SAN ANTONIO WATER

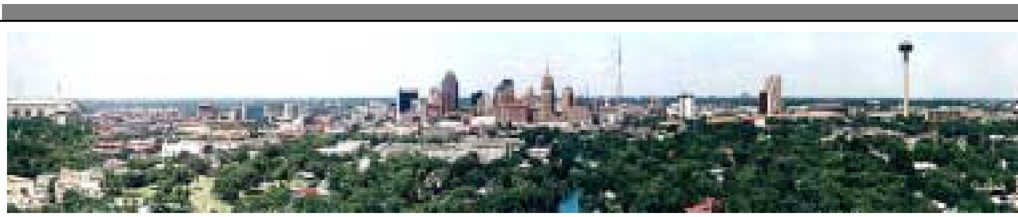
PIPES, PLANNING, POLITICS AND PEOPLE

THE EDWARD'S AQUIFER: SAN ANTONIO'S ONLY SUPPLY OF DRINKING WATER

The world's supply of water is 326 million cubic miles. But only a small portion of that water supply is usable fresh water. In fact, of the Earth's total water supply, less than one-half of one percent is usable fresh water.

The United States is water "rich." For example, we have 39,400,000 acres of lakes and reservoirs. The Great Lakes contain about 1/5 of the world's fresh water supply.

80% of U.S. communities use groundwater as their primary source of drinking water and San Antonio is one such community. In order to have quality drinking water, three important factors must be present: Quality, Quantity & Location. The Edward's Aquifer, the first aquifer to be designated a sole source drinking supply by the Environmental Protection Agency (EPA), supplies water to the citizens of San Antonio and historically has possessed all three factors. Although San Antonio's water is considered to be slightly hard because of the calcium and magnesium that comes from the limestone aquifer, the QUALITY of water has never been a problem. However, recently the QUANTITY of water in the Edward's has come into question.



SAN ANTONIO'S WATER NEEDS WILL DOUBLE BY 2050

Greater San Antonio is one of the fastest growing areas in the country and its water needs are rapidly increasing. It helps that San Antonio currently has one of the most efficient and successful conservation programs in the state. But even the best conservation efforts won't completely solve all water challenges.

Most realize that the Edwards Aquifer is a limited resource. In fact, no one knows for sure exactly how much usable water it actually contains. However, it is generally agreed that if you took the water out of the aquifer, you would be able to fill the state of Texas to about 1foot in depth. As a result, the Edwards region made a choice to limit the amount of water taken from the aquifer so it can be preserved for many years to come. But relying solely on the Edwards Aquifer is not the answer. That's why SAWS has been actively developing additional water resources to limit the dependence on the aquifer.

SAWS is looking at additional sources that may include the Guadalupe River, the Lower Colorado River Basin or other nearby resources. New ways to produce more water from the Edwards are still being pursued. Approximately one million dollars have been programmed annually for these studies to continue.

WATER RIGHTS

Water rights are used to allocate water in an organized and systematic manner. A water right allows an individual, business, community or agency to use a specified amount of water. People may own the water right; but never the water.

The history of water rights is closely related to settlement and land ownership. If a person owned the land, he or she could readily make use of water on or adjacent to their property. Over time, however, this simple allocation didn't work well because people began to settle areas alone on rivers upstream of the first settlers. These new settlers, although arriving later in time, now began to use water once only used by those downstream. In times of water scarcity, the downstream user might receive less water than they felt entitled to. The conflict that emerged pitted neighbor against neighbor in a fight for water, and ultimately resulted in a fight for basic survival.
A region's water rights doctrine is the result of many human and environmental factors. The successful settlement of the west was as closely tied to water as to any other factor. Limited water quantity is usually not the only issue. How people use water is also critical. For example, in the past few decades many changes have occurred that have added new dimensions to water rights and water allocation programs. Irrigated agriculture is one large consumer of water. Individuals and corporations invest millions of dollars in irrigation systems to grow crops and to produce forage for livestock which feed a hungry world. Cities also need water to meet the needs of residents, businesses, and industry. Water for recreation, fish and wildlife is receiving growing attention and is pressuring policy makers to reshape traditional water allocation patterns.

