 and for the 4 percent set aside (§ 35.915–1(e)) where cost effective.

(e) Certify that such treatment works will be properly installed, operated and maintained and that the public body will be responsible for such actions;

(f) Certify prior to the Step 2 grant award that the project will be constructed, and an operation and maintenance program established to meet local, State, and Federal requirements including those protecting present or potential underground potable water sources;

(g) Establish a system of user charges and cost recovery in accordance with §§ 35.928, 35.929, 35.935–13, and 35.935–15;

(h) Obtain assurance (such as an easement or other covenant running with the land), prior to the Step 2 grant award, of unlimited access to each individual system at all times for such purposes as inspection, monitoring, construction, maintenance, operation, rehabilitation and replacement. An option will satisfy this requirement provided it is exercisable not later than the initiation of construction;

(i) Establish a comprehensive program for regulation and inspection of individual systems prior to EPA approval of the plans and specifications. Planning for this comprehensive program shall be completed as part of the facility plan. The program shall include as a minimum, periodic testing of water from existing potable water wells in the area. Where a substantial number of on-site systems exist, appropriate additional monitoring of the aquifer(s) shall be provided;

(j) Comply with all other applicable limitations and conditions which publicly-owned treatment works projects funded under this subpart must meet.

§ 35.918–2 Eligible and ineligible costs.

(a) Acquisition of land in which the individual system treatment works are located is not grant eligible.

(b) Only the treatment and treatment residue disposal portions of toilets with composting tanks, oil-flush mechanisms or similar in-house systems are grant eligible.

(c) Commodes, sinks, tubs and drains and other wastewater generating fixtures and associated plumbing are not grant eligible. Modifications to homes or commercial establishments are also excluded from grant eligibility.

(d) Only reasonable costs of construction site restoration to preconstruction conditions are eligible. Costs of improvement or decoration occasioned by the installation of individual systems are not eligible.

(e) Conveyance pipes from wastewater generating fixtures to the treatment unit connection flange or joint are not eligible where the conveyance pipes are located on private property.

§ 35.918–3 Requirements for discharge of effluents.

Best practicable waste treatment criteria published by EPA under section 304(d)(2) of the Act shall be met for disposal of effluent on or into the soil from individual systems. Discharges to surface waters shall meet effluent discharge limitations for publicly-owned treatment works.

It is to be noted that small publicly-owned systems for one or more residences or small commercial establishments are not covered under paragraph 35.918; however, they are covered under regulations governing grants for publicly-owned treatment works and are grant eligible. Additional guidance is expected on the conditions for funding small publicly-owned treatment systems.

The degree of control over and management of individual and/or small treatment systems by a grantee will be the same as that for a publicly-owned conventional treatment system.

Question: Do you have any idea how Colorado is going to implement this program? Are they going to run a separate priority system for individual on-site disposal as opposed to municipal systems?

Answer: To my knowledge, they haven't given any thought to it. They must determine whether they will consider a small systems priority list separate from large systems.

Comment: (By Dr. N. A. Evans) It is correct, the Water Quality Control Commission has not given any thought to the eventuality that these systems will be handled. In part, because - not to be passing the buck - the EPA is still in the process of establishing guidelines. Thus, the subject has not reached the point where the State can do more than acknowledge that at some point in the future the Commission must consider implementing the program.

PUBLIC ATTITUDES TOWARD COMMUNITY MANAGEMENT

by
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A non-central system may be defined as a collection of on-site systems designed, installed, operated and maintained by an organizational entity. The extent and distribution of responsibility for the above mentioned services is site specific, depending upon the physical, social, political, and economic amenities and constraints present in a given community.

Through funds made available through the Colorado Experiment Station, data concerning the operation of on-site systems in communities requiring improved wastewater facilities is available. In the summer of 1976, a questionnaire was developed and a door-to-door survey carried out in three communities seeking improved wastewater facilities. Results of nine questions covering: 1) Wastewater problem recognition; 2) Existing maintenance practice; 3) Preferred government level of maintenance and responsibility; and 4) Economic support; are presented following a brief description of the three communities.

Community Background

Severance

Severance is an old town with a population of approximately 100, centrally located between three rapidly growing towns on the front range of Colorado. Outhouses and cesspools still remain from earlier days; the town is served by a central county water system; and the wells in the

community are used for irrigation. The town is assessed at $123,860 and occupies 32 ha (80 ac), of which 16 ha (40 ac) were recently annexed and are completely undeveloped.

Based on the responses to the questionnaire, residents of the town are fairly evenly distributed in age, with 46% over the age of 50. Fifty percent of the respondents have not completed high school and 44.8% are not earning more than $8,000 per year.

Red Feather Lakes

Red Feather Lakes is an unincorporated mountain community which had its beginnings as a fisherman's retreat. More recently, Red Feather Lakes has become a year-round community as it is changing to a retirement and bedroom community for Fort Collins. High density developments on log cabin batholith granite presents a severe limitation for conversion from the outhouse to more comfortable year-round systems.

The Red Feather respondents included only 13.9% not completing high school. Income levels reflect this higher level of education, with 47% of those answering the question having incomes above $15,000.

Grand Lake

Grand Lake is a summer resort community with on-site systems near the shore of the largest natural lake in Colorado. Almost all homes are used intensively for short periods only during the summer. The community is composed of highly educated individuals (all going to college and 39% going beyond their baccalaureate degrees) in their forties and fifties, many of whom have spent the summer on Grand Lake for most of their lives.

Each of the three communities was surveyed during the summer of 1976. The surveying was done in person with 30 completed questionnaires obtained from Severance, 64 from Red Feather Lakes and 39 from Grand Lake.

Results

Wastewater Problem Recognition

Several questions on the survey dealt with the ability of the public to recognize or acknowledge that there was a wastewater treatment and disposal problem. In Table 1 the results of two of the questions on problem identification are presented. All three communities agreed that inadequate sewage disposal is "a problem" on a community basis. However, few people appear willing to acknowledge that their system may be contributing to the problem.

Table 1. Problem Identification

Question	Adjusted frequencies		
	Severance	Red Feather	Grand Lake
How much of a problem is inadequate sewage disposal *in your community?*			
Absolutely a problem	25.0	15.2	10.3
Very much a problem	17.9	16.7	28.2
A problem	17.9	31.8	30.8
Not a problem	32.1	31.8	28.2
Slight problem	3.6	4.5	2.6
Definitely not a problem	3.6	--	--
	100.1	100.0	100.1
Do you feel your present sewage disposal system is adequate?			
All of the time	75.0	93.9	73.7
Most of the time	21.4	2.0	21.1
Some of the time	3.6	4.1	5.3
Not very often	--	--	--
	100.0	100.0	100.1

Existing Maintenance Practice

A review of existing maintenance practices in the three communities (Table 2) revealed that, on the average, 55% of those surveyed used a "crisis" as the basis for their maintenance program. Once a failure or

problem is identified, 65% of those sampled seek professional help in correcting the problem. In Severance and Red Feather, where income levels are lower, a considerable number of those surveyed felt they could repair their own system.

In the mountains of Colorado many systems fail, not by clogging or backing up, which is the heart of crisis maintenance, but by inadequately treating the wastewater before it reaches the ground water. A survey by Millon (1970) revealed that 62% of the fresh water wells in Red Feather Lakes failed to pass the coliform tests for safe drinking water. Recently (October 1977), the local health department responsible for the Red Feather area conducted a test of wells on a voluntary basis. The results, as reported in a local newspaper, are as follows: "three-fourths of them [wells] would be classified by the state as 'unsafe' to drink . . ." (Triangle Review, 1977). It is the prevention of this form of malfunctioning that is a major goal for a non-central system developed in this community.

Table 2. Exisiting Maintenance Practice

Question	Adjusted frequencies		
	Severance	Red Feather	Grand Lake
How often do you check your sewage disposal system?			
On a regular basis?	38.4	54.9	41.7
Whenever there is something noticeably wrong?	61.5	45.2	58.3
	99.9	100.1	100.0
Do you have sufficient understanding of your sewage disposal system to maintain it?			
Yes, I can fix it myself.	29.6	25.5	8.3
No, I need help to fix it.	22.2	10.9	8.3
No, I need a professional to maintain my system.	48.1	63.6	83.3
	99.9	100.0	99.9

Preferred Types of Maintenance

Given that many people recognized that their community has a problem with its individual systems, a number of questions were asked as to who should take the responsibility to see that the problem is corrected.

Results of the three related questions are presented in Table 3. The questions are labeled as follows:

A. Who should be responsible for maintaining the quality of the groundwater?

B. Who should be responsible for maintaining the quality of your drinking water?

C. Who should be responsible for maintaining your sewage disposal systems after it is installed making sure it does not contaminate the groundwater?

Each column of numbers separated by slashes represents the response for each of the three communities.

Table 3. Preferred Maintenance Data

	Adjusted Percentages		
	Community 1	Community 2	Community 3
	A/B/C	A/B/C	A/B/C
EPA	- / -/ -	- / - -	3/ 3/ -
The State	15/22/ 4	25/14/ 3	24/ 3/ -
The County Health Dept.	27/41/ 7	28/18/11	27/ 8/ 8
The Local Community	12/ -/11	20/32/15	8/45/ 8
The Individual	35/33/74	6/28/56	18/29/53
More than one of the above	12/ 4/ 4	22/ 8/15	21/10/32

Comparison of the responses in Table 3 indicates that the different aspects of the water system (supply, treatment and ground water quality) are not connected in the consciousness of the individual, or the public does not want them managed by the same body. In general, it appears that in the minds of most people, maintenance of septic tanks is the responsibility of the individual, and ground water quality is the responsibility of the County Health Department. Drinking water is felt to be a county responsibility in Severance (which it is now), and a local community responsibility in Red Feather Lakes (where individual and community wells are used) and Grand Lake (where individual wells or a seasonal community system currently operate at a cost of $60-180 per year.)

Economic Considerations

Table 4 indicates the willingness of the individual to pay for control of the "problem" of waste water treatment and disposal in his community. The questions asked were:

A. How much are you willing to pay for not ever having to worry about sewage disposal?

B. How much would you pay for a non-central system? (paraphrased)

The first question implies the use of a central system while the second implies the use of managed individual systems. A comparison of the results indicates little difference in preference for either approach.

The major variation in the results of Table 4 is between communities. The major response was from those willing to pay whatever is acceptable to the rest of the community. However, fewer of these opinions existed in Red Feather Lakes than in the other two, while more existed in the higher income community of Grand Lake. Red Feather has the highest percentage (40.9%) with an opinion on the amount to be paid. At the same time, they stand as the greatest opponents to any payment. Less than half of the residents of Red Feather will support a central system which costs much over $5 per month. It is interesting to note that in a community which individually states that 93.9% of their systems work "all the time," 40.9% of the community is willing to pay $5 to $20 per month for not having to worry about sewage disposal. This is nearly twice the percentage willing to commit themselves to a specific amount in the other two communities.

Table 4. Economic Data

Question	Adjusted Frequencies					
	Severance		Red Feather		Grand Lake	
	A	B	A	B	A	B
Nothing	22.2/	25.9	28.8/	28.8	15.8/	13.2
$ 5/mo or $ 60/yr	3.7/	11.1	13.6/	12.1	5.3/	2.6
$10/mo or $120/yr	11.1/	--	16.7/	15.2	2.6/	5.3
$15/mo or $180/yr	7.4/	3.7	4.5/	3.0	-- /	--
$20/mo o4 $240/yr	-- /	7.4	6.1/	4.5	5.3/	2.6
Whatever is acceptable to the rest of the community	55.6/	51.9	30.3/	36.4	71.1/	76.3
	100.0/	100.0	100.0/	100.0	100.0/	100.0

Conclusion

Given the preceding information, it is obvious that the present system of individual responsibility for on-site systems may fail to provide the necessary regular maintenance to sustain effective on-site system operation. Under "crisis" maintenance, the leach field system is limited to the time required for the septic tank to fill with solids. By the time the homeowner pumps the septic tank, the leach field is seriously damaged, and most likely will have to be replaced. In areas where the leach field clogs and overflows into fractured bedrock, not seriously affecting the homeowner's wastewater removal, the system "failure" may be "overlooked" for an extended period of time. Such inaction is very likely to lead to degradation of the groundwater quality. When such inactivity occurs on a community-wide basis, serious problems with the water supply for that community are probable.

Delegation of responsibility for different water forms (as related to the individuals use of the hydrologic cycle) to a number of different agencies may increase the cost of a safe drinking supply by removing responsibility for inaction. Lack of continuity in responsibility for acquisition, utilization and elimination can only lead to a decrease in quantity and/or quality of available supplies, given the present self-centered state of individuals.

Surprisingly, all three communities were open to non-central systems, giving economic support similar to that for a central system. The level of support, although low, is an indication that with some financial assistance the non-central system may be implemented at a cost far below that of a central system. Once the preliminary work of defining a non-central system is completed, and funds begin to move into development of these systems, many of the communities previously unable to meet their

wastewater needs will have an effective wastewater system. Further, the non-central system will facilitate land treatment, eliminate strip development which often accompanies sewers, while at the same time reducing investment in system capacity to meet projected populations.

References

Million, E. R. Water Pollution, Red Feather Lakes Area, Colorado. Thesis, Colorado State University, Fort Collins, Colorado. 1970.

Toups Corporation. Technical Planning Report Sewage Facilities, Red Feather/Crystal Lakes Area. (Draft). Larimer-Weld Regional Council of Governments, Loveland, Colorado. 1976.

Toups Corporation. Technical Planning Report Sewage Facilities Town of Severance. (Draft). Larimer-Weld Regional Council of Governments, Loveland, Colorado. 1976.

Question: What time of the year did you make your survey?

Answer: I did it during the summer of 1976. To get a random sample, I sampled at different times during the summer and at different times during the week. This was to make sure a representative cross section was obtained.

LEGAL CONCERNS AND IMPLICATIONS OF COMMUNITY MANAGEMENT PROGRAMS

by

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I would like to talk for a minute about the 1977 amendments to the Clean Water Act. In addition, I would like to go through some of the legal concerns I've outlined, including the concerns with the form of organization that you might establish for a community management program, the problems of coordinating that organization and its activities with other related programs and governmental regulations. I then want to briefly look at the existing and enabling legislation that we have in Colorado that might allow for these organizations and what alternatives are available.

First, with regard to the Clean Water Act of 1977: In order to understand some of the possibilities in this area, obviously funding is going to be a major concern. I will admit to have not had a chance to study the new regulations which have just come out. So will base my discussion primarily on the reading of the statute and legislative history. We have mentioned earlier, we have amendments to section 201, the grants for individual systems. As you've heard earlier, the regulations have just come out amplifying the thrust of this section but in my mind creates some problems for funding in this area. I would like to outline some of the questions I raised.

