

## **Chapter 8. EVALUATING ALTERNATIVES, CONDUCTING THE ENVIRONMENTAL/SANITARY SURVEY, DEVELOPING THE PRELIMINARY ENGINEERING REPORT, AND CHOOSING THE RIGHT PROJECT**

The activities described in this chapter should be conducted concurrently with the activities described in Chapter 10, The Formation of a Sewer District.

### **A. Conduct an Environmental/Sanitary Survey**

Your community will want to gather some preliminary information to assist in deciding whether to develop a wastewater management improvement project. An Environmental/Sanitary Survey (ESS) should be performed before hiring an engineer. A community needs to have some idea of what they are facing regarding wastewater treatment and management, and an ESS will provide you with important background information. Being able to articulate your concerns, needs, and wants is key in setting the design parameters for the engineer.

The ESS is needed to document that a wastewater problem exists and to establish the need for a project by evaluating the number and the nature of failures of onsite systems. The survey can be initiated by the homeowners, the local environmental health department, the state regulatory agency, or the county commissioners. It is an assessment and evaluation of the current public health and/or environmental pollution problem(s) that occur under existing conditions in a community. An inventory of the location, age, condition, design and use, and rate of failure of onsite systems in all or sections of a community based on available data and numbers from onsite inspections is developed. This is also a useful tool for evaluation of future wastewater needs.

You should first select a planning or steering committee to ensure the community's involvement in the decision making process. It is critical to remember that the wastewater management system that is chosen is the system you probably will have to live with for the next 20 to 40 years: make sure it is a system that you can live with. The committee could be the governing body, a separate group, or a mix of governing leaders and citizens. The committee must articulate your community's goals as well as goals for the wastewater management system. Knowing what you want from a system will help an engineer design a system that fits your community. A well designed system should:

1. Meet community goals.
2. Comply with environmental laws and codes.
3. Be affordable (community can pay the monthly user rate).
4. Be as easy to operate and maintain as possible.
5. Be long lasting.

The ESS should help to determine if present problems can be fixed with minimal or limited solutions. For example, just concentrating on fixing a few failing onsite systems may be enough to address your community's wastewater problems. The "centralized management of decentralized systems" approach to wastewater management in unsewered communities emphasizes the managed

operation of existing onsite systems, the use of alternative technologies as appropriate, and local government management of small waste flow onsite collection, treatment and disposal systems, and combinations of these (See Chapter 6).

Most of the time devoted to ensuring that onsite systems function properly has historically occurred before a system is put into operation. This includes time spent on site evaluation, system design, permitting and post construction inspection. Once the system is put into use, it is left to the homeowner to manage it for the life of the system. As a result, onsite systems have seldom been inspected after construction and during subsequent years of operation. Inspections or verifications of adequate functioning usually occur only at the time of a change in ownership of the property, often when problems have already developed. With managed operation of onsite systems throughout the life of the system, most failures can be prevented.

Some onsite system failures are probably the result of small lot size, inadequate depth to groundwater or bedrock and unsuitable soil type. Many other failures can be attributed to inadequate sizing of system components, poor maintenance, abuse, or leaking indoor plumbing. A straight pipe or direct surface discharge without a septic tank or absorption field is considered a failing system. In the cases where small lot size prevents effective functioning of conventional soil absorption systems, many options exist for the use of alternative systems. See Chapter 4 for a discussion of these treatment alternatives. Using these technologies may be a more cost effective solution than centralized collection and treatment.

The Environmental/Sanitary Survey establishes the need for an improvement project by evaluating the number and the nature of failures of onsite systems. Traditionally, the purpose of the ESS has been to convince the funding agency that wastewater system improvements are needed. This has historically resulted in the construction of a centralized collection and treatment system. However, the survey can also be very valuable in ensuring that less costly, decentralized alternative solutions are given serious consideration during the evaluation process. Making decisions related to providing sewage facilities for small towns and rural communities can be expensive and confusing. It is especially difficult for community leaders to make informed decisions for their community when they do not have complete understanding of what is wrong and what is needed. The ESS can provide information useful in determining if a “decentralized management” system may be appropriate in solving the wastewater problem.

## **B. Performing the Environmental Sanitary Survey with Evaluation of Alternatives**

The boundaries of the area to be included in a wastewater management system should be decided on before beginning the survey. This is probably a good time to begin the process of forming a sewer district by holding a public meeting to inform residents of what is happening with the survey (see Chapter 10).