WORKING TOGETHER TO SOLVE THE WATER SUPPLY ISSUE

In November of 1998, the San Antonio City Council unanimously approved a long-term water plan. This plan was based on two years of input from city leaders, neighborhood groups, and citizens from all over San Antonio. Since then, SAWS has been steadily developing additional water resources, protecting the quality of aquifer water, and making the most of the water that is used.

In order to coordinate water projects across the state, the Texas Legislature has established a "from the bottom up" process. Local water projects will not be permitted by the state unless they are part of the regional and state water plan. Thus, all of the projects described here align with the regional plan and are supported throughout the planning region.

SHORT TERM PLANNING

San Antonio's water supply requirements will be met for the short term (the next ten years) from the following sources:

*Water From The Edwards Aquifer

The Edwards Aquifer will always be San Antonio's primary source of water. Thus, conservation programs to use it efficiently and protect the water quality will be expanded. Additional water from the Edwards will be acquired in several ways.

*Recycled Water

In 2001, SAWS will complete the first phase of its system to recycle treated wastewater effluent for irrigation and industrial uses. This program will provide 35,000 acre-feet of non-drinking water per year.

One acre-foot equals 325,851 gallons. That's enough to fill up an acre of space with one foot of water — or enough water for two families of four for one year.

*Oliver Ranch/BSR

Sustainability studies are being conducted to determine how much water can safely be withdrawn from a portion of the Cow Creek formation of the Trinity Aquifer in northern Bexar County. Preliminary studies suggest that 4,500 acre-feet may be sustainable from this source.

*Western Comal Project (Canyon Lake)

SAWS has contracted with the Guadalupe-Blanco River Authority for 3,000 acre-feet of water from Canyon Lake. An additional 6,000 acre-feet may be available on a short-term basis (through 2010) to serve the northwestern part of the SAWS service area.

*Aquifer Storage and Recovery (South Bexar County)

Property has been acquired in southeastern Bexar County for Aquifer Storage and Recovery (ASR) project using the Carrizo Aquifer as a storage facility. Water would be injected into this sand-based aquifer during periods of rainfall excess — and withdrawn during dry periods. This process will yield an additional 30,000 acre-feet.

*Regional Carrizo

SAWS is working to secure approximately 30,000 acre-feet of additional groundwater that may be available from the Carrizo Aquifer in Gonzales County.

LONG TERM PLANNING

San Antonio's long-term water needs (beyond 2010) will be met from the following sources:

*Guadalupe River Diversion

Negotiations are now underway for a larger supply of water from the Guadalupe River. Model runs show that approximately 60,000 to 70,000 acre-feet could be available from a large diversion in the lower part of the Guadalupe River basin near the Gulf Coast.

*Simsboro Project

SAWS has contracted with Alcoa to acquire groundwater from the Simsboro Aquifer in Milam and Lee Counties. SAWS has also purchased water rights owned by City Public Service on a site near-by. Sustainable yields from these two sites combined are projected to be 55,000 acre-feet.

LCRA Diversion

The purchase of 150,000 acre-feet may be available to SAWS and others from the Lower Colorado River Authority (LCRA) at Bay City.

Regional Aquifer Storage and Recovery

SAWS has agreed with the Evergreen Underground Water Conservation district to pursue a large-scale regional Aquifer Storage Recovery (ASR) program in Atascosa and Wilson Counties. This plan will not yield any additional new water supplies, but it will enable SAWS to store water underground during wet weather for use during dry periods.

Desalination Project

Taking salts and other minerals out of seawater may be an opportunity for San Antonio to acquire large volumes of water. Current technology makes this alternative one of the more expensive options, but it has been included in the current draft of Region L's South Central Texas Regional Water Plan (in accordance with the requirements of Senate Bill 1).

As you can see, a number of sources around the area are being developed to meet our water needs well into the future.