First we are talking again about grants available to construct a privately owned treatment works but which are operated by some public entity. Right there, I think we have the origin of a problem. As the regulations further point out and as mentioned earlier by Mr. Brooks,

the regulations are going to require such things as permanent access, and unobstructed access to privately owned systems such as septic systems, but this requires public maintenance. We are going to have a coordination problem in setting up a management system that is publicly operated but with privately owned facilities in order to be eligible for grants. Again it does not include the vacation home situation, and I see that the regulation provides you have to occupy your vacation home 51 percent of the time in order to be eligible. So between this regulation and the IRS, we can only let you use your vacation home for two weeks; you're really out of luck.

What we have here are some obstacles to using these grant sections in order to set up a management system. First, it is sort of a tactical problem in my mind. You have to create a public entity that then certifies that it is incapable of getting its own funds for a central system but which is capable then of setting up a management system for which they will be responsible. At the same time, you have privately owned components of that system. So, to fit within the framework of these grants, you've got a fairly narrow system you are going to have to come up with.

Legislative history indicates that septic tanks, wastewater recycling devices, and aeration treatment plants are all what they call alternative or unconventional treatment works, which are eligible for grants under the program. It goes on to say that these have to be used in a systematic way to provide rural and other areas with sanitary services through a public body. So back to the point that there must be created some public entity to supervise and to be legally responsible for maintenance of the program, and I'll mention later what some of the problems may be legally, in getting that organization set up.

In addition to Section 201 in the grants for individual systems we have a new section under the subsection on Section 205 of the 1972 amendments which is a set-aside funds for small communities. It is interesting to note that Colorado was on the borderline and doesn't quite make the classification of 25 percent rural, which means under the statute that the Governor may request the use of the 4 percent set-aside funds from the EPA administor, but EPA is not required to spend that 4 percent on these small communities. Hopefully, the regulations will answer a question I had in reading the legislative history. The statute says that the money, the set-aside funds, are available for alternatives to conventional sewage treatment works for municipalities having a population of 3,500 or less. Senate legislative history in a report used the word communities of 2,500 or less. I am assuming that the regulations will clarify this so that we don't have to incorporate an area and make it a town under state law in order to be eligible for these funds and in fact we are talking about a group of residents that have a community of interest. In this case, one related to wastewater disposal.

In addition, we have several places in the 1977 amendments that offer systems to what is called the innovative and alternative technology. As mentioned, Section 202 raised the grant contribution for assistance from 75 to 85 percent. New Section 201 J provides a new cost effective formula that applies to these systems and it says that you can get up to 115 percent of most cost effective alternative. The way I interpret this is that essentially you are getting a 15 percent bonus in evaluating these innovative and alternative techniques in doing your cost benefit analysis. As mentioned by Mr. Brooks, it is not entirely clear what we mean by innovative and alternative technology or I should say what

Congress intended. The legislative history defines innovative to mean new and promising technology not fully proven, and defines alternative as the different from secondary treatment and advanced waste treatment. Somewhere in there we are going to hope that we can fit the kind of management systems and services we are talking about into these definitions and make it work for the four percent set-aside funds.

In summary of my reading of these histories, and I think we will all have to go back and look at the regulations and talk some more about what they mean and hopefully address these during the 60 day comment period. It would appear to me that a private management system cannot qualify for the grant funds under 201 and what you are going to have to have is a publicly operated system with privately owned individual units. On the other hand, a completely private system, something like a privately maintained system or a home owners association maintenance system could potentially qualify for funds under the 4 percent set aside funds for small communities or possibly under the innovative or alternative technology classification, which if they fit under both would then increase the changes of funding.

I would like to turn now to the issues that I have outlined involved in community management programs that we are discussing today. Probably the first question is what form of organization, what legal entity, do you need to establish to facilitate this kind of program. I've divided them into two classifications, public and private, and narrowed them down under public to special districts, municipal and county operated systems. It's possible to add a regional or some state-wide but I've eliminated that at least for the time being for my discussion. Under the private half I include home owners associations, other nonprofit corporations, and profit corporations, as being the vehicles. The major

distinctions that I have found between the organizations and the way you set them up relate first to eligibility for grants and I've just talked about that. It appears that there is going to be a definite distinction between whether it is public entity or a private entity as far as being eligible for federal money. The next major distinction between going public or private in these entities would be in the areas of management and enforcement. In the case of the key management and enforcement powers you need some sort of fund raising financing element to your organization and the power to tax and assess is typically a lot easier under a public entity which has explicit statutory authority than it would be under a private home owners organization, for example, which by contract sets up a vehicle for the assessment of funding.

The same, I believe, is true in the case of enforcement. Typically, a public entity would have greater enforcement powers and we find, especially in the home owners situation, that the enforcement situation becomes difficult because you've got agreements or the provision that the home owners essentially have to sue each other. You are down to the neighbors suing each other and this can be over anything, it doesn't have to be over maintenance of septic systems. Some covenants in subdivisions these days deal with everything and anything including, for example, parking recreational vehicles and you can imagine suing your neighbor because he has his Winnebago parked in front of your house. The practical difficulties in administering a home owners association where you are asking the neighbors to police themselves presents problems and in my mind a disadvantage for the home owners association approach.

The same, I believe, is true in the financing situation. Typically, the way that the association might be set up is to provide a pro rata

contribution for the payment of the costs of maintenance, let's say in this case maintaining septic systems and a tax lien would apply to the property of the delinquent home owner in the case of failure to pay. This is what I would call a pro rata fee rather than some sort of user charge. In other words, as the overall cost of the system goes up, everyone shares equally rather than figuring out a formula whereby those that use the system more pay a greater cost.

Finally, with regard to home owners associations in older subdivisions, I believe these create a real problem, from everything from road maintenance to other things like septic system maintenance. If we have an old subdivision you are going to have real difficulty getting the existing home owners plus owners of vacant lots, which may be scattered all over the country in a mountain situation, organized and agreed to a home owners association. Now you have a different situation where you are going in with unsubdivided land and you're working with the developer, but in many of our situations in Colorado you have some very old platted subdivisions, many with very small lots, which are precisely the kinds of site situations where you need some sort of solutions like a maintenance association.

Another area where we are going to run into some legal difficulties both with the public and private entity is legal access to the individual treatment works, in this case septic systems. Apparently the new regulations will provide for grant eligibility. You are going to have to show the publically operated system can have unobstructive access both before and after construction to the individually owned treatment works. Now I can see some problems in this, especially again in older subdivisions where you may have trouble getting that kind of consent from each individual owner. The situation with private home owners associations are not

alot easier. In the older subdivisions you've got the same problems. There may be some legal problems in describing the nature of an easement which doesn't exist yet because you haven't actually located a site of your septic system until you do your site analysis and planning and begin construction. It has been suggested by some that you could get a grant of a general easement that says essentially I'll give you an easement wherever you put my septic system and then later I'll be more specific. But that could create some problems and may also create some problems with some of the lenders or title insurance companies if you take this particular route.

Those are very quickly the most central issues (legal issues) I see faced in the formation of either a public or private organization or entity to carry out maintenance activities. I'd like to shift now to other problems which I see deal more with coordinating an activity of a community management system with other related laws and regulations. The most prominent would be how these management systems will affect other existing land use regulations. If for example you were to form a management system in Colorado as a special district, we have some controls in Colorado over the formation and expansion as a special district. County Commissioners have a kind of veto power in Colorado under the Special District Control Act and they can refuse the creation of a special district for a number of reasons including if they find, this is again the County Commissioners, that it is incompatible with existing land use plans (master plan), or existing water quality management plan, such as 208 plan. So there is both a potential for integrating the creation of these systems with existing land use regulations, and also potential for conflict.

We have a recent legislation in California which creates a special kind of district for the maintenance individual septic systems. Primarily that statute requires that the managers of that district make a finding themselves that they are operating in conformity with all local and regional health laws, and all applicable land use regulations. I guess what I am referring to here is that you may have a situation where the creation of a maintenance district may stimulate development, let's say in a mountain area, which may or may not be compatible with the local land use plan or the desires of other residents in the area. The question comes up, if that is the case how are you going to coordinate this with the land use decisions being made by the County Commissioners or by someone else. The California legislation leaves that decision of coordination or compatibility up to the district itself. It would be their own determination as to whether they are preceding in conformity or not.

This above is with regard to land use, however, with regard to health, they take a different approach. In that case, the proposed siting of the maintenance organization, the special district and location of it and total number of units to be served, all have to be approved by both the local and regional and state health department authorities. They have a veto power. They can say we don't want an organization that is going to maintain a thousand units, we only want five hundred- two very different approaches to the same question.

In addition to the coordination with land use, we have another problem of coordination with water rights, especially in the west. For those of you from Colorado I refer primarily to a case again involving the Red Feather area called Glacier View and in that case we have an excellent illustration of the problem. The Colorado Supreme Court in

that case recognized, without doing anything about it, the problem of proving a water rights plan, a water supply plan for about 2,000 individual wells and about 1,800 individual septic systems of leach fields, pointing out that perhaps there will be a water pollution problem in the future, but the court, sitting as water right arbitrator, could not do anything about the water pollution problem at this time. They had no authority to act one way or the other.

It is interesting to note that in that case the applicant, the subdivider was required to come with a water augmentation plan in order to prove to the county commissioners that their water supply was adequate for the future residents of the subdivision. That plan included a home owners association which would supervise the water rights distribution from each of the individual wells and would say that in a time of shortage that each well would have to cut back a pro rata share in order to meet call on the river and to meet their required priority. On the other side of the question, no such organization was required by State law for the maintenance of septic systems which will be adjacent on one and two acre lots in a 1,800 unit subdivision. The question, I think, remains, couldn't a similar requirement be imposed? That is, if we are going to have to maintain the water wells in order to respect water right laws, can't we be required to maintain septic systems, in a similar fashion, in order to meet health requirements and water quality control.

Let me turn quickly to existing enabling legislation. To summarize what I was going to say in more detail, I don't think right now in Colorado we have authority for a special district that would carry out the management responsibilities that we're talking about today, and which the grant eligibility requirements they are talking about. That

is, supervising construction maintenance and continued operation of these systems. The sanitation district authority seems too narrow, when it talks about storm and sanitary sewers or flood and surface drainage structures and disposal facilities. Now maybe you could squeak by under disposal facilities, I'm not sure. We have a multitude of special districts for special purposes but not one in Colorado for this purpose. The legislation for metropolitan sanitation districts, regional service authorities, urban drainage and flood control, were all very specific and really too specific, to take in what we are talking about today.

It remains possible, however, that through municipalities and counties that under their authority they could set up a similar structure. This seems unlikely they would do that given the nature of the problem especially with its rural, nonurban orientation.

What alternatives would be available in Colorado? One obvious one is to go to some sort of legislation like California which sets up a special district for a specialized purpose such as operation and maintenance of waste water facilities on individual lots. Give those districts taxing powers, enforcement powers and other powers that public entities need and would also need to qualify for federal grants. In my opinion this would require new legislation.

The other alternative would be to expand the powers now given to existing sanitation districts in Colorado and that perhaps would be an easier solution. I think the precaution that would have to be taken there would be to make sure that the purpose, the powers and authority given the sanitation districts really are compatible with what you want to do for this specialized district.

The other alternatives that I see that don't involve new legislation would be the use of privately maintained and operated management

systems or home owner association systems along with the active involvement of the local health authority. In Colorado we are talking primarily about the county health authority. First we have some land use controls that help and some health regulations that help. If the county commissioners use their zoning and subdivision planning and development ordinances, they can encourage the use of the approval of subdivisions that would have septic systems, but would also have home owner maintenance organization. It may be possible to require these organizations, in the same way they require organizations to supervise the management of individual water well, as I mentioned. I understand this has been done in at least one Colorado county.

From the health department standpoint, the county health department and the local health departments clearly have the regulatory authority and the enforcement authority to go in and require the shut down of systems that are operating poorly or not effectively. The problem, of course, is how do you supervise all these systems all over the place, in the mountains, and I appreciate that problem, however, if the enforcement threat was the real one, in my mind it would provide an incentive for the formation of these maintenance organizations. In other words, those people in Red Feather that think the problem is always somebody else would start thinking, well maybe I'm the one that is going to be told to shut down and get a citation that I'm a public nuisance and I'm going to have to come up with a solution. I, individually don't have a solution so maybe I ought to find a way to solve the problem.

In addition the state health department has authority and has regulations to identify certain areas, require special regulations where it is determined that septic systems in those areas are not working.

They have been asked to do this; at least on one occasion they have chosen not to do so, relying upon the discretion of the local health authorities. Again, the power exists there and if the state health department were to go in and identify an area and require that it be operated under state regulations and state guidelines, those guidelines in my opinion, could include requirements of the operation and continued maintenance of those systems to make sure they don't cause a health hazard. I think the vehicles may now exist. It could involve, again, an active role by the health department in backing up on occasion the threat of an enforcement action against some individuals.

One final thing was mentioned early, and that is one way to bring about a further incentive for these programs would be a change in the requirements in the home lending market. Right now we have requirements in the home mortgage market with regard to septic systems. It is required essentially that an engineered system that meets county health requirements in order to get a loan. If those requirements were more stringent, for example, not only require an engineered system, but one which will be indefinitely maintained by an organization, I think you have a definite motivation for people to organize and form these organizations. They either do it or they won't get a loan. That is another alternative which ought to be considered. Thank you.

Don Niehus
U.S. EPA

You raised the question about legislative history dealing with size of community - the size of eligible communities is under the set-aside provision. This provision is designed for fairly stable rural communities that are detached from urban areas.

In addition, set-aside funds can also be used for urbanizing portions of metropolitan areas. At present, guidance for determining qualifying low density areas is up to the discretion of the EPA Regional Administrators.

In regard to facilities to be funded in urbanizing areas, I question whether or not those are designed for temporary installation until sewers are available or whether they are permanent. Obviously, in the rural areas facilities should be designed as permanent installations where sewers are never going to be feasible.

What is meant by innovative systems? The regulations provide some general criteria. There are six of them in Appendix E that outline the characteristics of innovative systems. The Office of Research and Development is currently developing more detailed guidance, including developing lists of technologies which we consider to be conventional, alternative, and innovative. These will be distributed to all EPA regional offices, which will have the ultimate authority to make those determinations. There might be some variations among regions.

The last thing I want to say is that you're making comments about privately owned versus publicly operated small flows facilities. I think you have overstated the

situation. As a minimum, the public entity is required to guarantee proper operation and maintenance, monitor ambient water quality and establish and administer user charge and cost recovery systems. However, the actual monitoring, maintenance and operation does not necessarily have to be done by that agency. It can be done through private arrangements. The facility plan must include specification of institutional arrangements. There can be many different combinations of public and private arrangements.

