4

Barton Springs and the Edwards Aquifer, along with the Colorado River and its network of creeks and lakes, are crucial to Oak Hill and all of Austin. In addition to the water the city draws from the river, these water features provide habitat for diverse native species and recreation and relief for residents. A core value of Oak Hill stakeholders is that these resources must be protected and restored. Concerns about Barton Springs, the Edwards and Trinity Aquifers, and the rest of the rich hydrological tapestry in Oak Hill appear throughout this plan, but are primarily collected in this chapter, alongside the history of how these values have taken form in development regulations, institutions, and organizations that are still active today.

HOW DEVELOPMENT AFFECTS WATER QUALITY

Oak Hill is located in the Barton Springs segment of the Edwards Aquifer. Eastern Oak Hill is located above the Edwards Group, a formation of fractured limestone, which is soluble. Landscapes of this type of dissolved rock are commonly known as karst regions and are generally associated with aquifers that can yield large quantities of water.

When rain falls on large undeveloped areas, most of it is absorbed by the soil and vegetation, while typically less then 5% runs off the land. Water that is absorbed into the ground is filtered by plant matter and soil to some degree as it travels into the earth. This is the process by which surface water becomes groundwater (or recharges the aquifer) and contributes to baseflow of creeks. Baseflow in creeks and rivers and adequate recharge of groundwater supports aquatic life, provides recreational opportunities for humans, and provides municipalities with drinking water.

Figure 4-1: Williamson Creek in Oak Hill

In developed areas that have a large amount of impervious cover (i.e. roadway, building, and parking lot surfaces that prevent water from being absorbed by the soil), rain is not absorbed by the ground. Instead, it becomes runoff and carries contaminants with it as it travels. In developed watersheds, much of the precipitation becomes runoff. For example, an 80% impervious site will convert about 76% of rainfall into runoff (Environmental Criteria Manual, Table 1-9 Runoff Coefficient Table)."

(continued on page 38)

GOALS, OBJECTIVES, AND RECOMMENDATIONS

4.A. Preserve and enhance environmental resources including watersheds, air quality, and wildlife corridors.

4.A.1

Preserve the water quality of area aquifers, streams, rivers, and springs and protect endangered species dependent on the quality of those water resources.

4.A.1a—Consider implementation of policies recommended in the Regional Water Quality Protection Plan for the Barton Springs Segment of the Edwards Aquifer and Its Contributing Zone. Regional land development regulations designed to protect sensitive recharge and contributing zone areas of the Edwards Aquifer would help achieve regional and local water quality goals. Note: Some property owners represented on the Oak Hill Contact Team believe land use regulations should be applied on a regional level; if a certain land use is restricted in Oak Hill's recharge zone, they feel that land use should be restricted in other recharge areas as well.

4.A.1b—Where appropriate, maintain rural density in Oak Hill. To help achieve regional water quality goals, manage the urbanization of Oak Hill by minimizing dense development and guiding new development away from the recharge zone.

4.A.1c—Utilize bonds and other City funds to actively acquire environmentally sensitive land in Oak Hill for preservation as wildlife areas, trails, or parkland.

4.A.1d—Integrate Stormwater Treatment Program water quality controls for all new development and redevelopment projects in Oak Hill. Ensure regional water quality controls (wet ponds) are carefully maintained. For more information on this City program, see http://www.ci.austin.tx.us/watershed/stormwater_treatment.htm.

4.A.1e—Prevent polluted runoff from commercial property and residential areas in Oak Hill by increasing public education; increase funding for City of Austin WPDR educational programs. Find information about these programs at http://www.cityofaustin.org/watershed/education.htm.

4.A.1f—Regional transportation authorities should create a regional hazardous materials roadway plan to minimize risk of spills and extensive contamination of groundwater.

4.A.1g—The City should encourage more frequent inspections of facilities monitored by City of Austin Stormwater Discharge Permit Program staff over the recharge and contributing zones. For more information about this program, see http://www.cityofaustin.org/watershed/stormwater_permit.htm.

4.A.1h—City staff should conduct and publish research on the environmental impact of creating a densely developed transit center in Oak Hill. Some stakeholders are concerned that too much development in Oak Hill will draw additional visitors to the environmentally sensitive area, which will result in additional car trips and resulting automobile related pollution.

4.A.1i—City staff should conduct and publish research on the environmental impact of City of Austin regulations on regional development patterns. Some stakeholders are concerned that development will "leap" beyond Austin into environmentally sensitive areas with little regulation outside of the Austin City limits ultimately having a negative impact on water quality.

4.B. Provide opportunities for high-quality new development and redevelopment.

4.B.1

Minimize the ecological footprint of development in the Oak Hill planning area to help achieve environmental goals, particularly the preservation of water quality.

4.B.1a—During the development process, city staff should consider offering incentives for developers to comply with current land use regulations for "grandfathered" projects.

4.B.1b—City staff should retrofit existing dysfunctional water quality controls as redevelopment occurs in Oak Hill.

4.B.1c—City staff should consider conducting and publishing research on the merits of conservation development laws.

4.B.1d—Support trail connectivity in Oak Hill to achieve wildlife preservation goals and water quality goals. Trails can preserve open space and reduce car trips by providing alternate methods for travel within Oak Hill.

Runoff is collected by both natural and manmade watercourses and is carried through Oak Hill until it reaches the Colorado River or is able to infiltrate into the ground and recharge the aquifers. Natural watercourses include creeks and rivers. Manmade systems include storm drains and sewers and creek channels that have been straightened, lined, channelized, or otherwise altered.

Karst features below streambeds in the recharge zone contribute much of the groundwater to the Edwards Aquifer. These streams bring water from the contributing zone to the recharge zone (see Figure 4.2 for more detail on recharge and contributing zones). The rest of the aquifer's recharge comes from direct entry over the recharge zone itself in uplands soils and recharge features.

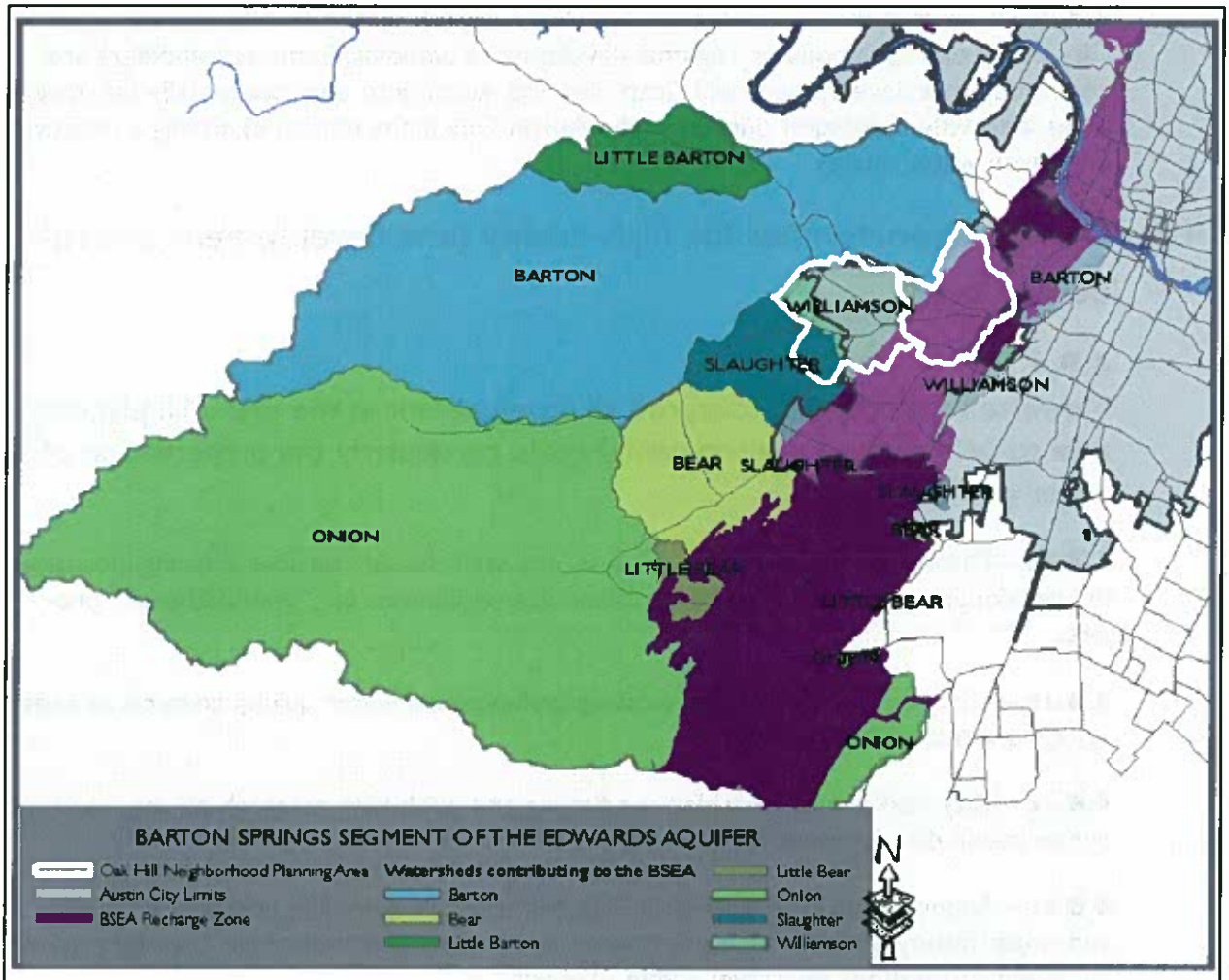


Figure 4-2: Recharge and contributing zones

The Barton Springs/Edwards Aquifer (BSEA) recharge zone is the area of land that recharges the Edwards Aquifer. The contributing zone is made up of the watersheds that drain into or across the recharge zone. Both are further defined by the City's Land Development Code for regulatory purposes. The recharge zone, and the watersheds that contribute to it, are shown above.