Using available data and information from the community, determine the number and percentage of onsite systems that are currently failing or have evidence of having failed in the past. In addition to

documenting failures, gather information about lot size, soil characteristics, water use, size, depth and condition of the septic tank, depth at which sewage lines exit the house, square feet of lateral lines, depth to limiting layers, slope, and any other factors that might contribute to failures. Are there leaking pipes contributing to overloading of the system and could water conservation measures address the problem? Because the interviewer is already onsite, gathering of this additional information should not take as long as return visits.

Some of this information can be obtained from interviews with residents of the community. Interviews generally require minimal work for the respondent; they are not required to read or write anything, they just respond to the questions. While interviews do require a substantial amount of time, they do not require up front expenditures for printing and postage as do mail questionnaires. For assistance in conducting an ESS and locating existing information, the local sanitarian or environmental health specialist, the KDHE District Office, or K-State Research and Extension may be contacted.

Community leaders are ideal to conduct the interviews because the results of a survey belong to the community. Citizens and local officials are much more likely to act on the results and recommendations if personally involved in the data collection. Also, going door to door to collect information gives the interviewer first hand information and gives residents a chance to voice their opinions directly to one of the persons making the decisions.

The interview can be followed by a walk-over inspection of the property to collect and record data on the location, age, condition, design and use of the onsite wastewater systems. Sampling of the water supply, soil borings, or other representative sampling, may be scheduled concurrently with the onsite ESS. Various degrees of information can be gathered during this walk-over. The information can be used to define the problem, begin to determine how to solve the problem, and to examine the types of alternatives available.

If the ESS is not accomplished by local volunteers, the community may request that the state or local regulatory authority perform it. The regulatory authority will simply document the existing conditions, however, and is not likely to gather additional information to be used to examine alternatives. Alternatively, a consultant can be hired to perform the ESS, but this increases the cost.

### **C. Developing the Preliminary Engineering Report**

After getting input from the community and the ESS, an engineer will develop a Preliminary Engineering Report (PER). A PER is an engineering report normally completed prior to applying for funding to construct the project and is required by most funding agencies. The report examines the need for an improvement project, analyzes the feasibility and practicality of several solutions, recommends the best solution, provides cost estimates for building improvements and the cost of operating and maintaining the system after construction. The report should indicate how monthly user charges will be affected by the recommended project. The engineer should be given guidance on what you want the PER to accomplish. Ask a funding agency such as USDA-Rural Development

(RD)or Community Development Block Grant (CDBG) for their guides on what needs to be included in a PER. The PER should help you answer the following questions: (1) What are the consequences if we do nothing? (2) If we need to do something, can we build the project we most desire?

The following procedure emphasizes evaluation of existing individual systems before concluding that existing onsite systems must be abandoned in favor of a centralized collection system. Can the existing systems be made to work? Many times there may be simple solutions to problems that are attributed to operation and maintenance issues.

1. Supplement information not available from the ESS or the community with soil maps, review of water bills, permit records, etc.
2. Once the information is gathered, and with the assistance of a qualified engineering consultant (see Chapter 9) or environmental health specialist, make assumptions of the appropriate technologies required, both onsite and off site, and the estimated costs of these technologies for subsequent comparison with central sewer alternatives. Plot all of the information on a map, using overlays as necessary. Depending on the quality of the available data, this may demonstrate which areas require sewers due to limiting site conditions, which areas can utilize upgrading, replacement or renovation of existing onsite systems, which areas may utilize clustered systems, and which areas require no action.
3. Develop descriptions of the common types of onsite system failures in the area with known, ongoing failures located on a map of the planning area. Analyze the sites, usage, construction, conditions, lack of maintenance or design factors which contribute to the failures. Develop technology selection criteria which relate local problems and their causes to feasible structural and non-structural solutions. Determine the estimated number of onsite systems requiring upgrading, replacement or renovation. Select specific technologies and their design for individual properties.
4. If you've decided that improvements need to be done and decentralized management may be an option, what next? At this point, a consulting engineer (Chapter 9) is probably needed. Along with the consulting engineer, determine and locate the approximate mix of methods estimated to be required to correct failures. Perform a cost effectiveness analysis of the feasible conventional, innovative and alternative wastewater treatment systems, processes and techniques capable of meeting the water quality and public health requirements of the community. This includes an evaluation of upgrading the operation and maintenance and efficiency of existing facilities to resolve all failing systems as an alternative or supplement to construction of new onsite or central collection facilities. Include the cost of ongoing maintenance in the evaluation.
5. Select the final solution. Determine the treatment method or mix of methods, develop the preliminary design, and perform a detailed economic evaluation. Obtain public input and

select the site(s) for any treatment method using a collection system. This information will be included in the Preliminary Engineering Report. This is a good time to circulate a legal petition to form a sewer district, if not already started in Step B (see Chapter 10).

