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Environmental Assistance Division
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Managing Small Domestic Wastewater Systems: Part B, Sustainable Systems

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Introduction

This publication is Part B of a five-part series *Managing Small Domestic Wastewater Systems* (TCEQ publication series RG-530) and includes information and resources for managing your system more efficiently through energy assessments and energy-efficiency improvements, water conservation, and public-participation programs. It includes information about managing your influent through pretreatment and a road map to sustainability.

As you work though Part B, you may find it beneficial to review other parts of the series, particularly Part A, *Asset Management* (RG-530a), to help you prioritize your upgrades. To view or download the complete series, go to the TCEQ Small Business and Local Government Assistance section's webpage at <www.tceq.texas.gov/goto/rg-530>. If you do not have internet access, call the SBLGA's toll-free hotline number 800-447-2827 to request a paper copy of the complete series *Managing Small Domestic Wastewater Systems* (RG-530).

What is sustainability?

If your system is "sustainable," that means it is well-managed—using energy and water responsibly, preparing to meet projected population changes through financial planning and technical know-how, and meeting compliance with the rules—while providing good service and encouraging communication with your customers. Many small wastewater systems are taken for granted by customers, and it's possible that you can improve your image by simple outreach to your customers directly and to the community at large.

There are many resources to help make your system more sustainable. The USDA and EPA have prepared the *Rural and Small Systems Guidebook to Sustainable Utility Management,* and you can use it to improve several management areas, including product quality, customer satisfaction, employee and leadership development, financial viability, infrastructure stability, and others. The guidebook also has a self-assessment worksheet

to help you find areas for improvement. It is available online at <www.tceq.texas.gov/goto/PartBResources>.

We will walk you through some components of sustainability. These are all best management practices that you can incorporate into your existing management plans. Some funding sources will want to see that you are considering the long-term management of your system before they offer you a loan.

Sustainable Systems: Best Management Practices

- **Develop an asset-management plan.** In Part A of this guide, *Asset Management* (RG-530a), we discuss developing an asset-management plan—which is a good place to start. The worksheets and instructions will help you conduct an inventory of the treatment system's resources; prioritize repairs and replacements, plan for future needs, and develop a budget.
- **Prepare an operation-and-maintenance plan.** In Part C, *Operation and Maintenance* (RG-530c), we detail the requirements for creating an operation-and-maintenance plan for your system. You can also create a program for scheduling and performing preventive and general maintenance.
- **Conduct an energy audit.** Consider changing equipment and processes, referring to your energy-audit results and asset-management plan.
- **Evaluate your effluent and influent.** You need to make changes to your treatment process or upgrade your pretreatment ordinances if you determine your current treatment system is not adequate. Worksheets in Part E, *Resources* (RG-530e), will help you identify trends in monthly sampling results.
- **Conduct inflow and infiltration analyses.** Capacity needs change over time. The EPA's *Guide for Estimating Infiltration and Inflow* and their *Quick Guide for Estimating Infiltration and Inflow* are available at <www.tceq.texas.gov/goto/PartBResources>.
- **Develop a water conservation plan**. Work with the water provider in your area to reduce water use by installing more efficient fixtures, encouraging reuse, and conducting water-use audits.

Review Your Energy Use

You should conduct an annual energy survey to determine where you can conserve energy or improve efficiency. This survey should review all energy-consuming processes, such as aeration and pumping. Through the results of the survey, combined with your asset-management plan, you should see what equipment upgrades will benefit your system.

Energy Audits

You can have a staff member who is knowledgeable about the process conduct your energy audit, or you may decide to hire a consultant. Monitoring the activities of the consultant takes time, but you may find it less time consuming than conducting the audit in-house. An in-house audit will require your staff member, as opposed to a contractor, to follow through with recommendations he or she identifies before your facility sees positive results.

There are three types of audits, ranging from simple to complex: preliminary, single-purpose, and comprehensive. A simplified audit will contain less detail and result in less money saved than a more comprehensive audit. A preliminary audit will indicate whether a more extensive review is required, whereas a single-purpose audit analyzes one aspect or function, such as lighting, motors, HVAC, etc. A comprehensive audit is facility-wide and evaluates all major energy-using systems.

