Raw Water Enterprise Newsletter
4th Quarter 2018 Newsletter
San Jacinto River Authority
Lake Conroe & Highlands Division

SJRA's Support of Galveston Bay Estuary Program

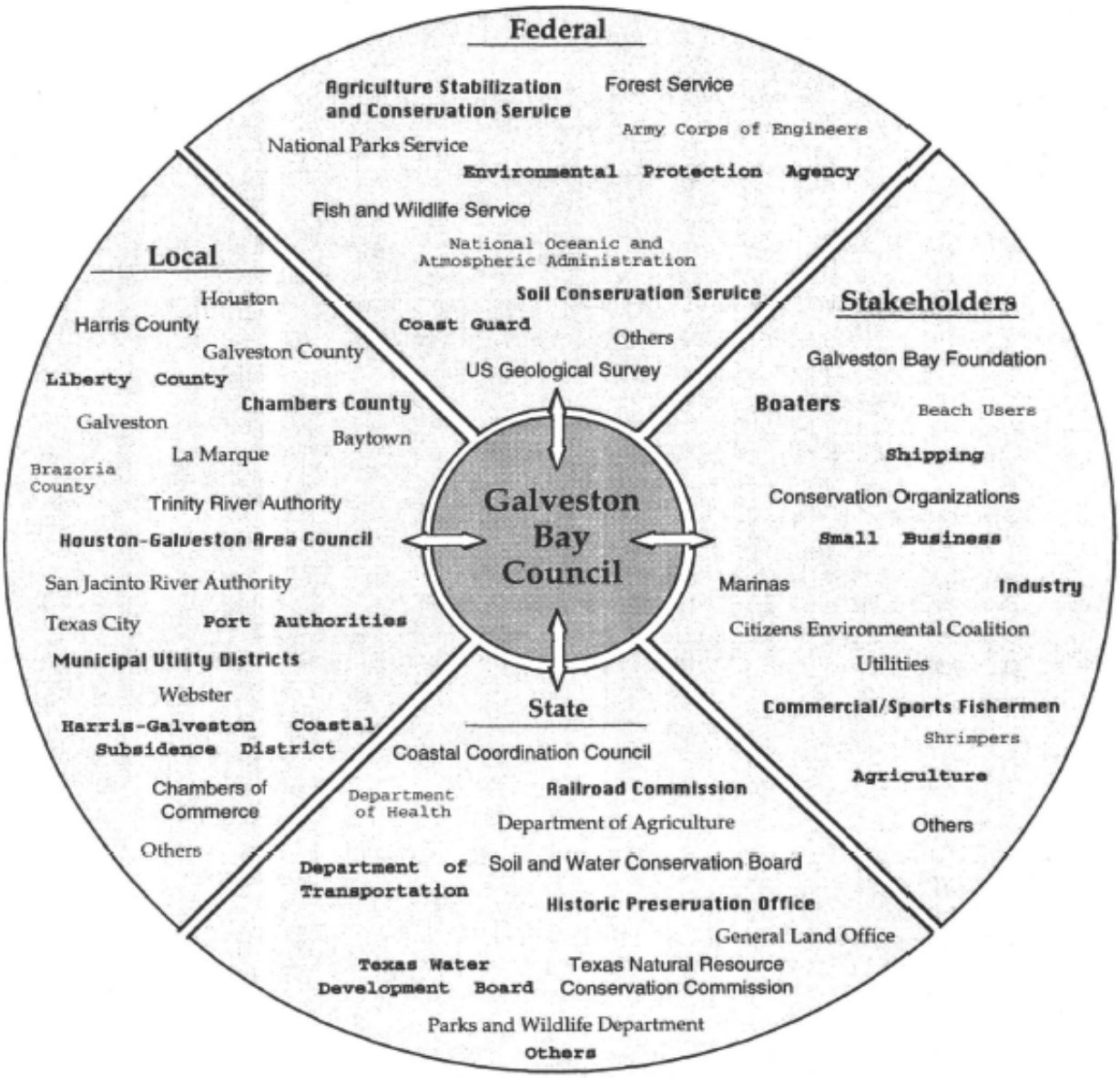
SJRA has a long history of involvement and direct support for various external efforts in the San Jacinto River Basin related to water resources management. One of these important programs is the Galveston Bay National Estuary Program (GBNEP), which was established under Section 320 of the Water Quality Act of 1987 with a purpose to develop a Comprehensive Conservation and Management Plan for Galveston Bay (the *Galveston Bay Plan*). This particular program has been very successful and SJRA is proud to be one of the local government agencies who have dedicated staff time and expertise to help develop and provide continued support for the goals of this local program.

Program Results

The Estuary Program partners have made notable achievements in improving water quality, restoring wetlands, protecting unique habitats, and educating the public. Since 2000, the Galveston Bay Estuary Program and its partners created, protected, and enhanced 21,150 acres of important coastal habitats, leveraging approximately $80 million in local, industry, state, and federal contributions. The Estuary Program receives approximately $1.6 million on average in base funding (state and federal). Base funds support program operations, and also serve as seed funds to execute specific projects that implement the *Galveston Bay Plan*.