Karst features (such as caves, sinkholes, springs, wetlands, and faults or fractures in underground rock) are pathways that have dissolved in limestone and dolomite rock over long periods of time. They closely connect surface water to groundwater in the aquifer, which means there is less time and distance available to filter pollutants. Most groundwater in the Barton Springs segment of the Edwards Aquifer flows through karst features and is effectively unfiltered. Therefore, Austin's Land Development Code considers karst formations to be Critical Environmental Features (CEFs) and protects them from water pollution.

WATER QUALITY REGULATIONS

Water quality regulations span all levels of government, from federal law to local ordinance. Regulations relevant to this plan are reviewed here.

FEDERAL REGULATIONS

The Federal Clean Water Act (1977, previously the Federal Water Pollution Control Act (1972)) established water quality standards, provided a framework for regulating surface water pollutants, and allowed the Environmental Protection Agency (EPA) to implement federal pollution control programs. Early on, the EPA focused on point source pollution, such as sewage plants and industrial facilities. In the late 1980s, the EPA broadened its focus to include polluted runoff (storm drain systems and construction sites). For information on EPA's Smart Growth Practices, see http://www.epa.gov/smartgrowth/pdf/sg_stormwater_BMP.pdf.

In 1990, the EPA developed the National Pollutant Discharge Elimination System (NPDES) to regulate stormwater discharge, or non-point source pollution. Through NPDES, the EPA seeks to improve the nation's water quality by reducing the harmful effects of stormwater discharges from industrial facilities, municipal sewer systems, and construction sites. Municipalities with a population greater than 100,000 people are required to reduce and prevent non-point source pollution. A city's Storm Water Management Program must include oversight of specific industrial and high-risk operations (such as concrete batch plants, chemical manufacturing and storage, and bulk petroleum storage and dispensing), spill prevention and response, wet and dry weather monitoring, public education, construction site runoff control, and illicit discharge mitigation. Current regulations work on the basis of entire watersheds.

The Endangered Species Act, passed in 1973, requires the United States to conserve endangered species. Specifically, "Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species" (Section 2, Findings Purpose and Policy, The Endangered Species Act of 1973, U.S. Fish and Wildlife Service, http://www.fws.gov/laws/lawsdigest/esact.html).

The U.S. Fish and Wildlife Service (USFWS) listed the Barton Springs Salamander as endangered in 1997. The USFWS Draft Barton Springs Salamander Recovery Plan explains that the salamander was listed as endangered because of "degradation of the quality and quantity of water that feeds Barton Springs, as a result of urban expansion over the watershed." (*Barton Springs Salamander Recovery Plan,* September 2005, Southwest Region U.S. Fish and Wildlife

Service, p. v). The plan lists several recovery criteria to guide actions, including maintaining water levels and quality in the Barton Springs watershed, avoiding and remediating hazardous material spills, and removing local threats to surface waters in the Barton Springs ecosystem.

STATE REGULATIONS

State of Texas regulations administer and extend federal regulations. Chapter 26 of the Texas Water Code requires the state to establish plans and regulations to control water quality. Chapter 213 of the Texas Administrative Code authorizes the Texas Commission on Environmental Quality (TCEQ) to administer the Edwards Aquifer Protection Program. The program regulates hazardous substances (including those stored above and below ground), sewage collection systems, and stormwater runoff from construction sites. The Texas Pollutant Discharge Elimination System, administered by the TCEQ, regulates the discharge of wastewater by wastewater treatment facilities and stormdrain systems in large cities.

CITY OF AUSTIN DEVELOPMENT REGULATIONS

The City's Land Development Code (LDC) governs zoning, subdivision, and site development standards. Land use is primarily addressed in Chapter 6. Impervious cover limits, one of the major tools for stormwater management, are discussed here, along with other City water quality regulations.

Land Development Code

The LDC controls impervious cover limitations across the entire city through base zoning categories. It also establishes the following Watershed Regulation Areas: the Barton Springs Zone Watershed, Water Supply Rural Watersheds, Water Supply Suburban Watersheds, Suburban Watersheds, and Urban Watersheds. The Barton Springs Zone is all of the watersheds that "contribute recharge to Barton Springs, including those portions of the Barton, Williamson, Slaughter, Onion, Bear and Little Bear Creek watershed located in the Edwards Aquifer recharge or contributing zones" (LDC 25-8-2). (Figure 4-2 shows the Watershed Regulation Areas around the planning area.)

Oak Hill is in the Barton Springs Zone watershed, which has strict impervious cover limits: Edwards Aquifer Recharge Zone: 15%; Contributing Zone within Barton Creek Watershed: 20%; remainder of the Contributing Zone: 25%. Property owners are required to supply licensed engineers' reports with all site plan applications. These engineers' reports are used by City reviewers to determine the "Net Site Area" (NSA) of all tracts.

A property owner's NSA is used to determine how much impervious cover is allowed for that site. NSA is calculated by taking total gross site area (the square footage of the entire property) and subtracting areas with significant slope, areas used for wastewater irrigation, CEF setbacks (see next page), and creek buffers. The presence of these features affects the placement and amount of development allowed on a piece of property. Impervious cover calculations for sites also include "perimeter roadway deductions." Depending on the width of a property owner's right of way, the owner may be required to compensate for the impervious cover created by roadways adjacent to their property.

A caveat to these regulations are any properties that have been "grandfathered" under Chapter 245 of the Texas Local Government Code. This law releases property owners and developers from current watershed regulations, including impervious cover limitations. This law is discussed in more detail below.

Critical Environmental Features—CEFs (25-8-281)

By City code, CEFs are "of critical importance to the protection of environmental resources, and include bluffs, canyon rimrocks, caves, sinkholes, springs, and wetlands." This includes karst features. CEFs are protected by buffer zone setbacks. The Code states that drainage patterns for proposed development must be designed to protect CEFs from the effects of runoff from developed areas, and to maintain the catchment areas of recharge features in a natural state.

Critical Water Quality Zones and Water Quality Transition Zones (25-8-91; 25-2-92 and -93)

These zones are areas along creeks that are protected from most development. In all watersheds, creeks and their tributaries are classified by the size of their drainage area (the amount of land draining into them). These waterway classifications—Minor, Intermediate, and Major—are used to determine how much land along a creek will be protected from development (Figure 4-3). Generally, waterways with larger drainage areas have wider creek buffers. The critical water quality zone (CWQZ) is roughly based on floodplain boundaries, though both minimum and maximum buffer widths are established. Water quality transition zones (WQTZ) are located just outside of CWQZs and vary in width.

In the Barton Springs Zone, almost no development is allowed in CWQZs or WQTZs, and

Figure 4-3: Creek buffer widths in the Barton Springs zone

Critical Water Quality Zone	*Width of Buffer*
Minor	50-100 feet
Intermediate	100-200 feet
Major	200-400 feet
Barton Creek proper	400 feet

Water Quality Transition Zone	*Width of Buffer*
Minor	100 feet
Intermediate	200 feet
Major	300 feet

street crossings are limited. Wastewater lines are prohibited in these zones, and decentralized wastewater system requirements are specific. However, a significant amount of development occurred in Oak Hill prior to the adoption of these regulations, and many roadways and structures are located within these buffers.

No Variances in Barton Springs Zone

Properties located within the Barton Springs Zone are not eligible for the exceptions or variances available for property owners in other areas. For example, properties may not be granted additional impervious cover beyond standard code limits without an amendment from City Council. An exception allows limited redevelopment to occur (less than 25% of the existing impervious cover) without complying with current impervious cover limits, if it adheres to water quality control regulations.

Erosion and Sedimentation Control for Construction

Temporary structures are required to address construction site runoff. Sites with disturbed soil and cleared vegetation allow higher volumes of runoff to collect loose sediment. Construction sites within the Barton Springs Zone are required to install and maintain additional controls and are required to develop a temporary erosion control plan.

Tree and Natural Area Protection

Site plans must include protections for certain trees (or provide for some kind of mitigation, if protection is not possible) during construction. Trees receive this protection based on their diameter four feet above the ground. The threshold is eight inches for commercial developments and nineteen inches for residential developments.

Save Our Springs Ordinance

The Save Our Springs Ordinance, adopted in 1992 through citizen initiative, introduced requirements for "non-degradation" and lowered impervious cover percentages (as described above). Non-degradation means that contaminant levels must not increase following site development. Most developments meet this requirement by providing controls that do not discharge runoff directly to waterways but instead infiltrate it into the soil. Approved systems include retention-irrigation ponds and vegetated filter strips.

Grandfathering

In 1987, the Texas Legislature vested property owner development rights. Chapter 245 of the Texas Local Government Code (as amended in 1999) requires regulatory agencies (like the City of Austin) to process development applications using only the land use regulations in effect at the time the application was filed. If a series of permits is required, then the applicable regulations are those in effect when the application for the first permit was filed. As defined by Chapter 245, original filing of development permit applications includes subdivision plats, site plans, public restrictive covenants, and utility service agreements.

The City of Austin has a standing "Chapter 245 Review Team." This group of City staff reviews site plan applications as they are filed with the City and then determines which projects are grandfathered under Chapter 245.

As a result of Chapter 245, many projects in Oak Hill are determined to have vested rights or entitlements to develop in ways that conflict with current land use regulations. Current impervious cover limitations and other site development standards adopted to protect water quality do not apply to these projects. Multiple projects have already been built under grandfathered rights, and more may be constructed in the future.