Audit forms are available online to help guide you through an internal audit. We have modified a checklist created by the Consortium for Energy Efficiency and included it at the end of this publication. Once you've completed the checklist, you can discuss possible upgrades with your asset-management team. The team will have prioritized maintenance and replacement schedules and will be able to use the results of your audit to make more energy-efficient choices. For help creating an asset-management plan, see Part A of this series, *Asset Management* (RG-530a).

Energy Assessments

Energy assessments are a more intense energy audit. Some funding sources, like the Texas Water Development Board (TWDB) Clean Water State Revolving Fund, can fund energy efficiency projects, including the energy assessment, if the assessment is reasonably expected to lead to a capital project. Tools to assist you with your energy assessment are available through the EPA and the New York State Energy Research and Development Authority (NYSERDA). We will guide you through the general concepts.

Step 1: Conducting an energy assessment will help you determine your baseline power use, evaluate your plant, and identify opportunities to save energy. The first step to conducting an in-house assessment is to **form an energy team** to develop an energy management plan, establish goals, define resource needs for the team, and serve as an information clearinghouse. The energy team should consist of many layers of the facility staff and may include the manager, operator, mayor, and an accountant. The size of the team will depend on the size and complexity of the system.

Step 2: Your team will **develop baseline energy use** from historical records. By looking at the last 12 months of energy bills, you will begin to understand where and when energy is used most. You'll also better understand your energy costs, such as changes in rates during peak and non-peak hours. Determining baseline energy use will require organizing treatment processes by functional area, evaluating energy bills and understanding rate structures, assessing the energy use difference with hydraulic loading, and organizing data in a useful way.

Step 3: Once your baseline energy use is established, you're ready to **evaluate the system and collect current data**. This includes conducting a system walk-through to verify the equipment specifications and operations, performing staff interviews to determine operational history, identifying conservation opportunities, conducting measurements and collecting data on run times of motors, or calculating the energy used for millions of gallons of wastewater treated per day or biochemical oxygen

demand (BOD) removed. You will create a benchmark to compare future data. You might start with the largest pieces of equipment or more energy-consuming processes.

Step 4: **Identify opportunities for energy conservation.** This can include capital improvement or replacement of equipment, a change in process or operations, automation or change of controls, or improving maintenance. You might talk to neighboring facilities, associations, or consultants to help identify ways to improve efficiency at your plant.

Step 5: **Prioritize implementation of your changes.** Evaluate the areas where upgrades will improve energy efficiency the most. Some equipment may be due for replacement as part of your asset-management plan. When choosing new equipment, consider your energy goals. The most efficient equipment may have a higher cost up-front, but it may be easier to maintain and less expensive to operate for the long-term. This will require a cost-benefit analysis to evaluate the costs of buying and operating less expensive equipment that uses more energy as compared with more expensive energy-efficient equipment.

As you prioritize your changes, you will be developing an implementation plan. This plan should communicate what you plan to do, what resources (staff, time, and money) you will need, and what the results will be. Implementing an energy program can be difficult for several reasons, including cost, space, staff, engineering constraints, changes in chemical use, and changes in operations. The more effort you put into the assessment, the stronger your plan will be. A clear plan will help you inform stakeholders of your decisions.

Once new equipment and processes are put into place, keep track of how the change affected the system, staff, and energy use. More information is available in the *Best Practices Handbook* from the NYSERDA, including best management practices for energy conservation and spreadsheets for conducting your own energy assessment: <www.tceq.texas.gov/goto/PartBResources>.

Here are resources to help you conduct an audit, all available at <www.tceq.texas.gov/goto/PartBResources>:

- The EPA's Energy Use Assessment Tool can help you evaluate equipment and create a baseline of energy use.
- The Texas comptroller's State Energy Conservation Office can conduct preliminary energy assessments for you. This service is available to public utilities.
- The Department of Energy Industrial Assessment Centers conducts audits.

Energy-Efficiency Improvements

Some energy-efficiency improvements are easier to make than others. For example, you can make energy-saving changes by:

- Modifying lighting, updating HVAC, or making other building improvements.
- Reducing facility loading by using equalization basins to minimize peak flow and investigating inflow and infiltration.
- Using supervisory-control and data-acquisition (SCADA) software to monitor processes and use data to create a table of expected results for the system.
- Implementing an energy-management program by creating an energy team, monitoring power use, and reducing peak power demand.