#### **D. Choosing the Right Project for Your Community**

The following questions and issues should be addressed as the PER is being developed and before the final solution is chosen.

1. **Does the plan achieve our goals?** Always ask if the desired project attains the goals you have set for your system. Review the goals the planning committee articulated to the engineer. If you are told your goals will not be achieved, ask why they will not be achieved. Be realistic though with your analysis. If your goal is to have reasonable user rates, expect to pay a rate that other new or improved systems have to pay.
2. **Can we bring the project we desire to culmination?** If not, identify the obstacles and determine if they can be overcome; you will not have instant answers.
3. **Is this a good system that we have the ability to operate?** The planning committee or governing body should visit with your engineer about what kind of a system he is proposing. A well designed system should be as easy to operate and maintain as possible and long lasting. Ask the engineer what it will take to operate the proposed system; can you do it. Ask about operating costs and required training.
4. **Can we afford the proposed system or improvements?** Once you receive the PER, it is wise to review cost the analysis with your engineer. A good preliminary engineering report should always discuss financial aspects of a project. Ideally this information would be presented in a budget form. The engineer's cost summary should show:
  - How much it will cost to repay debt assumed to construct the project.
  - How much it will cost to operate and maintain (O&M costs) the system.
  - How much it will cost to maintain required financial reserves.
  - How much an average household will be charged per month to pay for debt repayment, O&M costs, and to maintain reserves.
  - The type of rate structure that will be needed, and the amount of revenue that it will generate.

#### **E. Develop a Mock Budget**

The majority of preliminary engineering reports will provide cost estimates that are very close to actual expenses or a conservative estimate, but review them carefully based on your knowledge of the community.

Cost estimates usually look at four areas:

1. Debt repayment -- tied to the cost of construction.
2. Required debt reserve payments -- usually at least 10% of the debt repayment.
3. Yearly operation and maintenance costs -- variable.
4. Reserve fund for equipment replacement.

A community normally will borrow (issue bonds) money to pay for construction. Because most engineers are fairly accurate, but conservative, in estimating costs it can be assumed their debt repayment calculations are realistic. If you are uncertain, you may have someone who is familiar with figuring interest payments check the engineer's estimate.

The estimate for the required reserve payment is based on the amount of the debt repayment. Typically this payment will be 10% of the yearly debt repayment. Each creditor may require a different percentage. Again, this area of a cost estimate is usually accurate since it is tied to cost of construction/debt repayment.

The area that causes some problem is the estimating of operation and maintenance costs, especially for alternative onsite and cluster systems. The exercise of creating a mock budget for the first and second years of operation can help you to determine if O&M estimates are reasonable. At some point your governing body will have to develop a budget anyway; now is a good time to start. If you have an existing system, use your own knowledge about operating expenses to determine if the engineer's estimates seem reasonable. If you have a new system, ask another community similar to yours what costs should be.

If your community is adamant about keeping monthly user fees under a not-to-exceed cap or a funding agency is saying they will not fund your project if monthly household fees exceed a set level, then be aware an engineer may try to reduce operation and maintenance cost as a way to reduce estimated monthly user costs. Funders will review cost estimates for operation and maintenance expenses, but your community is ultimately responsible. Once a system is on line and expenses are higher than estimated, you will likely have to raise rates higher than planned to pay for increased expenses. This can cause problems with customers who are expecting to pay lower rates.

Equally as important to estimating expenses is determining if your planned revenue stream will generate the income predicted. For example, if your rate structure is tied to water consumption, you should ask what will happen if people quit using water -- will rates generate enough money to repay debt and operation and maintenance costs. Take into consideration how you will handle uncollected payments and how uncollected accounts could affect the revenue stream. A community that bases its rates largely on water consumption must remember that as the average age of the community's population increases the consumption of water will decrease. For many small communities the issue of population stability is very important when trying to determine if you will be able to generate adequate revenues decades from now. Many communities also count on receiving funds from assessments placed on undeveloped lots; this is a very unreliable source of income. Some funders will not even let you count on receiving any income from vacant lots. The following are the things that you need to know, and a mock budget can help you answer:

1. Are the expenses to operate and maintain the system realistic?
2. Are reserves adequate?
3. How much money is needed meet regular debt payments?
4. Will enough revenues be generated to pay for all anticipated expenses?
5. Will the revenue be there when it is needed?