



## On-site wastewater treatment systems

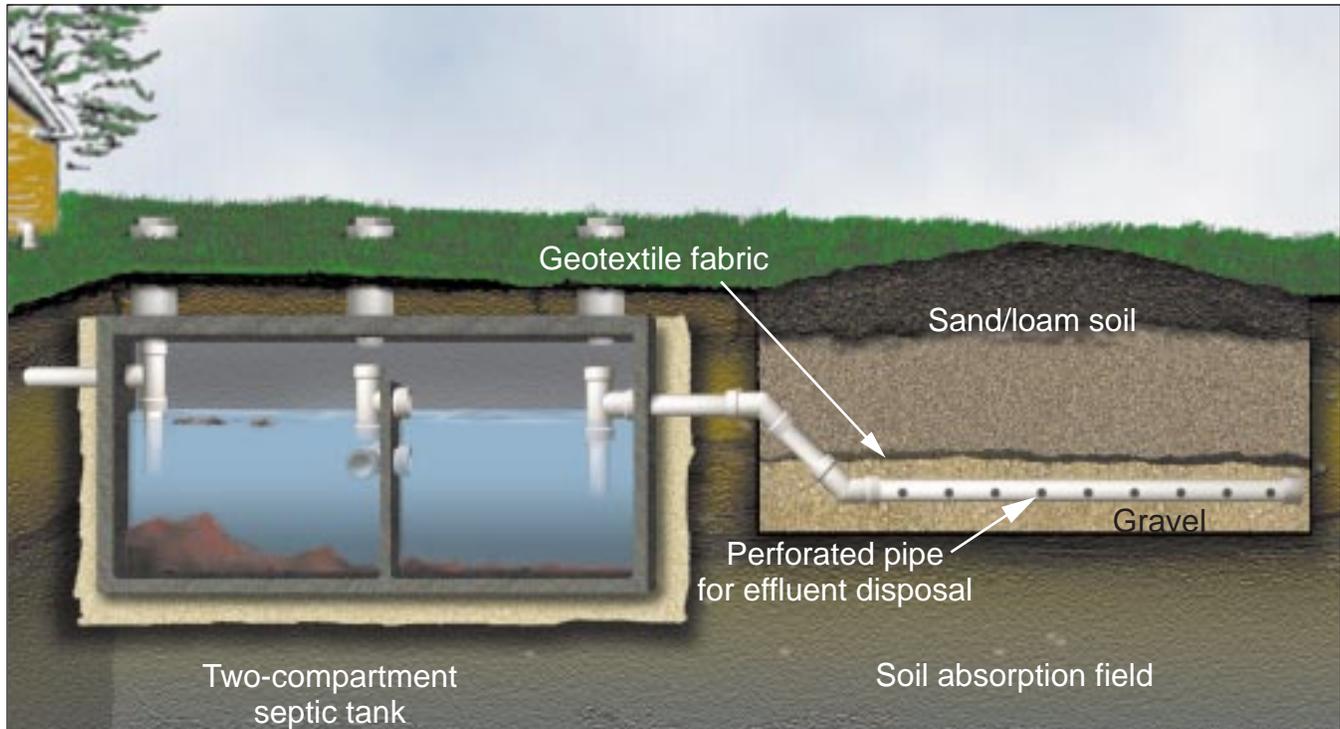


Figure 1: A septic tank and soil absorption field system.

# Selecting and permitting

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About 45,000 on-site wastewater treatment systems are installed annually in Texas to treat wastewater from rural and suburban homes as well as from small businesses. An on-site wastewater treatment system collects, treats and applies wastewater to the soil.

By definition, wastewater managed by an on-site system cannot leave the property where it is generated. The water can evaporate into the air, transpire through plants or move through the soil to groundwater. An effective on-site system removes wastewater from the home, treats and distributes the wastewater, and protects our water resources.

Selecting the appropriate system for the site conditions is critical to the system's success. If you select the wrong system or design, or install, operate or maintain the system improperly, it can fail, which could result in pollution of your property and that of others. You could also be fined.

Because homeowners are responsible for conducting or contracting for

maintenance of a system, they should be involved in selecting the technology, or type of system used.

## State regulations

The Texas legislature passed a law (HB 1875) in 1987 to regulate on-site sewage facility (OSSF) systems statewide. The law called for regional and local governments — such as counties, cities, river authorities and special districts — to implement and enforce on-site sewage regulations with approval and oversight by the Texas Natural Resource Conservation Commission (TNRCC).

