**Chapter 4: Growth Capacity**

Continued growth and development in the Conroe area will require a strong “backbone” of supporting infrastructure that includes water supply, wastewater treatment, and storm drainage. The provision of these services lays the groundwork for growth by preparing municipal infrastructure systems for the demands of additional population and development at higher densities. Infrastructure provision also sends a signal to the market that the City is encouraging development in certain areas. As a result, the availability of infrastructure capacity is extremely influential in determining the location and intensity of development. This chapter provides a general overview of the City’s infrastructure system and presents a framework to guide the development, upgrading, and extension of municipal infrastructure in accordance with current and projected needs.

**Key Issues**

**Supplementing Groundwater with Surface Water**

The City of Conroe currently meets 100 percent of its water demand through groundwater wells. Growing water use in the City and other parts of Montgomery County risk a slow depletion of the aquifer since the County is currently pumping more water than is recharged annually through rainfall. To prevent this, the Lone Star Groundwater Conservation District (LSGCD) has developed a plan that asks water users in the County to make a partial transition to surface water once treatment facilities and conveyance infrastructure are in place. It is estimated that the City of Conroe will use surface water for 30 percent of its water supply starting in 2015. In the meantime, the City will need to drill additional wells and also promote water conservation to meet water needs.

**Wastewater Treatment Capacity**

It is estimated that the City’s only wastewater treatment plant is operating at 65 percent capacity. The City is already exploring options to increase this capacity by either expanding the existing facility or constructing a new one. Improving efficiency through the reduction of inflow and infiltration is also a necessary strategy to improve the capacity of the system.
**Drainage and Flooding**

Some areas of Conroe lie within the floodplain of the San Jacinto River or one of its tributaries. This presents development constraints and challenges when dealing with storm drainage. As the area develops and adds more impervious (hard) surfaces such as roads, parking lots and rooftops, stormwater has fewer places to infiltrate naturally through the ground. This results in an increased amount of rainwater that is funneled directly into storm pipes at a faster rate. This can overload the storm drainage system and cause brief flood events after a storm. It also threatens surface water quality because pollutants such as oil and sediment are carried with rainwater directly into lakes and rivers without first being filtered through the ground.

As Conroe grows, techniques will be needed to better respond to the increasing problem of managing stormwater. However, an effective stormwater management program will require more accurate information and a willingness to improve management of flood-prone locations.

**Utility Infrastructure**

**Water**

The City of Conroe’s existing water system, including water lines, storage tanks and nearby Municipal Utility Districts (MUDs) is shown in *Figure 4-1*. The City, like all of Montgomery County, currently gets 100 percent of its water supply from groundwater wells that tap into the Gulf Coast aquifer system. According to City staff, Conroe currently uses approximately 7 million gallons of water per day (MGD). The City is in the process of locating and drilling six new wells and pumping stations because pumping stations are currently operating near capacity.

The water treatment plant has adequate capacity to handle a maximum of 15 MGD, which is more than double the current average daily demand. The City is currently developing projections to estimate future water demand. As shown in *Figure 4-2*, the Lone Star Groundwater Conservation District (LSGCD) has estimated Conroe’s 2040 water demand to be approximately 16,310 acre feet per year. This figure converts to approximately 14.5 MGD, which is just under the maximum capacity of the City’s existing water treatment plant. The water treatment facility will need additional capacity beyond the average daily demand to handle peak demand and fire protection, particularly during summer months when substantial water is devoted to lawn care.

Drilling additional wells is a necessary strategy to meet Conroe’s immediate and short-term water needs. However, water use projections show that a “groundwater only” strategy will not be
adequate to meet long-term water needs. In 2006, The LSGCD completed a Regulatory Study and Facilities Implementation Plan to identify groundwater management strategies and chart the path for supplementing groundwater with alternate water resources.

According to the study, the Gulf Coast Aquifer’s recharge rate (the amount of water returned to the aquifer each year through precipitation) is approximately 64,000 acre feet.

Currently the County has pending and permitted applications for 69,584 acre feet of water resulting in a deficiency of over 5,000 acre feet for the year. This deficit is projected to increase with an estimated water demand of 150,000 acre feet by the year 2040. Continuous withdrawal of water in excess of the annual recharge rate will cause water levels in the aquifer to gradually decline.

Monitoring by the U.S. Geological Survey from 1990 to 2004 shows that groundwater levels in Montgomery County are declining. The southern part of the County west of IH 45 showed declines of 100 feet and the area around the Woodlands declined 120 feet. The large volume of water stored in the aquifer means it is unlikely that overuse will entirely deplete the system, however there are many other problems associated with running a groundwater deficit. Primary concerns associated with declining aquifer levels include:

- **Land subsidence** – When water levels decline, the clay layers within the aquifer may compact causing the land to subside. This has occurred within the Gulf Coast aquifer, though it has been most problematic closer to the coast in Harris and Galveston Counties. More information is needed to predict the potential for subsidence in Montgomery County. However, monitoring in one area of the Woodlands from 2000-2003 showed downward movement of the land surface at an average rate of
0.54 inches per year. Subsidence is a serious concern as it can add to storm drainage problems and increase maintenance costs to infrastructure, streets and the foundation of structures.