Smart Growth Initiative: The Drinking Water Protection Zone

As part of the City's mid-1990s attempt to reshape growth in Austin, the Smart Growth Initiative created the Desired Development Zone and the Drinking Water Protection Zone to reinforce the growth areas originally identified in the Austin Tomorrow Plan. Development, and especially intense activities that have the highest impact on water quality, would be directed

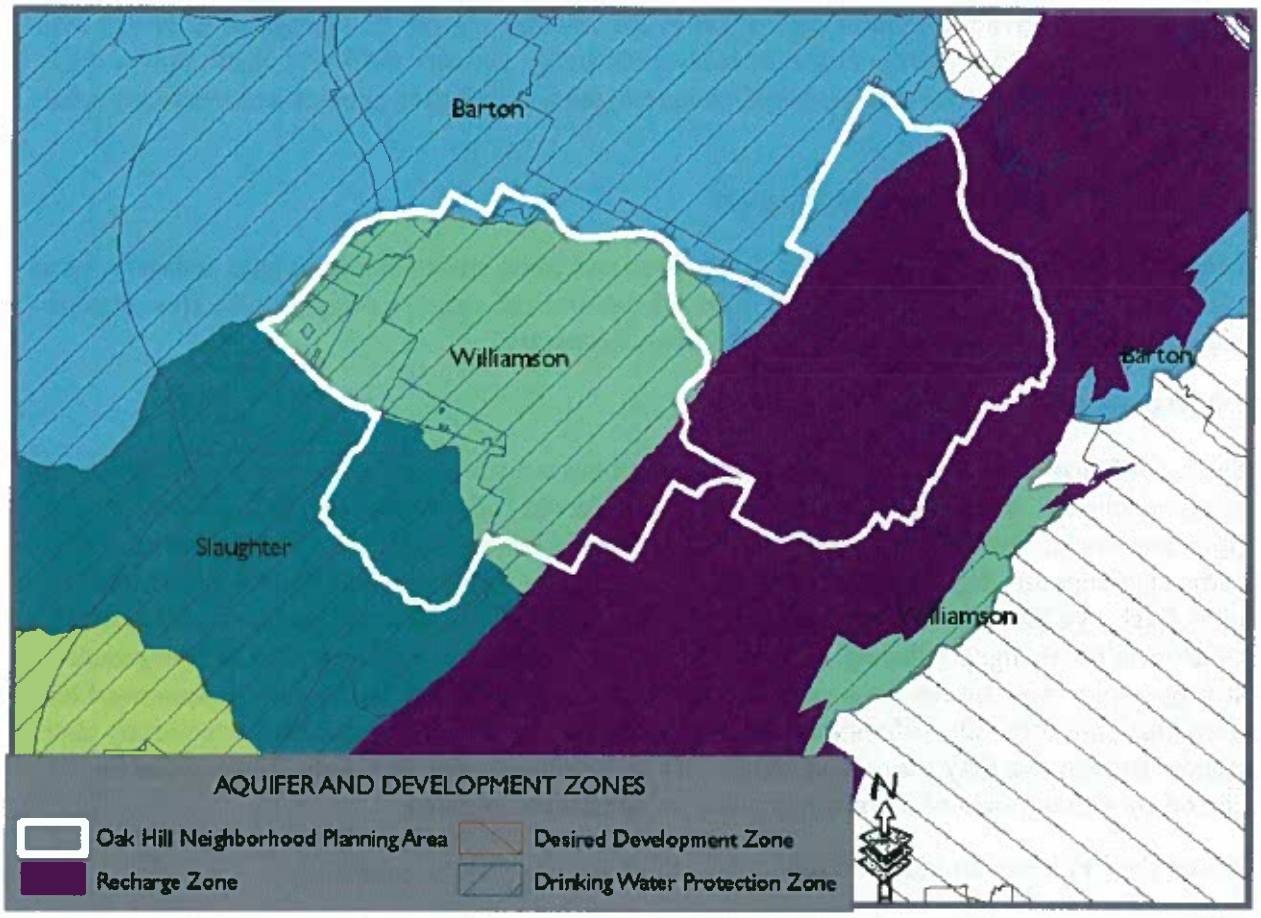


Figure 4-4: Desired Development Zone and Drinking Water Protection Zone in Oak Hill. All of the planning area is in the Drinking Water Protection Zone.

toward the desired zone and away from the environmentally sensitive features in the Drinking Water Protection Zone (Figure 4-4). The Drinking Water Protection Zone, which includes the Barton Springs Zone and all of the planning area, requires that development be implemented with great care and with the highest engineering and site development standards to protect drinking water.

WATERSHED PROTECTION AND DEVELOPMENT REVIEW

The City of Austin's Watershed Protection and Development Review Department (WPDRD) administers the Water Quality Protection Program, which maintains City compliance with multiple state and federal environmental requirements: "The goal . . . is to prevent, detect, evaluate and reduce water pollution in order to protect water quality and aquatic life in Austin's creeks, lakes and aquifers" (http://www.cityofaustin.org/watershed/waterq.htm).

Stormwater Discharge Permit Program

Program staff conduct routine site evaluations and permit specific businesses and industrial operations to prevent pollutant discharges in stormwater runoff. The program provides oversight for the state's implementation of federal discharge permits (NPDES). Staff identify illicit discharges and can require responsible party mitigation. Staff also provide enforcement when necessary.

Spills and Complaints Response Program

Program staff respond to emergency hazardous and toxic spills and investigate pollution complaints from citizens. Staff identify illicit discharges and can require mitigation by the responsible party. Staff also provide enforcement when necessary.

Underground Storage Tank Regulations

Since 1985, the City has regulated the storage of hazardous materials in underground storage tanks within city limits, the City's five-mile Extra-Territorial Jurisdiction (ETJ), and water supply watersheds. The water supply watersheds include Lake Austin, Lake Travis, Barton, Williamson, Slaughter, Big Bear, Little Bear, Onion, and the Northern and Southern Edwards Aquifer Recharge Zones. A Hazardous Materials Storage Permit must be obtained and maintained by anyone receiving, producing, or storing hazardous materials underground. Underground storage tanks must be tested or monitored for releases on a regular basis with approved leak detection methods. Out-of-service underground storage tanks may not be permanently abandoned, though the City may allow temporary abandonment for one year. Tanks must be closed by either removal from the ground or by closure in place.

Watershed Protection Master Plan

WPDRD completed Phase I of the Watershed Protection Master Plan, covering the twelve urban watersheds and five surrounding non-urban watersheds. The plan's process includes three steps: Assessment, Solution Development, and Implementation. The Master Plan inventoried existing watershed problems and gauged the impact of future urbanization in the 17

Phase I watersheds, which includes the planning area. The technical studies identified the location and severity of watershed problems and developed and prioritized conceptual solutions and cost estimates to fix each problem area. WPDRD has involved the public through public meetings and the creation of a Citizen's Advisory Group.

The planning area is primarily located in the aquifer-related Williamson and Barton Creek watersheds, with a small part of West Oak Hill located in the Edward's Aquifer contributing zone of the Slaughter Creek watershed.

The Master Plan study results for Williamson Creek in the planning area indicate that creek flooding problems are worse in an area along the main stem, from near the confluence with the Motorola Tributary continuing along McCarty Lane to just south of the intersection with U.S. Highway 290 W. The flood problem score for this reach of creek is "high" due to the flood threat to public safety caused primarily by the flooding of U.S. Highway 290 and Joe Tanner Lane.

TxDOT improvements to U.S. Highway 290 will alleviate much of the roadway flooding, and the City will upgrade Joe Tanner Lane in conjunction with the highway improvements. Roadway flooding has also been identified where Covered Bridge Road crosses a tributary of Williamson Creek near State Highway 71. WPDRD has plans to upgrade the culverts for this roadway. Preliminary design on this project are to begin in fall of 2007.

The Barton Creek portion of East Oak Hill has a "very low" creek flood score. Localized flooding (flooding occurring outside the 100-year floodplain) has been reported for the Scenic Brook and Bannockburn areas, both in the Williamson Creek watershed. WPDRD has completed a project to improve flooding conditions in the Scenic Brook area, which includes a detention pond and storm drain upgrades. A storm drain project for the Bannockburn area is currently under design, with construction to be funded by 2006 bond election funds.

Erosion threats for both Barton Creek and Williamson Creek in the Oak Hill area were rated "low" and "very low" by the Master Plan. The overall problem score for erosion includes components for both current and future erosion problems.

Overall water quality problem scores are based on current water quality conditions, future predicted changes in water quality and hydrology, and the watershed's contribution of flow and pollutants to the Edward's Aquifer, Barton Springs and Pool, and McKinney Falls.

The water quality of Williamson Creek has been impacted by urban development. The water quality score for the southern-most tributary of Williamson Creek, which runs through Dick Nichols Park, is "high," with the current water quality conditions rated "good." The primary water quality problem causes are depressed aquatic life support (55% of score), habitat quality (34%), and non-contact-recreation (12%).

The northern tributary of Williamson Creek (Motorola tributary) has an overall water quality score of "very high," with current water quality conditions rated "fair." The primary water quality problem causes are depressed aquatic life support (36% of score), non-contact recreation (31%), water chemistry (21%), and habitat quality (12%).

The Barton Creek portion of the Oak Hill planning area has an overall water quality score of "very high" and has a current water quality score of "very good."

Because development is underway in much of the watershed, future impacts to water quality and hydrology may be significant. Overall, future water quality problems are rated as "very high," which is reflected in the overall water quality score for this area.

Current Water Protection Projects

WPDRD has two structural stormwater control retrofits scheduled for the Williamson Creek portion of the planning area in the five-year Capital Improvement Projects plan (Fiscal Years 2008 – 2013). The first retrofit project is Lundelius McDaniel Tract, where WPDRD will construct a water quality control to treat runoff that enters a major recharge feature. This project is currently under design.

