



Nacogdoches Comprehensive Plan Update

Utility Infrastructure

CHAPTER 7

The purpose of the Utility Infrastructure element is to provide a framework for the logical development, extension and upgrade of the City's infrastructure system, which includes potable water, wastewater and storm water services.

The potable water system is comprised of supply facilities (ground water wells and surface water), treatment facilities, and distribution facilities. The wastewater system includes gravity flow collection lines, pump stations (lift stations) with pressure lines, and treatment units. Storm water drainage facilities typically include collection inlets, gravity flow collection lines, open channels, detention ponds, and storm water treatment facilities.

The findings and recommendations in this plan element are based, in part, on interviews with City of Nacogdoches Engineering and Public Works staff and comments received during a Community Forum held in September 2002. In addition, information has been included from existing utility plans including the *Comprehensive Water System Plan* published in August 2000 by KSA Engineers, Inc., the *Wastewater Master Plan* published in October 2002 by Schaumburg & Polk, Inc., the *Flood Control Study* published in November 1995 by Schaumburg & Polk, Inc., and other available utility system maps, plans and data sources available from the City. This plan element is not intended to update or replace these current utility master plans. Instead, it should be used in conjunction with these studies as well as the Future Land Use and Thoroughfare Plan maps found in this Comprehensive Plan.

Key Issues

The Comprehensive Plan Advisory Committee (CPAC), in response to concerns discussed at the Community Forum, identified the following issues:

- ◆ **Increasing Water Supply Treatment and Distribution Capacity** – While the City of Nacogdoches has the advantage of having two water supply sources, planning for future demands from projected growth is always an important concern. Based on the City's *Comprehensive Water System Plan*, water sources are available to accommodate estimated demands through Year 2050. Water treatment and distribution facilities are the limiting factor in supplying potable water to existing and future developments. Making water distribution improvements to help raise system pressures and increasing system capacity for fire protection were two priorities noted during the Community Forum.
- ◆ **Conserving Water** – Water conservation practices were discussed during the Community Forum as an item needing consideration for implementation in new or existing ordinances. Even though the City of Nacogdoches has sufficient water capacity for projected demands over the next 50 years, the conservation of treated water can help to reduce usage and subsequently lower ever-rising treatment and distribution costs.
- ◆ **Improving and Expanding the Wastewater Collection System** – The availability of sanitary sewer collection lines or lift stations of sufficient depth often limit the development of properties along existing roadways. The lack of wastewater collection system capacity and coverage was another concern expressed during the Community Forum.
- ◆ **Enhancing and Adding to Existing Storm Drainage Systems** – Over 70 percent of the comments received during the Community Forum address concerns over drainage-related issues. Localized street flooding, regional detention needs, the maintenance of existing ditches/creeks, and creation of community amenities around existing natural creeks were some of the items discussed. The hilly terrain of Nacogdoches makes the collection of storm water difficult. The numerous privately-owned low areas and natural creeks found across the City offer potential flooding problems and a significant challenge to resolve. Potential growth and Federal and State legislation will drive the need for the City to continue to address storm water quality, drainage capacity and floodplain management issues.

Goals, Objectives and Actions

The goals, objectives and action steps outlined in this element of the Nacogdoches Comprehensive Plan Update are based on traditional infrastructure planning and community design principles as well as input from community residents and leaders during the planning process. The goals, objectives and actions appear in no particular priority order.

Increasing Water Supply Treatment and Distribution Capacity

Goal: Increased capabilities and capacity of the potable water system.

Objectives

- ◆ Use the Thoroughfare Plan and Future Land Use Plan as tools to identify areas where transportation access will spur development activity. Coordinate alterations and expansions to the water distribution system with demands appropriate for the designated land use. Water system

improvements should conform to the overall infrastructure planning described in the current *Comprehensive Water System Plan*.