- **Increased costs** – water level decline creates the need to drop the level of pumps and replace existing wells that become inefficient. In addition to the capital costs of replacing equipment, operating costs increase when wells have to be lowered.

- **Water quality** – as water levels decline there is less water available to dilute contaminants in the soil. In North Harris County this has resulted in arsenic and radioactive constituent concentrations above acceptable levels. Montgomery County has not experienced significant water quality issues resulting from over pumping, but two wells have been shut down by exceeding the accepted Maximum Contaminant Level (MCL). This will become an increasing problem as additional development occurs throughout the area causing runoff to carry added urban pollutants, unless appropriate “scrubbing” techniques are put in place.

The LSGCD was created to manage Montgomery County’s groundwater resources and prevent further depletion of the Gulf Coast aquifer. In order to do this, the LSGCD has identified the need for communities within Montgomery County to begin using surface water resources, such as Lake Conroe, to reduce groundwater pumping. Though the need for surface water conversion is immediate, the infrastructure needed to treat and distribute surface water from Lake Conroe will not be in place until at least 2015. Until then, communities in Montgomery County will have to rely on other strategies such as drilling additional wells and promoting water conservation to meet water demand.

Once surface water conversion is available beyond 2015, it is estimated that Conroe will need to receive 30 percent of its overall water supply from Lake Conroe. If Conroe and other water users in Montgomery County follow the LSGCD’s guidelines for surface water conversion, the County should be able to meet long-term water demands without depleting the aquifer. The conversion to surface water will require substantial infrastructure investments and increase the retail cost of water. The transition to more expensive water resources may be an opportunity to introduce conservation programs, especially with large industrial water users.

### Wastewater

The City of Conroe operates and maintains a wastewater treatment system (shown in Figure 4-3) consisting of gravity sewers, lift stations and sewer pipes to carry waste from homes and businesses to a single wastewater treatment plant (WWTP) where it is treated and released into the San Jacinto River. Conroe’s treatment facility, the Southwest Regional Wastewater Treatment Plant, was built in 1987 with an initial capacity of 6 MGD. The capacity was expanded to 10 MGD in 1991. The WWTP is currently operating at approximately 65 percent capacity; treating an estimated average daily flow in the range of 5 to 6.5 MGD.

According to City staff, the treatment facility could be at or over maximum capacity within only five years.
The City has already begun exploring options for either expanding the existing plant or building an additional facility, despite the fact that the State does not recommend planning for future treatment needs until the WWTP is operating at 75 percent capacity. Conroe is wise to start planning for improvements early given the City’s desire to attract additional industrial and commercial users, which increase wastewater flows more rapidly than residential users.

In addition to adding capacity, the City should be exploring ways to increase the efficiency of the current system. Inflow and infiltration (I/I) are common problems that reduce the capacity of the wastewater treatment system by allowing storm water and other unnecessary materials to enter the system. Infiltration occurs through cracks in flow lines and manhole covers. Inflow occurs through improper connections to sewer lines (i.e. downspouts and groundwater sump pumps). When this unwanted fluid enters the system, the wastewater facility is required to treat much more waste than is necessary. Sources of I/I can be difficult to detect, because they are located underground and often on private property. Proper maintenance of existing lines and aging manhole covers can considerably reduce problems of infiltration, which increases the capacity of the existing treatment facility and prevents taxpayer’s dollars from literally “going down the drain”.

Investing in wastewater capacity will be a key issue as Conroe continues to grow. Major infrastructure investments like this should be undertaken with adequate information on the status of the existing system, current inefficiencies due to I/I, projections for future needs, and associated costs for improvements. This type of information is currently not well documented in Conroe, making it more difficult to systematically plan and budget for improvements. As Conroe plans for additional wastewater treatment capacity, it should take the opportunity to undertake a comprehensive study of existing and future wastewater needs to provide an accurate foundation for future wastewater planning and investment.

**Stormwater**

As shown in Figure 4-4, some areas of Conroe lie within the 100 and 500-year floodplains of the San Jacinto River and its tributaries. These areas as well as low-lying pockets throughout the City are susceptible to flooding and poor stormwater drainage. This has become an increasingly important issue in recent years due to rapid urban growth in and around Conroe. The additional development activity has weakened the area’s ability to handle storm water naturally by decreasing the amount of vegetative cover and increasing the amount of impervious surfaces. To counter this effect and protect residents from flooding, the City will need a comprehensive approach to storm water management that includes improved

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**Detecting I/I Sources**

The Texas Water Development Board (TWDB) offers low-cost assistance to communities by lending smoke generators to locate sources of I/I. TWDB also trains city staff to use the equipment with no charge other than the cost of the used smoke cartridges.
data, higher development standards, and public investment in storm detention facilities.

The City is currently upgrading its data on storm drainage through the use of light detection and ranging (LiDAR) technology. This radar system can accurately measure topography to identify low-lying areas that are prone to flooding. The City is waiting to make decisions regarding regional detention or floodplain improvements until LiDAR data is acquired. Currently, it is unknown whether regional detention is a viable strategy, or where detention facilities would be ideally located. The data will also help the City to identify areas that should simply be off-limits to development. If LiDAR data is not obtained from the City, it is important that these issues be addressed using alternative data sources.

