Disconnecting Impervious Surfaces in Urban Stormwater Management: Implications for San Antonio's Unified Development Code

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This literature review examines academic research on green stormwater infrastructure (GSI) including Low Impact Development (LID) as key strategies for advancing urban stormwater management. Practices such as disconnecting impervious surfaces and directly connected impervious area (DCIA) reduction are increasingly recognized as effective tools to mitigate flooding and improve water quality. Academic literature from both U.S. and international studies is analyzed to assess the hydrological effectiveness of GSI and LID, as well as the most impactful policy implementations to date. The findings from this review are intended to inform an evaluation of San Antonio's Unified Development Code aimed at improving stormwater management practices. By identifying common regulatory mechanisms and implementation strategies, this research contributes to ongoing efforts to integrate sustainable and adaptive solutions into urban planning.

Key Words: Low Impact Development, Stormwater Management, Disconnecting Impervious Surfaces, Green Stormwater Infrastructure

Abbreviations and Acronyms

Short name or acronym	Descriptive name
UDC	Unified Development Code
GI	Green Infrastructure
LID	Low Impact Development
GSI	Green Stormwater Infrastructure
EPA	Environmental Protection Agency
BMP	Best Management Practices
DCIA	directly connected impervious area
UIA	unconnected impervious areas
DIA	disconnected impervious areas
NEIA	non-effective impervious areas
NCIA	non-directly connected impervious areas
SCM	Stormwater Control Measures
WSUD	Water Sensitive Urban Design
SCM	Stormwater Control Measures
FFE	First Flush Effect
SWMM	Storm Water Management Model
PP	permeable pavement
RB	rain barrels
BC	bioretention cells
GR	green roofs

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Introduction

The region known as the Texas Triangle is composed of the Dallas-Fort Worth, Houston, and Austin-San Antonio metropolitan areas. This region is undergoing rapid urban growth, which has subsequently led to significant increases in impervious surfaces such as roads, rooftops, and parking lots. Impervious surfaces reduce the natural land infiltration and increase stormwater runoff. As impervious surfaces expand, large metropolitan cities face growing challenges related to flooding, stormwater management, and water quality. Furthermore, impervious surfaces intensify flooding risk while also transporting pollutants through stormwater runoff (EPA, 2025).

The challenges arising from impervious surfaces are particularly significant for San Antonio, which lies within Central Texas's Flash Flood Alley. Geographically, Flash Flood Alley is characterized by the convergence of tropical moisture, large air masses, and cold fronts above the Balcones Uplift, which contribute to frequent storm events. San Antonio sits above the Edwards Aquifer, which is its primary source of drinking water. Runoff from urban areas can introduce nonpoint source pollution into the Edwards Aquifer Recharge Zone and its watershed, threatening groundwater quality and putting residents at risk. Moreover, The Texas Water Development Board (TWDB) analyzes the Social Vulnerability Index regarding flood risk. TWDB considered a threshold of 0.75 to be a reasonable indicator for a highly vulnerable area. The metropolitan area of San Antonio (see Figure 1) ranges from:

- 0.25 - 0.5 in the suburban outskirts;
- 0.5 - 0.75 surrounding the downtown area; and
- 0.75 - 1 specifically in the downtown area.

Historically, water policy responses to flooding in the region are typically reactive and often emerge only after major flood events that are coupled with loss of life. It is imperative that proactive stormwater management strategies are implemented within legal frameworks. This paper examines the role of impervious surface disconnection as an approach to reducing runoff and improving stormwater management. Additionally, this paper reflects on the current municipal codes to observe the progress made in Green Infrastructure (GI), Low Impact Development (LID) and Green Stormwater Infrastructure (GSI) implementation. Finally, the paper aims to understand how both U.S and international applications of these methods may relate to planning frameworks such as San Antonio's Unified Development Code and their potential role in supporting more sustainable urban water management.