Jim Brooks
U.S. EPA

I have one comment that I think would be appropriate at this time. Since there may be some commentors here who may comment on the regulation, there is a problem in the set-aside. The set asides start in fiscal 1979. There is the 2 percent for innovative and alternative projects. There is the 4 percent for the small community and rural areas that may be funded. The problem is with the 2 percent set aside, it could be with the 4 percent, but I do know that 2 percent set aside is a maximum. Let me give you an example; let me take Utah. Utah allotment is 20,000,000, 2 percent of that is 400,000. That 400,000 is used as the 10 percent supplementary grant to the 75 percent grant. The 400,000 is a maximum. Also, out of that, 1/2 of 1 percent of the total fiscal allotment to the state must be set aside for innovative projects. So of the 400,000, only 300,000 exists for alternative technology with 100,000 set aside again for innovative projects. One land treatment project in

Utah which was completed last year, costs $3,500,000, for instance. A $3,000,000 project could wipe out the $300,000 set aside in Utah. We're just left then with funds for the innovative projects. Therefore, if we wipe out all the alternative money with one project there may be none left for small treatment systems which would be eligible for 85 percent funds if the money was there. Again, too if we try getting land treatment projects in the states and don't have enough funds to cover all the projects looking for 85 percent. They may say "Well, heck, we'll wait another year and not construct it for another year."

EFFLUENTS FROM INDIVIDUAL WASTE-TREATMENT SYSTEMS AND EFFECTS ON GROUND WATER

by

Dennis C. Hall

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Lakewood, Colorado

In this talk I plan to briefly discuss results of studies made by the U.S. Geological Survey that I have been involved in during the last 7 years in Jefferson and Boulder Counties, Colorado. In these studies attention has been focused on the quality of the ground water. The results of the original Jefferson County study, done with Warren E. Hofstra (Hofstra and Hall, 1975), were discussed at the previous workshop in 1975.

The U.S. Geological Survey has also completed work on a followup study of the mountainous part of central Jefferson County, in cooperation with the Jefferson County Health Department. In that study I worked closely with Dr. Carl Johnson, Dan Tipton, Edward Nickum, William Dorrance, and Richard Bell, all of the Jefferson County Department of Health. Two reports are planned for this study: One report, currently in review, summarizes the general water quality in the unconsolidated-rock and the fractured crystalline-rock aquifers and the second report, now being written, summarizes the effectiveness in reducing selected water-quality contaminants by individual waste-treatment systems in three communities with differing lot sizes.

In the study of the unconsolidated-rock and the fractured crystalline-rock aquifers in Jefferson County, water samples from more than 750 wells and springs were analyzed for nitrite plus nitrate, coliform bacteria, and fecal-coliform bacteria. Water from 5 percent of the wells and springs tested contained nitrite plus nitrate as nitrogen in excess of

10 mg/L, which is the drinking-water standard of the Colorado Department of Health (1977) (table 1). Coliform bacterial concentrations were greater than one per 100 mL of water from 19 percent of all wells and springs, and fecal-coliform bacterial concentrations were one or more per 100 mL of water from 3 percent of all wells and springs. Both groups of bacteria occurred more frequently in water from wells completed in the unconsolidated-rock aquifer than in wells completed in the fractured crystalline-rock aquifer.

Table 1. Summary of Analyses of Water from Wells and Springs, Central Jefferson County, Colo., 1972-73

Aquifers	Percentage of Wells Containing		
	More than 10 mg/L nitrite plus nitrate as nitrogen	Two or more coliform bacteria per 100 mL	One or more fecal-coliform bacteria per 100 mL
Unconsolidated-rock	5	35	4
Consolidated-rock	6	14	2
Both	5	19	3

The relationship between water quality and distance from leach fields was not clear, but it appears that many factors may be involved. The presence of coliform bacteria and fecal-coliform bacteria indicated a source of pollution at or near the well. The dieoff rate of bacteria usually precludes the possibility of polluted water originating more than a few hundred feet from the well. Excessive nitrate indicates a source of pollution either near the well or as far away as hundreds to thousands of feet from the well.

Another phase of the Jefferson County study involved a detailed study of three small mountain communities south of Evergreen, each underlain by the same bedrock type, but with different average lot

sizes, ranging from about 1 to 3½ acres. Concentrations of several pollution indicators were determined in about 30 wells in each community. We had anticipated that water would be most contaminated in the community with the smallest average lot size. However, ground water from the community with the medium-sized lots had the most pollution. In addition to lot size, the following factors were considered: Well depth, well yield, depth to water, soil depth, slope of the land, and age of the community. Age of the community and slope of the land were the only factors that correlated with the water-quality results. We also found that the specific conductance and concentrations of chloride and nitrate increased downgradient or downshope throughout all three communities.

During the second phase of the study we compared efficiencies of aeration waste-treatment systems with septic waste-treatment systems. I should point out that leach fields in both systems are aerobic, when working properly. Observation wells were installed in 15 leach fields -- 8 leach fields with septic-treatment systems. When possible, the top of the slotted part of the observation-well casing was placed 4 feet below the distribution pipes of the systems, and the well was cased to land surface. In all instances, unweathered bedrock was 10 feet or less below the land surface. No more than 4 feet of soil was found in any of the backfilled leach fields, whereas some of the sand-filter leach fields had 4 feet of filtering material below the distribution pipes. Eight of the observation wells were completed below the water table; the other seven wells were dry. In addition to sampling the leachate that entered the observation wells, samples were obtained from the treatment tanks. Predictably, aerobic products of bacterial metabolism (nitrite, nitrate, and sulfate) occurred in greater concentrations

in samples from aeration tanks and associated leach fields (table 2). In addition, specific-conductance values and dissolved-solids concentrations were greater in the aeration systems. Average phosphate concentrations were about the same in both types of systems. Average concentrations of bacteria, total solids, detergents (MBAS), and biochemical-oxygen demand were greater in the septic systems.

Table 2. Comparison of Average Concentrations of Indicators in Water from Leach Fields and Treatment Tanks in Aeration- and Septic-Treatment Systems, Jefferson County, Colo., 1975-76

A = Average concentration (or amount) in aeration system more than 50 percent greater than in septic system.

S = Average concentration (or amount) in septic system more than 50 percent greater than in aeration system.

- = Average concentration in the two systems differ by less than 50 percent.

nd= Not determined

Indicator	Leach Field	Treatment Tank
Nitrite, dissolved	A	A
Nitrate, dissolved	A	A
Sulfate, dissolved	A	A
Phosphate, dissolved	-	-
Specific conductance	A	-
Dissolved solids	A	-
Total solids	-	S
Coliform bacteria	A	S
Fecal-coliform bacteria	S	S
Detergent (MBAS)	S	S
Biochemical oxygen demand	S	S
Chloride, dissolved	S	S
Dissolved oxygen	-	nd

There seemed to be drawbacks in both types of systems. Aeration-treatment systems require more maintenance, cost more to install and

to operate, and cause greater increases in the nitrate concentration in the ground water downgradient. Although aeration systems theoretically should result in more complete digestion of wastes, they are still in a developmental stage, and several owners reported rapid build-up of solids in the aeration tanks and associated leach fields. Septic systems are not capable of complete breakdown of wastes. The undigested wastes accumulate and, if the tank is not periodically cleaned, the lifetime of the leach field is significantly shortened. Leach fields, regardless of the system, cannot operate efficiently for an indefinite period. Also, soil conditions and hydrology in the Front Range are not ideal for leach field construction or operation.

The Boulder County study, done in cooperation with the Boulder City-County Health Department and the Colorado Geological Survey, has been completed, and the report is currently being reviewed. Elaine Boyd and Doug Cain assisted with that investigation.

Aquifers consisting of unconsolidated and consolidated rocks were studied in Boulder County, and samples were analyzed from more than 640 wells and springs. Countywide, nitrite plus nitrate as nitrogen exceeded 10 mg/L in 6 percent of the wells and springs. Two or more coliform bacteria per 100 mL occurred in water from 26 percent of the wells and springs and one or more fecal-coliform bacteria per 100 mL occurred in water from 8 percent of the wells and springs (table 3).

Table 3. Summary of Analyses of Water from Wells and Springs in the Unconsolidated-Rock and Consolidated-Rock Aquifers, Boulder County, Colo., 1975-76.

Aquifers	Percentage of Wells Containing		
	More than 10 mg/L nitrite plus nitrate as nitrogen	Two or more coliform bacteria per 100 mL	One or more fecal-coliform bacteria per 100 mL
Unconsolidated-Rock	6	33	11
Consolidated-Rock	7	20	6
Both	6	26	8

Water from 6 to 7 percent of the wells and springs in the unconsolidated-rock and consolidated-rock aquifers contained nitrite plus nitrate as nitrogen greater than 10 mg/L. Two or more coliform bacteria per 100 mL occurred in water from 33 percent of the wells and springs completed in the unconsolidated-rock aquifers and in 20 percent of those in the consolidated-rock aquifers. One or more fecal-coliform bacteria per 100 mL occurred in water from 11 percent of wells and springs in the unconsolidated-rock aquifers and in water from 6 percent of those in the consolidated-rock aquifers.

Water from wells and springs in the mountains had nitrite plus nitrate as nitrogen greater than 10 mg/L, two or more coliform bacteria per 100 mL, or one or more fecal-coliform bacteria per 100 mL less frequently than did water from wells and springs in the plains (table 4). Excess concentrations of nitrite plus nitrate occurred more frequently in the water from aquifers in the plains than in the mountains. The sources of the nitrite plus nitrate may be from residential waste-treatment systems, agricultural use, or the sedimentary rock. Coliform bacteria occurred more frequently: In the unconsolidated-rock aquifers, especially in the plains; in wells with depths to water less than 10 feet below land surface; in poorly sealed wells; and in wells or springs close to leach fields.

Table 4. *Summary of Analyses of Water from Wells and Springs in the Mountains and Plains, Boulder County, Colo., 1975-76.*

Location	Percentage of Wells Containing		
	More than 10 mg/L nitrite plus nitrate as nitrogen	Two or more coliform bacteria per 100 mL	One or more fecal-coliform bacteria per 100 mL
Mountains	2	18	6
Plains	8	31	10
Entire County	6	26	8

References

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Question: Did you inspect the wells for proper construction? Were they properly sealed?

Answer: We didn't inspect all of them. We probably inspected half the wells.

Comment: If you were getting surface contamination, your results would be distorted.

Answer: We are not really sure of the sources of contamination. We think some of the contamination comes from the aquifer. That's why we get more in the shallow aquifer where the groundwater is in equilibrium with the surface water. The surface water carries contamination to the well.

REVIEW OF NATIONAL HAPPENINGS IN HOME SEWAGE DISPOSAL

by

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I am happy to be back in Colorado and to be with you here today for this Home Sewage Disposal Workshop. I always enjoy coming to your state.

As you have heard, there are many, many good news, bad news jokes going around. I do not have any jokes today but I do have some good news and bad news regarding national happenings in home sewage disposal. First, let's take a minute to look at some of the good news. Much of this is contained in the 1977 Amendments to the Clean Water Act. Especially Section 201 of that Act pertaining to a grant program for innovative and alternative systems and for individual, privately-owned sewage disposal systems. Many of you know about the EPA Grants Program for the construction of waste water treatment works. I will not attempt to go into any detail on those. To meet the 75 percent grant funding for the sewage treatment works over the next decade, Congress has authorized a five-year program of $4.5 billion for fiscal year 1978 and $5 billion for each of the following four years. It is clear that a large portion of these funds will be spent for a considerable and growing number of projects for rural and semi-rural communities.

In the past, virtually all of the many smaller wastewater treatment facilities which have been planned or funded through the EPA program have been for conventional systems -- that is, a collection network of at least eight-inch pipes, interceptors, and a traditional biological or chemical treatment plant -- which have often proven to be too expensive

for many families to bear. User charges exceeding $200, $300, or more per family annually have had to be established to cover operation and maintenance and debt retirement costs. In a few cases, these charges have exceeded $500 per family per year where the medium income for household is $6,500 to $10,000 annually.

To address this problem, EPA is now requiring (1) fuller advice and involvement of the affected citizens, and (2) consideration of on-site systems among the planning alternatives. In the past, on-site systems serving clusters of two or more homes have been eligible for grant fundings if they are state-approved and certified projects. The 1977 Amendments recently passed by Congress and signed by the President on December 27, have extended eligibility to the single family residence. Under the new Amendments to the Clean Water Act of 1977, grant funding eligibility has been extended to the construction of privately-owned treatment works serving one or more principal residences or small commercial establishments. There are basic restrictions to these grants which have been amplified fully in the EPA regulations which were published in the Federal Register, April 25, 1978. Briefly, the treatment systems are only for existing principal residences, preventing grant funds from being utilized for secondary or recreation cottages. The definition for principal residences as given in the April 25th Federal Register is the normal the voting residence, the habitation of the family household occupying the space for at least 51 percent of the time annually. Not included in the definition is the second home, vacation, or recreation residence. Commercial establishments with wastewater flow equal to or smaller than one user equivalent (generally 300 gallons per day dry weather flow) are also included as residences. Small commercial establishments are those private establishments normally found in small

communities such as restaurants, hotels, stores, filling stations, recreational facilities, etc., with dry weater wastewater flows less than 25,000 gallons per day. Private non-profit entities such as churches, schools, hospitals, charitable organizations, etc., are considered small commercial establishments.

A public body must apply on behalf of the units and must guarantee that such treatments works will be properly operated and maintained. A system of charges must be established to assure that each recipient will pay his proportionate share of the cost of operation and maintenance. Of course, before these grants can be made, the total cost and environmental impact of the on-site system must be less than the cost of providing a system of collection and central treatment to the wastewater.

The Amendments also provide for a set-aside of four percent of the grant funds allocated to each rural state to be available only for alternatives to conventional sewage treatment works for municipalities having a population of 3,500 or less or for highly dispersed sectors of larger municipalities. Where a project calls for innovative processes or techniques, it may be eligible for an 85 percent grant rather than the standard 75 percent grant. You might ask, "What are alternative or innovative processes and techniques?" The definition of an alternative process or techniques is one which is a proven method that provides for the reclaiming and reuse of water, productively recycles wastewater constituents and otherwise eliminates the discharge of pollutants, or recovers energy. In the case of processes and techniques for the treatment of effluents, these include land treatment, aquifer recharge, aquaculture, silviculture, and direct reuse for industrial and other nonpotable purposes, horticulture and revegetation of disturbed lands. Total containment ponds and ponds for the treatment and storage of wastewater

prior to land application and other processes necessary to maintain minimum levels of application and treatment are considered to be part of alternative technology systems for the purposes of the grants program.

For sludges, the alternative techniques include land application for horticultural, silvicultural, or agricultural processes (including supplemental processing by means such as composting or drying), and revegetation of disturbed lands.