The EPA's *Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities* details equipment replacement, operational changes, and process-control enhancements to improve energy efficiency, including increasing efficiency of pumping systems, modification and control of aeration systems and blower types, and conservation measures for treatment processes. You can download the report at <www.tceq.texas.gov/goto/PartBResources>.

If you want to streamline the assessment and audit phases, you might consider contracting an energy services company. Resources are available to help you choose a contractor, including *How to Hire an Energy Services Company* from the California Energy Commission, available online at <www.tceq.texas.gov/goto/PartBResources>.

Water Conservation

To qualify for Clean Water State Revolving Fund funds greater than $500,000 from the TWDB, you must have a water-conservation plan. The goal is to reduce water use, which will ultimately reduce flow to the wastewater system. This may involve collaborating with your water provider and could be accomplished in several ways:

- **Water-saving fixtures.** Install or retrofit plumbing fixtures, such as shower heads, toilets, and faucets. Consider education and incentives to conserve water.
- **Water meters.** Make sure meters are functioning properly and consider upgrading meters that are old.
- **Water audits and conservation plans.** Assess large water users to determine ways they can conserve.
- **Develop a conservation program.** See the TWDB's Water Conservation Plans at <www.tceq.texas.gov/goto/PartBResources>to create a water-conservation program.
- **Use reclaimed water.** You can reuse treated water at your facility without authorization [30 TAC 210.4(c)*]. Your community can consider using reclaimed water for irrigation at parks, golf courses, and residential developments. Other uses include crop irrigation, dust control, and fire suppression. The analytical requirements and authorization levels vary. You can find more information about the TCEQ's Requirements for Reclaimed Water at: <www.tceq.texas.gov/goto/PartBResources>.

More information is available from the TWDB, including what to include in your conservation plan, conservation-plan checklists, and fact sheets.

Know Your Operation

In order to maintain your system and meet permit requirements, you need to understand a few things about your system:

- know your influent
- understand the effects of inflow and infiltration

* Short for 'Title 30, Texas Administrative Code, subsection 210.4(c).'

- control influent from lift stations
- maintain optimal solids

These topics and others are included in our publication *Troubleshooting Bacteria Levels at Wastewater Treatment Plants* (RG-515), wherein we discuss meeting bacteria limits, which are new to some permits.

Pretreatment

Wastewater plants are designed to handle five conventional pollutants: BOD, total suspended solids, fecal coliform, pH, and oil and grease. Industrial and commercial facilities that discharge toxic or non-conventional pollutants to your system could harm your plant in several ways, by:

- Causing damage to the infrastructure through corrosion.
- Killing your microorganisms and disrupting the system.
- Contaminating your sludge and affecting your ability to dispose normally.
- Exceeding your permitted effluent.

The national pretreatment program was designed to protect **publicly owned** wastewater systems from toxic or non-conventional pollutants, and the TCEQ has the delegated authority to run the pretreatment program in Texas.

To establish a pretreatment program at your facility, you must perform a survey to determine what types and amounts of pollutants industrial users will discharge. You will also develop a program for sampling, inspection, and reporting in accordance with Title 40, Code of Federal Regulations, Sections 403.8 and 403.12. There are other requirements, and the TCEQ can help you. If you have questions about the pretreatment program, call TCEQ's Pretreatment Program at 512-239-4671.

Your city should have specific ordinances to establish its pretreatment program, and you can make your program as stringent as you need to protect your plant and infrastructure.

The EPA has prepared an *Introduction to the National Pretreatment Program,* available at: <www.tceq.texas.gov/goto/PartBResources>. It

includes a good background on pretreatment and the requirements for your wastewater system and industrial users.

If you have a privately owned or investor-owned wastewater system, you can follow the federal guidelines and create a local program. You will want to incorporate user agreements into your program. Privately owned pretreatment programs are not regulated by the TCEQ.

Making Changes to Your System

Remember that your facility's permit is written specifically for the processes at your plant. You may determine that you need to make changes to your plant. Before you consider making changes, consult a permit writer on the Municipal Permits Team at the TCEQ to determine how you will need to amend your permit.