The second retrofit project is the Williamson Creek Water Management Area 8 (WMA-8) retrofit and restoration project. This effort has identified up to 13 existing stormwater ponds that could potentially be improved to better treat the stormwater from 100 to more than 500 acres to reduce pollutant loads, improve hydrology, and improve riparian conditions in Williamson Creek. This project area is located north of U.S. Highway 290, along the tributaries to Williamson Creek that are located near State Highway 71 and Old Bee Caves Road. The Williamson WMA-8 project is in the project planning phase.

Using bond election funds to acquire Water Quality Protection Lands also plays a significant role in implementing water quality solutions in the recharge zone. Since this program seeks cost-effective purchases of undeveloped land, it is likely that most of these purchases will be made in areas beyond the planning area.

Barton Springs Zone Advisory Group and Ordinance Initiative

The Barton Springs Zone Advisory Group was formed due to the concern among some in Oak Hill that the requirements of the redevelopment exception in the current code ("No Variances in Barton Springs Zone," above) has limited the redevelopment potential of older properties. Many of these properties have more impervious cover than is allowed by current code and no structural water quality controls.

Councilmember Leffingwell created the Advisory Group to develop "a consensus plan to optimize environmental protection while allowing responsible economic development." It was composed of diverse stakeholders, including the SOS Alliance, Save Barton Creek Association, Oak Hill Association of Neighborhoods, Barton Springs/Edwards Aquifer Conservation District, RECA, Chamber of Commerce, Hill Country Conservatory, Chair of the Environmental Board, consultants including licensed engineers, and citizens including land developers and property owners.

Approved by City Council on November 8, 2007, section 25-8-27 (Ordinance No. 20071108-121) allows redevelopment projects to retain (but not exceed) current levels of impervious cover, if certain water quality controls are installed. Properties with less than 40% impervious

cover must provide on-site water quality controls compliant with the SOS Ordinance. Properties with more than 40% impervious cover must (a) provide at least a sedimentation-sand filtration level of on-site water quality controls and (b) provide for purchase and permanent protection of off-site, undeveloped lands in the Barton Springs Zone to obtain an overall impervious cover level of 20%. The proposed ordinance establishes thresholds beyond which City Council approval is required.

REGIONAL WATER QUALITY INITIATIVES

CONSERVATION DISTRICTS

Both the Edwards and the Trinity aquifers have conservation districts that regulate water well construction and water usage. Over-pumping wells has led to decreased water tables in many areas, and the districts work to preserve groundwater and use it judiciously, especially during droughts.

TCEQ designated the Trinity Aquifer region as a "Priority Groundwater Management Area," where a critical water shortage is occurring or could occur within 25 years. This gives counties more regulatory power over wells; the designation has also helped create several conservation districts, such as the Trinity-Glen Rose Groundwater Conservation District and the Hays Conservation District. However, pumping regulations in the Trinity region are not standardized, and many water users and water conservationists are opposed to the district approach to groundwater management.

The Barton Springs/Edwards Aquifer Conservation District (BS/EACD) was created in 1987 and regulates well use in the watersheds that affect Austin-area surface and groundwater. The BS/EACD is discussed in more detail in Chapter 5.

THE REGIONAL WATER QUALITY PROTECTION PLAN FOR THE BARTON SPRINGS SEGMENT OF THE EDWARDS AQUIFER AND ITS CONTRIBUTING ZONE

This project was sponsored by a group of Edwards Aquifer-area municipalities, counties, and conservation districts, including the City of Austin, and was approved in June 2005. It was partially funded by the Texas Water Development Board and the Lower Colorado River Authority. The intent of the project was to achieve a regional consensus for how to address water quality concerns across the several jurisdictions in the Barton Springs Zone. The City of Austin worked with other key regional partners, such as the City of Dripping Springs and Hays County (among many others), to develop a plan, which included standards for the following:

- Maximum impervious cover percentages for (1) "Preferred Growth Areas" and (2) all other areas for the recharge and contributing zones;
- Open space conservation incentives and requirements, including a system to transfer development rights to Preferred Growth Areas;
- Minimum structural water quality controls;

- Minimum stream and CEF buffer setbacks;
- Land management;
- Public education and outreach; and
- Location, type, and maintenance of wastewater treatment systems.

For copy of the plan, go to http://www.waterqualityplan.org/.

In February 2006, City Council asked WPDRD staff to review the steps required to implement the Regional Water Quality Plan within the City and to assess the impact of doing so. Notably, the City of Austin's existing stormwater regulations were more closely aligned with the Regional Water Quality Plan goals and standards than most other participants. WPDRD is currently studying the effect of extending stream buffer protections to 32-acre drainage area thresholds, along with other recommendations of the plan. The City of Austin continues to meet and confer with other Regional Plan participants to determine the most effective ways to implement the plan.

CITY OF AUSTIN PLANS

In addition to all of the foregoing, the City has a number of plans, visions, and principles that shape its responses to growth, development, and environmental stewardship. The Austin Tomorrow Plan, introduced in Chapter 1, assigns growth area assessments to different parts of the City and its 1979 ETJ. These assessments (Priority Growth Areas I, II, and III and the non-preferred Areas IV and V) strove to balance environmental suitability against growth needs and existing infrastructure investments, including roads. It specifically called for the protection of the region's creeks, lakes, and aquifers. Thus, the Oak Hill area was assessed into Area IV (growth not preferred), recognizing both its environmental sensitivity and its existing highways and residents. Balancing these competing demands continues to be a thorny concern.

Less formally, the City has adopted the following vision: "We want to be the most livable city in the country." Pursuant to that vision, City Council's priorities include maintaining water quality, providing a healthy and safe city, and developing the economy in a sustainable manner.

City staff also have organization values that guide sustainable, collaborative work among departments. Among these values, the City is "Green"—"*We consider the impact on the environment in everything we do*"—and "Collaborative"—"*We work together and support one another as team members across departmental boundaries.*"

Chapter 1 listed the City's 18 Land Use Principles, which balance growth and property rights against equity and environmental protection. NPZD staff, including the Oak Hill team, seek to incorporate all of the above plans, policies, and organizational values, while balancing Oak Hill stakeholder goals and concerns. The recommendations listed in this chapter and in Chapter 6 reflect these efforts to balance multiple land use planning considerations.

RECENT CITY-WIDE VOTER ACTIONS

Proposition 2, a citizen initiative organized by the Save Our Springs Alliance, was not approved by voters in the May 2006 general election. Proposition 2, also known as the Save Our Springs Clean Water Charter Amendment, was designed to further protect the Barton Springs Zone from development.

Seven funding propositions were approved by Austin voters in November 2006. Proposition 2 funded projects designed to improve water quality in Oak Hill based on the Watershed Protection Master Plan. This funding is for the design and construction of facilities that conserve regional water quality by acquiring land for preservation in the Barton Springs contributing and recharge zones. The exact locations of those tracts has not been determined. The City will purchase land and conservation easements to create water quality management areas, which will be publicly accessible where appropriate.

Proposition 3 provides funding to expand trails along creeks, a major goal for many Oak Hill stakeholders. For additional information, please see Chapter 10.

ENVIRONMENTAL ORGANIZATIONS ACTIVE IN OAK HILL

The list below is a collection of the environmental advocacy organizations actively working on land development and aquifer issues involving Oak Hill at the time this document was published. Please contact these organizations directly for information.

Greater Edwards Aquifer Alliance, (210) 320-6294, http://www.aquiferalliance.org/.

Save Our Springs Alliance, (512) 477-2320, http://www.sosalliance.org/.

Save Barton Creek Association, (512) 480-0055, http://www.savebartoncreek.org/.

Hill Country Alliance, (512) 560-3135, http://www.hillcountryalliance.org/public/home.cfm.

Hill Country Conservancy, (512) 328-2481, http://www.hillcountryconservancy.org/.

SUMMARY OF STAKEHOLDER RECOMMENDATIONS

Some property owners are concerned about land use or zoning changes that would restrict the use of their property; they are concerned that their investments in land and existing businesses would be unnecessarily harmed. These stakeholders oppose any zoning overlays that would prohibit land uses on their property. However, other stakeholders and City staff support conditional overlays intended to restrict land uses that pose risks to water quality.

Some Oak Hill stakeholders support high density redevelopment in specified areas of Oak Hill. Many area residents look forward to participating in the design process for a transit-oriented Town Center-type development near the intersection of State Highway 71 and U.S. Highway 290. Others strongly support the redevelopment of older commercial structures and properties in Oak Hill. Several of these individuals have been active participants in Councilmember Leffingwell's Barton Springs Task Force meetings.

Although Neighborhood Planners and Watershed Protection Department staff strive to balance Oak Hill stakeholder goals, some of the recommendations listed at the beginning of the chapter are not supported by all Oak Hill stakeholders. A complex challenge for land use planning in Oak Hill is to both provide adequate neighborhood services for Oak Hill residents through new development and redevelopment while, at the same time, preserving the rural density and undeveloped land in Oak Hill, which is vital for preservation of the aquifer. For additional information on zoning recommendations designed to protect water quality, please refer to Chapter 6.

5

Utilities convey some of the services essential to contemporary life, especially water and power. They have shaped development historically in important ways, because their infrastructure—power lines and generators, water and sewer lines, treatment plants, and reservoirs—is extremely intensive. Creating and modifying this infrastructure is costly to do, both financially and physically. The utilities that have shaped, and continue to shape, Oak Hill the most are water and wastewater systems.