Energy recovery includes codisposal of sludge and refuse, anaerobic digestion (provided that more than 90 percent of the methane gas is recovered and used for fuel), and equipment which provides for the use of digestor gas within the treatment works. Self-sustaining incineration may also be included, provided that the energy recovered and productively used is greater than the energy consumed to dewater the sludge to a burnable state. Also included in the alternative processes and techniques definition are individual and other on-site treatment systems with subsurface of other means of effluent disposal and facilities constructed for the specific purpose of septage treatment.

Innovative processes and techniques are developed methods which have not been fully proven under the circumstances of their contemplated use and which present a significant advancement over the state-of-the-art in terms of meeting the national goals of cost reduction, increased energy conservation or recovery, greater recycle or conservation of water resources (including preventing the mixing of pollutants with water), reclamation or reuse of effluents and resources (including increased productivity of arid lands), improved efficiency and/or reliability, the beneficial use of sludges or effluent constituents, better management of toxic materials or increased environmental benefits. Innovative wastewater treatment processing techniques are generally limited

to new and improved applications of those alternative processes and techniques which I have discussed. They include both centralized facilities and individual on-site treatment facilities.

I mentioned earlier that smaller less densely populated areas just simply cannot afford the costs of conventional sewering and treatment facilities without drastically affecting the quality of life of the families there. Properly designed septic systems (constructed in adequate soils and suitable ground water conditions and properly operated and maintained) function very well and virtually indefinitely. Very few failures have been noted in locations where conditions are favorable and where centralized control of on-site systems is efficiently administered.

EPA encourages the use of facility planning grant funds to help secure centralized management of on-site systems and small plants, potentially an excellent and advanced solution to the problem of maintenance and operation. The establishment of a municipal district, combined with the rehabilitation and upgrading of existing on-site units could in numerous instances be the cheapest and most cost-effective solution. Their policy also requires a detailed look at the fringe areas which might use on-site systems, even when conventional treatment practices are the most effective for the center part of the city or town. Alternatively, in areas where on-site systems are not environmentally acceptable nor meet the requirements of the law, reliance may be placed on the piping of septic tank effluents by small-diameter gravity or pressure sewers to suitable subsurface or central treatment. These could be more suitable and less expensive solutions. These small flow systems are grant eligible and are encouraged wherever they are cost-effective. A growing number of projects utilize these concepts.

One excellent example is the successful use of individual home or cluster-unit lagoons to receive septic tank effluents where soil absorption beds will not function. Many small communities can now meet Federal standards with sewage treatments ponds or lagoons. The requirements for suspended solids in the effluent of these ponds has been adjusted where climate and geographic conditions allow and where quality standards will not be violated. At present, there are between 2,000 to 3,000 such ponds which provide generally adequate treatment without overly sophisticated or costly operation and maintenance.

These ponds, when combined with land application of the effluent, achieve the zero discharge requirement. EPA is pressing vigorously for publicly-owned treatment works to use land treatment to reclaim and recycle municipal wastewater. The return of nutrients to the soil and the recharge of ground water are two vital benefits of land treatment. USDA, in cooperation with EPA, is taking a close look at the land application of effluent and sludge, particularly to lands producing food crops, to evaluate this method in terms of its potential hazards from pathogens or toxic substances being introduced into the food chain.

The reclamation and recycling of wastewater combined with water conservation are of direct interest to all of us. Substantial savings are possible from reduction in wastewater flows entering the treatment works. Both by lower capital costs and lower operation and maintenance costs are the result of reduced flow. Simple low-cost measures such as water saving devices in toilets and baths can result in 15-20 percent savings in wastewater flows. Reduction of flows in individual disposal systems could achieve extended life and fewer maintenance problems for the absorption fields. The new Clean Water Act requires consideration of water conservation as well as energy conservation and recreation

and open space opportunities for each project. It also requires establishment of a public information program on recycling and reuse of water and wastewater volume reduction.

Now for a bit of the bad news, on September 7, 1977, EPA sent out a request for proposals to revise the Manual of Septic Tank Practice which was issued by the Public Health Service in 1962. We had hoped that by this time the contractor would be well underway and we could see a first draft of the revisions. However, there has been some difficulty and delay in getting the proposals evaluated and a contract let. At this point, we are not sure when the contract will be let nor when the contractor will submit his final revised version for printing.

Let us turn now to national research aimed at eliminating pollution from small wastewater flows. The on-going research is divided into basically five categories: (1) On-site technology, (2) collection technology, (3) septage technology, (4) institutional and community-wide management, and (5) futuristic and anticipatory systems. In the on-site technology research area, the approach previously was previously giving highest priority to systems which are compatible with present socioeconomic patterns and lower priority to more novel methods which will have greater impact on the habits and sensibility on the user community. Starting in FY 77, however, research priorities were expanded to include newer, promising, innovative approaches to on-site wastewater systems. Projects in this area include identification, evaluation, and comparative evaluation and demonstration of on-site systems, plus some basic research on the more promising alternative on-site systems which are more closely allied to traditional treatments and disposal methods. In addition to work on individual home on-site systems, there is a serious need to devote research efforts to similar technologies

adapted to larger point sources of commercial or institutional nature, seasonal homes, recreational sites, and clustered or community developments.

Research in the collection technology has been in demonstrating higher priority pressure sewers, followed by a state-of-the-art assessment of vacuum sewers and small demonstrations of these vacuum sewer systems. The last major items to be accomplished in this activity are the gathering of long-term operation and management and treatment data on pressure systems; complete costs of operation, management, and treatment; and information on other advanced collection techniques.

In septage technology, the septage handling has progressed through characterization and small plot treatments studies into field demonstrations. All of these data combined with the management information base, will be presented in a practical handbook on septage management which will array the applicability, capital and operating costs, environmental impacts, and design methods for all viable septage handling operations.

Institutional and community-wide management research is to satisfy the immediate and long-term needs of the construction grants program in fulfilling the directives of the Clean Water Act of 1977. The approach of this research effort is to provide the necessary information for small communities to develop management plans which best meet the political, technological, physical, and economic constraints specific to their situations. The research projects which are planned or are underway include (1) a preliminary review, options available, and experience with and specifics of the options employed; (2) indepth community-wide management study and demonstrations specify insensitivities to various technologies, legislative bounds, and other pertinent factors; (3) development

of a handbook which will provide guidance to planners, engineers and public officials on evaluation, implementation, and maintenance of community-wide management systems.

Futuristic and anticipatory systems research is to anticipate non-sewered wastewater processing systems for the year 2001 which is compatible with building technology at that time. The approach will be to establish the baseline (2001 dwelling design and construction technology), develop promising wastewater/energy conservation systems commensurate with this baseline, and demonstrate the most favorable systems. Close liaison with several public and private agencies will be utilized during the study period. Specific projects planned are (1) establish baseline conditions and anticipatory research goals, (2) technology development employing appropriate energy sources and equipment compatible with 2001 dwellings, and (3) demonstration of the most promising wastewater systems in conjunction with other agencies, as part of total home demonstrations.

In addition, the Clean Water Act Amendments of 1977 requires the establishment of a clearinghouse to collect, catalogue, and disseminate criteria, data, and other information about on-site systems. EPA's Environmental Research Center in Cincinnati will be responsible for the clearinghouse, perhaps utilizing the assistance of a private institution by contract.

These are the major national happenings in home sewage disposal as I see them now. While EPA has the lead in this area, other departments are working quite closely with and cooperating with EPA in establishing goals, procedures, and regulations.

I am happy to have had this opportunity to be with you. I have enjoyed your program this morning, and I am looking forward to being with you the rest of the day. Thank you.

Question: The Extension Service has, historically, been the lead organization in collecting and disseminating information on home sewage disposal. Will the establishment of the EPA clearinghouse duplicate your efforts?

Answer: A clearinghouse could or could not be involved in dissemination. The Extension Service could continue its role of education and information dissemination using information supplied by the clearinghouse. It is not a duplication because, I think, we basically will reach different audiences. It takes more than one organization to reach all the audiences. We may reach into some urban and suburban areas, but our audience is still basically rural. EPA will, I assume, be orienting its efforts toward federal, state and local governments (an emphasis more toward the urban and suburban audience).

MONITORING THE PERFORMANCE OF SYSTEMS UNDER COMMUNITY MANAGEMENT

by

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Introduction

In the past the role of monitoring has been poorly defined in regulatory water quality management programs. The necessity of monitoring in order to secure data on which management decisions can be made is widely accepted; however, the methodology necessary to obtain statistically sound data is lacking. Given the "out-of-sight" characteristic of effluent from septic tank systems, monitoring is particularly critical to obtaining accurate information on the performance of the system in terms of the quality of effluent being released to the ground water. This is especially important in some systems where failure of the system does not result in a noticeable problem to the homeowner but rather in the discharge of insufficiently treated waste to the ground water supply, a problem of major importance in mountainous regions which often lack suitable porous media for adequate treatment of the effluent. Once failure of the system has been defined, it is the responsibility of the management organization to insure that the disposal systems are functioning properly. This results in activities such as pumping tanks, repairing or rehabilitating systems, etc., which will be undertaken after a decision has been made that the system is not functioning properly. This decision must be based on statistically analyzed data.

Background

The physical methodology for monitoring ground water has been described by a number of authors (Schmidt, 1976; Todd, et al., 1976; and Fenn, et al., 1977); however, the statistical aspects of designing

a ground water monitoring network are lacking. Community management of on-site disposal systems is a relatively new concept. As a result there is virtually no information available in the literature on the design of monitoring systems to provide data for the community management organizations. When these organizations are established, ordinances and regulations are passed by the governing bodies which invariably indicate that monitoring is necessary, but they fail to indicate how the monitoring is to be carried out so that the data obtained is statistically meaningful and can be used in making decisions. For example, the following quote from the ordinance establishing rates and charges for sewage disposal service and providing for its enforcement by the Georgetown Divide Public Utilities District (GDPUD) of Georgetown Divide, California is typical (El Dorado County Health Department, 1972).

> "To assure protection of surface and subsurface waters the district will maintain a watershed monitoring program throughout said areas of said improvement Districts A and B, such programs to be in conformance with standards determined in conjunction with the (El Dorado) County Health Department, the Regional Water Quality Control Board and the Bureau of Reclamation."

The monitoring system established by the GDPUD consists of six monitoring stations, inspection of septic tank effluents, and analysis of soil cores. This monitoring system might not be adequate especially in areas subject to system failure by direct discharge of effluent into the ground water (i.e., areas where systems are located on inadequate porous media such as the fractured bedrock common in mountainous regions).

Monitoring Approaches

There are two basic types of monitoring which will be necessary in order for community management organizations to obtain the data needed to carry out their responsibilities.

1. Inspection monitoring -- The monitoring involved in the routine inspection of an on-site system to see if it is exceeding design discharge of pollutants to the ground water.
2. Trend monitoring -- That monitoring which detects over time and space the cumulative effect of the management organizations pollution control efforts.

Inspection Monitoring

Inspection monitoring will be used to determine if a given system is functioning properly. The statistics involved in this type of monitoring are similar to those used in effluent monitoring described by Popel (1976). Inspection monitoring is a necessary part of the decision making for which the management entity will be responsible. This type of monitoring involves defining the desired effluent quality in terms of which parameters are necessary to measure and the value which is to be expected from each parameter. A standard for a particular parameter will be given in terms of a mean and an acceptable variability. The values then measured from samples are compared to this mean and variability to determine if the value is within design limits. Values outside design limits which cannot be attributed to random variation will then be an indication of a malfunction in the system and can be interpreted as just cause for some type of management decision to correct the problem. How this will be done at least cost is not yet known. This involves such decisions as the sampling frequency which is dependent on the desired precision and the desired level of confidence.

For example, one can determine statistically the number of samples necessary to be 90% confident that the sample mean will lie within plus or minus three standard deviations of the population mean. It is

necessary to define the meaning of a sample in these terms since the sample mean is only an estimate of the true population mean and cannot be expected to equal the population mean. These statistical procedures offer a method of assigning a certain degree of confidence that the sample mean which is calculated is acceptably close to the true population mean. The increased cost involved in additional sampling must be compared to the desired precision and confidence level in order to reach the optimal balance between cost and information content obtained from the monitoring network.

In order for the statistical monitoring to be carried out, it will also be necessary to physically describe the system. Mathematical simulation of drainfields using the theory of hydrodynamic dispersion is necessary to determine the fate of the wastewater as it passes through the porous medium. This physical description of a system is a requirement if the design criteria are to be meaningful.

Trend Monitoring

Trend monitoring of the ground water will be necessary to indicate over an extended period of time the collective effect of the entire community. The statistical procedures for trend monitoring of surface water have been discussed by Ward, et al. (1976). Many of the same statistical techniques used for inspection monitoring, such as determining the required sampling frequency, can also be applied to trend monitoring. It will be the main objective of this type of monitoring to statistically check if there is any trend over a given period of time.

The statistical development which have been used in quality control can be applied (Sanders and Ward, 1978). A parameter which is being measured is assumed to come from a specific population defined by its

mean and variance which are determined from historical data. An upper control limit and a lower control limit can be determined based on this data and a given level of confidence. As long as samples indicate that values of parameters fall within these control limits, it can be assumed that the population has not changed. However, a significant number of samples falling outside these tolerance limits indicate that the mean or variance or both have changed and that the samples are now coming from a different population. This may indicate a need for management action.

Conclusions

In order for a community management organization to make decisions which will protect the quality of the ground water, an accurate data base must be available. All management strategies must be defined in terms that account for both the physical and statistical characteristics needed to define this data base.

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Editor's Note: Following Jim's paper there was considerable discussion; however, the tape recorder was malfunctioning at the time. The discussion centered on where the wastewater is to be monitored and what quality should be expected.

At sites where there is considerable soil, treatment, via extended filtration can be expected beyond the leachfield. On the other hand, without considerable soil below a leachfield, as we have in the mountains of Colorado, little, if any, further treatment can be expected before the water enters a stream or well.

A question was raised as to how this difference would be handled in a monitoring effort. The answer dealt with the fact that a properly designed on-site system should have an expected quality at the point where the effluent leaves the leachfield. It is this quality that would have meaning in a monitoring effort.

Another question dealt with the progress of the research work on on-site system monitoring performed to date. As the project is just beginning (with support for the Colorado Experiment Station) the comments presented today must be considered a progress report. The research approach will involve theoretically determining what effluent water quality a monitoring effort can expect to find and where and then validating the theoretical results in the field.

A member of the audience asked what water quality parameters will be measured. The answer pointed out that parameter selection must consider the major health and environmental concerns with the system and it also must recognize our technological ability to economically obtain the data and statistically gain meaningful and conclusive information. Currently, at a practical level, it appears coliform (health) and nitrogen (health and environment) are the major water

quality parameters of concern. This will definitely be examined in more detail as the research proceeds.