If the changes are not urgent, you may consider waiting to make them until your permit is scheduled for renewal. Depending on the type of changes you want to make, you may be able to renew your permit with a minor amendment. Extensive changes (e.g., potential modifications to address buffer-zone issues for a new treatment unit) will require a major amendment. Major amendments require mailed public notices to affected landowners in addition to the published notices. Your permit writer will be able to advise you on application timelines. You can contact the Municipal Permits Team at 512-239-4671.

Public-Participation Programs

Much of the wastewater that is received at your plant is likely from homes, apartment buildings, or commercial businesses. You have an opportunity to improve the wastewater coming into your plant through education and outreach.

We know that starting with young children is an effective way to improve behaviors of adults at home. Once you decide what message you want your customers to hear, you might consider going to the elementary schools to tell the kids where their toilet and sink waters go. You might

also consider teaming up with apartment management companies to supply them with outreach materials to be posted in a central location. The TCEQ's Small Business and Local Government Assistance section and Take Care of Texas Program may have some resources that suit your needs.

Here are several issues that you might consider talking about: fats, oils and grease; "flushable" products; and drug disposal.

Fats, Oils, and Grease

Fats, oils, and grease (FOG) can damage your system in a few ways. FOG can cause sanitary sewer overflows (SSOs); it can affect your ability to treat and disinfect your wastewater; and it can result in wear on your collection system.

When you have an SSO, not only do you have requirements to report the overflow to the TCEQ and remediation to conduct, you also have a public-relations problem. This costs you money in resources (equipment use, personnel, overtime pay), and it affects your image with the community. The best way to prevent SSOs is to reduce FOG in the system. The best way to reduce FOG is to let people know it's a problem.

There are many examples of FOG outreach. The most notable is the City of Dallas' Cease the Grease program. It's a complex combination of television ads, flyers, bill inserts, stickers, door hangers, and direct mail-outs. They also have locations where customers can have their used grease and cooking oil recycled into gas to run the wastewater plant. You may not be able to create a recycling program or multimedia outreach campaign, but the TCEQ has devoted a webpage to FOG to help you improve outreach in your area. To view this information click on the "TCEQ's Fats, Oils, and Grease (FOG)" link at: <www.tceq.texas.gov/goto/PartBResources>.

"Flushable" Products

Wastewater systems have encountered problems with items that should not be flushed (paper towels, personal hygiene items, cat litter, baby wipes, etc.). Within the last few years, use of "flushable" wipes has increased the number of clogs and amount of maintenance needed in

collection systems. You can consider outreach or you can consider installing grinder pumps to address the issue.

Some slogans for outreach include “wipes clog pipes” and “no wipes in the pipes, only toilet paper down the toilet.” King County, Washington, created a public-outreach webpage titled “Don’t flush trouble.” We provide a link to their webpage at <www.tceq.texas.gov/goto/PartBResources>. You could also consider contacting your local media outlets (tv stations, newpapers) to do a story on your plant and the issues flushable products create.

In addition, the San Jacinto River Authority has created a “Patty Potty” campaign that has generic outreach materials you can use. More information is available on the authority’s website, linked at <www.tceq.texas.gov/goto/PartBResources>, including the “don’t flush list” and “no wipes in the pipes.” The Galveston Bay Foundation is working to combine Patty Potty with its Cease the Grease campaign to create a one-stop shop for outreach.

Drug Take-Back Programs

Pharmaceuticals in wastewater are a growing water quality concern. You can let customers know not to flush medication. Resources are available to locate drug take-back programs, including the American Medicine Chest Challenge—see <www.tceq.texas.gov/goto/PartBResources>.

Customers should know about alternatives to flushing medication. These are some tips for proper disposal:

1. Pour medication into a sealable plastic bag. If the medication is solid (pill, liquid capsule, etc.), add water to dissolve it.
2. Add cat litter, sawdust, coffee grounds to the bag (or any material that mixes with the medication and makes it less appealing for pets and children to eat).
3. Seal the bag and put it in the trash.
4. Remove and destroy all identifying personal information (usually on the prescription label) from all medication containers before recycling them or throwing them away.