The Galveston Bay Plan, April 1995 illustrates the geographic coverage of the Galveston Bay Program.

Officially established in 1989, the Galveston Bay Estuary Program is one of two estuary programs in Texas and one of 28 National Estuary Programs in the United States. This non-regulatory program is now administered by the Galveston Bay Estuary Program and consists of a small staff of professionals based in Houston offices. Since many agencies and organizations are concerned with managing the resources of Galveston Bay, coordinating a broad range of issues among them is necessary. The program has been successful in forging diverse partnerships with these organizations and strives to effectively work with local governments, businesses, ports, commercial fisheries, recreational anglers, environmental organizations, and state and federal natural resource agencies.



The Galveston Bay Plan, April 1995 reflects the many partnerships for implementing the Galveston Bay Plan.

Council Partnership

The *Galveston Bay Plan* guides the conservation and restoration of the estuary and identifies problems, solutions and actions to rectify the Bay's growing needs. The development of the *Galveston Bay Plan* occurred through a partnership of state and federal agencies, local governments, stakeholders, users, and other interest groups and continues to be guided by the Galveston Bay Council, which provides an advisory role for the Galveston Bay Estuary Program's implementation of the Plan. The Council is comprised of various interest groups, each represented with at least one designated appointee. The various interests include:

- Federal Agencies,
- State Agencies,
- Regional/Local Governments,
- Environmental/Citizen's Groups,
- Private Sector, and Research/Academia.

The Council has five subcommittees that meet regularly to ensure the Plan's implementation and to identify projects and programs needed to address actions established in the Plan document.

Subcommittees include:

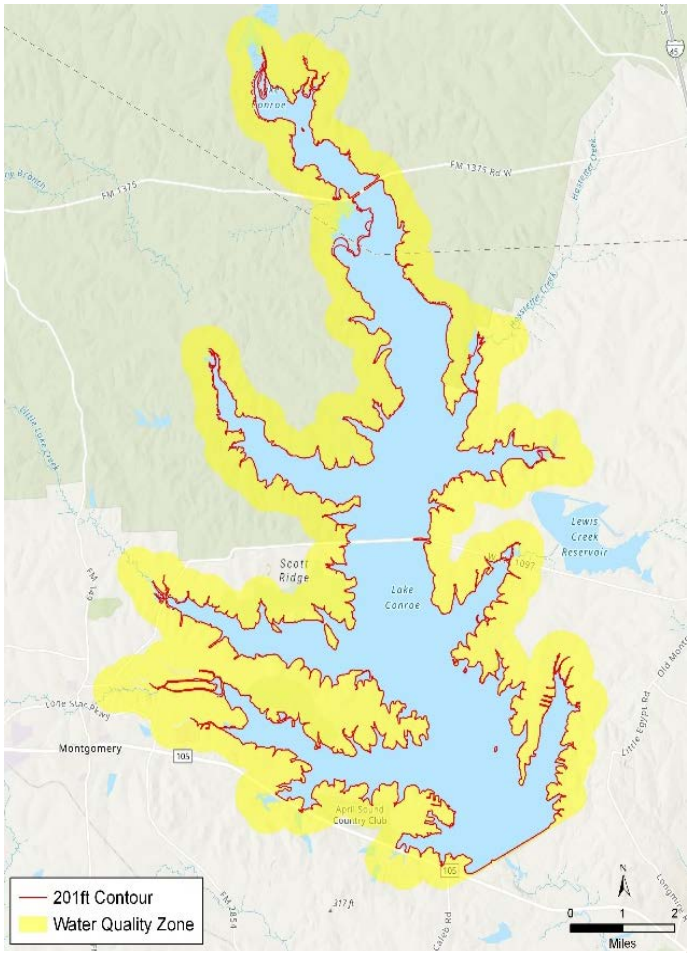
- National Resource Uses
- Water and Sediment Quality
- Public Participation and Education
- Monitoring and Research
- Budget and Priorities

SJRA Involvement

Since the formation of the Council in November 1995, the San Jacinto River Authority has provided a council member representing Regional/Local Governments. Historically, SJRA's General Manager has served as the appointee, including Jim Adams, Reed Eichelberger, and currently, Jace Houston. SJRA's involvement in these various activities not only contributes to the protection of our natural resources, but also allows SJRA to be directly involved in the coordination and collaboration that occurs between local and regional entities to address the watershed/environmental issues that are important to the region

Protection of Lake Conroe's Water Quality

Some of the major responsibilities for the Lake Conroe Division include safely operating and maintaining the Lake Conroe dam facilities, managing the reservoir and its shoreline, and properly passing storm events through the dam spillway. However, protecting and preserving the quality of water within the Lake Conroe watershed is also a major responsibility of the Lake Conroe Division and one that requires many different activities. One of the primary activities to help achieve this goal is proper management of the On-Site Sewage Facility (OSSF) program.