**Table 1. Minimum required separation distances for on-site sewage facilities.<sup>A</sup>**

From	To					
	Sewage treatment tanks or holding tanks	Soil absorption systems and unlined ET beds	Lined evapotranspiration beds	Sewer pipe with watertight joints	Surface distribution (spray area)	Drip distribution
Public water wells	50	150	150	50	150	150
Public water supply lines	10	10	10	10	10	10
Private water well	50	100	50	20	100	100
Private water well (pressure cemented or grouted to 100 ft. or cemented or grouted to water table if water table is less than 100 ft. deep)	50	50	50	20	50	50
Streams, ponds, lakes, rivers (measured from normal pool elevation and water level); saltwater bodies (high tide only)	50	75, LPD (Secondary treatment and disinfection) - 50	50	20	50	25 when $R_a \leq 0.1^B$ 75 when $R_a > 0.1$ (with secondary treatment & disinfection) - 50
Foundations, buildings, surface improvements, property lines easements, swimming pools and other structures	5	5	5	5	No separation distances except: property lines - 10 <sup>E</sup> swimming pools - 25	No separation distances except: property lines - 5
Sharp slopes, breaks	0 Special support may be required for zero separation distances	25	5	10	25	10 when $R_a \leq 0.1^B$ 25 when $R_a > 0.1^B$
Edwards Aquifer recharge features <sup>D</sup>	50	150	50	50	150	100 when $R_a \leq 0.1^B$ 150 when $R_a > 0.1^B$

<sup>A</sup> All distances measured in feet.

<sup>B</sup>  $R_a$  refers to the application rate for wastewater to the soil. This term is presented as gallons of wastewater applied per square foot of absorption area. Soil types Ia, Ib, II, III and IV have the corresponding  $R_a$  values 0.5, 0.38, 0.25, 0.20 and 0.1, respectively.

<sup>C</sup> Drip distribution lines may not be placed under foundations.

<sup>D</sup> No on-site sewage facility may be installed closer than 75 feet from the banks of the Nueces, Dry Frio, Frio or Sabinal rivers downstream from the northern Uvalde County line to the recharge zone.

<sup>E</sup> A separation distance of 10 feet is for spray systems controlled by a timer. A separation distance of 20 feet is required for uncontrolled spray systems, which spray effluent when the pump tank is full. This can occur at any time of the day.

Although the state law has since been modified and expanded, its basic intent remains: The state sets minimum standards, and local authorities can adopt more stringent rules if the TNRCC approves them.

## Obtaining a permit

Before building, altering, extending or operating an on-site sewage facility, a person must have a permit and approved plans from the TNRCC or its authorized agent.

The permit process comprises nine steps. Follow all nine steps when installing an on-site system. The various players—designer, installer and designated representative—should work as checks and balances to ensure that an appropriate technology is built at the site. These steps are a safeguard to ensure that the homeowner receives a quality product.

### Step 1. The site and soil are evaluated.

A person must conduct a site and soil evaluation. This person prepares a report on the soil conditions and site survey, and locates structures on the property that have specified separation distances from on-site systems. Table 1 lists important separation distances for on-site systems.

### Step 2. A sewage treatment system is chosen.

The choice of OSSF system is based on the site and soil conditions found during the evaluation. Choosing the appropriate technology is critical to the system's success.

Each on-site sewage system consists of a treatment component, which initially treats the wastewater, and a land application component, which distributes the wastewater to the soil.

To determine possible land application options, compare the key conditions of the site and soil to the requirements for the various systems.

Table 2 illustrates the various land application options available for specific soil types, soil depths and groundwater conditions. Contact your county Extension agent for additional fact sheets on the various wastewater treatment and distribution systems. To obtain approval for the system you have chosen, you must contact a designated representative or TNRCC regional office.