Need more help?

The TCEQ's Financial, Managerial and Technical Assistance Program offers free on-site assistance from a contractor to help you analyze your planning options and help you with all aspects of running and funding your wastewater system. For more information about the program, visit <www.tceq.texas.gov/goto/PartBResources>, call the Water Supply Division at 512-239-4691, or contact the SBLGA representative in your region by calling our toll-free, confidential compliance hotline: 800-447-2827.

Many state and federal funding agencies make grants and loans available for planning and development of new wastewater-treatment plants and infrastructure improvements. The Texas Water Infrastructure Coordination Committee (TWICC) is a group of local, state, and federal agencies that collaborate to identify issues with water and wastewater infrastructure and compliance, and to seek affordable, sustainable, and innovative funding strategies for the protection of public health and efficient use of government resources in Texas. You can contact TWICC by phone at 512-463-7870, by e-mail at <TWICC@twdb.state.tx.us>, or by fax at 512-475-2086 or visit <www.tceq.texas.gov/goto/PartBResources> to learn more about the program or the TWDB's financial assistance to wastewater systems.

References

Publications and webpages referenced throughout this module are available at <www.tceq.texas.gov/goto/PartBResources> and are listed in the order in which they appear in Part B.

Sustainability

USDA and EPA: *Rural and Small Systems Guidebook to Sustainable Utility Management*

Energy Assessments

California Energy Commission: *How to Hire an Energy Services Company*

Department of Energy Industrial Assessment Centers: EPA Energy Use Assessment Tool

EPA: *Evaluation of Energy Conservation Measures for Wastewater Treatment Facilities*

NYSERD: *Best Practices Handbook*

The State Energy Conservation Preliminary Energy Assessment

Operation Guidance

DEA: drug take-back programs

EPA: *Guide for Estimating I&I and Quick Guide for Estimating I&I*

EPA: *Introduction to the National Pretreatment Program*

King County, Washington: “Don’t flush trouble”

San Jacinto River Authority: “Patty Potty” Campaign

TCEQ: Requirements for reclaimed water

TCEQ: Developing a new pretreatment program

TWDB: Conservation-plan checklists

TWDB: Tools to create a water-conservation program

TCEQ: Fats, oils, and grease

TCEQ Financial, Managerial and Technical Assistance Program

Texas Water Infrastructure Coordination Committee

Energy Audit Checklist

Many wastewater facilities could save 20 to 40 percent of energy use by making energy-efficiency upgrades. You should conduct an energy survey every year to determine where you can conserve energy or improve efficiency. This survey reviews energy-consuming processes, such as aeration and pumping. Use the results of the survey and your asset-management plan to determine what equipment upgrades will most benefit your system.

Answer only the questions that apply to your system. For each section, include additional comments or notes about past or planned upgrades. **More than five responses in the shaded boxes, for Table 1 through Table 5 collectively, indicates potential for energy savings.**

Table 1. Influent and Effluent Pumps

Yes or No Questions on Influent and Effluent Pumps	*Yes*	*No*
a. Do you have influent or effluent pumps?		
b. For influent pumps: do they have variable speed control?		
c. For influent pumps: are premium-efficiency motors currently installed?		
d. For effluent pumps: do they have variable speed control?		
e. For effluent pumps: are premium-efficiency motors currently installed?		

Table 1 Notes:

Table 2. Aeration

Yes or No Questions on Aeration	*Yes*	*No*
a. Does your plant use aeration blowers or compressors for pre-aeration, post-aeration or other aerated channels?		
b. If yes, can you adjust the air output?		

Table 2 Notes:

Table 3. Intermediate Pumping

Yes or No Questions on Intermediate Pumping	*Yes*	*No*
a. Do you have intermediate pumps to convey flow from primary to secondary processes or from secondary to tertiary treatment processes?		
b. If yes, do you have variable speed control on these pumps?		
c. Are premium-efficiency motors currently installed on these pumps?		