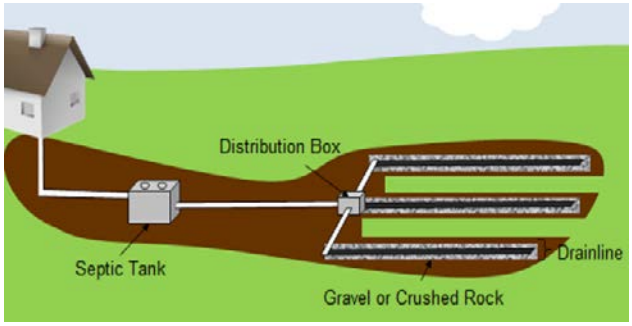
SJRA Water Quality Zone.

OSSFs, also known as septic-tank systems, are wastewater systems designed to treat and dispose of effluent on the same property that produces the wastewater. The Texas Commission on Environmental Quality (TCEQ) sets the minimum regulatory standards for managing OSSFs, issues licenses to OSSF operators, and delegates permitting and enforcement authority to local governmental entities such as SJRA. The TCEQ has designated SJRA as the Authorized Agent to implement and enforce TCEQ's On-Site Sewage Facility Order for the area immediately surrounding Lake Conroe. SJRA's area of jurisdiction, also known as the Lake Conroe Water Quality Zone, is currently defined as 2,075 feet in all directions horizontally from the lake shoreline established at elevation 201 feet mean sea level (MSL).

Wastewater Technology

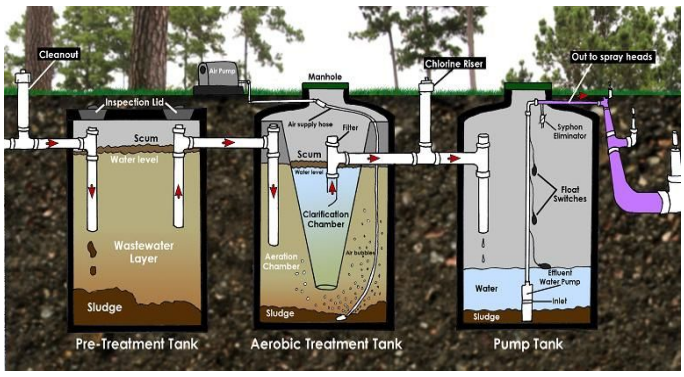
There are many different types of OSSFs; however, the most common types found within the Lake Conroe Water Quality Zone are "Conventional Systems" and "Aerobic Treatment Units" (ATUs). Conventional systems are quite simple. Household wastewater enters a large tank and settles into two layers (liquid and solid). Anaerobic microbes break down the solids within the tank and wastewater is discharged from the tank into a subsurface drain field. The drain field treats the wastewater by allowing it to slowly trickle from slotted drain pipes out into a gravel layer and eventually down through the soil. The gravel and soil serve as biological filters to

decompose the waste particles. The majority of the treatment occurs in the tile bed as oxygen from the air is introduced to the wastewater via the soil, and aerobic bacterial treatment occurs in the soil and in the gravel bed. These systems work very well where soil conditions are appropriate.



Typical Layout for a Conventional Septic System.
http://www.brighteyestexas.com/Septic-Systems-Liberty-TX

Prior to the 1980's, most of the OSSFs installed within SJRA's jurisdiction were conventional systems. Unfortunately, very few areas around Lake Conroe, or even throughout Montgomery County, are now deemed suitable for Conventional Systems and these systems can no longer be used in these areas. Instead, more costly and mechanically-advanced Aerobic Treatment Units are typically used around Lake Conroe and in most of the County.



Example of an Aerobic Septic System.
http://www.brighteyestexas.com/Septic-Systems-Liberty-TX