PLANNING LAND USE

(*Information used permission by The Water Sourcebook, Education Research and Inservice Center, University of North Alabama, Florence, Alabama).*

In communities throughout the U.S., land use is usually determined by immediate economic considerations. However, in recent years, more and more communities are planning their growth more carefully. Part of the reason for this is that people have recognized that environmental quality and aesthetic value- clean, healthful and attractive characteristics- are important considerations along with economics.

Since natural areas do yield economic benefit to the community, land use planners are taking these less immediate concerns into account when developing new land areas.

Natural areas such as parks, tracts of forest or grasslands, streams and ponds are usually desirable features in any community. They have been proven to increase an area's livability and to increase property values. Water bodies are highly desirable to most people.
Urban and regional planners often leave strips of natural area along these watercourses. These strips help protect water quality by filtering pollutants out of the runoff entering the water; it also provides habitat for many plants and animals.

AGRICULTURAL LAND USE

(*Information used permission by The Water Sourcebook, Education Research and Inservice Center, University of North Alabama, Florence, Alabama).*

The increasing world population has placed a huge stress on agricultural systems to produce food. While food distribution remains a problem, new advances in agriculture are encouraging.

In 1940, the average farmer in the U.S. could produce enough food for 19 people. Today, an American farmer can produce enough food to feed 129 people—101 in the U.S. and 28 abroad. Technological advances have increased the productivity of farmers, particularly by improving their ability to provide water to their crops through irrigation. Irrigation is defined as the managed application of water to soil for the purpose of increasing crop production.

Irrigated agriculture has helped American farmers produce the most abundant and diverse supply of food, fiber and foliage products in the world. Irrigation plays an especially important role in the Western United States where growing seasons are longer but there is not enough rainfall to supply an optimum amount of water to commercial crops.

Most countries use a large amount of water resources for agricultural purposes. In the U.S., agriculture accounts for 42 percent of water consumption. For crop irrigation, most of the areas of high production depend on water from underground sources-groundwater. In recent years, scientists have measured drastic falls in the water tables of important aquifers like the Edwards. These aquifers are almost impossible to replenish.

The by-products of agriculture also are affecting the groundwater. While pesticides and fertilizers are greatly responsible for production increases, residues from these products can filter down through the soil and into groundwater. Animal waste, or manure, has also contributed to groundwater contamination. Nitrates from both the manure and agricultural chemicals, can contaminate drinking water supplies.

On the positive side, many of these threats can be diminished through efficient farming methods and creative problem solving. By using manure instead of commercial fertilizer to enrich land, farms and the environment can both profit. Reducing the amount of pesticides and applying them only in critical times can also save money and lower the risk of contamination. Other alternative uses for manure range from enriching landfill cover soil to producing an alternative energy source (methane gas). Recent surveys involving farmers in the

Midwestern U.S. indicate that many farmers would welcome more efficient techniques and that the use of such techniques has increased.

WASTEWATER

We consider wastewater treatment as a water use because it is so interconnected with the other uses of water. Much of the water used by homes, industries, and businesses must be treated before it is released back to the environment.

If the term "wastewater treatment" is confusing to you, you might think of it as "sewage treatment." Nature has an amazing ability to cope with small amounts of water wastes and pollution, but it would be overwhelmed if we didn't treat the billions of gallons of wastewater and sewage produced every day before releasing it back to the environment. Treatment plants reduce pollutants in wastewater to a level nature can handle.

Wastewater is used water. It includes substances such as human waste, food scraps, oils, soaps and chemicals. In homes, this includes water from sinks, showers, bathtubs, toilets, washing machines and dishwashers. Businesses and industries also contribute their share of used water that must be cleaned.

Wastewater also includes storm runoff. Although some people assume that the rain that runs down the street during a storm is fairly clean, it isn't. Harmful substances that wash off roads, parking lots, and rooftops can harm our rivers and lakes.

WHY TREAT WASTEWATER?

Fisheries

Clean water is critical to plants and animals that live in water. This is important to the fishing industry, sport fishing enthusiasts, and future generations.