A SYSTEMS APPROACH TO COMMUNITY WASTEWATER MANAGEMENT

by

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Community wastewater management is generally carried out by some government agency, such as the local or regional sanitation district. Centralized management and planning usually lead to centralized technology as well -- for example, collection sewers and waste treatment plants. But the concept of central management is not limited to a single technology. It requires the availability of many technologies that may be used as alternative solutions for wastewater treatment. For example, in a dispersed mountain community where the soil, landslope and groundwater conditions may be different for each residence, a variety of on-site wastewater disposal systems may provide the optimum management strategy. In this way, each residence can have a waste disposal system selected and designed for the use and soil conditions present at that site. In some cases, several homes or condominiums may be served by a single large disposal system. And if the conditions warrant it, a central treatment plant may be considered as an alternative.

From this perspective, wastewater management can be handled as the system of individual treatment units present in the community. This view lends itself to systems analysis.

The Individual Wastewater Treatment Unit

First we must look at how we select the individual wastewater treatment system or unit, and then we can discuss how these individual units fit together in aggregate for management as a system.

Let us assume that there are several waste disposal systems that may be applicable to a given site. All of these are assumed to maintain

water quality standards. Let us also assume that information is available about the performance of each unit. The probability that any given waste disposal system will operate successfully is based on the ratio of the number of successful units divided by the total number of that type of unit installed. For large numbers of systems, this probability can be used for planning and management purposes. In other words, it represents a history or track record available for each potential design upon which we may base our decisions.

Using these assumptions, it is now a relatively simple matter for us to optimize several factors -- initial design, construction costs, maintenance requirements and replacement costs -- so that we are able to select a design that meets environmental standards with certainty and at reasonable cost. The key to this process is the fact that we have a minimum water quality standard that we must meet. This is called an environmental constraint. We also have several soil and topographic conditions with which we must be concerned, and for which we must design (figure 1). These can be considered as resources. For these physical conditions and for a given use, we can then consider which designs or methods can be used successfully. These are called technological constraints.

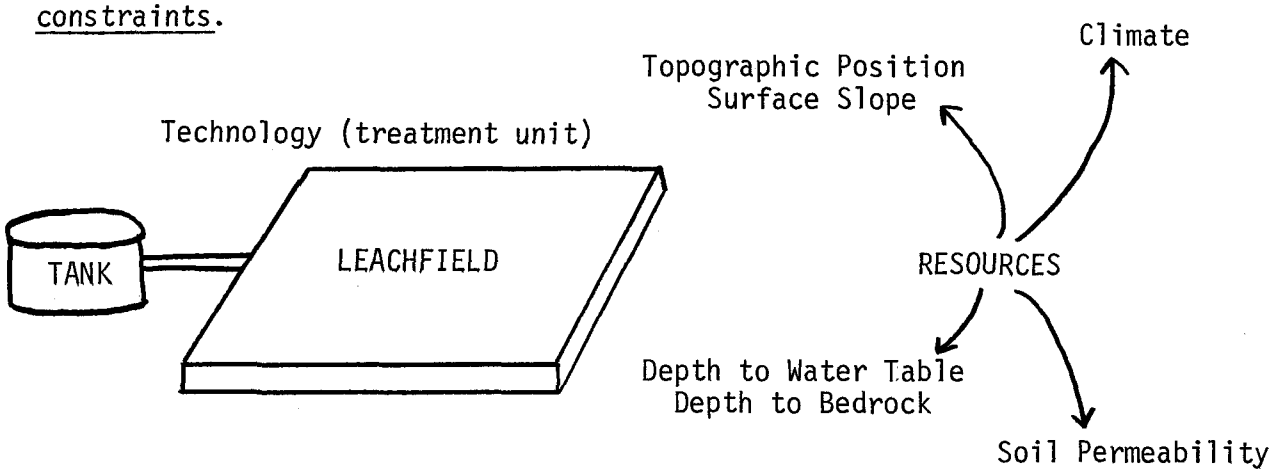

Figure 1. Resources Available at a Site and Technology that May Be Considered for a Given Location.

Given these resources and constraints, our problem is to select a design that meets our requirements at reasonable cost. This is not so difficult a task to perform if we are provided with accurate information about the resources and technology. One problem arises from our ignorance of how well most waste disposal systems really perform. There isn't a good definition of success or failure of a subsurface wastewater system. It is very difficult to know whether or not groundwater contamination is occurring. Some data of this nature is available for sand filters and similar point outflow systems, but only estimates are available for septic tank-drainage fields. This is because sampling outflow from a subsurface system initially requires many samples and, therefore, it can be expensive.

Community wastewater management involves the construction, maintenance, replacement and monitoring of many individual waste disposal systems or units. These tasks may be carried out by a sanitation district, a regional body of government or by semi-private and private firms, similar to utilities or engineering companies. Regardless of which organization manages the system, decisions would have to be made within a systems framework.

Now we must consider, not just a single disposal design, but many sources of wastewater. Initially, some of these residences or wastewater production sites will already have disposal units which may or may not be adequate. If they are not working properly, corrective measures must be made; if no other remedy exists, the system may be replaced. Also, homeowners will not join a management system all at the same time, so sites may be quite scattered throughout the community.

The same systems approach can be applied to many units as it was to the individual home. For any given potential disposal system, the

resources and constraints of that site, and the overall water quality standard, must be met. Now we optimize the same general factors -- initial design, construction cost, maintenance and possible replacement costs over the expected life of the unit -- while still meeting environmental and legal constraints. But within the management system, we try to reduce overall costs, at the same time that we allow for several different natural resource conditions and manage for a variety of uses, volumes and wastes.

There are advantages to managing the disposal systems collectively. Most important of these is better management because the system manager can monitor each site regularly and maintain it to prevent major problems. The average individual owner generally does not monitor or maintain the disposal unit. By joining the management district, the homeowner benefits by reducing his financial risk and by eliminating most of his responsibility. An added advantage of central management is the certainty of an expected result. It is difficult to predict exactly how well, or how long, a single waste disposal system will operate successfully, but with a large number of systems, this prediction becomes much more reliable. Also a well-managed community system can be significantly cheaper than installation of a large central treatment plant and can be less expensive for the individual resident than managing his own system.

Some general observations about the systems approach can be made. 1) A system of individual waste disposal units which rely upon local site conditions encourages innovative design. 2) The system of individual units <u>does not</u> encourage growth, because decisions must be based on environmental constraints and therefore the managers must recognize the limits of the natural resources to support large numbers of waste disposal systems. This differs significantly from the use of

central treatment plants which ignore environmental conditions and thereby encourage growth and development in marginal areas.

Limitations of the Systems Approach

Management of many wastewater disposal units in a community sounds like an appealing idea, but there are limitations which hold it back at present. First, much basic data on the performance of individual units is not available. This information must be collected before realistic performance probabilities can be established. To do this the data collection systems must be well thought out and designed to yield specific data. Secondly, it has not been done on any large scale up to now, except at a couple of limited experimental sites, such as Westboro, Wisconsin.

We need to conduct research into this area 1) to establish the criteria for successful operation of individual disposal designs; 2) to gather performance data for each of these major disposal designs; and 3) to initiate a demonstration project in a typical existing community to study the systems aspects of management, including economies of scale, the degree of community dispersal, and other factors.

The systems approach appears to be the start of a new wave in the field of sanitation management.

Comment: What we are discussing this afternoon, in the last two papers, relates more to the practical realities of institutionalizing management of individual systems. This morning we discussed the institutional arrangements (legal, economic, education, etc.). While recognizing that the institutional arrangements are very important and will require considerable effort at developing effective management institutions, we must also recognize that by institutionalizing such management we create new technological problems that must be solved if the management efforts are to be successful. Examples are monitoring system performance and planning the technological wastewater treatment system for each site which best meshes with the sites needs and the management approach.

PANEL DISCUSSION

"COMMUNITY MANAGEMENT PERSPECTIVES"

Opening Remarks

PERSPECTIVES FROM FHA

by

J. Leo Dirnberger
Chief, Rural Housing
Farmers Home Administration
Denver, Colorado

My title of Agricultural Engineer really has very little to do with my actual job although my education and some experience has been in that field. Right now I am working primarily in the field of water and sewer for rural communities. Work in the field of Home Sewage Disposal is dormant in our agency.

Like most agencies, we tend to react, so after getting our fingers burned in subdivisions with individual family sewage disposal systems, we have reacted. That really is what happened. Some subdivisions with wells and septic tanks turned sour because of contaminated wells and effluent running on top of the ground. I caught Mr. Cox's comment about the tomcat and agree that is pretty good criteria. If you are out far enough so that you have to have your own tomcat, we might approve an individual waste disposal system for you, but that is about the only place we would.

In recent years, we have really gotten into the housing business in a big way in Colorado. Last year we put over $40 million into housing in this state so it is a multi-million dollar business. The point is that we serve those people who, for the most part, cannot get financing in a rural area, meaning communities up to 10,000 population, any other way. Given those restrictions, we have to be pretty careful about what kind of subdivisions we approve for our loans. Therefore, we have gone away from individual water systems and individual waste disposal. In fact, our regulations state that individual water and

waste disposal systems will not be used if any other systems are economically or environmentally feasible.

I think it is also important for you to understand that we, the Farmers Home Administration, is not a regulatory agency. We are a lending agency. We have to determine if something is feasible and that we are going to be paid back. I think that is very important to remember.

Consequently, we have gone to subdivision approval. In subdivision approval, we look very strongly at the water and waste disposal systems. Who owns and operates them? Is it a local district, a municipality, or what? Do they have a good history of providing the services that are required for homeowners to have a system that is relatively maintenance or trouble free. If they do not have, we are going to think seriously before we approve that subdivision.

Secondly, if we do talk about (approval of) individual systems, we rely entirely upon the local health people. I am talking from the level of the state office so that if one slips by sometime without approval because the local county supervisor missed it, he may have a problem. I'm not saying we don't slip up. It does happen, but for the most part we get health authority approval.

We will not approve an individual system or subdivision unless there is professional technical assistance given to that developer. The professional technician looks at the soil and all other factors and says we have done what needs to be done and based on our professional experience that system will work in this subdivision.

Someone mentioned that perhaps another approval criteria should be added and that is that they (homeowners or subdivision) be part of a management system. We have not really addressed ourselves to that subject yet. I suspect that we will have to begin to look at that possibility. I can see some advantages, and maybe in some subdivisions

where it is not feasible because of distances to put in central systems, we could go with a local entity to manage waste disposal systems.

Now, I think there is another thing that is important for you to remember and that is we do not put money directly into subdivision development, neither loans or grants. We end up making loans to the individual to buy a residence on a lot within the subdivision. So, it is really not within our bailiwick to begin telling a developer how to design and develop his subdivision. All we tell him is what we expect if we are going to make loans in it. Then, if he does not want to try and build to suit the people we can serve, that is his prerogative. We are talking about low to moderate income people, so if you start talking about two, two and a half or three acres you are probably out of our ballgame anyway.

You may have concluded from these remarks that I am not an advocate of individual water and sewer systems for homes. If so, you are absolutely correct!

A CONSULTANT'S VIEWPOINT WASTEWATER SYSTEMS EVALUATION - A CASE STUDY

by

W. B. Heller

Up-to-date technical information regarding most subjects is accessible to anyone who knows how to find it. This information can explain any subject to the "nth" degree. If properly used, the information is a tremendous boon to the consultant. The consultant's problem lies not with the lack of information, but in the bulk of it.

In the field of sewage disposal, there are numerous collection, treatment, and disposal options. These options present a tremendous number of combinations which must be evaluated during a pre-design study in order to develop the optimum solution. This paper describes a case study of an approach taken to analyze wastewater treatment alternatives. The study involved an analysis of the management, institutional, operational, and funding possibilities along with the technical alternatives.

Study Area

The study area was the Big Thompson Canyon between Loveland and Estes Park. The study was a portion of the total flood recovery effort following the 1976 flood disaster. This is a long, narrow mountainous river canyon. Soils are typical mountain-type soils, consisting predominantly of granite and weathered granite.

Summer use of second homes and commercial establishments is heavy. The permanent population is a very small percentage of the summer population. There are no incorporated communities, districts, or formal organizations of any kind within the canyon.

Lot sizes are small, with 5,000 square foot lots being very common. Many of these lots are sandwiched between the river and a highway.

The receiving stream for any discharging system is the Big Thompson River, which is classified as a cold water fishery by the Colorado Water Quality Control Commission.

A survey conducted by the Larimer County Health Department indicated that the most common wastewater disposal method currently in use is the privy.

Approach

Four major tasks were identified:

1. Document pre-and post-flood conditions;
2. Determine opportunities and constraints;
3. Develop alternative solution strategies;
4. Screen alternatives and fully develop the optimum strategy.

The first two tasks included the items discussed in the section entitled, "Study Area." The final two tasks entailed the detailed development of alternatives and screening thereof.

Alternatives

The collection, treatment, and disposal alternatives investigated are listed in Table 1. Some of the processes were eliminated due to excessive operational requirements, inability to meet standards, or inability to perform under the conditions in the canyon. For example, septic tank/absorption fields were rejected because of soil conditions, lot sizes, and proximity to the stream and potable water wells.

Cost estimates were prepared for the construction and operation of the remaining alternatives. These were presented separately and as

Table 1. Technical Alternatives Evaluated

ITEM	PROCESS
Collection Methods	Sewers
	Gravity
	Pressure
	Vacuum
	Corridor
	Tank Truck
Treatment Methods	On-Site
	Septic or Aerobic Tank/Absorption Field
	Evapotranspiration
	Vault System
	Septic Tank/Sand Filter (Otis, R.J.)
	Mound
	Composting
	Privies
	Community or Canyonwide
	Stabilization Pond Systems
	Unaerated
	Aerated
	T. Evaporation
	Mechanical Systems
	Extended Aeration
	Conventional Activated Sludge
	Oxidation Ditch
	Biofiltration
	Rotating Biological Contractor
	Physical/Chemical
	Septic Tank Sand Filter
Disposal Methods	Soil Absorption
	Surface Discharge
	Total Evaporation
	Land Application

present worth. It must be pointed out that design and construction costs of some facilities are grant eligible, but operating costs are not. This tends to make alternatives with low operating costs more attractive than those with high operating costs.

The optimum alternative was a modified version of a system developed by R. J. Otis, et al. of the University of Wisconsin. Mr. Otis presented a paper at the second CSU-sponsored workshop. The system is referred to as "intermittent granular filtration." It is a discharging system consisting of a septic tank followed by a sand filter and chlorination. Wastewater is recirculated over the sand filter prior to chlorination. A very high quality effluent is obtained by the system. The system was modified to serve a community rather than an individual dwelling. A wasteload allocation was run on the river to verify that no stream standards would be violated.

Several of these systems are to be installed and will be operated by one management agency to take advantage of the benefits of scale. One of the unique benefits of this type of treatment is that it can be successfully operated under conditions of extremely light loading as well as conditions approaching design capacity. The system is also very amenable to a staged construction schedule.

The recommended collection system was a combination of gravity sewers, pressure sewers using grinder pumps, and hauling by truck.