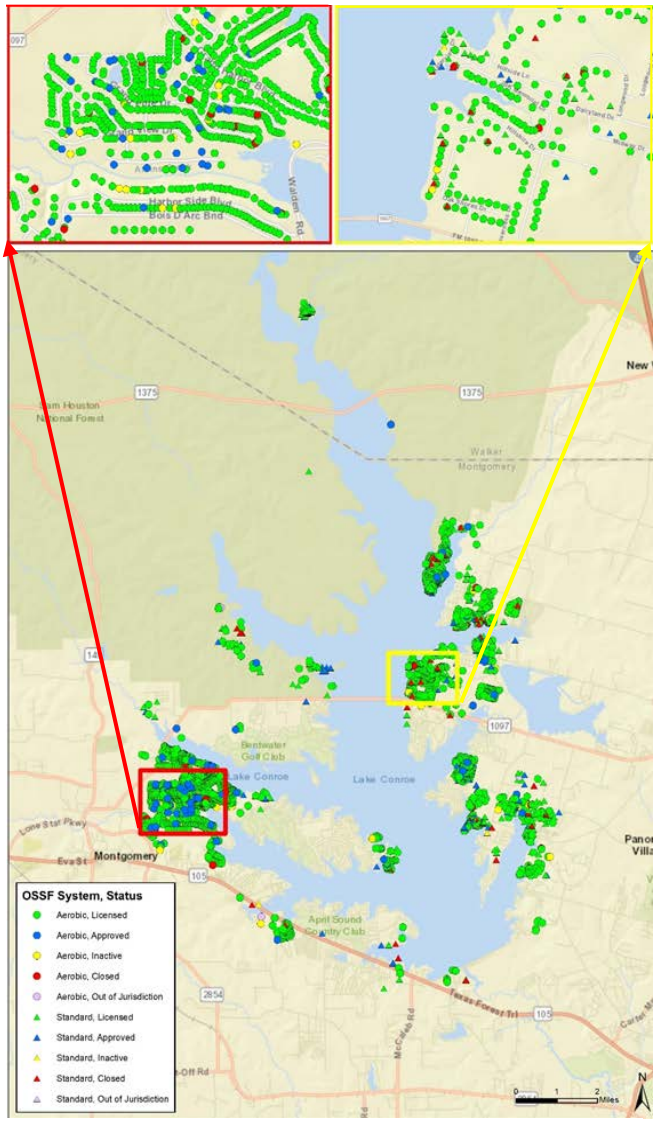
ATUs provide secondary treatment of the wastewater and use spray or drip irrigation to dispose of the treated effluent. These systems have treatment components that must be maintained to function properly and a lack of maintenance may result in a failure of the system. Figure 1 shows the distribution of the current OSSFs in the Lake Conroe watershed. Within SJRA's Water Quality Zone there are approximately 1,650 ATUs and 550 Conventional Systems that have been permitted for construction. ATU systems, when maintained properly, provide effective protection in the Lake Conroe Water Quality Zone.

Routine Maintenance

A failure of an OSSF ATU is generally associated with a lack of maintenance to the system. In order to help reduce the potential for this problem, SJRA amended its regulatory OSSF Order in December, 2015, and adopted standards more stringent than current TCEQ standards. The amendments to the OSSF Order are similar to the requirements already adopted by Montgomery and Walker counties.

In order to facilitate more effective implementation of the new requirements adopted by SJRA, a comprehensive program is underway which includes: 1) initial construction permitting, 2) new construction inspections, 3) licensing of the systems, 4) routine inspections of systems, 5) tracking of O&M contracts and maintenance reports, and 6) prompt enforcement measures when necessary. SJRA's Lake Conroe Division administers this program with in-house staff, and partners with local

regulatory and law enforcement agencies for any required enforcement. One of the more significant amendments to the SJRA's OSSF Order is the requirement that all ATU's be properly maintained by licensed maintenance providers and that at least three system inspections be conducted each year for all systems. For homeowners who do not wish to enter into a contract with a licensed maintenance provider to provide this service, SJRA has provided a second option which allows property owners to perform the maintenance themselves.



OSSF's located with the SJRA's Water Quality Zone.

The inspection and maintenance of ATUs serving single family dwellings can be performed by a homeowner if any one of the following criteria is met:

- The property owner has satisfactorily completed the 8-hour course entitled "Troubleshooting Aerobic Treatment Units", offered by Environmental Training Systems (http://www.environmentaltrainingsystems.com).
- The property owner is a maintenance provider licensed by the TCEQ.
- The property owner holds a valid Class-D or higher wastewater treatment license.
- The property owner has satisfactorily completed a TCEQ-approved Basic Maintenance Provider Course.

Inspections and Enforcement

In addition to enforcing the OSSF Order, Division staff also conduct random and routine inspections of all ATUs within Lake Conroe's Water Quality Zone in order to help ensure that systems are functioning properly and that proper maintenance is being performed by either a licensed maintenance provider or the homeowner.

SJRA makes every effort to encourage voluntary compliance with the State's rules and regulations and the SJRA's OSSF Order. However, failure to repair a malfunctioning system or to meet SJRA's maintenance requirements for an ATU can lead to legal enforcement action. Citations for violations of these rules are now being issued by law enforcement officers from the Montgomery

County Precinct-1 Constable's office. A property owner who operates and maintains an OSSF within the Lake Conroe Water Quality Zone must comply with the OSSF Order and the Lake Conroe Rules and Regulations related to these facilities.

OSSF Program Administrator performs a routine inspection of an OSSF.

Since increased enforcement actions began in June 2016, the following OSSF program implementation activities have taken place:

- Routine Inspections of OSSFs
    - Eight to ten inspections of newly constructed ATU's are performed monthly.
    - 25 random inspections are performed per week on existing ATUs. The goal is to have all ATU's randomly inspected at least once every two years.
- Maintenance of OSSFs
    - Approximately 17 homeowners have obtained certified training to conduct maintenance of their ATUs.
    - Approximately 1,600 homeowners have executed contracts with licensed maintenance providers to provide the maintenance services needed.
- Enforcement Activities
    - Complaints from neighbors are investigated promptly as needed.
    - Those homeowners who fail to get a maintenance contract receive multiple notices and reasonable time to obtain the contract from a Licensed Maintenance Provider or to provide documentation of completion for one of the SJRA approved homeowner courses. Failure to obtain the contract will result in the customer being issued a citation by the Montgomery County Precinct-1 Constable.
    - Should the homeowner not respond to citation, the homeowner may be summons to appear before the Precinct 1 Justice of the Peace.