The type of land application system you choose determines what kind of treatment system can be used. Examples of treatment options include septic tanks, aerobic treatment units, sand filters, trickling filters and constructed wetlands. The treatment system chosen depends on the water

## Key players in Texas' on-site wastewater industry

Several agency and industry representatives are responsible for making sure that the right on-site wastewater treatment system is chosen for a site and that the system is designed and installed properly:

- ✓ *Authorized agent:* The local governmental entity (permitting authority) authorized by the TNRCC to implement and enforce rules for on-site sewage facilities (OSSFs). In areas with no authorized agent, TNRCC staff members enforce OSSF rules.
- ✓ *The Texas Natural Resource Conservation Commission (TNRCC):* The state agency that oversees permitting, inspection, complaint investigations and enforcement of state OSSF regulations.
- ✓ *Designated representative:* A person or group designated by the TNRCC or its authorized agent to evaluate sites and to design and inspect systems subject to the TNRCC or its authorized agent's approval. The representative must have successfully completed an educational training program and passed a certification exam.
- ✓ *Installer:* A person paid by another to build, install, alter or repair an on-site sewage facility.
- *Installer I:* can install standard systems. The person has completed a training course, has passed a certification exam, and holds a license from the TNRCC.
- *Installer II:* can install all on-site systems. This person has been an Installer I with two years' experience, has completed the Installer II course, has passed the exam and holds a license from the TNRCC.
- ✓ *Professional designer:* A registered professional engineer or registered sanitarian who develops the layout for an on-site sewage facility. A professional design is required by the state for some systems.
- ✓ *Apprentice:* A person registered with the TNRCC as a worker for an installer. The installer takes responsibility for the work performed by the apprentice and must visit the job site at least once a day during construction.

**Table 2. Choices of wastewater distribution systems for various soil conditions. Information obtained from the site and soil evaluation is used to determine which distribution system can be used.**

Soil conditions	Distribution systems							
	Standard drain field <sup>A</sup>	Low-pressure dosing	Subsurface drip distribution	Spray distribution <sup>B</sup>	Mound system	ET bed <sup>C</sup>	Soil substitution drain field	
Soil type <sup>D</sup>	Ia	No	No <sup>B</sup>	No <sup>B</sup>	Yes	Yes	Yes (lined only)	Yes
	Ib	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	II	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	III	Yes <sup>H</sup>	Yes	Yes	Yes	Yes	Yes	Yes
	IV	No	Yes	Yes	Yes	Yes	Yes	No
Depth of good soil (type Ib, II, III) below application depth	2 or more feet	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	Yes	Yes	Yes	Yes <sup>F</sup>	Yes	Yes <sup>E</sup>
	Less than 1 foot	No	No	No	Yes	Yes <sup>F</sup>	Yes (lined only)	Yes <sup>E</sup>
Groundwater depth below application depth	2 feet or more	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	1 foot	No	No	Yes	Yes	Yes <sup>F</sup>	Yes (lined only)	No
	Less than 1 foot	No	No	No <sup>B</sup>	Yes <sup>G</sup>	Yes <sup>F</sup>	Yes (lined only)	No
Soil surface slope	0-30%	Yes <sup>I</sup>	Yes	Yes	Yes	Yes	Yes	Yes
	Over 30% or complex slopes	No	Yes	Yes	Yes	No	No	No

<sup>A</sup> This option includes conventional gravel-filled trench, leaching chambers and gravelless pipe.

<sup>B</sup> This option is available with a pretreatment system giving a secondary-quality effluent and disinfection. Class I aerobic units and sand filters are designed to give secondary-quality effluent. Other treatment systems need to be professionally designed to obtain the secondary-quality effluent.

<sup>C</sup> ET= Evapotranspiration

<sup>D</sup> Soil types: Ia - sandy soil with more than 30% gravel; Ib - sand and loamy sand; II - sandy loam and loam; III - silt, silt loam, silty clay loam, clay loam, sandy clay loam and sandy clay; and IV - silty clay and clay. A site evaluator determines these conditions.

<sup>E</sup> The soil substitution drain field is built by removing the unsuitable soil and placing 2 feet of suitable soil around the absorption system. However, this system should not be used in a type IV soil.

<sup>F</sup> The mound must be constructed to maintain 2 feet of good soil below the wastewater application level and above groundwater.

<sup>G</sup> Spray distribution of wastewater can be used on surface slopes of 0-15%. Land with steeper slopes needs to be landscaped and terraced to minimize runoff.

<sup>H</sup> This soil type is unsuitable for soils with a platy or massive structure.

<sup>I</sup> Sites with a slope of less than 2% need a drainage plan for removing rainfall runoff.

quality requirements of the land application system, which is chosen to accommodate the site and soil conditions. Final selection of the system components should be completed in cooperation with the professional designer.