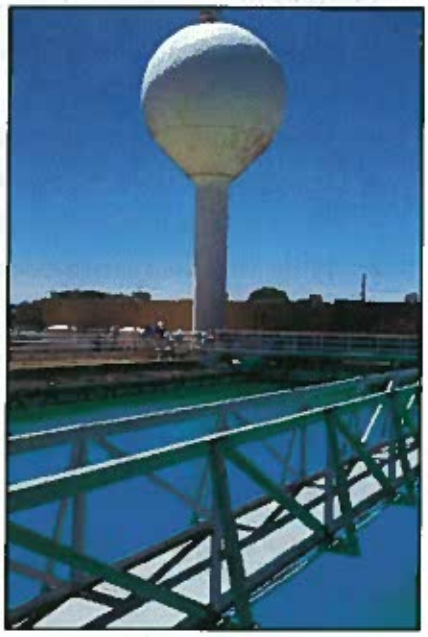


Figure 5-1: The Thomas C. Green Water Treatment Plant opened in 1925

This chapter briefly explains the history of how centralized utility services were extended throughout Oak Hill. The chapter also reviews City programs and regulations that address erosion and stormwater. Understanding the history of Oak Hill's infrastructure planning, including City water and wastewater services, contributes to sound land use planning processes. The information in this chapter supports the long-term land use and transportation recommendations in chapters 6 and 7.

CENTRAL WATER AND WASTEWATER SERVICES

The Austin Water Utility supplies water to water supply corporations, municipal utility districts, private utilities, and individual customers within and outside of Austin's city limits. Water is drawn from the Colorado River (Lake Austin and Town Lake) and purified at three water treatment plants.

The Austin Water Utility serves approximately the same area for drinking water as it does for wastewater collection. Austin Water Utility's service area is shown on the map in Figure 5-2. This boundary includes areas that the Austin Water Utility currently serves and the areas into which it plans to extend service. Figure 5-3 shows the current connection points for water and wastewater. The Austin Water Utility does not currently provide wastewater service to most areas of southwestern Oak Hill that fall outside Austin's full purpose city limits.

The availability of municipal water and wastewater systems helps to shape land development patterns. Certain engineering and design limitations on development density are removed once residential subdivisions and commercial sites

Stakeholder comments and concerns that influenced the content of this chapter

- Address existing and future untreated runoff from the U.S. Highway 290 and William Cannon intersection.
- Create additional regional retention ponds that increase the base flow of creeks.
- Augment flow to "Lake Midwood" (local name for wet pond east of Midwood Road) to ensure it continuously supplies water to creeks and recharge features.
- Mitigate the negative consequences of older structures located in the floodplain.
- Enforce the codes for floodplains and streams.
- Provide more structural runoff controls; there is too much water diverted away from the aquifer.
- Provide fire hydrants on Old Bee Caves Road.
- Address the abandoned sewage treatment plant on Silvermine and Fletcher.
- Provide utilities for Oak Hill residents west of the "Y" that do not currently have utility service.

are no longer forced to rely only on well water and decentralized wastewater systems (usually septic tanks). Property values typically rise when centralized utility service becomes available. As a result, the extension of water lines and service is often controversial, especially in environmentally sensitive areas.

WATER SERVICE

Dependence on Well Water

Until the middle of the twentieth century, Oak Hill residents and businesses relied on wells

Barton Springs/Edwards Aquifer Conservation District (BS/EACD)

The BS/EACD was created in 1987 by the State Legislature, with the support of voters, to "conserve, protect and enhance the groundwater resources of the Barton Springs segment of the aquifer." The BS/EACD regulates well usage through conservation and drought planning and regulation of well construction within its boundaries. It requires all non-exempt well owners to develop User Conservation Plans; the BS/EACD states that these Plans, "when followed, will maximize the utility of water withdrawn from the aquifer." Non-exempt well owners are also required to develop a User Conservation Plan which should dictate conservation pumping levels during times of drought in the District. The BS/EACD maintains a list of non-compliant permittees which can be viewed at http://www.bseacd.org/regulatory.html. These well owners are pumping illegal quantities of water during times of drought; Tier C permittees are pumping over 100% their share of underground water.

Figure 5-2: Austin Water Utility Service Area

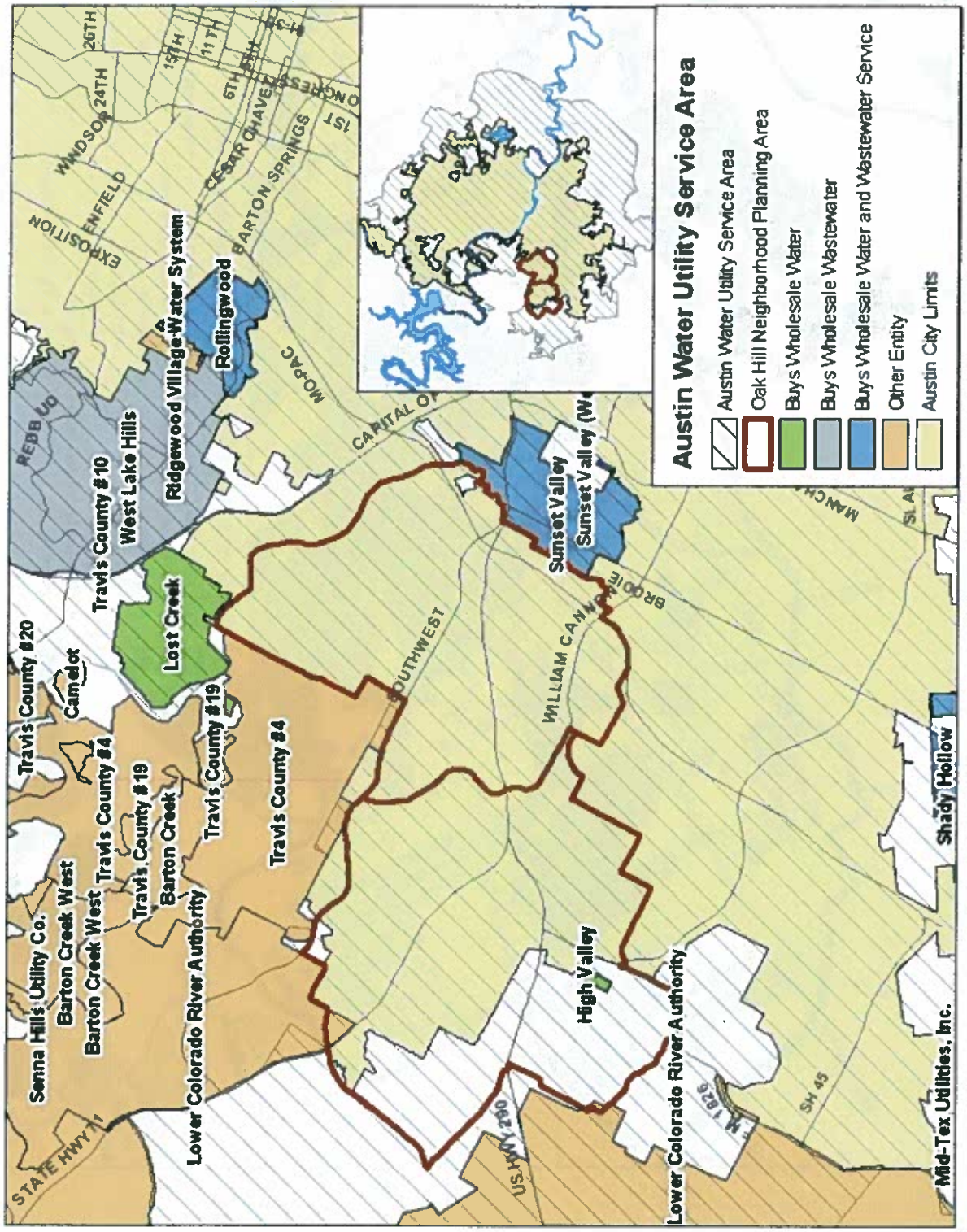
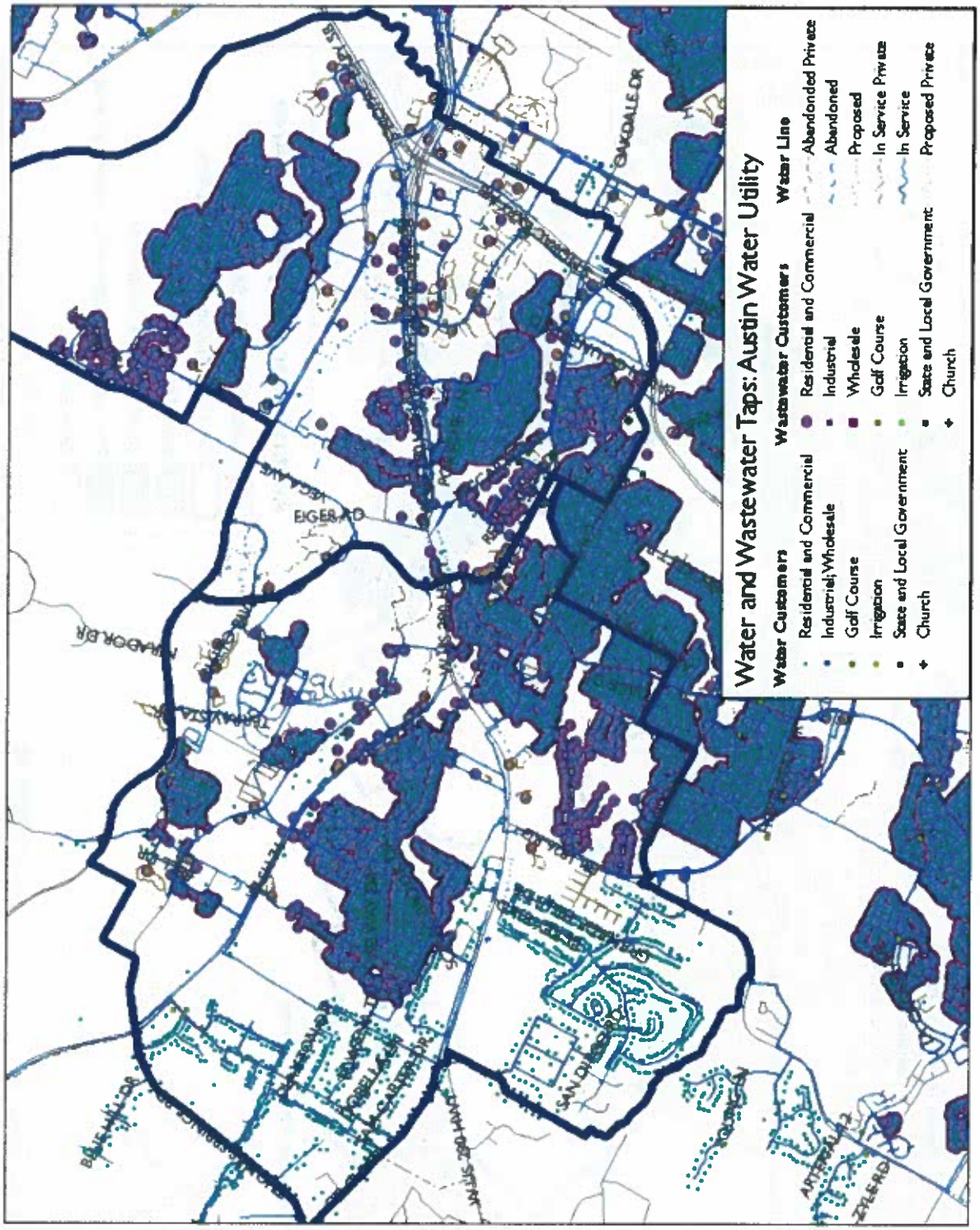