Summary

SJRA has developed this OSSF program to protect the water quality and minimize future potential water quality problems that may result from urban growth around the reservoir. The SJRA program of permitting, inspection, complaint investigation, and enforcement action when necessary, will continue to be implemented for those OSSFs in the Water Quality Zone and is expected to contribute to maintaining the water quality in Lake Conroe and throughout the watershed.

Maintenance of Oldest SJRA System Requires Many Talents

Since the late 1940's, the Highlands Division staff has been charged with operating and maintaining approximately 30-miles of a Raw Water System, including canals, levees, pump stations, 50+ siphons, and the 1,400 acre Highlands Reservoir. This effort requires multiple skill sets and a team focused on getting the job done on a daily basis. The Highlands Division currently has a dedicated O&M team of nine employees, including Heavy Equipment Operators, a Pump Stations Manager, an O&M Lead, and an O&M Manager. The Division staff is fortunate to have three veteran employees with over 10+ years working in the Highlands. This article outlines the various responsibilities that this team tackles on a routine schedule to keep the system operating reliably on a 24/7/365 basis.

Daily Operations

Each morning, one O&M staff member drives the entire 30-mile system to inspect the canals and levees, to observe conditions at the siphon and culvert crossings, and measure water levels at critical locations. This information guides staff on any required changes to pumping, flow, or gate adjustments to be made to meet customer demands. Once water is pumped into the canal, raw water flow is gravity fed through the system. It is essential that there is enough head pressure to allow water to flow through the structures down to the Highlands Reservoir to maintain reservoir storage levels and to adequately meet flow requirements at the diversion points for all customers. The O&M staff also monitor water salinity weekly and distributes this information to industrial customers on the East and South Canals. An important element of the daily inspection of the system is to record any canal problems and identify any issues/concerns for repair. Issues/concerns that pose a risk for causing a blockage require immediate attention to maintain reliable raw water flows in the system.

Gate adjustments as needed in order to match customer demands.

O&M staff are required to immediately address any unanticipated blockages that impede/restrict flow. If required, staff may use heavy equipment to remove debris out of the canal system and ensure proper disposal. Unfortunately, illegal dumping of all sorts of

trash occurs in the remote areas of the canal system and frequently occurs at major roadway crossings during night-time hours.

Mowing/Canal Maintenance

The entire interior canal is grass-lined above the canal flow line and the outside of the canal levees are primarily grass-lined; therefore, the system requires mowing approximately four times a year using tractors with "bat-wing" or slope-mowing attachments. Between mowing cycles, siphon headwalls and other structures require use of hand-operated tools for weed removal and/or herbicide spraying to control weeds and small brush, especially along fences, at gates, and for other structures at the property boundaries. The O&M staff typically conducts one additional monthly inspection solely to review vegetation issues along the entire length of the canal system and log their findings in order to create appropriate work orders for subsequent action.

Periodic mowing of approximately 60 miles of levees.

Invasive Species Control

Control of aquatic invasive species, both plant and animal, require constant attention along the entire system. Nutria represent a particular challenge in the Highlands due to damage from burrows and tunneling into the sides of the levees, which can result in voids that can collapse and flip a mower or actually cause levee

Spraying vegetation control products.

Another continuous challenge is the control of aquatic vegetation. Staff must periodically attend training in order to acquire and maintain herbicide application licenses from the Department of Agriculture and must meet all the requirements defined in SJRA's formal Pest Control Program before authorization to conduct animal eradication. Rooted plants growing in the shallow Highlands canals can restrict the flow and significantly reduce the carrying-capacity to unacceptable levels. The EPA strictly regulates the type and application of herbicides that are acceptable for use in water supplied for municipal purposes; therefore, regular training and education is necessary to

maintain the required licenses for aquatic systems.

General Maintenance

The Highlands Division O&M staff not only operate a wide range of machinery, but also have special expertise in maintaining and repairing mechanical machinery and heavy equipment used by the Authority. The O&M staff perform the majority of all preventative maintenance (PM) work orders on machinery and for pumps, motors, gates, and other equipment in the system. The O&M staff also diagnose and address issues that arise related to the maintenance of equipment and fleet vehicles. Scheduled PM includes maintaining and periodically changing all fluids in the equipment at required intervals and completing comprehensive inspections on all operating machinery and equipment in the system.

Along with PMs, the staff also conducts many required corrective maintenance activities such as replacing worn or broken bearings, seals, belts or other mechanical parts, as required. The possibilities for corrective maintenance are endless due to the variety of equipment and facilities that must be maintained.

Small Construction Projects

The O&M staff in the Highlands possess a variety of skills that extend beyond the operations and maintenance of the system into the physical construction activities required to repair and rehabilitate many components of the system. The cost savings provided by performing projects in-house rather than using third-party contractors can be significant.