- ◆ Following the *Comprehensive Water System Plan*, complete the engineering and construction bidding of the surface water treatment plant expansion.
- ◆ Monitor Interstate 69 activities and progress to be prepared for the likely development and utility system impacts of this significant project.
- ◆ Monitor the expansion of FM 225 by the Texas Department of Transportation and prepare for the impacts to the current trunk water line from the Lake Nacogdoches surface treatment plant.

Actions

- Utilize the Thoroughfare Plan during the subdivision and site development review process to ensure functional integration of new streets with the expansion and extension of properly-sized water distribution lines.
- Periodically review the City's *Comprehensive Water System Plan* with the Thoroughfare Plan and consider amendments as necessary, particularly to maintain consistency with the Future Land Use Plan, zoning and other development-related ordinances.
- Bid and award a construction contract for the expansion of the surface water treatment plant at Lake Nacogdoches. Complete the expansion as planned.
- Continue and complete the construction of new water lines and line replacements currently under construction.
- Update the *Comprehensive Water System Plan* (including system computer models and digital maps) as needed to reflect the current condition and capacity of the water treatment and distribution system.
- Participate in a planning role as an advisory or technical committee member of the Interstate 69 project. As definitive plans for the corridor develop, modify the *Comprehensive Water System Plan*, in conjunction with other Master Plans, as appropriate.
- In the immediate future, begin the design and funding processes for the replacement of the trunk water system line from Lake Nacogdoches.
- Monitor the intended construction date for the Phase 1 widening to FM 225, and start construction and easement acquisition 24 months prior.
- Plan to replace the 685,000 linear feet of existing asbestos cement water distribution lines before asbestos fiber counts in the water supply grow to unacceptable levels.
- Continue to require high standards for water-related infrastructure in ETJ developments, in coordination with Nacogdoches County, to avoid inheriting problem situations as the City grows.
- Update the City's Subdivision Ordinance to reflect the issues outlined in the *Comprehensive Water System Plan* and to maintain consistency with current laws and proper engineering practices.

Conserving Water

Goal: Efficient and cost-effective use of treated water supplies.

Objectives

- ◆ Ensure that water is used efficiently.

- ◆ Continue periodic reviews of tiered water rates to maximize revenue and reduce consumption where appropriate.
- ◆ Actively promote water conservation by industries, businesses, public agencies and institutions, and individuals.

Actions

- Make sure every tap is properly metered, including water for City uses.
- Implement leak-detection systems and monitor variances between production and sales. The installation of interior distribution system meters at strategic locations can help narrow the locations of water losses.
- Continue to involve local community groups in the creation of awareness programs designed to reduce water consumption.
- Continue annual updates to the City's water rate model to ensure that water rates are set appropriately. Organize rates to reward low-consumption users.
- Periodically review the City's engineering design, plumbing and construction standards and adopt amendments as necessary to include water-saving devices.

Improving and Expanding the Wastewater Collection System

Goal: Increased capabilities and capacity of the wastewater system.

Objectives

- ◆ Use the Thoroughfare Plan and Future Land Use Plan as tools to identify areas where transportation access will spur development activity.
- ◆ Coordinate alterations and expansions to the wastewater collection system with capacities appropriate for the designated land use. Wastewater system improvements should conform to the overall infrastructure planning described in the current *Wastewater Master Plan*.
- ◆ Following the *Wastewater Master Plan*, complete the engineering and construction of "Phase I Improvements" in an order that best fits current development trends.
- ◆ Monitor Interstate 69 activities and progress to be prepared for the likely development and utility system impacts of this significant project.

Actions

- Utilize the Thoroughfare Plan during the subdivision and site development review process to ensure functional integration of new streets with the expansion and extension of properly-sized wastewater collection lines.
- Periodically review the City's *Wastewater Master Plan* with the Thoroughfare Plan and consider amendments as necessary, particularly to maintain consistency with the Future Land Use Plan, zoning and other development-related ordinances.
- Bid and award construction contracts for sewer system replacements and extensions described as "Phase I Improvements" in the *Wastewater Master Plan*. Complete Phase I items by 2010.
- Update the *Wastewater Master Plan* (including system computer models and digital maps) as needed to reflect the current condition and capacity of the wastewater treatment and collection system.