Management Alternatives

Another factor which has a significant and direct impact on the cost of alternatives is the selected management system. Some technical alternatives cannot be implemented without first establishing an institution having taxing authority and operation and maintenance capabilities. The need for a public management agency is shown in Table 2.

Table 2. Acceptable Management System.

Technical Alternative	Management System	
	Private	Public
Collection		
Sewers		*
Truck	*	*
Treatment		
Septic Tank	*	*
E-T	*	*
Vault		*
Ponds		*
Mechanical		*

Some alternatives can be implemented by private individuals or by some type of agency. They include most of the on-site treatment systems and collection by tank truck. It was recommended that the vault and haul alternative not be implemented unless a management agency is formed. If a private citizen must pay $50 to have his vault pumped several times a year, he has a tendency to knock a hole in the vault and pour his grey water out the window.

If a combination of collection and treatment alternatives is chosen which have conflicting management structures, a publicly-managed system must be used. For instance, this could happen if sewer lines were used to transport wastewater to a common septic tank or if wastewater was hauled by truck to a mechanical plant.

Detailed duties of the agency were also presented. For example, grinder pumps are most effective if the management agency assumes complete control of the maintenance. If a problem occurs, the operator

can quickly pull the pump and replace it with a spare. In the shop he can repair the broken pump. This is quick, efficient, and the cost can be distributed to all users.

The specific type of public institution was also evaluated. There are seven types of agencies which are legally empowered to provide wastewater service in Colorado. These alternatives were screened primarily on the basis of political realities with local input rather than in terms of dollars and cents. This invokes the human element of engineering which is very interesting and rewarding.

Financial Program

The implementation of this project entails major capital expenditures and substantial operating costs. Although there is no financial aid available to offset operating costs, the capital expenses are grant eligible. Federal, state, and regional agencies are sources of financial aid. Each source specifies which elements of the collection and treatment system are eligible for grant monies.

The funding sources and the applicability of each were described and analyzed. The residents of this area can receive between 95 and 100 percent of the capital cost of the facilities including house connections, collection lines, and treatment plants.

PERSPECTIVES FROM THE COUNTY HEALTH DEPARTMENT

by

Dan W. Tipton
Jefferson County Health Department

I think in the regulatory agencies' viewpoint of institutional management of individual sewage systems, it is not yet established. The first thing that comes to my mind (and I never had experienced professional management of individual systems so this information is just what I picked up today and what reading I've done on it, but we have had considerable experience with sanitation districts and municipalities) is that the competence of the organization is really the basis of the whole thing that the county health department must see in order to have reliability in the system. I think Bill's last slide stating taxing ability and authority are very essential in having a management organization that is going to be useful. In addition, I would state that it has to be formed under the law of the state so that it does have the authority to perform the tasks that it is created to perform.

I would expect, if it is public entity, it certainly has to have representation of the people and it would necessarily have a board of at least one elected officer. It would need rules, regulations, bylaws and a constitution in order to handle details of management that would come up in the future. It also needs a method which would ensure financial solvency. If a management district, or whatever it is eventually called, is created there's going to have to be a guarantee that they are going to be able to operate financially. Also it's the regulatory officials' view that it would have to have some insurance of permanency. It couldn't be phased out at the end of the development period or when

all the lots were sold or when the developer decided to retire or whatever. So permanency is certainly a significant factor.

Of course, fitting into what I first stated, it has to have the authority to implement the management functions for which it's designed. It would have to have a responsible entity or person who can take action when problems arise, when an emergency occurs or when violations exist. The legal restrictions, from earlier talks today, to me appear to be fairly restrictive. I think it takes time to really digest and understand all the legal restrictions and particularly when grant money is involved and we try to identify who qualifies and who doesn't. That is an area that certainly needs to be explored and be thoroughly understood.

I thought I would mention that in my experience in at least in two situations, we've had serious problems with waste disposal systems that were operated by developers, corporations which exist for a profit. We found serious problems with systems operated by these people. Another problem that I would see where you have a group of individual systems under one agency, would be with the individual home owner who would abuse the system. Where you have continuous problems with one system due to the amount of water or the usage that it is subjected to, and if the individual knows that the district is responsible for everything that goes wrong with his system then there's a chance that this person would be careless. You'd see this probably more obviously in a rental unit. Admittedly water may restrict his use if there is a shortage of water or if he's paying to have it pumped or hauled. In the experience that I've had I'm sure that somewhere in the subdivision there is going to be a bad actor that creates 80% of your problems.

As far as creating a district in an existing subdivision or an existing area where systems are now in operation, I have serious question

if it is determined by vote, whether or not there will ever be a majority vote to get it approved. I've seen voting occur several times in regard to other utilities, public sewer and specifically water. In Jefferson County a lot of the negative votes in the formation of water and sanitation districts appear to come from people who don't want anybody else to live in their neighborhood, and where they are having problems with their water or their sewer system or whether or not they benefit personally from approval or disapproval of the system, is really contingent upon individual needs. If their sewage system is working properly and they are asked to vote on whether or not to join an institutional or management organization, I think there is a tendency to vote against it unless they are really the ones who are having problems. Again I think they see this as a method of controlling growth and many people in our county are very much against having anybody else move into the neighborhood.

Those are just some rough ideas that I would like to present. If in the discussion there is anything further to be reacted to I'd be happy to answer any questions.

STATUS OF EPA SMALL FLOWS MANAGEMENT RESEARCH

by

Don C. Niehus
Environmental Planner
Municipal Environmental Research Laboratory
U.S. Environmental Protection Agency
Cincinnati, Ohio

It's a real pleasure to be here today. This conference recognizes a real turn around in the thrust of EPA's approach to this area; you're getting a head start on the rest of the country in trying to come to grips with recent changes in the amendments to the Clean Water Act (P.L. 95-217). It's somewhat of a handicap going last because previous speakers have already touched upon some of my ground, so I'll try to take care of some of the loose ends as I go, and, hopefully, get the rest of them during the question period. As Bob Ward mentioned, I did work with the 208 program (OKI-Cincinnati) before coming to EPA. If there are any 208 people in the audience you can appreciate that 208 is not going to be the answer to all the problems in the first go-around. Much of the research that I'm involved with in Cincinnati is directly supportive of the 208 effort. Therefore, as we enter the continuing planning phase of 208, hopefully we can better tie down some of these other areas.

For the most part, 208 agencies across the country (and Colorado is very much excepted here from what I understand from talking to Bob) have done very little in the area of on-site management. In fact, most of the 208 agencies with which I'm familiar have taken the rather traditional anti-septic tank/anti-on-site management approach. Engineers and sanitarians have done a really good job in convincing planners that septic tanks are bad! Now it is our hope to try to re-educate planners,

engineers, and public officials concerned with water quality in order to get things turned around. Research has shown that septic tanks are not bad, per se, from an environmental engineering standpoint. It's the management of the systems that's inadequate. Management is what we're concerned about now. We're investigating ways in which local areas can manage on-site systems and other small flows systems to make them function effectively. As Jim Brooks and others have mentioned, EPA and Congress have come to the realization that for many small communities and rural areas, centralized systems and other conventional systems are not technically effective, environmental sound, or economically feasible. In many cases, on-site systems and other small flows systems may be the only alternative at any cost.

What we are trying to do in our small flows research program in Cincinnati is, for the first time, to get involved in the institutional part of the game.

It probably comes as no surprise to many of you that research in small systems was a low priority, low budget effort within the agency for a long time. In fact, you had to know the right people to know that anything was going on at all. About the only person that had any direct interest in this field was James Kreissl, who is head of the EPA small flows research program in Cincinnati. Jim added a second man two years ago and just got a third man full time last year. I'm working part time in the program. Even now, it's a pretty small program when you compare it with all the money and people involved in the construction grants program.

Despite the issuance of PRM 77-8, "Eligibility of Septic Tanks and Other Small Treatment Systems", very few facilities plans have given serious consideration to the possible use of non-conventional wastewater

systems. The Clean Water Act, with its stronger planning requirements and construction grant set-asides, should provide a strong incentive to the greater consideration and utilization of on-site and small flows systems.

But before the new regulations can be fully implemented, there is a tremendous education process ahead of us. This begins with EPA itself and also with people at the state level who are involved in reviewing the facility plans. As part of this education effort, this coming August in Cincinnati we're having a training workshop for EPA and state project officers who will be designated responsibility for on-site management activities. For a whole week we will bring these people in and have an intensive training session to explain to them the state-of-the-art in terms of on-site technology. I will be spending a morning with the participants describing what can be done in the area of on-site management. Hopefully, the EPA Regional Offices will designate people specifically to review small flows projects. We are also hoping that the states will develop specialized expertise in a limited number of staff to specifically provide technical assistance to the consulting engineering community, to review the facilities plans, and to make sure that these requirements and regulations are implemented.

Research on Small Flows

We define small flows to not only on-site systems but also cluster units and alternative collection systems (e.g., small diameter pipes, pressure systems, and vacuum systems). Discharge may be either on-site or off-site and be either subsurface or surface. Other speakers today have given you an overview of the technical alternatives.

The EPA Small Flows Research Program has been divided into four main categories. The first three areas represent our traditional thrust in Cincinnati wastewater research: on-site technology, collection technology and septage technology. We've done a pretty good job in these areas. Much of the information that we have come up with has been assimilated and translated into understandable form by our Technology Transfer staff. Those who want to become better acquainted with the state-of-the-art of various techniques in this area are directed toward a three-volume set of reports that were recently published by EPA Technology Transfer.

We are also doing additional research (this morning Bill Cox mentioned a few projects which we have underway). One of the main projects that will be of direct assistance in this area is a contract research effort being done by SCS engineers, that is collecting and evaluating performance data for a large range of alternative and innovative small flows systems. The results should be available later this year.

As a follow-on to that effort, we plan to demonstrate some of the techniques in order to supplement operational data under varying local conditions. Those sites have not as yet been selected. Obviously we get requests for money for demonstrations continuously, so we have quite a file of communities and equipment manufacturers that are interested in demonstrating their systems. We hope to begin this effort during our next fiscal year, which begins in October.

The final category is institutional and community-wide management research. Some work in this area has been done for EPA by the University of Wisconsin, primarily by Dave Stewart, formerly on the staff of the Small Scale Waste Management Project. Another report in this

series should be released later this year. The effort in this area of our research program, however, has been fairly minor. The state-of-the-art in terms of on-site management districts or other type of management approaches is poor.

Planned Community Management Research

What I want to do now is to give you a detailed description of a research project for which I am project officer. During the current fiscal year, we have committed significant resources to a new research effort which will concentrate on management alternatives for on-site and alternative small community systems. Unfortunately, we don't have anything to show you right now because the procurement is going through the selection process right now. The research community has shown tremendous interest in this project. Over 230 engineering firms, universities and other consulting firms have expressed an interest in this project. Such a response is encouraging to us at EPA because it shows that the time is right for this research. The due date for receiving the proposals from those individuals who decide to respond to the RFP is June 2. We will be spending the summer agonizing over, hopefully, not too many proposals, and selecting a contractor approximately in September. The period of performance for this project is 19 months.

Unfortunately, our scheduling on this project obviously misses the deadline for implementation of the new Clean Water Act regulations which is this October. But, in the meantime, we hope to provide some information through the Small Flows Clearing House, which is to be administered by Denis Lussier in Technology Transfer. Thus, some information will be put into the field before the completion of this research effort.

The planned research, "Institutional Arrangements for the Management of On-Site and Alternative Wastewater Systems", has several different, but related objectives: (1) develop case studies of existing on-site management practices, (2) evaluate selected state legislation, regulations, and policies relating to on-site and alternative systems management, (3) identify issues, problems, and opportunities for management, (4) develop and evaluate management alternatives, and (5) recommend selection and implementation procedures for local planners and public officials. These objectives will now be further described.

I'm surprised that no one today has discussed more specifically some already existing on-site management agencies. For a number of years, Tim Winneberger has been one of the chief proponents of on-site management districts. It is largely through his efforts that the State of California has adopted legislation last year which specifically authorizes the establishment of on-site management districts. Approaches other than a special district are also possible under California law. It is not surprising that the majority of the action has been in California. Approximately a dozen different management districts have been established in California. Some of that experience has been documented in HANCOR publications which were mentioned this morning. For the most part, the literature in this area has been of a descriptive nature, rather than providing hard dollars and cents in operating costs and evaluation of successes and failures in terms of actual performance. What we hope to do in our case studies is to spend at least a week at each case study area. This should provide sufficient time to evaluate successes and failures of various types of management arrangements. We also plan to identify the factors behind the establishment of each district, the kind of problems they have had, the kind of institutional

constraints, and the legal problems they have had to overcome. Most importantly, we want to see to what extent successful experiences can be transferred to other areas.

Before moving on, I don't want to give the impression that California is the only place where something has happened in the management area. Other areas that have been frequently mentioned in the literature are Boyd County, Kentucky; Fountain Run, Kentucky; the Whitewater River Conservation District in Vermont has been involved in system performance monitoring and providing technical systems to home owners; and Westboro, Wisconsin, has been involved with small diameter collection systems. We have not yet selected the case study sites. In fact, if any of you know of any areas please let me know. I'm sure that there is information that we haven't come across at this point.

A second objective is to look at a cross section of states. Here again, I'm surprised that very little has been said today about the states' role in system management. It's not just a local effort. We want to identify the extent to which the states are becoming involved, in what ways the regulations may either inhibit or encourage local control, operation and maintenance of on-site systems, the type of political and institutional constraints at the state level that we must be concerned about.

There has been some discussion already today about the pros and cons of on-site systems. The next phase of our project is to look at some of the problems, constraints, and issues involved in on-site management. Some of the disadvantages of non-central systems are as follows: management of non-central systems untried, more confidence in conventional facilities, provision for future growth more difficult, and unfavorable biases in regulatory and funding

agencies. On the other hand, there are many advantages to non-central systems: utilize existing functional septic tank systems, no need to extend sewers to isolated homes, less costly, more ecologically sound, and may permit more rational community growth planning. What we are trying to do in this part of the research project is to develop a framework to identify institutional alternatives, to identify some of the problems we have to overcome and to determine the public acceptability of various approaches.

All of the previous information will provide background material. The key task is the identification and evaluation of alternative approaches to managing on-site and alternative systems. There is not a single best way to do it which is appropriate everywhere. Each of the existing management arrangements that we know about is different. The best approach in any given area will be dependent upon local political and institutional arrangements already in existence.

Many different agencies will be involved in system management. At the state level, responsibility may be shared among the departments of natural resources, plumbing, health, environmental protection, and planning. Even with traditional systems, responsibility in many states is divided. Of course, after EPA was set up many states also reorganized so that responsibilities were more centralized. Even so the responsibility for on-site systems has generally remained separate. This presents some institutional problems at the state level.