SJRA Highland Division Operations and Maintenance Staff

Recently, the O&M staff in the Highlands, assisted by other departments within the SJRA, have planned and executed multiple small construction projects, including demolition and construction of new concrete slabs, SCADA buildings, meter houses, flow control gates, culvert crossings, and access pipe gates and fences for improved access and security throughout the system.

Summary

The Highlands Division operates and maintains 30-miles of canal system extending from Lake Houston through Crosby downstream to Baytown and Mont Belvieu. These O&M staff are a talented group of individuals that have diverse and valuable skill sets for the SJRA's various needs in the Highlands Division, but who work effectively as a team. This hard-working group of individuals tackle many diverse projects with pride, ownership, and a focus on getting the job done effectively and efficiently. The Authority is fortunate to have these dedicated employees working in the Highlands and making sure the water is delivered every single day with no exceptions, as required by our customers.

Water Conservation in Montgomery County

The SJRA is now nearing completion of a Raw Water Supply Master Plan (Master Plan) that will define SJRA's options for meeting long-range water supply needs in Montgomery County. A key element of the Master Plan is identification of the most efficient and effective potential strategies by which SJRA can meet future water supply needs. One strategy that is highly recommended in the Master Plan is "water conservation." Instead of developing new sources of supply, this strategy involves reducing the actual future demand for water primarily by promoting proven water conservation practices. Therefore, instead of creating a new "project," this strategy considers how SJRA might develop "programs" to promote specific water conservation activities within the various utilities in Montgomery County that would directly benefit those utilities and would result in a permanent reduction of raw water demands for those entities as well as a lower-cost water supply overall for the region.

Water conservation involves the implementation of various methods to increase the efficiency of water use. Worldwide, water conservation is a widely used strategy to meet increasing growth needs without developing new supplies and enables communities to

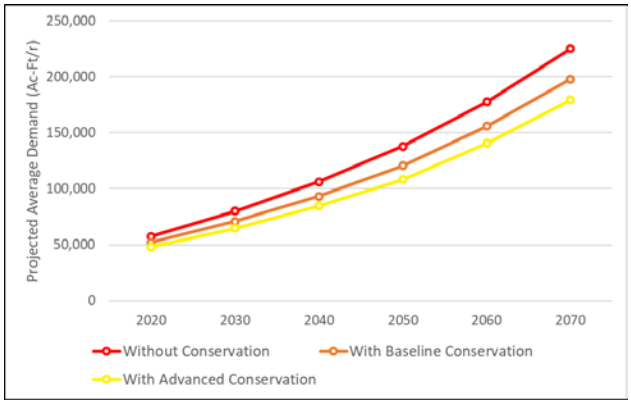
Lone Star Groundwater Conservation District Trailer on-site at SJRA Campus for Tours.

continue to thrive with ever-diminishing water resources. This can be accomplished via practices to reduce water consumption for industrial, agricultural irrigation, or municipal uses.

SRJA Planning

For the purposes of the SJRA Master Plan for the Montgomery County area, the water conservation strategy is focused on reducing municipal water demands such as water used to serve residential, commercial, light industrial, and landscape irrigation demands which may include golf courses or other landscape areas irrigated by public water systems or private wells. Historically, per capita municipal water use is projected to actually decrease without any special encouragement from water suppliers due to the universal adoption of plumbing codes with higher standards for water efficiency, mandates for higher-efficiency appliances, and other water savings that will occur over time as the cost of water increases for the individual consumers. The question the Master Plan addresses is whether even more conservation is possible and warranted in Montgomery County beyond that which is expected to occur passively.

The graph below shows the water demand projected for Montgomery County under three different assumptions related to water conservation: 1) No conservation, 2) Baseline Municipal Conservation, which is municipal water conservation that is anticipated to occur exclusive of any action by the SJRA (as identified by the Texas Water Development Board in conjunction with its 5-year regional water planning efforts), and 3) Advanced Conservation, which incorporates the additional conservation achievable through focused program(s) by SJRA to further promote and encourage utilities to implement water saving practices appropriate to the Montgomery County area. The total potential baseline reduction in water demand (which reduces the need for additional raw water sources) is estimated to reach approximately 27,000 acre-feet per year by 2070, while advanced conservation could result in an additional reduction amount of more than 18,000 acre-feet per year by 2070. The baseline conservation amount, as identified in the Master Plan, is clearly achievable at an extremely low cost compared to other strategies and is recommended as a foundational element in SJRA's strategies to supply the future water demands of the region, with advanced conservation presented as another potentially feasible option to be considered for implementation under appropriate scenarios.



Montgomery County SJRA Service Area Demand Projections.

Therefore, under the Master Plan recommendations, the SJRA will be expecting a baseline conservation reduction in water

demand that will occur passively, but could also actively pursue additional conservation savings through program(s) of advanced conservation.

Advance Conservation

Examples of advanced conservation activities that are recommended as potential options in the Master Plan include: water loss reductions for specific utilities through infrastructure improvements, outdoor landscape watering programs that limit outdoor watering to two occurrences weekly, and other miscellaneous advanced conservation programs designed to encourage best management practices for municipal utilities which could include but are not necessarily limited to:.