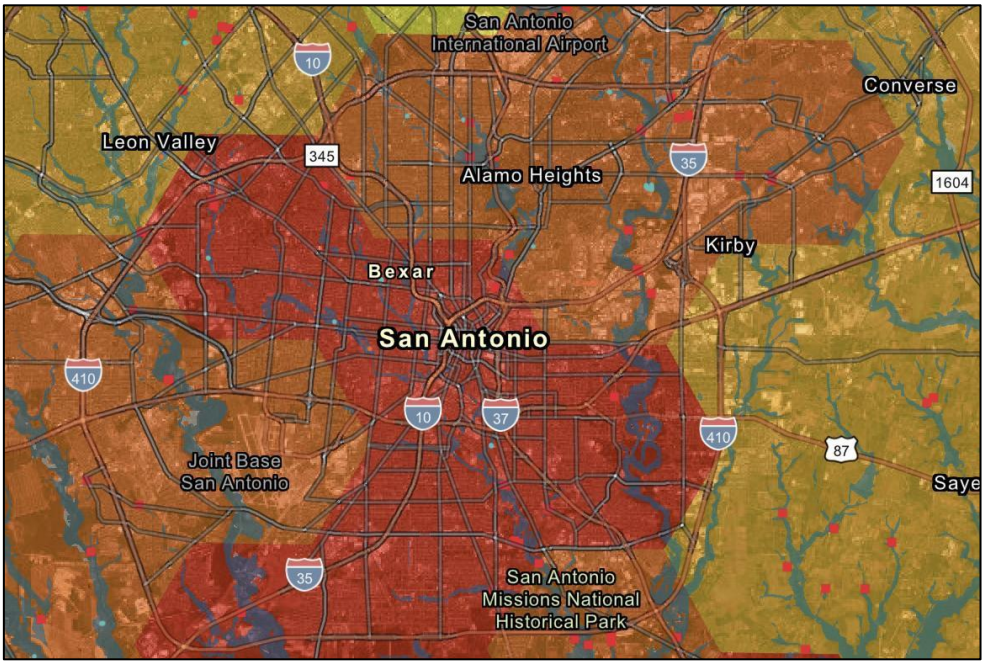

Figure 1: Existing Flood Risk in San Antonio Metropolitan Area (TWDB 2024)

Best Management Frameworks

The terms Green Infrastructure (GI), Low Impact Development and Green Stormwater Infrastructure are often used interchangeably, and their use can vary from region to region. The EPA has clarified their use as follows:

- GI has been used outside of a stormwater context to describe the networking of natural ecosystems and greenway corridors (e.g., forests and floodplains) to provide ecological services and benefits. GI is becoming an umbrella term under which other terms, such as LID, and GSI fit.
- LID is a management approach and set of practices that can reduce runoff and pollutant loadings by managing runoff as close to its source(s) as possible.
- GSI relies on natural or engineered-as-natural ecosystems to specifically control and manage stormwater runoff. It has often been used in reference to combined sewers.

Within each of these strategies, a primary goal is to mitigate the runoff from impervious surfaces. The primary term used to describe impervious surfaces in stormwater studies is directly connected impervious area (DCIA). DCIA refers to impervious surfaces that are directly connected to storm drainage systems, allowing runoff to flow rapidly into drainage networks with little opportunity for infiltration. As a result, these surfaces typically contribute to increased runoff volumes and reduced natural infiltration (Wang 2019).

In contrast, impervious surfaces that are not hydraulically connected to drainage systems are described using several related terms. In the literature, these areas are called unconnected impervious areas (UIA), disconnected impervious areas (DIA), non-effective impervious areas (NEIA), or non-directly connected impervious areas (NCIA). For this

paper, the term NCIA will be used when referring to this topic. These surfaces drain onto adjacent pervious areas, such as lawns or landscaping, where runoff can infiltrate or be partially absorbed before reaching the drainage system (Schoener 2017; Silva 2020; Wang 2019). Because runoff from these disconnected surfaces can infiltrate or disperse across pervious ground, these surfaces often reduce stormwater volumes and slow the movement of water through urban drainage systems. As a result, impervious surface disconnection can improve stormwater quality, support groundwater recharge, and reduce downstream erosion without the higher costs associated with structural runoff control systems (Silva 2019; Javan 2025)

While Low Impact Development is often noted for its use to improve water quality, its strategies aiming to mimic natural hydrological flow regimes assist to also manage stormwater runoff at its source. LID methods include a variety of structural and landscape-based practices such as rain barrels, green roofs, permeable pavement, rain gardens, and overall impervious surface disconnection. However, the diversity of these techniques, ranging from cost to construction, can sometimes constrain their implementation in urban environments (Taheri 2025).

Reducing DCIA through these practices is an important strategy within Stormwater Control Measures (SCMs). These approaches aim to slow, store, and infiltrate runoff rather than quickly transporting it through drainage systems. In the United States, many leading examples come from cities in the Northeast, where regulatory frameworks, combined sewers and historic implementations of greywater infrastructure have encouraged the adoption of GSI (Hopkins 2018). Similar approaches are implemented internationally under different names but follow comparable principles. For example, Water Sensitive Urban Design (WSUD) in Australia, Sustainable Urban Drainage Systems (SuDS) in Europe or Sponge City initiatives in China both focus on managing stormwater runoff at its source rather than collecting stormwater to be discharged at various urban drainage outlets (Javan 2025).