- Participate in a planning role as an advisory or technical committee member of the Interstate 69 project. As definitive plans for the corridor develop, modify the *Wastewater Master Plan*, in conjunction with other Master Plans, as appropriate.
- Continue to require high standards for wastewater-related infrastructure in ETJ developments, in coordination with Nacogdoches County, to avoid inheriting problem situations as the City grows.
- Update the City's Subdivision Ordinance to reflect the issues outlined in the *Wastewater Master Plan* and to maintain consistency with current laws and proper engineering practices.

Enhancing and Adding to Existing Storm Drainage Systems

Goal: Increased capabilities and capacity of the storm water collection and conveyance system.

Objectives

- ◆ Use the Thoroughfare Plan and Future Land Use Plan as tools to identify areas where transportation access will spur development activity. Coordinate alterations and expansions to the storm water collection system with capacities appropriate for the designated land use. Storm water system improvements should conform to the overall drainage planning described in the current *Flood Control Study*.
- ◆ Provide for flood relief in developed areas.
- ◆ Reduce localized street and channel flooding incidents.
- ◆ Lower 100-year flood elevations on La Nana Creek and Banita Creek to reduce the footprint of floodplain areas.
- ◆ Update Flood Insurance Rate Maps (FIRMs) and Floodway Maps to match current conditions.

Actions

- Utilize the Thoroughfare Plan during the subdivision and site development review process to ensure functional integration of storm sewers and inlets with new streets.
- Periodically review the City's *Flood Control Study* with the Thoroughfare Plan and consider amendments as necessary, particularly to maintain consistency with the Future Land Use Plan, zoning and other development-related ordinances.
- Implement a Watershed Management Plan, as outlined in the *Flood Control Study*, to develop policies, standards and regulations that promote the reduction of peak run-off rates.
- Review and consider the creation of a Municipal Drainage Utility System (MDUS) to allow the generation of new funds designated for drainage improvements. These funds could support the replacement of undersized drainage pipes, addition of new inlets, improvements to open drainage channels, and the studies necessary to solve many localized street-flooding problems.
- Prepare any additional study information needed to supplement the *Flood Control Study* so that it may be submitted to the Federal Emergency Management Agency (FEMA) for the preparation of new Floodway and Flood Insurance Rate Maps and an updated Flood Insurance Study.

- Begin land acquisition and engineering design for the construction of Regional Storm Water Detention Ponds as outlined in the *Flood Control Study*. The installation of regional ponds would immediately reduce numerous flood hazards that are the direct result of high water surface elevations along La Nana Creek and Banita Creek.
- Continue to require high standards for drainage-related infrastructure in ETJ developments, in coordination with Nacogdoches County, to avoid inheriting problem situations as the City grows.
- Update the City's Subdivision Ordinance to complement the current Drainage Policy and reflect the issues outlined in the *Flood Control Study*, as well as to maintain consistency with current laws and proper engineering practices.

Potable Water System

The City obtains its water from a surface water facility at Lake Nacogdoches and eight water supply wells, with a ninth well under development in 2003. Groundwater is withdrawn from the Carrizo Aquifer. The water distribution system has 16 water storage tanks, including 2,550,000 gallons in eight elevated storage tanks and 12,500,000 gallons in eight ground storage tanks. Water treatment processes include filtration, sedimentation, chemical coagulation and disinfection. Treatment for both the surface water and ground water supplies is adequate to meet State and Federal standards. Six high-service pumps are used to enhance distribution and maintain system pressure throughout six separate pressure zones. Water distribution main sizes range from 1-inch to 20-inch diameter.