- Efficient residential irrigation controllers,
- Efficient meter installations,
- Tank-type ultra-low-flow toilet rebates,
- Efficient commercial dishwashers,
- Efficient commercial spray-rinse valves,
- Efficient commercial steamers,
- Efficient commercial cooling towers,
- Landscape surveys for large single-family residences,
- Landscape water budgets for large single-family residences.

Advanced or "active" conservation presents challenges in implementation due to uncertainty caused by factors such as the effects of seasonal weather patterns on conservation programs, and variability in enforcement and compliance across multiple independent utilities. As reflected in the Master Plan, baseline conservation ranks higher than active conservation in its potential to be an effective and efficient strategy due to higher levels of certainty in its implementation and lower costs (baseline conservation, being passive, is essentially cost-free). However, active conservation is still considered a very cost-effective and viable strategy that can be implemented as appropriate in the long term as SJRA faces shortages in future water supplies to meet customer demands. Because active conservation programs take time and effort to be developed and even more time and effort to become effective, they must be initiated early and must be sustained over time to remain effective. Although the costs are small, SJRA will be required to dedicate resources and efforts to achieve the goals of advanced conservation if it is a pursued strategy.

Water Conservation Public Relations Poster.
(http://freecoloringpages.co.uk/)

Lake Conroe Relief Well Rehabilitation Study

Lake Conroe Division Dam Relief Well Hole.

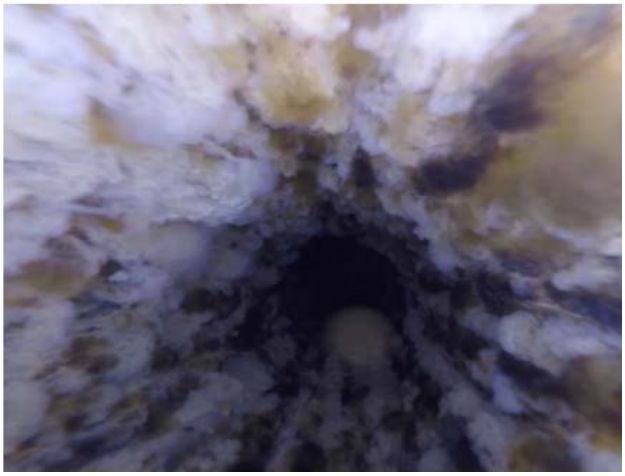
During recent inspections of the Lake Conroe relief well system, located along the western portion of the dam, bio-fouling (reddish-brown sludge / bacteria) was identified as being present within the system. SJRA's dam safety engineers recommended that the system be cleaned and rehabilitated to remove the bio-fouling since this material can reduce the flow capacity of the wells and these wells are critical for reducing groundwater uplift pressures which might reduce the structural stability of the dam if not functioning properly.

The relief wells are 6-inches in diameter and contain punched stainless steel screens and casings designed to collect groundwater seeping under the dam and safely drain it via a pipe network away from the dam. The depths of the wells range from 32 to 50 feet and function entirely by gravity pressure flow. In order to determine the most cost-effective method for cleaning and rehabilitating the well system, a pilot study was performed on 3 of the 20 relief wells to evaluate rehabilitation options and to determine the current functionality of the existing system. The other 17 relief wells will be cleaned and rehabilitated in a second phase using the processes and specifications which were determined to be most appropriate during the pilot study. The additional contract for rehabilitation of the remaining 17 wells is under preparation now and is anticipated to be ready for award at the October meeting of the SJRA Board of Directors.

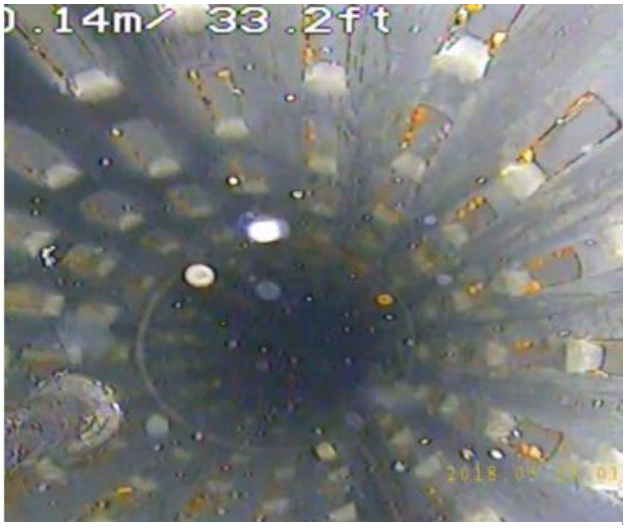
Brushing of a Relief Well.

The pilot project consisted of pre-maintenance inspection and testing of the three selected wells including a video inspection, artesian flowrate, and pump test to determine specific capacity of the well. Specific capacity is a measurement of

well efficiency and can be used to determine when well rehabilitation is deemed to be necessary. The maintenance portion of the rehabilitation consisted of testing various techniques for cleaning and rehabilitating the well casing and screen using mechanical brushing, acid treatment, and hydraulic surging. Final disinfection was performed on the three wells along with post-maintenance testing after each process to be able to evaluate the effectiveness of the rehabilitation methods.