Figure 5-3: Water and Wastewater Taps: Austin Water Utility



for drinking water. Wells in eastern Oak Hill draw water from the Edwards Aquifer and are regulated by the Barton Springs/Edwards Aquifer Conservation District (BS/EACD, see page 48). Edwards Aquifer wells generally offer clean water with consistent yields and are called "firm yield" wells, New wells permitted for the western portions of the aquifer (the east Oak Hill area), however, are considered interruptible or "conditional yield" wells. Unlike firm yield wells, interruptible wells do not promise a steady water supply. In times of drought, well pumpage may be significantly reduced.

Wells in western Oak Hill may draw water from the Trinity Aquifer, not the Edwards Aquifer. Trinity well water is generally considered lower in quality and yield than Edwards well water. The Circle C golf course is irrigated with water drawn from a Trinity Aquifer well. Before the use of a centralized municipal water supply, development in Western Oak Hill was limited by the constraints of Trinity aquifer wells

Water Line Extensions to Southwest Austin

Figure 5-2 shows the Austin Water Utility's service area. The service area has been expanded over time as the City annexes land and state and local laws evolve. The planning area is located within the Austin Water Utility's service area.

Oak Hill contains one of the City's Certificates of Convenience and Necessity (CCNs) for water. Utilities in Texas, like the Austin Water Utility, register for CCNs with the Texas Commission on Environmental Quality (TCEQ). Austin's CCNs and Austin's CCN areas protect a service area from the encroachment of other utility providers; constructing infrastructure that supports water or wastewater services is costly, and CCNs ensure utilities they will have the potential customer base to recoup their initial investments. In exchange for this protected customer base, utilities with CCNs are required by TCEQ to provide service to that area, in accordance with service extension plans. The Austin Water Utility is required by law to provide water service within its water CCN boundaries or allow another provider to serve part of the area.

The CCN area within Oak Hill is the City of Austin's only CCN within its Drinking Water Protection Zone (see Figure 5-4). This area used to belong to Water Control and Improvement District (WCID) #14, a Travis County water provider using City of Austin water, which was acquired by the Austin Water Utility. WCID #14 was created in 1958 and probably distributed water to customers from one large Trinity aquifer well.

When WCID #14 was acquired by the City, its infrastructure became the property of the Austin Water Utility, and all of its existing and potential customers became Austin Water Utility customers. At that time, the Austin Water Utility assumed the responsibility to extend water service to any customers requesting water service within WCID #14's old boundaries (Figure 5-5).

Water service in other areas of Oak Hill was provided as a result of annexation. Annexation is one mechanism by which cities expand tax bases and regulate development. The City annexed the "Upper Williamson Creek" area in 1985 and created a service extension plan for the area.

Figure 5-4

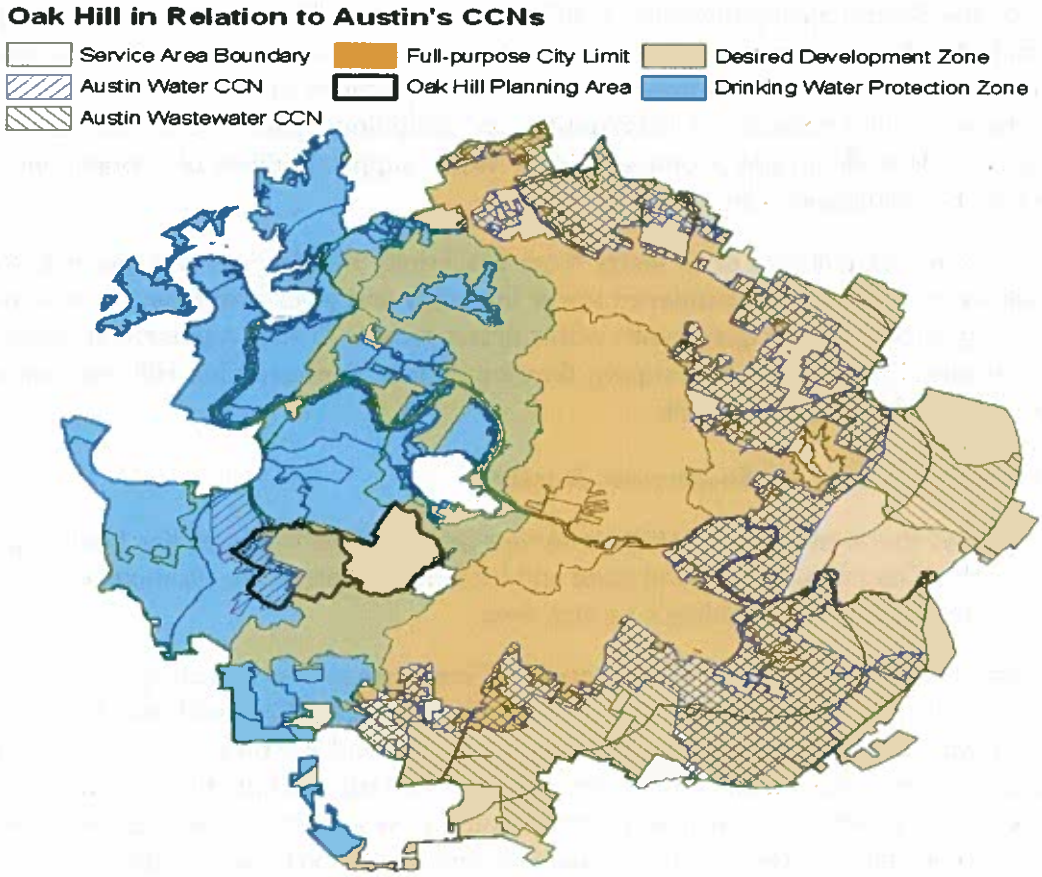
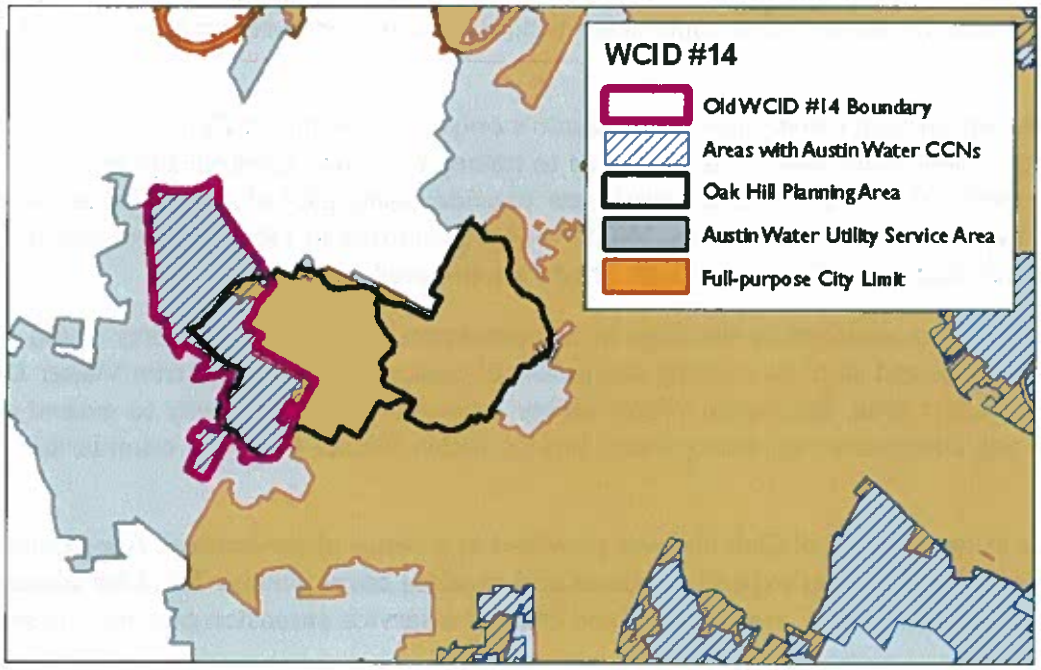


Figure 5-5: WCID #14



The plan included full water and wastewater services and fire services, which created a need for increased water line capacity. New lines and water tanks were constructed in 1986.

The City constructed new water lines for other areas of Oak Hill as they were annexed. The City became responsible for providing emergency fire services. The existing small lines, which belonged to rural water districts, were abandoned.