Average water consumption is approximately 10.5 million gallons per day (MGD), serving over 11,000 residential and commercial connections, with 6.7 MGD coming from surface water and 3.8 MGD from groundwater. City surface water plant improvements are currently under construction, which will increase the treatment capacity from Lake Nacogdoches to 25 MGD, meeting or exceeding Year 2020 needs.

The Water Utilities Department includes 40 staff members responsible for the operations of the water and wastewater systems, which are directed by the Water Utilities Manager. Key personnel are properly certified for the size and type of the City's water system. The City has adopted the International Building Code and provides plumbing code inspection and enforcement.

The City employs a supervisory control and data acquisition (SCADA) system to remotely monitor key water system data, such as pressures and water elevations in storage tanks. This system also provides automated operation of pumps as necessary to maintain system pressure and provide storage to offset peak demand conditions. Pressure is monitored continuously, and periodically, the City staff measures pressure at various hydrants throughout the City.

The City is currently following the plan of a potable water study titled *City of Nacogdoches Comprehensive Water System Plan* as published by KSA Engineers in 2000. Such documents are important to overall urban planning because they address water system improvements for future development as well as current problem areas. In addition, this document outlines expansion needs for the treatment plant facility at Lake Nacogdoches as well as future consideration of

additional ground water withdrawal. Current distribution system mapping may be found in the *Comprehensive Water System Plan*.

Wastewater System

The City of Nacogdoches operates and maintains an extensive wastewater collection and treatment system, including gravity sewers, 14 lift stations and a wastewater treatment plant (WWTP). The existing WWTP is located on La Nana Creek in the southern end of the City. This facility currently has a permitted capacity of 12.88 million gallons per day (MGD) with a two-hour peak capacity of 22.08 MGD. Recent average flows are 6.4 MGD. The WWTP employs the Activated Sludge treatment process, and treated effluent is chlorinated for disinfection and then de-chlorinated for water quality protection prior to discharge to La Nana Creek.

The Water Utilities Department includes 40 staff members responsible for the operations of the water and wastewater systems, which are directed by the Water Utilities Manager. WWTP personnel are properly certified for this size and type of facility.

The City operates 16 wastewater lift stations of various capacities. Thirteen of the lift stations are equipped with a SCADA or remote monitoring system to alert staff at a central location of an abnormal condition or malfunction.

The City enforces a Sewer-Use Regulation that controls the volumes and/or characteristics of industrial wastewater discharges to the sewer system. There are several significant industrial connections to the City's wastewater system at this time including Pilgrim's Pride, a food processing facility. Pilgrim's Pride currently employs an on-site pre-treatment plant to reduce the constituents of its waste stream to acceptable levels.

Based on anticipated growth of the current average flow and area population, the WWTP will be at 75 percent of its existing permitted capacity in 2012. The 75 percent level is a target used by the State to initiate the planning of treatment plant improvements. However, these projections do not account for increased wastewater flows that could result from additional large industrial or commercial development in the City's service area. The City is aggressively seeking to attract more industry, commerce and tourism, and these factors could increase wastewater flows beyond what is projected based on residential population growth alone. Consequently, the WWTP permitted capacity could be reached sooner than 2012. This would require a significant re-evaluation of the utility capacity outlook and the City's capital improvement planning and financing options.

The City currently has a wastewater study plan titled *City of Nacogdoches Wastewater Master Plan* as published by Schaumburg & Polk in 2002. Such documents are important to overall urban planning because they address sewer system improvements for future development as well as current problem areas. In addition, this document outlines expansion needs for the treatment plant and describes possible funding alternatives. Current collection system mapping can be found in the *Wastewater Master Plan*.

Drainage System

The major natural drainage systems serving Nacogdoches are La Nana Creek and Banita Creek and their smaller tributaries. Banita Creek flows into La Nana Creek in the southern portion of the City, then ultimately into the Angelina River. Various manmade drainage ditches and the City's storm sewer system complete the drainage collection network. Except for ditches associated with State Highway and railroad rights-of-way, the City does not maintain most of the drainage ditches and natural creeks, which exist mostly on private property. The City does, however, maintain storm sewer lines and inlets along public streets and across designated easements.