Table 3 Notes:

Table 4. Activated-Sludge Processes

Yes or No Questions on Activated-Sludge Processes	*Yes*	*No*
a. Does your plant use aeration blowers orcompressors as part of the activated sludge process?		
b. If yes, can you adjust the air output?		
c. Are premium-efficiency motors currently installed?		
d. Does your plant use mechanical aerators (including mixers in pure oxygen systems)?		
e. If yes, do the aerators have variable speed control?		
f. Is your aeration system controlled via dissolved-oxygen levels or pressure differentials?		
g. If yes, are dissolved-oxygen or pressure sensors located within the aeration basins?		
h. Do you currently use a fine-bubble aeration system?		
i. If you have a pure oxygen system, do you have a vacuum–pressure-swing adsorption (VPSA) O_2-generation system?		
j. Do you currently have variable-speed return-activated sludge (RAS) pumps?		
k. Do you currently have variable-speed waste-activated sludge (WAS) pumps?		

Table 4 Notes:

Table 5. Biological Treatment Processes

Yes or No Questions on Biological Treatment Processes	*Yes*	*No*
a. Does your plant use supplemental aeration blowers or compressors as part of a fixed-film process?		
b. If yes, are there currently means to throttle the amount of air delivered or otherwise adjust output?		
c. Are premium-efficiency motors currently installed?		
d. Do you pump to convey flow to the trickling filters?		
e. If yes, do you have variable speed control on these pumps?		
f. Are your trickling-filter distribution arms mechanically driven?		

Table 5 Notes:

Table 6. Disinfection Systems

Yes or No Questions on Disinfection Systems	*Yes*	*No*
a. Do you currently use an ultraviolet disinfection system?		
b. If yes, does the UV system use low-pressure, high-output lamps?		
c. Is the system operated via flow pacing or a dosing set point based on water quality?		

Table 6 Notes:

Table 7. Sludge Pumping

Yes or No Questions on Sludge Pumping	*Yes*	*No*
a. Do you process sludge on intermittently (less than 24 hours per day)?		
b. If yes, do you currently process sludge during off-peak hours?		
c. Do you currently have any equalization capacity within your existing process for handling sludge?		
d. If no, do you have variable speed capability on your sludge-transfer pumps?		

Table 7 Notes:

Table 8. Sludge Stabilization

Yes or No Questions on Sludge Stabilization	*Yes*	*No*
a. Does your plant use aerobic digestion?		
b. If yes, has there been any discussion of switching to anaerobic digestion or other stabilization method (e.g., lime stabilization)?		
c. Do you currently have the capability to produce biogas (methane) from anaerobic digestion?		
d. Is biogas currently flared or vented?		
e. Is biogas currently being used for thermal or electrical power generation?		
f. Does your plant currently accept hauled waste at its headworks?		
g. If yes, is there equalization to allow hauled wastes to be introduced gradually or during low-loading periods?		

Table 8 Notes:

Table 9. Sludge Processing

Yes or No Questions on Sludge Processing	*Yes*	*No*
a. Does your thickening or dewatering equipment run intermittently (less than 24 hours per day on average)?		
b. Do you use centrifuges for thickening, dewatering, or both?		
c. Do you currently use sludge-drying beds for dewatering?		
d. Does your plant currently haul sludge to another location for processing?		
e. Does your plant use incineration for sludge stabilization or disposal?		

Table 9 Notes:

Table 10. Other Projects

Yes or No Questions on Other Projects	*Yes*	*No*
a. Has your plant undergone any energy improvement projects in the last five years?		
b. If yes, have any of these projects involved switching to more efficient lighting?		
c. If yes, have any of these projects involved load shedding or off-peak load shifting?		
d. If yes, have any of these projects involved installation of new or improved HVAC equipment?		
e. Is your plant or will your plant be undergoing capacity expansion to comply with 30 TAC 217?		
f. If yes, are energy-conservation measures included within the capacity improvements?		

Table 10 Notes:

These forms have been adapted from forms created for Efficiency Vermont and the New York State Energy Research and Development Authority by the Consortium for Energy Efficiency.

Remember, if you plan to make changes to your system, verify that a permit amendment or design approval isn't required by calling the TCEQ wastewater permitting at 512-239-4971.

For More Information

For confidential assistance with environmental compliance, contact the Small Business and Local Government Assistance Hotline at 800-447-2827, or visit <www.TexasEnviroHelp.org>.