In addition to acquiring LiDAR data, the City needs to improve its records on the location of storm pipes. Currently this data is not systematically collected and is only available in individual subdivision records. This information should be located in a searchable database and in a geographic information system (GIS).

The creation of a drainage master plan would be one possible option for combining the updated LiDAR data along with an inventory of existing storm drainage facilities. This would ensure that the City has a comprehensive understanding of its drainage needs and priorities while also providing current information to guide development. Additionally, the study could identify a series of best management practices (BMPs) that would be feasible to implement in Conroe through amended development regulations, incentives and capital improvement projects. The BMPs could be incorporated into the City’s drainage manual. Examples of stormwater BMPs include: vegetative filter strips, wet ponds, riparian/forested buffers, low-impact development and dry detention ponds. The City will need to determine which BMPs are most effective and feasible to promote.

GROWTH CAPACITY GOALS

The City hopes to achieve the following long-term goals through the implementation of the Comprehensive Plan.

- Adequate water supply to meet the needs of residential, commercial and industrial users without depleting water levels in the Gulf Coast aquifer.
- Wastewater treatment and collection infrastructure adequate to meet Conroe’s growing needs.
- A stormwater drainage system that is adequate to mitigate the impacts of increased development, reduce flooding, and protect water quality.
**Growth Capacity Actions**

The following actions have been identified to aid the City in achieving its Growth Capacity goals.

- Develop a plan to supplement groundwater resources with surface water in cooperation with the Lone Star Groundwater Conservation District, the San Jacinto River Authority, and other water users in the County.
- Develop a “menu” of drought-tolerant plants and trees as an educational handout for homeowners, landscapers and developers to promote water conservation through landscaping.
- Begin a public awareness program to educate residents and large-scale water users about the water rate increase anticipated with the transition to surface water. Use this opportunity to promote conservation strategies and associated cost-savings.
- Study the feasibility of using wastewater effluent for non-agricultural irrigation purposes (i.e. golf courses) or manufacturing uses to minimize the amount of fully treated water directed toward these uses.
- Conduct a comprehensive study of the City’s wastewater system that documents the current system status, existing system inefficiencies (I/I), projected future demand, a schedule of priority improvements, estimated costs of improvements, and possible funding sources including water and wastewater impact fees.
- Collect improved drainage data using available technology such as light detection and ranging (LiDAR).
- Conduct a comprehensive inventory of the city’s storm drainage infrastructure and document the infrastructure in a geographic database.
- Revise the city’s drainage manual to incorporate and actively promote best practices regarding stormwater management.
- Establish a stormwater system operations and maintenance plan to ensure that facilities are adequately maintained and performing as designed.
- Revise the City’s drainage ordinance to include an enforcement mechanism and appropriate penalties for violations including improper maintenance.

**Growth Capacity Policies**

Policies are intended to provide additional guidance for daily decisions made by staff and City Council. **Decision-Making policies** are intended to guide decisions regarding development projects and other proposals. **Administrative Policies** provide guidance on the day-to-day business of the City regarding budgets, staff resources and City-initiated programs or projects.

**Decision-Making Policies**

- Promote development in close proximity to existing infrastructure to reduce the short term expense of extensive infrastructure development
and the long term expense of maintenance over a large geographic area.

- Ensure the availability of adequate infrastructure for any proposed new development or expansion.
- Protect natural vegetation on-site and encourage, to the extent possible, significant natural landscaping into the site design.
- Promote the integration of natural drainage systems into subdivisions as design amenities.
- Support development projects that minimize the amount of impervious surface through strategies such as:
  - reducing the number of parking spaces to the minimum required;
  - minimizing the use and size of cul-de-sacs:
  - reducing street widths to the minimum that can support travel, parking, sidewalks and emergency vehicle access; and/or
  - incorporating landscaped surfaces into paved areas.
- Coordinate infrastructure improvements with transportation improvements when possible to limit damage to and reconstruction of the roadway network.
- Use drought-resistant vegetation in all City landscaping and streetscaping projects to reduce the demand for irrigation.
- Pursue opportunities, where feasible, to develop storm drainage improvements (i.e. detention basins) as multi-use facilities for either active recreation or passive open space.
- Acquire land along streams and tributaries that could act as riparian buffers for storm water management water quality purposes.

**Administrative Policies**

- Regularly update information, maps and plans regarding infrastructure capacity to ensure that local officials, staff, developers and the public have accurate, up-to-date information regarding the state of the City’s infrastructure.
- Proactively guide growth by expanding or improving infrastructure in areas where residential, commercial or industrial growth or redevelopment is most desirable to the community.
Figure 4-1
Existing Water Service

Legend
- Ground Storage
- 20" Water Line
- 12"-16" Water Line
- 6"-10" Water Line
- 2"-4" Water Line
- MUDs In or Near Conroe
- City Limits
- Conroe Planning Area

Source: City of Conroe GIS, 2006