Inadequate drainage has been a chronic problem for the City of Nacogdoches, primarily due to its topography. Upland areas, principally in the northeast, east and southeast, are moderately to steeply sloped. These areas drain to La Nana Creek, which is primarily a wooded natural creek. Although some portions of the creek have received manmade drainage "improvements," many areas have flow-restricting vegetation and an irregular geometry that accelerates flooding. With increased rates of storm water runoff due to urban development, natural drainage systems are unable to contain and convey runoff from major storm events. In the more historic parts of the City, collection lines and inlets are undersized. As a result, localized flooding frequently occurs within the City.



In 1978, the Federal Emergency Management Agency (FEMA) mapped areas of the City subject to flooding during the 100-year flood for the National Flood Insurance Program, with the effective date of those maps being February 18, 1981. Caution must be exercised in using these maps, which are intended only to show a generalized area where flooding may occur during a flood of a certain frequency and severity (such as a flooding event that has a one percent chance of occurring in any given year, which is the definition of a "100-year" flood). Flooding can occur in areas not indicated on these maps due to storms of greater intensity than the one used in modeling, changes in watershed characteristics

subsequent to the modeling, obstructions in the drainage systems, or other reasons. Also, the 100-year as well as the 500-year floodplain may now be confined to smaller areas than are shown on the maps as a result of drainage improvements constructed by the City. On the other hand, flooding could occur over an even wider area than shown as a result of increased runoff subsequent to the 1978 FEMA study.

The City maintains a plan review function, authorized by City ordinance, that prevents building construction in flood-prone areas. Minimum floor elevations for new buildings are established to be safely above the 100-year flood surface elevation. In addition, a 1999 City Ordinance controls the design of private and public drainage facilities, including requirements for on-site detention. Storm water detention is intended to reduce runoff to near pre-developed rates by delaying the release of the runoff over a period of time. The Policy requires detention systems for new impervious areas over 14,000 square feet, using the runoff rate for a 25-year frequency storm as a basis for design.

The City has a master drainage plan titled *Flood Control Study for the City of Nacogdoches* as published by Schaumburg & Polk in 1995. Such plans are important to overall urban planning because they address drainage improvements for future development as well as current problem areas. This study describes a variety of drainage concerns and solutions including the need for regional detention, open channel improvements, storm sewer upgrades and new storm water collection systems.

The areas subject to flooding in Nacogdoches are primarily zones adjacent to La Nana and Banita Creeks and numerous localized low-lying areas. Quite often these localized areas have experienced land development but lack an adequate storm water collection system. The City is not empowered to effect significant changes in La Nana Creek or Banita Creek without Federal and State permits. Radical changes to these collector creeks would require significant financial resources to implement changes of the magnitude necessary to reduce flood elevations in the Nacogdoches area. Current drainage studies have suggested that regional detention systems could reduce the water surface elevations of flood-stage events.

Funding for further drainage improvements may be problematic for the City. The City's General Fund may be insufficient for capital improvements of this type due to the many existing City operations supported by the General Fund. One or more additional bond issues may be required to fund projects of this type. The previously referenced flood control study includes a draft evaluation of the feasibility of creating a Municipal Drainage Utility System (MDUS) as authorized in the MDUS Act of 1987. An MDUS would create an enterprise fund by establishing user charges for drainage on developed property. The creation of an MDUS should be explored as an alternate method to generate drainage-specific capital funds. An MDUS may also be the only equitable method to fund Federal- and State-mandated storm water quality programs.

The City of Nacogdoches has already utilized portions of the undevelopable flood areas along La Nana Creek for a rustic walkway trail, soccer fields and park areas. Banita Creek also has park and recreational areas within portions of its flood-prone areas. Comments from the Community Forum also supported further recreational development of areas adjacent to these natural drainage systems.