At the local level, responsibility for managing, operating or regulating on-site systems may be divided among an even greater variety of potential actors. Responsibilities may be assigned to one or more of the following: public departments of health, plumbing, planning/development, public utilities, wastewater district, 208 planning agency,

soil and water conservation district, homeowner, installer, septage hauler.

It is important to understand that the new EPA regulations do not require that the systems be publicly owned and operated. Actually there are two different funding mechanisms within the Clean Water Act. One is for publicly-owned and operated systems, the other is for privately-owned systems for which a public management agency will apply for funds and will adopt procedures to assure adequate operations.

In order to obtain adequate maintenance and operation of on-site and alternative systems there is a whole variety of responsibilities and different tasks that must be performed, whether it is by the public sector or private sector. In the RFP for this project, there was a list of about twenty different functions. Each of these tasks must be undertaken in order to insure adequate performance. Many of these functions could probably be combined or switched from one category to another. I've summarized these management functions in Figure 1.

Figure 1. On-Site and Alternative Systems Management Functions.

1. Planning	Water Quality Management Design Standards Plan Review and Approvals Design of Public Systems
2. Regulation	Installation Inspection Permit Issuance Licensure/Registration Performance Monitoring Enforcement
3. Management	Grant/Loan Applications User Charges Administration Public Education
4. Operations	Installation of Public Systems Performance Monitoring of Public Systems Repair and Replacement Septage Disposal

An important step is the development of a plan for the community showing where various types of wastewater systems including centralized on-site and cluster systems are appropriate. In large part, this task will require a modification of the facilities planning process as we know it today. Another research project that we have ongoing is a contract with Urban Systems Research and Engineering in Cambridge, Massachusetts, which is specifically attempting to develop a process for small flows community planning. The project will define a process by which consulting engineers, the audience for this report, will be able to more explicitly consider the problems of existing on-site systems, plan for future systems, and evaluate the alternative combinations of technologies in addition to consideration of more conventional systems. The completion date for this project is the end of this year; the report should be out next spring. We anticipate that this report will have a major impact in assisting consulting engineers and state and EPA reviewers review facility plans for on-site and other small flows projects.

One of the traditional activities of local and state agencies in terms of on-site systems has been regulatory control. Many different approaches can be taken in this area. If the system is owned and operated by a public agency, however, there could be a conflict of interest in terms of monitoring the performance of the agency and taking enforcement action. Therefore, in terms of a public agency, these probably should be separate. Where there is private involvement, a public agency (whether state, regional or local) can be involved through the issuance of permits and licenses, through certification, and so on. Again, as I mentioned this morning, one of the bottom line tasks that has to be done in terms of the Clean Water Act Amendments is public monitoring of the performance of on-site and alternative systems.

The public entity, whether the systems are publicly or privately owned, should probably have some kind of coordinative responsibility. For example, this may mean applying for EPA and state financial systems, installation of the systems, or collecting monies for the amortization of the debt and operation and maintenance of the systems.

An often overlooked area that is extremely important is public education. We look at this as a systems process - as has been mentioned before. It's not an end-of-the-pipe system by any means. One of the things that has to be done in order to guarantee proper operation is the education of the homeowner in terms of proper operation and respect for the system. This can include discussion of water conservation efforts, water reuse, grey water systems, incinerator toilets, composting toilets, etc. Another topic which should be covered is the importance of waste segregation. Too often, homeowners who are not familiar with their systems, will dump grease and other organic matter into the system and very much reduce the life of the system and disrupt biologic processes.

In terms of the different management functions listed in Figure 1, we intend to develop models or different reasonable combinations of the responsibilities in the public and private sector. After one makes the decision regarding the public/private relationship, then the appropriate (local, regional, state) must be determined. As mentioned before there is a variety of agencies that may be involved and there are many different ways to combine them. Once that's done, we want to determine the factors that a community should consider in selecting from among these different alternatives. The last part of the effort will be development of recommendations for implementation, including model ordinances.

That describes the thrust of this proposed research. I think you will agree that it has a pretty broad scope. I have great expectations for the project.

Discussion

In the mean time, you might be saying to yourself, "I can't wait two years to get the results from this research." I would feel the same way if I were in your position, since the new regulations should be implemented in October. Nevertheless, I suspect that there may be a slight delay until the states and EPA regional offices get their machinery set up. In the meantime, we all have to get educated and see what can be done in terms of management.

DISCUSSION

Robert Ward

We have the panel and other speakers still in the room. I feel now we are free to have an interchange among everyone here so if you have a question and would like to initiate the discussion, please feel free to do so.

Audience

I've been here all day and I've heard about the management program and the EPA Grant program. I may be a little dense, but I don't really know what kind of management you're talking about. Are you talking about public, individual septic tanks; installation and repair type of service, exactly what?

Can anyone tell me what the management program is going to manage? What is going to be their function?

Bill Heller

What I envisioned when we did the study on the Thompson Canyon and a couple of other places that we have worked in, was on-site sewage disposal (normal septic tank and leach field). But because the soil conditions were a little shakey it wouldn't work forever without maintaining it. So what you try to do is set it up, just like a sanitation district, so that it would operate as a wastewater treatment plant and management personnel would go through and pump out the tanks as needed, they make sure the leach fields aren't failing and if they are they get back and fix those systems before they really go haywire and before everybody in the whole area has a bad problem.

The biggest problem, I think what you are getting at, is setting up that management organization will require getting the people to vote for it. You need half of them to vote for it. Most of you people here

are in an enforcement position and you know that it is an area that is real bad and you know it is real bad even in those areas, usually don't have 50 percent of it failing and a guy that doesn't have a failing system doesn't want to vote to spend money to hire some guy full time. That's one of your biggest problems and I think that again Floyd's right when he says you've got to go in and get good, strong data to show how big a problem you've got.

Jim Brooks

What we are looking for is an institutional arrangement, setting up a management system. I have to disagree with Don just a little because you used the word "private". The law is very specific; a public entity must apply in behalf of the private facilities a private organization cannot. What we can do is get a public entity identified and then if they do not want to manage the system once it is constructed, they can contract with a private organization to do so. But a private organization is not an eligible entity, as far as the federal government is concerned. Now, what we're talking about in management is: (1) O & M, (2) user fees, and (3) industrial cost recovery; those are really three main items that must be managed. When you have user fees, you have to have an organization that can send out monthly bills or semi-annual bills or whatever. Some way must be established to collect a user fee to manage the system. They're going to have to have trucks, etc. and do they have a collection system they are going to have to maintain. These are the things we have to identify. What is the management agency? Again, if we are in the 208 planning area, we cannot make a grant to anyone unless they are identified in the 208 plan as a management agency.

Audience

Could Mr. Mathew give us an example of how his management agency is serving that subdivision?

Floyd Matthew

The service offered by Utility Engineering Corporation encompasses all aspects of management and it goes a little further than that. I think the best way to look at it is as a home owner coming in and buying a lot or one that is already there and what is going to happen to him and what controls you have. Then you have to look at it also as a member of the board of directors. That way you can get an idea of how broad that the scope of services is.

Part of the home owners concern - you've got what we call client services or home owner services and the board of directors has to identify what kind of home owner services they are going to provide. In our system, when the home owner comes in to look at the lot, we have instructed the developers salesmen as to what they can tell that home owner, what's valid, what kind of options they are going to have for water and sewer systems on that lot. That is our first contact with them.

When the lot owner wants to build, we are the first people to talk to them. John meets with them on a lot with a check list of what that man has to go through in order to get water and sewer systems installed on that lot. We give him designed standards that we have worked out with the reviewing agencies. We help him try to process then all the way through the reviewing and regulatory agencies and get all of his permits. That is a customer service that the Crystal Lakes and Glacer View home-owners associations have decided to furnish. They paid us to develop these standard details and work with the county. We run a statistical

analysis on percolation tests in the area. We have our own spacing formula that we apply, our own design standards. Those are all customer services. We also standardize all of the designs so they can be managed effectively by one central entity. Every system that goes in, a system we manage, has the same disconnect on the septic tank pump out. There is also a standard detail that we've got for access and a maximum slope, right down to the details that are necessary. We can maintain those systems with one central entity.

Our management agency has come in ahead of time and we have worked with the developer and put together a physical plan for him. We've made recommendations to him regarding what kind of a management system should be installed as a perpetual system. We have worked with the county in developing the perpetuity in that system and structuring it so that it is perpetual (for example covenants on the lot). They write the lien, the sales agreement, these things all have to be matched and somebody has to take care of the details and actually write it out or it's not going to get done. You have perpetual control and the ability to collect.

We've also run a rate structure, a rate study, so our accounting people and our engineers have to come up with long term cost estimates - a ten-year capital investment schedule. We have to figure out how we are going to amortize that first cost and how we are going to cover these O M & R expenses. That's all done by this management entity. I'm not saying this is a selling factor, I'm saying that if you're going to develop a management entity you are going to have to do these same things.

Then we've got the board of directors for this management entity, whether it is a sanitary district or whatever it is. We provide them

with recommended rules and regulations. For instance, we certify the contractors that are going to work in that system because that is who the home owner is going to talk to first, and that contractor better know what is going on and what the rules and regulations are. We actually have a test that we give our contractors. It is even a little tougher sometimes than the county's in some respects. They have to work with us. Our manager is working then with the county, and here is where we interface. Without this kind of cooperation it wouldn't work. It wouldn't be professional. Our man helps the county with the inspection procedures. They do not delegate any of the responsibilities for regulation to us, but we help reduce their work load because we develop credibility with them over a long period of time, and we help with the inspection procedures then to make sure that the facilities are installed correctly according to the county's code. Our signature is required on the building permit before it is approved, the county has required that for any system that is going to be built in our area.

There is where the meshing is, between the regulatory agency and private enterprise. There is nothing that this homeowner has to do; by the way, we don't think you have to use this standard detail. We're saying you can use this standard detail. We've worked out all the details. We've analyzed the percolation rates in this particular area during the development phase. You don't have to use it, you can go through the normal procedures if you want to. Then the county has to go through all the normal procedures and you have to get a special engineered system. This is what management entails. That's why I'm getting into this kind of detail.

Then we go to the board. They establish policy and they authorize expenditures; they authorize customer services. If they have to spend one hour outside of their monthly meetings, we don't feel we are doing our job as a manager. This means then that we are responsible for all collections, all banking, all accounting, all bookkeeping. When we meet with that board of directors at the end of the month, we give them a complete fiscal accounting. They know who's arreared in payments, what kind of collection activities we've got going on. They know what kind of down time we had in our water and sewer system and what kind of maintenance problems we've got. We've got a cash flow worked out for them, so that we can show them that we're going to have enough working capital to take care of that system for the next four or five years. If there is a government grant involved, we're monitoring that government grant. We take care of all the legal problems, the interaction with the regulatory agencies. We arrange the annual inspections, we collect water quality samples, we maintain the trucks, we fill the clorinator tanks, make sure the clorinator is greased, etc. We monitor the electrical pull on all three poles on a three-phase pump, etc. I'm just trying to let you know it is a detailed operation. It takes a lot of people with a lot of capabilities to keep it going. You've got to have lawyers, accountants, operators, engineers, clerical people, people that know how to respond to an irate homeowner calling in and saying "My bill is wrong". We've got the sweetest little blond in Rapid City, you can't believe how she manipulates and handles those people. They always walk away smiling and happier than hell, and they pay their bill. Then we've got another tough guy that goes out and actually turns the water off if after 60 days we don't have it.

I went further than I wanted to but that gives you an idea of the broad scope of a management agency's activities. It's not simple.

Audience

Your definition of management is not what our definition is under 208 planning in this state. You're an operating agency and I'm going crazy because everybody is flinging all these terms around all day. We've just spent quite a few million dollars in this state coming up with a 208 plan and the thought that we're going to let new structures come in after we have spent the money to take care of small communities is about to drive me crazy. We would consider a good offering agency, but in Colorado I want any of the new community programs to be part of the planned 208 structure. Now, except for two of the four designated areas, all of the undesignated areas and the four designated areas look like they are going with counties being the management outside of the municipalities. The counties will be the management agencies that will do those things that he put up there. No one else will be grant eligible. The same things that work here, as long as the counties are management agencies, then they could be a homeowners association. They could do a thing such as yours. They could do anything as long as the county set the standards for whatever is going to go on in the small community.

Floyd Matthew

The only thing I'd like to comment on there is that in reality it doesn't make any difference whether the government does it or private enterprise does it. You don't just go praying and have an active staff that can handle this broad range of activities. It takes years to do that and so what we've done here in Larimer County is we've welded the county and the private enterprise in the homeowners

association and really the county is in absolute control; we just haven't formalized it.

Audience

The state has worked very hard to make units of local government the management agencies that are responsible for the land use decisions. "Management agency" is flung around when in essence in this state what is meant is an "operating agency" after the county applies for the grant.

Floyd Matthew

It depends on how you are going to identify it and define it. I think that's true, but say we couldn't get a grant and we would recommend that some grant eligible entity own that system if that turns out in the preliminary analysis to be the best solution for the homeowner. I agree with you.

Audience

I have a question for Don Niehus. You mentioned proprietary systems and something you were going to do next year. Could you expand on that a little bit.

Don Niehus

I have to be a little careful how I use that word. EPA is not in the position of certifying, reviewing, or recommending proprietary systems. The National Sanitation Foundation does that. What we intend to do in the next fiscal year will be to look at several systems for research and demonstration purposes. While our findings will be of interest to the design and regulatory communities, our intent is not to approve or recommend particular products.

Audience

After what I've heard today, if I want to develop some land and if I don't hire somebody, like Mr. Mathew or some other firm, I better

look out; I'll get into trouble. Are there other agencies here that we could go to for this type of information or should we continue with a firm like Mr. Mathew's. How are we going to start the development with all these regulations.

Dan Tipton

You asked if there were other consultants you could go to, or other management companies. I'm sure there are. I think for the health regulations, water and sewage, you've got to see your local county health department, but certainly if you're developing land you've got to talk to your zoning and planning commission. I think that is where you get the legal information on what has to be done and from there on I think it is your decision as to which consultant or which firm to use. Somewhere along the line you've got to make a decision on how you're going to handle water and sewage facilities.

Audience

There are so many agencies (EPA, etc.) and you know that they have the regulations and I'm not criticizing the regulations at all. I'm wondering how we get in contact with them.

Robert Ward

One thing with respect to the question that you raised that has come across at the university is with respect to extension activities. Years ago the extension service put out numerous bulletins relative to designing a home sewage disposal system. That was really prior to a lot of the counties getting in as extensively as they have in developing regulations. What you find is that over the years the extension service is beginning to taper off in publications because, in my own opinion, these county regulations are now very thick books that tell you exactly what you need to do and there is no need to come out with an

extension bulletin that violates your county regulations. I think one of the first things that you would want to do would be to get the county regulations with respect to wastewater disposal for a noncentral area being developed. How you wade through that, whether you go through that yourself or whether you hire someone to go through it, would be up to your judgment as to whether you think you could handle it or whether you prefer to pay someone else. It is interesting that the regulations are getting as extensive as they are, especially with respect to your comment on the extension service.