Relief Well No. 5 Pre-Maintenance Inspection.



Relief Well No. 5 Post-Maintenance

Table 1 presents the results of the well's specific capacity prior to and after the entire rehabilitation process. The efficiency of all three wells improved through the rehabilitation process. Similar rehabilitation methods as refined during the pilot study will be utilized for the future rehabilitation of the additional 17 relief wells.

Table 1: Specific Capacity Results

Well No.	Prior to Rehabilitation (gpm/ft)	Post Rehbilitation (gpm/ft)	Specific Capacity Improvements (%)
5	0.32	0.52	62.50
10	0.72	0.79	9.72
18	1.20	1.41	17.50

Specific Capacity Results Table.

The system of relief wells at the Lake Conroe Dam have had only minimal maintenance and no previous rehabilitation over their lifetime Monitoring and testing of the relief wells will occur at regular intervals in the future so as to determine an appropriate schedule for future cleaning. With continued maintenance and periodic cleaning the existing relief wells should provide adequate service for many years into the future.

Raw Water Enterprise - Next Quarter Calendar

September 2018

27th	Board of Directors Monthly Meeting at SJRA in Conroe

October 2018

17th	Galveston Bay Council Meeting at Subsidence District in Friendswood
17th	Regional Flood Management Council Meeting at HGAC in Houston
23rd	Bacterial Implementation Group (BIG) Meeting at HGAC in Houston
25th	Board of Directors Monthly Meeting at SJRA in Conroe
31st	TWDB Region H Meeting at SJRA in Conroe

November 2018

1st	HGAC Natural Resource Advisory Committee Meeting at HGAC in Houston
7th	TWDB Region H Meeting at SJRA in Conroe

Lake Conroe and Highlands Division Safety Tailgates

Highland Division Tailgates

- Heat Safety – *Travis Alexander*
- Safety Shower and Eye Wash Safety – *Jarred Thomas*
- Carpel Tunnel – *Brian Kilgore*
- Back Pain/Proper Lifting – *Steven Gwaltney*
- Tractor Safety – *Harlan Colvin*
- What Causes Accidents – *Lynzey Jett*

Lake Conroe Division Tailgates

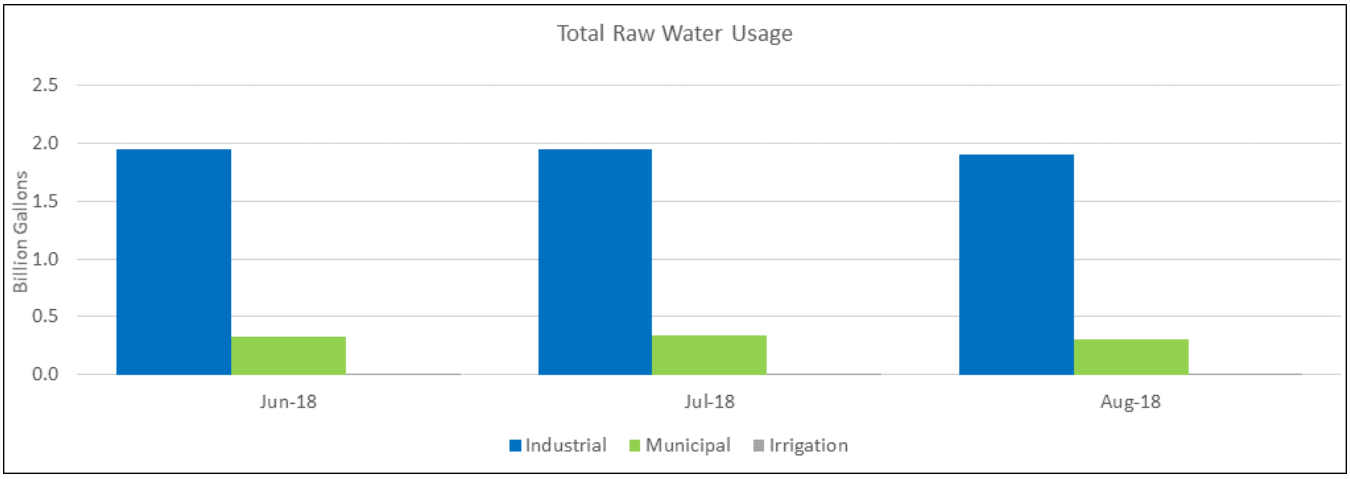
- Office Trip and Snag – Rhonda Mona
- Diversion Channel Safety – Tony Hodges

Human Resources and Safety Coordinated Meetings

- Hot Weather Preparedness – *Garrick Landrum*
- Emergency Action Plans – *Keith Prescott*

**Note: Fourth Quarter Financials for the Raw Water Enterprise, Highlands Division and Lake Conroe Division have not been provided for the report due to end of year reconciliation.

Raw Water Usage Data



Lake Conroe - Reservoir Level Data