### Step 3. A plan is developed for the system.

The system must be planned by a person authorized by the permitting authority under current regulations. Installers can normally plan standard

or conventional systems, including gravel-filled standard drain fields, unlined evapotranspiration beds, gravelless pipe and leaching chambers.

In some instances, homeowners can design their systems with help

from the local designated representatives. Systems that are more complex — including surface application, low-pressure dosing, mounds and non-standard systems — require professionally developed planning materials.

Table 3 specifies which systems must have planning materials submitted by a professional designer and what level of installer may install it.

A professional designer is either a registered professional engineer (PE) or a registered sanitarian (RS) licensed to practice in Texas with

experience in designing on-site wastewater systems. Several local jurisdictions in Texas require that the planning materials of all systems be submitted by a PE or RS.

A PE or RS is also required when submitting planning materials for:

- ✓ Lots smaller than 1 acre when served by an individual water system (well), those less than 1/2 acre when served by a public water supply (no individual wells) and those platted after January 1, 1988.

- ✓ Nonstandard and other more complex systems specified as required in Table 3.
- ✓ All systems in the Edwards Aquifer recharge zone.
- ✓ Any on-site sewage system serving manufactured housing communities, recreational vehicle parks or multi-unit residential developments owned or controlled by a person who rents or leases such space.
- ✓ Any OSSF for a structure not exempted by the Texas Engineer-

**Table 3. Texas Natural Resource Conservation Commission on-site sewage facility system designation.**

System description	System type	Professionally developed planning materials*	Installer requirements
Septic tank and absorptive drain field	Standard	No	Class I or II
Septic tank and evapotranspiration bed			
Unlined	Standard	No	Class I or II
Lined	Standard	No	Class II
Septic tank and pumped drain field	Standard	No	Class I or II
Septic tank and leaching chamber	Proprietary	No	Class I or II
Septic tank and gravelless pipe	Proprietary	No	Class I or II
Septic tank, filter and drip distribution	Proprietary	Yes	Class II
Septic tank and low pressure dosing	Non-standard	Yes	Class II
Septic tank and absorptive mounds	Non-standard	Yes	Class II
Septic tank, secondary treatment, disinfection and surface distribution	Non-standard	Yes	Class II
Aerobic treatment and absorptive drain fields	Proprietary	Yes	Class II
Aerobic treatment and evapotranspiration bed	Proprietary	Yes	Class II
Aerobic treatment and leaching chamber	Proprietary	Yes	Class II
Aerobic treatment and gravelless pipe	Proprietary	Yes	Class II
Aerobic treatment, filter and drip distribution	Proprietary	Yes	Class II
Aerobic treatment and low pressure dosing	Proprietary	Yes	Class II
Aerobic treatment and absorptive mounds	Proprietary	Yes	Class II
Aerobic treatment and surface distribution	Proprietary	Yes	Class II
Any other treatment system	Nonstandard	Yes	Class II
Any other subsurface disposal system	Nonstandard	Yes	Class II
Any other surface disposal system	Nonstandard	Yes	Class II
Non-standard treatment & surface distribution	Nonstandard	Engineer only	Class II
Holding tank	—	No	Class I or II

\*Professionally developed planning materials can be provided by a professional engineer or a registered sanitarian.

ing Practice Act. Such systems must have planning materials submitted only by a registered professional engineer.

- ✓ Systems needing variances from the rules.

#### **Step 4. An application and planning materials are submitted to the permitting authority.**

A permit application and planning materials must be prepared and submitted in the property owner's name and on a form provided by the permitting authority.

#### **Step 5. The permitting authority reviews the application and planning materials.**

The permitting authority reviews the application, site and soil evaluation, the type and size of the system selected, and other supporting documents required for a permit to be issued. The review ensures that rules in that jurisdiction are followed and that good engineering practices are used. An agency representative may visit the site to verify the application's accuracy and completeness.

#### **Step 6. The permitting authority grants an authorization to construct.**

An authorization to construct must be granted by the permitting authority before building can begin. This authorization should include specific instructions on the number and schedule of inspections and at what stages of construction the inspections are required.

#### **Step 7. The system is built.**

Licensed installers or their apprentices can begin building the system only after receiving the authorization

to construct. The system must be built according to the approved plans and permit application. Any changes to the system must be approved by the permitting authority before the changes are made.

In some cases, a new review will be needed, such as when site conditions are different from those submitted in the planning materials. The level of certification (Installer I or II) required for construction depends on the type of system (Table 3).