Service Extension Requests within the Austin Water Utility's Service Area

All of the planning area is in the Austin Water Utility Service Area, though not all of the planning area receives service. The Austin Water Utility extends water and wastewater service in accordance with City service extension policies and ordinances. The City has additional legal obligations within the service area boundary for the portion that is covered by its water CCN.

Within the Austin Water Utility Service Area, Service Extension Requests (SERs) made by applicants are approved administratively by the Director unless a property is outside the City limits and within the Drinking Water Protection Zone or if the project will require the City to Cost Participate (usually to oversize proposed service extension request water or wastewater lines to provide additional capacity for future Utility needs).

Water and Wastewater lines are extended by Service Extension Requests applied for by applicants to meet their project needs while following City criteria and utility planning goals, such as providing reliable water service. An example of providing reliable water service is "looping" water lines—where a tap receives water from two directions—makes that tap's water supply less vulnerable to failure (since both directions must fail for the tap to be cut off from water). The utility's goals and extension plans are outlined in the Austin Water Utility Strategic Water Resources Plan (most recently updated in November 2003), which shows that the Utility is planning to provide water and wastewater services to the parts of the Oak Hill area that does not yet receive them.

If an SER is made for a property that is outside the City limits and within the Drinking Water Protection Zone, then it will also be reviewed by WPDRD staff. WPDRD staff considers the following criteria when they review these SERs:

1. Will future development be required to comply with current code?
2. Does the requested service result in more intense development than would be possible absent the service?
3. If so, is the development in an area in which we are encouraging development?
4. Does the service provide for additional development other than the requesting tract?
5. Would central service solve known or potential environmental problems?
6. Is serving the area consistent with long-term service area and annexation goals?

WPDRD forwards their recommendation for each proposed SER to the Environmental Board which makes their assessment. The Austin Water Utility takes the proposed SER to the Wa-

Austin Water Utility Cost Participation

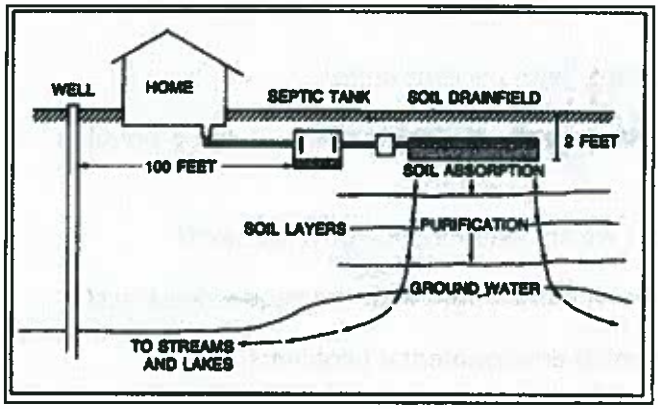
The Austin Water Utility occasionally "cost participates" with private developers to install oversize water or wastewater lines in particular areas. During SER Review when utility staff anticipates there will be additional development in that immediate area which will require additional water or wastewater capacity, the utility will provide cost participation to construct oversized water or wastewater lines large enough to provide future anticipated capacity. This oversizing refers to requiring larger diameter lines than the standard diameter line that would specifically be required for the applicant's project.

ter and Wastewater Commission, which also provides their assessment. The Utility then submits the proposed SER and both assessments to City Council. City Council makes the final decision on whether to approve these types of SERs.

The Extension of Centralized Wastewater Service

Development intensity is also limited by wastewater service. Until the 1970s, the absence of access to centralized wastewater maintained Oak Hill's rural, low density character. Decentralized service in Oak Hill commonly takes the form of septic tanks and drainfields (Figure 5-6). Sewage reaches the septic tank where solids and liquids separate and begin to break down. Liquid waste or effluent then drains out from the tank to the drainfield to be treated or purified by surrounding soil. Functioning soil drainfields require a significant amount of space. Austin residents using septic tanks with access to centralized water must have lots at least one half acre in size (21,780 square feet); those using water from on-site wells are required to have lots of at least one acre (43,560 square feet). By contrast, the minimum lot size required for residences with full water and wastewater service is 5,750 square feet with property in the SF-2 Single Family Residence Standard Lot or SF-3 Single Family Residence zoning categories.

Figure 5-6: Septic System



Buncombe County Soil and Water Conservation Department image, http://www.buncombecounty.org/Living/news_Detail.asp?newsID=1767

Oak Hill is located at the outer reaches of the City's centralized wastewater service area. The "Water and Wastewater Taps" map (Figure 5-3) shows that most residences and businesses in eastern Oak Hill are connected to city water and wastewater service. Some homes in western Oak Hill do not connect to the city's central sewer system.

In the early 1970s, prior to the adoption of the watershed-based development regulations discussed in Chapter 4, Oak Hill's de-

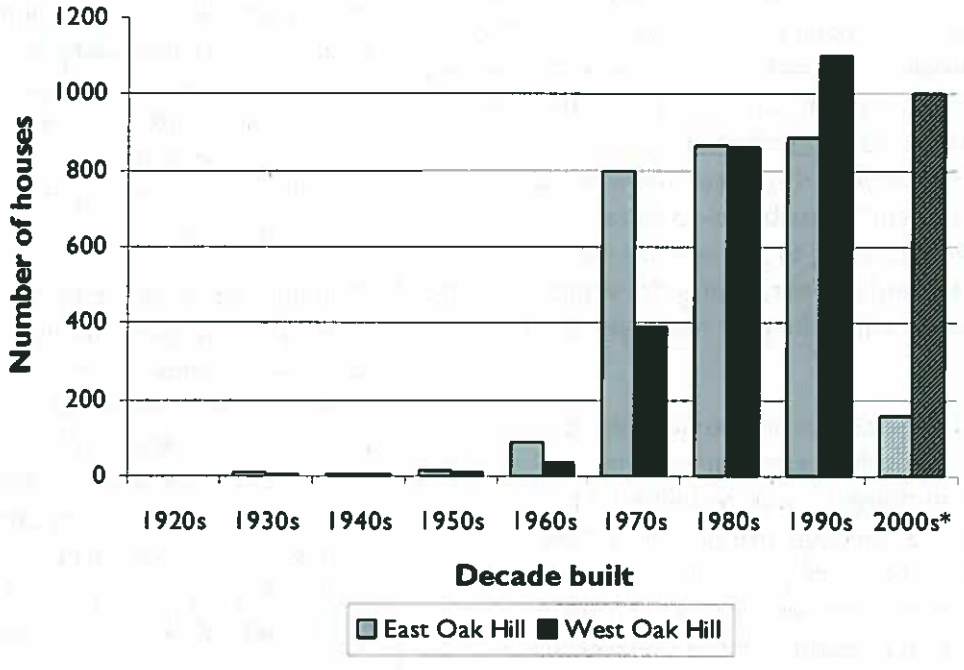
velopment patterns began to shift dramatically. The State of Texas and the City of Austin approved the construction of small private wastewater treatment plants. These plants were designed to collect sewage from homes in new subdivisions and to eventually become part of the City of Austin's central wastewater system. These treatment plants facilitated the construction of relatively dense residential subdivisions in the 1970s. The sudden boom in housing in the 1970s (Figure 5-7) reflects this.

The Austin Water Utility had plans to build major interceptors to eventually connect to these private wastewater treatment plants; major sewer main extensions were part of the City's capital improvement plans. In the mid to late 1970s, voters rejected bonds that would have funded the extension of wastewater lines into the Barton Springs Zone because of environmental concerns. In many cases, however, developers paid for pipeline extensions themselves. When the private wastewater treatment plants for Travis Country and Scenic Brook subdivisions began to function poorly, TCEQ required the Austin Water Utility to take over sewage collection services and retire the private plants.

The Austin Water Utility and the Lower Colorado River Authority (LCRA) now provide water and wastewater service to many homeowners who once used Trinity well water. These homeowners softened their hard well water with salt, which then damaged their septic tank systems. The homeowners successfully lobbied for access to a surface water supply.

Centralized wastewater service has also been established through the creation of Municipal

Figure 5-7: Age of single-family homes in East & West Oak Hill



* 2000s data is for 2000 – 2006.

Utility Districts (MUDs). In the 1980s, continued private development led to multiple State-approved MUDs. MUDs are often approved in association with land use plans and are authorized to provide services, including water and wastewater, within their boundaries. For example, the Circle C MUD was approved in 1984 in conjunction with a land use plan for 1,200 acres. MUDs led to the construction of major sewer mains in the Williamson and Slaughter Creek drainage basins.

Austin Water Utility's service area has been expanded over time by various mechanisms and has been influenced by evolving state and local laws, bond elections, and projects developed out of compliance with current watershed regulations through grandfathered status (see Chapter 4). Although certain SER decisions are now reviewed by the City's Environmental Board, major sewer mains constructed in the 1980s generally provided capacity for dense development in the Oak Hill area.

RUNOFF, CREEK EROSION, AND FLOODING

Current land development and watershed regulations require developers to address runoff on a site-by-site basis. Until 1974, buildings and roads were constructed without any structural controls to mitigate runoff; there was limited knowledge of the effects stormwater runoff would have on downstream neighborhoods. In addition to the water quality impacts discussed in Chapter 4, the stormwater runoff created by impervious cover contributes to hazardous creek erosion and localized flooding in streets and yards. Streams and creeks get wider and deeper, losing the vegetation that lives along their banks, which further increases the pace of erosion.

Areas of Oak Hill have been prone to flooding for years. Some flooding is the result of structures being built within the floodplain before doing so was restricted. Floodplains are land areas that are normally dry but are prone to periodic natural flooding. They are generally low-lying areas adjacent to creeks or other bodies of water. Some residents remember the flood that inundated the intersection of U.S. Highway 290 and William Cannon Drive in the early 1990s.