Audience

I think that in so far as the EPA is concerned here today, and what you've told us, is related to getting a grant from them. If you choose not to get a grant then the EPA regulations will not be applicable to you. If you choose to get a grant through EPA, then you have to comply with their regulations, but the first people you have to go through in connection with an individual sewage disposal system in Larimer County is the Larimer County Board of Health. If you choose to go further and get a grant to set up this management system, then you will have to comply with their regulations whenever they decide what they are going to do.

Audience

Getting back to Floyd's management consultant service and the public entity, where do you separate the two? I'm sure he has an efficient operation which provides all the things necessary to maintain the total system. He has provided for these board of directors. What happens if bankruptcy or something comes to his company - how many more of these are available to a board of directors like this that can take over and do the job he is doing now. Who has the responsibility in such a

situation? You have a board of directors with all these systems and they don't have the understanding that Floyd does. Who do they go to then?

Robert Ward

I think that is a critical point. We need people trained in the field. I don't think that there are that many that are well trained. Initially, I think that is a very good concern because if you did lose a firm that was working with you, there is not that many people that are trained in this area right now. I think the federal stimulus is going to create the demand for people in this area that is going to result in more training at the universities which will eventually filter down into the consulting firms that will provide that expertise. Right now, I really don't know where someone like that could go.

Jim Brooks

I think you should keep in mind that the federal grant is only open to those homes and commercial activities that were inhabited on or before December 26, 1977. New developments are not covered and therefore they would have to go to the county and state agencies to determine what the applicable regulations are.

Audience

You mentioned residences in existance prior to December 26, 1977. Now, on any new construction is it conceivable that they still may be eligible based on the cost effective study?

Jim Brooks

No. They are excluded from any grant.

Audience

Suppose a cost effective study would indicate the individual systems may be the way to go even for a new area or community.

Jim Brooks

Then they would have to be funded by whoever is developing the property. If it is a new subdivision, whoever is developing the property (should be responsible for providing needed facilities). There would be no federal money available to them.

Audience

Mr. Tipton, as a consulting engineer, if I came to your county (Jefferson County) with a group of individual sewer systems interested in a management type plan, would your health department be interested in that type of approach?

Dan Tipton

My answer would be yes, but I would wait until we got the results of this project and the models to determine whether or not your proposal was worth considering.

Audience

Based on information available at this time, what would be the general opinion of health departments for this type of feasibility study?

Dan Tipton

I think if it were properly set up and met the criteria that I mentioned, I think it can be a very helpful situation for the local health department.

Audience

I think our Board of Health (Boulder County) is interested in the management concept.

Audience

I would like to know what the state's position would be on that. I represent a small county and in our county, it would be taken through the county commissioners because by statute they are the board of

health. But then the state oversees everything we do, so we wouldn't want to do it unless we had the state's blessing approving the management.

State Health Department Representative

I think EPA is coming up with something that is going to be real good. For a long time this state has been getting about $40,000,000 a year to participate in controlling pollution from community systems. In Colorado we have 140,000 estimated individual sewage disposal systems and that's being added to by about 6,000 a year. That's 16 percent of the state's population. They pay taxes too, but they haven't been getting anything back. I think it's time we get into this because even if no new systems went in we still have just less than 150,000 of these systems now. I think the management plan is a good plan. We already have a district law. I think if someone wanted to organize a district, they should start out on the basis of developing it around the existing water and sanitation district law.

Audience

The staff of the health department that I'm on the board for, is trying to throw the ball to me. I wasn't at the meeting on Monday and I'd like to have Brian Miller to explain the small step we took in a new subdivision on Monday night when I wasn't there.

Brian Miller

On Monday night the board of health reviewed a subdivision plan and in that the cluster system of septics and leach fields was proposed and the board of health did approve it then. It was a small step and from the stipulations, which I can't remember exactly what they were, the board of health required sort of a management type of system that we are discussing here now.

Robert Ward

It seems to me we've got EPA at a federal level very active and promoting community management, and we apparently have quite an upswell of interest from developers, counties and so forth. It seems to me that the State of Colorado is caught in the middle. Presently I don't see any action at the state level. What should the state be doing?

Audience

The state needs guidelines from EPA before they can act and we do not have the final guidelines yet.

Robert Ward

Beyond the regulatory aspects, is there anything from the point of view of the legislature with respect to maybe passing a law like California did to specifically deal with this? In other words, should the state begin to get more actively involved from the legislative point of view or are our existing laws and institutions capable of handling it?

Audience

State laws would have to be passed based on the federal guidelines.

Audience

What happens in the meantime? Suppose a new developer comes in, or a subdivider, who wants to create a management district for individual systems. The developer goes to the county and the county says we don't have any guidelines, we don't know what to do. He goes to the state and they don't have any guidelines. There ought to be a method for an interim basis. Time is costly to the developer. If he has to wait two years just to get a guideline, he loses money.

Jim Brooks

There again, you are going to have to look to the state and county for the guidance that we were talking about a minute ago. In regards to that I would like to throw out another date because back under Public Law 92-500, collection systems are eligible. The eligibility of collection systems is based on October 18, 1972. At least two-thirds of the community must have been in existence on or before that date before collection systems can be considered eligible. The new act says as of the enactment date of this law, individual systems, or small clusters of systems, are now eligible. Actually, the new law gives incentive for planning for areas that have no service at the present time, other than maybe a privy or a septic system. Now, if we look beyond these dates, there are no federal funds available for new development, so the county and the state are going to set up their own rules, regulations, and design criteria for individual systems. Hopefully, they will set up some kind of guidance for management agencies.

Audience

Regarding these dates, December 26, 1977 is the magic date after which no other development is eligible for grant funds. Is that correct?

Jim Brooks

Yes, for individual systems.

Audience

Suppose for example, we had a group of homes in the area and they applied for a grant to service them with small individual systems. What would be the chances of their obtaining federal support?

Jim Brooks

The applications for that group of homes must be submitted and the projects will be funded in accordance with the priority system

established by the state. The money available and the priority determines the chances.

Bill Cox

That December 27, 1977 date is for grants for privately-owned home individual systems - not public.

Jim Brooks

Public treatment systems would be eligible.

Bill Heller

Talking about these EPA grants, I feel it is almost a moot point for several reasons. One is that if you can get EPA money you still have to do a step 1 facility plan - prepare an environmental impact assessment which is a very costly and time consuming thing to do. In addition, usually with this kind of system we're talking about a rural area or semi-rural situation. The treatment plant itself is not the major expense, it is the collection lines and if these are not grant eligible, it doesn't do much good. There are other sources of funds; HUD, FHA, etc. have money through grant and loan program that will help fund collection lines. Say you can put in a system that's going to cost $150,000. The treatment plant might cost only $40,000. With a local share of $110,000 (completely local share) we really haven't gained a whole lot by getting 75% of $40,000. Not to mention the fact that there is no money in the program anyway.

Robert Ward

There is another point that we're not emphasizing. Although a community is eligible, it still has to go through the state and get on their priority listing. The amount of time that you can sit on that list, slowly moving up as money becomes available, may be years. Even though you are eligible, that doesn't mean very much unless you have

a complete understanding of the state priorities for their construction grants.

Bill Heller

In Colorado there is so long a priority system, you can never get one funded.

Audience

In April new guidelines were issued by FHA saying that its loan policy was to be directed more toward financially-destitute communities. Do you see a follow-up in that perhaps you will be able to give loans for sewage systems in communities that are other than standard treatment. Maybe for community management systems like we've been talking about today.

Leo Dirnberger

FHA does have a community facilities program and as Bill said, there are water and sewer possibilities. There are also loan and grant possibilities. Again, you run into the same kind of problem as far as money is concerned, particularly with the grants. The grants get used up and there you sit for the next two years or three years on a list waiting for your turn to come up. By the time your turn comes up, you probably couldn't care less or you've done something else. You've got that problem as far as funding is concerned.

Audience

Do you think the new regulation dealing with the smaller financial base will bet a more top priority.

Leo Dirnberger

I can't answer that. That is strictly a policy question and someone higher up the ladder than I am will have to answer that question for you.

Audience

When you are talking about small flows, is it just a general EPA organizational term or is there specific criteria for this?

Don Niehus

As I described in my presentation, our use of the term "small flows" includes a wide range of technologies. Our concern in the past has roughly been defined as systems with flows less than 1 mgd. Although the 3,500 population figure in the draft regulations is about one-third of our informal figure, this criterion presents no problem. As with conventional systems, it is helpful to view the area in terms of various collection, treatment, and disposal options. For small flows systems, many combinations are possible either on-site or off-site. Another important characteristic is whether the system serves one house, a cluster, or a "community". Disposal may be either surface or subsurface.

Audience

It seems to me there is a considerable resistance in Colorado against the use of an individual systems. For example, the individual sewage disposal act encourages and requires utilization of the engineering profession, but most health departments interpret that to mean that an engineer will design it in accordance with their regulations rather than use his own expertise in adapting his knowledge to the problem of that particular site. Some years ago there was an effort to designate areas of the state that were unsuitable for conventional septic tank leach fields. Today we've talked about the fact that the septic tank leach field is a viable alternative providing you have sufficient soil.

The USGS has put out a map, several years ago, that tells you that 68% of the nation does not have suitable soil. In fact there were

extreme connotations against the use of leach fields, yet in Colorado there are some 140,000 septic tanks and probably 99% of the individual plants in Colorado are septic tanks and leach fields. There is not an assertive effort by the regulatory agencies to implement new technology. We have many new systems today, land applications, in the soil, some want to eliminate use of water entirely, and yet if an engineer were to propose that, he would find himself spending about twice as much money to innovate a system that probably would pay less than if he went ahead and did a perk test and standard septic tank/leaching field system. Knowing well it probably wouldn't work. My question is what effort has been done in this state first to designate these areas that do have geologic strengths and what effort has been made to implement new technologies from the local level, people that control it, the county health department. That's where the innovations have to be initiated.

Audience

One of the problems we have at the county health department level is that we are a regulatory agency. We have to abide by the statutes and regulations. We can't go beyond that. The legislature has to pass enabling legislation to allow some of these things. We believe we cannot get into some of these innovative designs or into operation and maintenance until enabling legislation is there to back our actions. We're regulatory enforcement, we can't go around creating our own rules.

Audience

I have to defend the engineering profession from the comment that Mr. Stone said. I can't imagine an engineer going ahead designing a septic system knowing full well it wasn't going to work. I don't believe that would happen. I think he was trying to make a point but I don't think that figures into it.

Robert Ward

I'd like to have each panel member summarize what has been going on and we will start with Leo Dirnberger.

Leo Dirnberger

I probably didn't make one thing clear. Talk about cut off dates with EPA and houses that were in existence at that time - the gentleman back there asked about other kinds of funding for subdivisions and groups of homes. FHA does have a community consumers program and funding is available. Again you have to have an entity that becomes the borrower, the grantee and the borrower, in those instances. We don't go out and make loans for sewage disposal and treatment systems to individuals unless it is part of a house. That part has to be clear. There are some other sources available for communities that need collection and treatment systems. Again, I need to expand on that and say that we again look at the size of the community at that point. How many taps are there available, and we put very little emphasis on future expansion. We're going to build a system that will serve those that are there.

Don Niehus

I want to respond to two comments that were made. First, with respect to what the gentleman from the state health department said in terms of EPA providing guidance to the states and what they should do. There are a lot of intelligent people at the state and local levels. Part of our strategy is hopefully to let state and local imaginations and creativity react to what we are saying here. Local officials should come up with solutions which are appropriate to their locations. It would be inappropriate for EPA to provide detailed recommendations for small flows management. We are providing general frameworks

and within that, it's up to the localities to review their state legislation to identify constraints in terms of the approval and use of innovative systems. In addition, it is necessary to identify the kind of adaptations which are needed to existing agency structures in order to implement management programs. Those are things that have to be done at the state level. EPA is not going to do it for you. In the design of our research program in this area for institutional research we had to make a trade off between trying to respond directly in a timely fashion with the regulations, or taking a more relaxed, in-depth look at the problem. We selected the latter approach. That does not mean that we are not going to be providing you information in a more timely fashion. This is hopefully what we will be doing through the clearinghouse process that was mentioned this morning. In summary on that point, I urge you not to hold your breath for two years for the study. You've got to get going and do other things.

Responding to comments on 208 process - I don't want to inject myself into your political problems here. But, in terms of 208 management recommendations, I don't see that there are any inconsistencies whatsoever with what we're saying. If the State of Colorado and local 208 plans specifically made provisions for the management, regulation, or other control for on-site systems, fine. What we're saying is that this will help you flush out those recommendations. It's not to say that you have to go back, reopen institutional analysis, and decide who is going to do it. If you've designated responsibilities already, great, no problem. Many areas, however, haven't dealt with on-site at all, at any level of detail. For those areas it is a matter, in the continuing 208 process, to go back and look at some of these other responsibilities that were not done the first time around.

Bill Heller

I used to be in the state health department so I used to be in an enforcement position like most of you are today. The biggest single problem that I saw there and at that time I'd seen virtually every wastewater system and public wastewater system on the eastern slope of Colorado. The biggest single problem I saw, in particularly in the smaller communities, was a lack of proper operation and maintenance, which usually got back to proper budget for operation and maintenance. Now, as a consulting engineer, I don't want to recommend installation of some high-powered facilities that is not going to work. I think most of you people in the enforcement and reviewing positions don't want to see a system go in that's not going to work either. The key question then is management. You've got to figure out the management structure to keep a system operating and functioning to achieve the purpose for which it was designed. Without that maintenance, you don't have anything and might as well not have put it in, in the first place. It is a very real problem, it's important, and it should be considered both from the consulting point-of-view and from the point of view of you in county sanitation, state health, EPA, etc.

Dan Tipton

I just want to summarize and conclude by saying that actually my response to Mr. Payne's question was somewhat in the negative. As far as our department is concerned, we are interested in seeing what could happen under better management than what we now have. We know we have problems with some of the disposal systems. The negative aspect comes, in my impression, when we have two failing systems in a community of fifty homes, we can be very sure that the other forty-eight people are happy with things the way they are. I think my experience leads me

to that kind of a negative hope - that all fifty people are going to join together and solve the problem that two people have. If we did receive an application or proposal for a community-managed or an institutional-managed system I think we would be very interested in it and try to be as constructive as possible in a review of it. There is a lot yet to be learned in the concept of public management of private systems. I think our presence here today is evidence of our interest in the program.

Robert Ward

I want to thank all of you for coming and I want to thank our speakers for being on time and for keeping the program schedule moving right along. We will now adjourn. Thank you very much.

HOME SEWAGE DISPOSAL IN COLORADO

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