#### **Step 8. The permitting authority inspects the system.**

The system must be inspected by the permitting authority at the appropriate stages of construction according to the type of system being installed. Inspections must be scheduled in advance and according to local policies. They should be comprehensive, covering all parts of the system.

The inspection should be based on the approved application and plans, current regulations, and accepted engineering practices. There should be no surprises during the inspection if the approved application was detailed and complete, and the system was built according to the approved application.

#### **Step 9. The permitting authority issues a notice of approval or license to operate.**

A notice of approval or license to operate is issued by the permitting authority after the completed system has passed all inspections.

### **Enforcement**

A homeowner can be subject to criminal penalties for not following proper procedures or for using a failed septic system.

The licenses or registrations of certified installers, apprentices, site

evaluators and designated representatives may be suspended or revoked for:

- Violating OSSF laws or regulations;
- Submitting false documents or information;
- Other causes such as fraud or deceit; or
- Failing to use reasonable or professional judgment in performing their duties.

## **Locating the players**

*Local permits:* Generally, the local health department can help you find the authorized agent responsible for permitting on-site systems. The regional TNRCC office with responsibility for your county can also help (Figure 2).

In counties without an authorized agent, the TNRCC regional offices are the contact for permitting. The regional office staff handles the permitting and inspection of the complete system. See the list of TNRCC regional offices in the state for the one in your region.

*State TNRCC offices:* Statewide leadership for the on-site permitting program is provided through the TNRCC offices in Austin:

Installer Certification Section  
Compliance Support Division; MC-178  
P.O. Box 13087  
Austin, TX 78711-3087

*Installers and professional designers:* Professionals in the industry have valid licenses.

Local permitting authorities generally have lists of licensed professionals working in their jurisdiction. Local advertisements will also assist in locating these professionals.

The TNRCC maintains a database of licensed professionals in the on-site industry. This database can be accessed

# Texas Natural Resource Conservation Commission Regional Offices and OSSF Contacts

**Region 1, Amarillo**

3918 Canyon Drive  
Amarillo, TX 79109-4996  
(806) 353-9251  
Lezlie Cooper

**Region 2, Lubbock**

4630 50th Street, Suite 600  
Lubbock, TX 79414-3509  
(806) 796-7092  
Amy Sanchez

**Region 3, Abilene**

209 South Danville, Suite 200B  
Abilene, TX 79605  
(915) 698-9674  
Lillie Johnson

**Region 4, Arlington**

1101 East Arkansas Lane  
Arlington, TX 76010-6499  
(817) 469-6750  
Kerry Niemann, Mike McClendon

**Region 5, Tyler**

2916 Teague Drive  
Tyler, TX 75701  
(903) 535-5100  
Randy O'Neal

**Region 6, El Paso**

7500 Viscount Blvd., Suite 147  
El Paso, TX 79925  
(915) 778-9634  
Robert Morales, Cindy Salas

**Region 7, Midland**

3300 North A Street,  
Building 4, Suite 107  
Midland, TX 79704-5421  
(915) 570-1359  
Cindy Williams

**Region 8, San Angelo**

301 W. Beauregard, Suite 202  
San Angelo, TX 76903  
(915) 655-9479  
Brent Wade

**Region 9, Waco**

Executive Plaza  
6801 Sanger Avenue, Suite 2500  
Waco, TX 76710-7807  
(817) 751-0335  
Jeff Kunze

**Region 10, Beaumont**

3870 Eastex Freeway, Suite 110  
Beaumont, TX 77703-1892  
(409) 898-3838  
Glenn Turner, Donna Crandall

**Region 11, Austin**

On-site Wastewater Registration  
1921 Cedar Bend, Suite 150  
Austin, TX 78758-5336  
(512) 339-2929  
Elston Johnson