Wildlife Habitats

Our rivers and ocean waters teem with life that depends on shoreline, beaches and marshes. They are critical habitats for hundreds of species of fish and other aquatic life. Migratory water birds use the areas for resting and feeding.

Recreation

Water is a great playground for us all. The scenic and recreational values of our waters are reasons many people choose to live where they do. Visitors are drawn to water activities such as swimming, fishing, boating and picnicking.

Health

If it is not properly cleaned, water can carry disease. Since we live, work and play so close to water, harmful bacteria have to be removed to make water safe.

The major aim of wastewater treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent, is discharged back to the environment. As solid material decays, it uses up oxygen, which is needed by the plants and animals living in the water. "Primary treatment" removes about 60 percent of suspended solids from wastewater. This treatment also involves aerating (stirring up) the wastewater, to put oxygen back in. Secondary treatment removes more than 90 percent of suspended solids.
(Information courtesy of USGS)

SAWS WASTEWATER SYSTEM

The San Antonio Water System has three major Water Recycling Centers that supply water to the SAWS Reuse Program and to the City Public Service cooling lakes. All are located on the city's south side, and together they presently (1996) produce about 120 millions gallons of water per day. Another smaller plant, the Medio Creek WRC, is located on the city's west side and produces about 4 million gallons per day. SAWS also owns and operates several small "package" facilities that serve individual high schools and neighborhoods.

*In the 1930's San Antonio's Rilling Road plant was one of the first water recycling systems in the state of Texas. It was replaced by the state-of-the-art Dos Rios facility in 1987.
*In the 1950's and 60's, San Antonio and City Public Service were pioneers in the large-scale use of recycled water for cooling electrical power plants. Over 6.5 billion gallons of recycled water are used each year.
*SAWS Water Recycling Centers treat wastewater from over one million persons in Bexar County.
*The area served by SAWS in Bexar County is over 400 square miles.
*There are over 4,300 miles of sewer lines in the collection system.
*Average discharge from the Recycling Centers is presently about 120 million gallons per day.
*Recycled water is discharged to the Medina and San Antonio Rivers

HOW DOES WATER RECYCLING WORK?

The water recycling process utilizes very basic physical, biological, and chemical principles to remove contaminants from water. Use of mechanical or physical systems to treat wastewater is generally referred to as ***primary treatment***. Use of biological processes to provide further treatment is referred to as ***secondary treatment***. Additional purification is called ***tertiary*** or ***advanced treatment***.

PRIMARY TREATMENT

Primary treatment uses simple mechanical and physical processes to remove approximately half of the contaminants from wastewater.

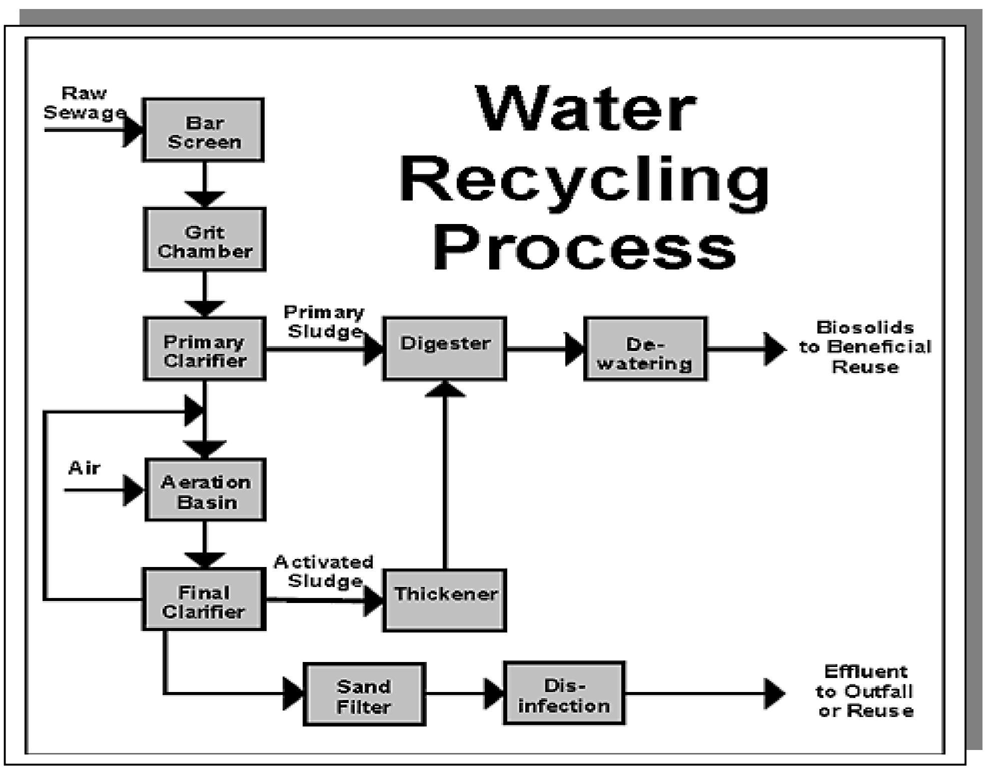
1. Bar screens: Screening removes large floating objects such as sticks and rags from the incoming wastewater stream. Unless they are removed, they could cause problems later in the treatment process. Most of these materials are sent to a landfill.