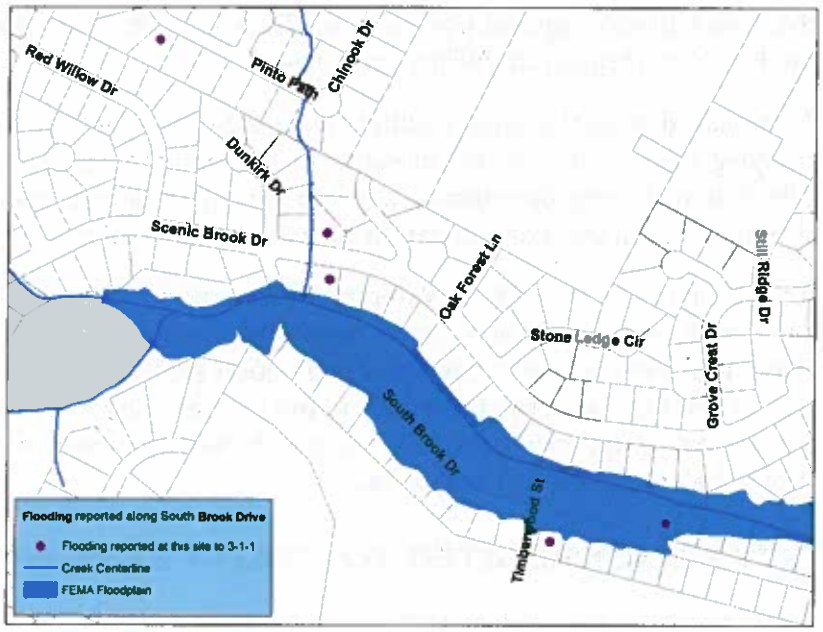
What happens to runoff?

When rain falls on soil, some evaporates, some is absorbed by plants, some recharges groundwater supplies like aquifers. When rain falls on surfaces that cannot absorb it (impervious surfaces), it becomes stormwater runoff. Runoff should never become part of a municipal sewer system (sanitary sewer) because these systems are not built for large quantities of water. Infiltration of runoff into sanitary sewer systems can cause sewage leaks which pose major hazards to human health and the environment. Instead, runoff is channeled into creeks and lakes or into manmade storm drain systems. Manmade systems include ditches, street gutters that feed underground pipes, culverts that carry water under bridges, and finally storm sewer outfalls, where pipelines release their contents into creeks or other bodies of water.

Drainage basins are areas of land that send water to the same river, creek, or tributary. Drainage basins are divided into drainage areas based on the natural branching of creeks or by the construction of concrete channels that carry stormwater or underground piping that carries stormwater.

Localized flooding also occurs because of high levels of impervious cover that are not adequately mitigated. Many of the residential subdivisions in Oak Hill were built without structural controls that limit the amount of stormwater runoff created by roads and homes. In Oak Hill, flooding reported on South Brook Drive (see Figure 5-8) may be caused by a combination of factors: steep slopes to the south of the property send water north toward homes, homes are built in the Williamson Creek floodplain, and the subdivision is older and may not have been designed under current regulations that require stormwater detention and drainage plans.

Figure 5-8: Flooding Reports



City of Austin Programs

Runoff is mitigated for new construction on a site-by-site basis. Each proposed development must go through a development review process; water quality and flood detention controls or alternatives are required by the Land Development Code and related criteria manuals. Private developers hire licensed engineers to apply City regulations to their particular site. City codes state that new development cannot exacerbate flooding conditions within the city; all runoff from new development must be managed.

In many watershed areas, developers can choose between providing storage facilities for stormwater on their own property or contributing a 'fee in lieu' toward the City's Regional Stormwater Management Program (RSMP). The RSMP was created in 1984 and allows developers to save the expense of constructing and maintaining their own detention facility. The RSMP uses a watershed-level approach to plan for flood control. Staff design and choose appropriate locations for regional detention facilities, such as the Oak Hill Regional Stormwater Detention Facility.

Figure 5-9: Erosion along Williamson Creek
http://www.ci.austin.tx.us/watershed/erosion_pbwilliamson.htm

The RSMP also builds retention facilities, enlarges and channelizes waterways, improves conveyance structures, and manages voluntary property buyouts. In Oak Hill, the City maintains the Scenic Brook regional pond and the Dick Nichols Park Regional Pond, which is built into the Kincheon Branch of Williamson Creek.

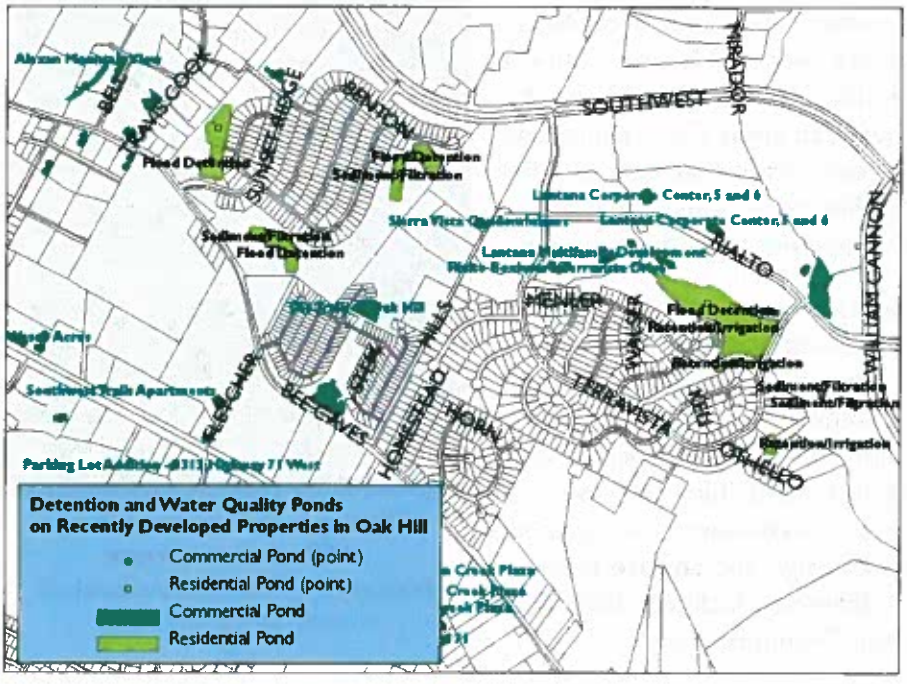
As private drainage facilities multiply (Figure 5-10), many municipalities, including Austin, are studying ways to ensure that privately maintained drainage facilities continue to function properly. Malfunctioning detention and water quality structures contribute to localized flooding, stream erosion, and contamination of surface and groundwater.

According to Phase I of the Watershed Protection Master Plan (see Chapter 4), the Williamson Creek watershed and parts of the Barton Springs Zone are high priority areas for Austin. These are areas where "watershed protection goals and objectives are not currently being met or are not expected to be met in the future." City hydrologists and engineers are studying the best ways to retrofit existing drainage facilities and will recommend what kinds of facilities should be constructed in new areas.

CITY POLICY RELATED TO UTILITY EXPANSION

Factors beyond the control of the Austin Water Utility have affected the extension of water and wastewater services into the Oak Hill area. The Austin Water Utility's service area currently encompasses significant acreage within the Drinking Water Protection Zone despite City policy which restricted the provision of wastewater services in the Barton Creek water-

Figure 5-10: Detention and Water Quality Ponds on Recently Developed Properties in Oak Hill



shed (Sector 11 Land Use Plan, City of Austin Planning Department, November 1988, p. 20).

Other infrastructure planning in Austin requires environmental impact analyses. In 2001, City Council adopted an update to the 2025 Austin Metropolitan Area Transportation Plan (AMATP), which included "Additional Criteria for Construction of Roadways in the Drinking Water Protection Zone" to affect all future bond expenditures. The criteria state

Figure 5-11: Oak Hill Regional Pond

> Unless the road is authorized by an election of the City of Austin or another jurisdiction and the spending is approved by the Austin City Council, the bond proceeds will not be used to fund matches for road infrastructure of right-of-way through:
>
> - The Drinking Water Protection Zone.
> - A City of Austin preserve.
> - A City of Austin destination park
>
> *City of Austin 2025 AMATP, adopted June 7, 2001, last amended May 23, 2002.*

City Council required that an environmental suitability analysis be conducted to determine how the construction of new roads would affect the Drinking Water Protection Zone. The Environmental Suitability Matrix considers whether a roadway is located in an aquifer recharge or contributing zone and whether any of the following are nearby: karst features, parks, water quality protection lands, greenbelts, or endangered species. For roadway projects that were ranked in the third and fourth quartiles of the matrix (having significant impacts), AMATP support staff recommended that they "should be evaluated in a special study during the long-range planning process, prior to design or construction, with specific attention to the mitigation of water quality impacts to the Edwards Aquifer." Please see Appendix B for further information on the Environmental Suitability Matrix.

CONCLUSIONS

Centralized infrastructure continues to allow for greater density in Oak Hill, such as new commercial and residential projects like Freescale, Advanced Micro Devices, Travis Country West, and various luxury condominium complexes. Although the capacity for potable water and central sewer service no longer poses a barrier to further development, the environmental consequences of continued development and related utility infrastructure construction still need to be considered as requests for development arise. Regional goals to maintain water quality also will need to be a part of this consideration.

Figure 5-12: Types of Detention Ponds

Sedimentation/sand filtration treatment was required in the Barton Springs Zone prior to the SOS Ordinance. These systems remove certain pollutants from storm-water runoff before discharging to a storm sewer or creek.

Retention irrigation systems retain runoff and distribute it through irrigation, meeting the non-degradation standard of the SOS Ordinance by allowing stormwater to infiltrate through the soil.

Wet ponds filter and detain stormwater runoff, provide habitat for wildlife, and offer aesthetic value. They achieve a level of water quality treatment equivalent to that of a sedimentation/sand filtration pond.