**Region 12, Houston**

5425 Polk Avenue, Suite H  
Houston, TX 77023  
(713) 767-3500  
Larry Dodd, Donna Phillips

**Region 13, San Antonio**

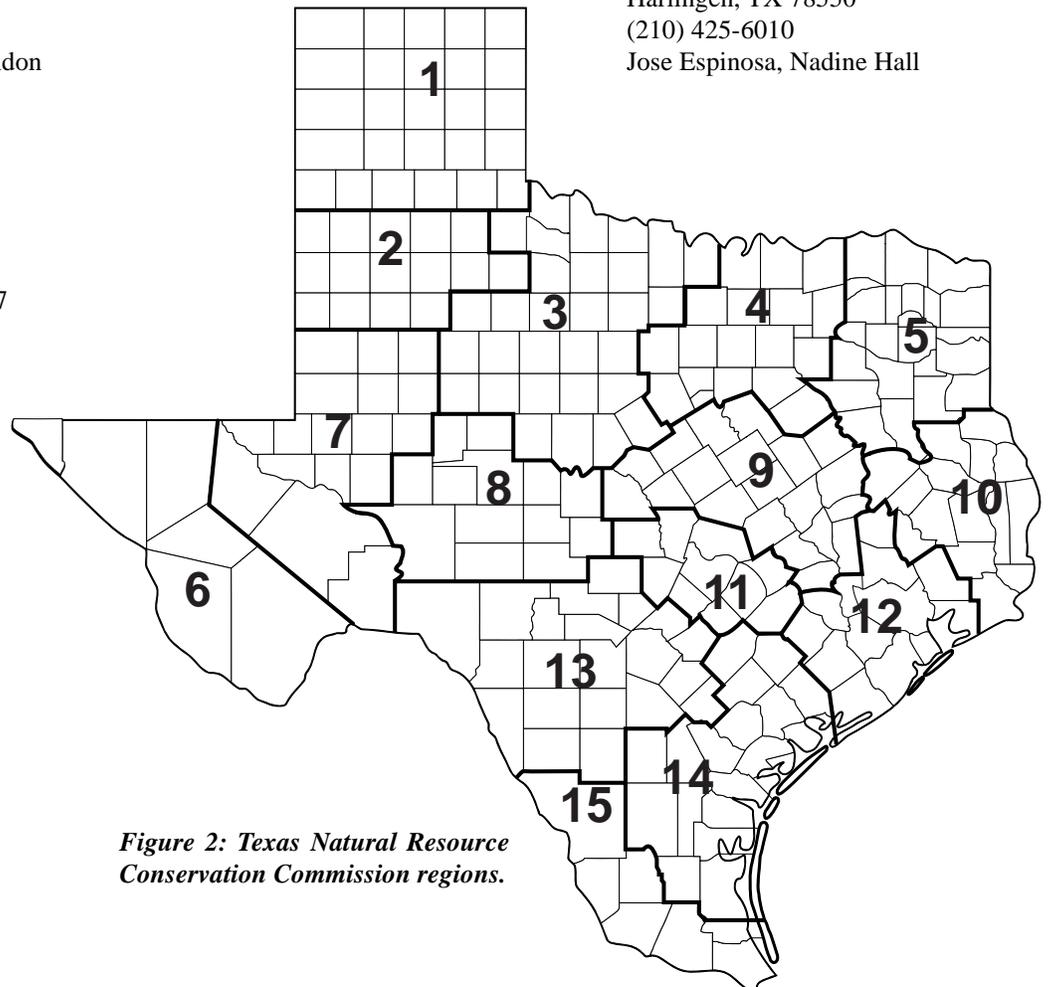
140 Heimer Road, Suite 360  
San Antonio, TX 78232-5028  
(210) 490-3096  
Jeff Depree

**Region 14, Corpus Christi**

6300 Ocean Drive, Suite 1200  
Corpus Christi, TX 78412-5503  
(512) 980-3100  
Ivan Santoyo

**Region 15, Harlingen**

134 East Van Buren, Suite 301  
Harlingen, TX 78550  
(210) 425-6010  
Jose Espinosa, Nadine Hall



*Figure 2: Texas Natural Resource Conservation Commission regions.*

via the World Wide Web at: [http://www.tnrcc.state.tx.us/enforcement/csdfs/ossf\\_search.shtml](http://www.tnrcc.state.tx.us/enforcement/csdfs/ossf_search.shtml). A search can be conducted by licensed individual's name, county, ZIP code, TNRCC region or certification license.

## Summary

On-site wastewater treatment systems can effectively manage our

wastewater. Historically, on-site systems served 25 percent of the new homes built in Texas. However, current projections estimate that 37 percent of new homes are being served by on-site systems.

To make sure your system functions properly, the first step is to choose the most appropriate technology for the site. Then the system must

be properly designed and installed. The checks and balances of the various steps in choosing, designing and installing an on-site wastewater treatment system can help ensure that your system will work properly. However, do not forget the maintenance requirements of your system. Failure to conduct this maintenance in a timely manner can destroy the best systems.

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