2. Grit chamber : Water flows into large tanks designed to slow it just enough so that sand and grit drop to the bottom.

3. Primary clarification: Water is slowed further so that settleable organic materials drop to the bottom while fats, oils, and greases float to the top. Biosolids removed at this point are digested, dewatered, and used for beneficial purposes like conditioning soil or composting.

SECONDARY TREATMENT or "Bug Farming For Clean Water"
Secondary treatment uses biological processes to remove most of the remaining contaminants.
1. Aeration and Clarification : Water flows into aeration basins where oxygen is mixed with the water. Bacterial microorganisms consume the organic material as food. They convert non-settleable solids to settleable solids and are later themselves captured in final clarifiers, ending up in wastewater biosolids. Most of the solids that settle out in final clarifiers are thickened and digested, but some are returned to the aeration tank to reseed incoming water with microorganisms. Many operators of WRC's consider themselves "bug farmers" since they are in the business of growing and harvesting a healthy population of microorganisms.

ADVANCED TREATMENT and DISINFECTION
After the bugs do their work, water is filtered through sand and then chemical disinfection in chlorine contact chambers is used to kill any remaining microorganisms. It is not desirable to have residual chlorine in the rivers and lakes, so chlorine is then removed using sulfur dioxide. This protects the aquatic life in the receiving stream. The point where recycled water is discharged to a stream or body of water is called the ***outfall***.



WASTEWATER RESIDUALS
Another part of treating wastewater is dealing with the solid-waste material. These solids are kept for 20 to 30 days in large, heated and enclosed tanks called 'digesters.' Here, bacteria break down (digest) the material, reducing its volume, odors, and getting rid of organisms that can cause disease. The finished product is mainly sent to landfills, but sometimes can be used as fertilizer.

RECYCLED WASTWATER

With the scarcity of water in some parts of the U.S. and with water conservation being so important nowadays, the reuse of treated wastewater is becoming more important. No, you don't have to worry about your drinking water at home coming right from a sewage-treatment plant (although a successful test of this has been done!!), but treated wastewater is being used for certain purposes throughout Bexar County.

The use of recycled wastewater helps us in two ways:

1. Recycled water can supply needed water for some purposes
2. Recycled wastewater frees up fresh water that can be used somewhere else, such as for drinking water

So, what exactly is recycled wastewater used for? A lot of it goes toward watering golf courses and landscaping alongside public roads, etc. Some industries, such as power-generation plants can use recycled wastewater. A lot of water is needed to cool power-generation equipment, and using wastewater for this purposes means that the facility won't have to use higher-quality water that is best used somewhere else.

In 1996 the SAWS Board approved a Water Recycling plan that will deliver 35,000 acre feet of this highly treated effluent to commercial and industrial users throughout the city.
Today the program consists of a planned 64-mile pipeline going around the entire city delivering recycled water to customers for **non-drinking** water purposes.