Some greenbelt and/or hike-and-bike trails are proposed for these locations in the City's *Parks Master Plan* (as shown in Figure 10.2 in this Comprehensive Plan), which was prepared simultaneously with this Comprehensive Plan.

Coordinating Land Use, Transportation and Utility Planning

Like every urban community, Nacogdoches faces challenging decisions on how best to address increased demands on the existing utility infrastructure while providing utility extensions that will meet the future demands of new development. This new development almost always requires utility services, which adds the need for line extensions and increases capacity demands on existing supply or collection lines. The coordination of roadway types and land use density/intensity with utility capacities is critical to proper planning and development. Arterial roadways with adjacent commercial or industrial land uses will almost always create a greater utility capacity demand than the extension of a small road in a residential land use zone. Utility capacities should be carefully planned to coordinate with anticipated land uses.

Ongoing Utility Needs and Challenges

Since the current Comprehensive Plan is intended as an update of the City's previous plan prepared in 1994, **Table 7.1** reviews the status of various utility issues and proposed improvements that were identified at that time. Some of these will remain long-range planning challenges since they do not involve simple or low-cost solutions.

TABLE 7.1:
Status of Utility Issues in 1994 Comprehensive Plan
Nacogdoches Comprehensive Plan Update
Nacogdoches, Texas

	ISSUE	STATUS
WATER SYSTEM		
1	Press Road 16" water line	Completed.
2	Butt Street 16" water line	Completed.
3	Center Highway 16" water line	Completed.
4	North Stallings Drive 12" water line	Completed.
5	0.5 MGD Elevated Storage Tank (NW) overflow line	Completed.
6	Upgrade NW Water Booster Pump Station to 2,000 gpm	Completed.
7	Upgrade SW Booster Pump Station – add one 2,700 gpm pump	No action.
8	Upgrade Butt Street Water Booster Pump Station to 1,900 gpm	Cancelled.
9	Upgrade Old Lufkin Road Booster Pump Station – add one 1,000 gpm pump	No action.
10	Construct parallel 30" water mains from Lake Nacogdoches Plant to SW Pump Station along FM 225	Beginning design process (2003).
11	Implement program to monitor monthly static and pumping levels in all wells	Periodic monitoring only.

	ISSUE	STATUS
WATER SYSTEM		
12	Implement Spill Prevention and Containment plan in the Lake Nacogdoches Watershed	No action.
13	Implement a water quality monitoring program to regulate drainage shed of Lake Nacogdoches	No action.
14	Evaluate need for parallel water main from Well 8 to Southside Pump Station	Completed.
15	Evaluate Water Treatment Plant needs for additional capacity	Completed.
WASTEWATER SYSTEM		
1	Myrtle Street 10" line	Completed.
2	Logansport Road 12" line	No action.
3	Mound & Park Street 12" line	Completed.
4	Church Street 12" line	Completed.
5	Junction Box 15" line	Completed.
6	First Street 8" line	Completed.
7	E. College Street 12" line	No action.
8	Harris Street 6" line	Completed.
9	Eastwood Terrace 12" line	Completed.
10	E. Austin Street 6" line	No action.
11	Mulberry Street 8" line	Completed.
12	Pecan Acres 18" line	Completed.
13	Butt Street 18" line	Completed.
14	Hoya Park 15" line	Completed.
DRAINAGE		
1	Continue to maintain an adequate drainage system for service area	Ongoing.
2	Make efficient use of existing drainage and flood control facilities	Ongoing.
3	Establish and define the needs of a Drainage Plan	Completed.
4	Establish that the Drainage Plan be consistent with planned development	Completed.
5	Promote that the Drainage Plan be flexible to accommodate changes in growth trends	Completed.
6	City to gain ownership or easements of drainage ways for maintenance	Ongoing.
7	Develop Policies for limiting construction in drainage ways	Completed.