U.S. States Applications

In response to the slow adoption of LID methods, in 2007, the Environmental Protection Agency (EPA) issued a memorandum supporting the use of GSI to not only protect water quality but to also reduce flood risk.[2] This effort highlighted the importance of, and aided the historically slow development of, Best Management Practices (BMPs) across the United States (Hopkins 2018). The implementation of GSI has expanded significantly across the United States since the early 2000s. The literature emphasizes Northeast, Upper Midwest, and Pacific Northwest cities, since they have historically integrated green infrastructure into municipal planning. Portland, OR and the District of Columbia have both adopted development codes mandating stormwater runoff to be directed to pervious areas before entering the public drainage system.

In addition, Hopkins (2018) identifies “green leader cities” to be Milwaukee, WI; Philadelphia, PA; and New York City, NY, all of which had “dedicated >20% of the control plan budget in green infrastructure.” However, it is important to note that in more recent decades, major developments have shown that states such as Texas and California are emerging as leaders in adopting and scaling GSI practices out of necessity. As extreme weather events continue throughout the U.S., further research should focus specifically on regions in southern and western states that are prone to flooding, such as flash flood alley in the Texas Hill Country.

Portland, Oregon

In Portland, Oregon, development projects that create or replace a specific threshold of hard surfaces must manage onsite stormwater using GSI. Managed through the Bureau of Environmental Services Stormwater Management Manual, rules require 100% of runoff to be handled via infiltration trenches, planter box ecoroofs, or vegetated facilities like swales or rain gardens before any remaining water can overflow into a public storm system versus direct pipe discharge.

District of Columbia (DC)

Under District of Columbia guidelines, Section 3.4 Impervious Surface Disconnection is a stormwater best management practice (BMP) that directs runoff from hard surfaces like roofs or pavements onto vegetated pervious areas to infiltrate and filter close to the source. It reduces overall runoff volume entering DC sewer systems.

Milwaukee, Wisconsin.

Milwaukee represents the importance of valuing GSI methods in the public sector and demonstrates that this support can lead to significant investment in related projects. The literature attributes Milwaukee's $1.3 billion investment in GSI to its early graywater infrastructure efforts and strong regulatory backing of green infrastructure (Hopkins 2018). The city first implemented stormwater tunnels to mitigate excess water, which proved successful and paved the way for future initiatives. Next, Milwaukee's green infrastructure program expanded with the land acquisition program, Green Seams, in 2000, which prioritized purchasing flood-prone land to prevent development.

This program turned into the BMP Partnership Program in 2002 (which provided matching funds for green infrastructure projects), followed by a rain barrel program in 2004 and a rain garden initiative in 2005 (Konopacky 2017; Hopkins 2018). Together, these initiatives helped maintain public support for GSI spending. Overall, Milwaukee found that shifting toward GSI was more cost-effective and that incentives across both the public and private sectors played a key role in building and sustaining that support.

These lessons can be directly applied to the city of San Antonio. Like Milwaukee, San Antonio has already invested in effective gray infrastructure, such as the San Antonio River Tunnel built in 1997. As noted by Environment Texas, "The conventional approach has been to move runoff away from buildings and roads …But this gray infrastructure is now being supplemented by green infrastructure" (Dimmick 2017). This clearly shows the next step is to build upon this foundation by continuing to integrate GSI alongside existing systems to create a more comprehensive and adaptive approach to stormwater management.

Philadelphia, Pennsylvania

Philadelphia exemplifies the importance of "idea emergence," or media programs that engage the public. The city emphasized the dialogue around green restoration ideas from the 1980s to the 1990s through initiatives from the West Landscape Project, which engaged the Philadelphia Water Department (Hopkins 2018). Along with this, Philadelphia began testing GSI effectiveness through local university programs. For example, at Villanova University, numerous studies have been done to observe BMP through using GSI methods such as vegetative infiltration basins and have found evidence to support the utility that LID has for groundwater infiltration (Kwiatkowski et al

2007 and Machusick et al 2011).

Hopkins (2018) notes that “the Mayor of Philadelphia announced Greenworks Philadelphia in 2009, creating a plan to make Philadelphia the greenest city in America by 2015.” The initiative emphasized the benefits of GSI, highlighted job creation for citizens, and provided data to show how GSI can be more cost-effective than gray water infrastructure. The Philadelphia example highlights how comprehensive planning, public involvement, and investment can shift cities away from reliance on traditional gray infrastructure towards more sustainable frameworks. Today Philadelphia has specific development codes and regulations enforced by the Philadelphia Water Department (PWD) under Philadelphia Code §14-704(3) that require development and redevelopment projects to manage stormwater on site encouraging the use of GSI.

In San Antonio, institutional efforts are already contributing to the broader recognition and adoption of GSI. Organizations such as the San Antonio River Authority (SARA) play a key role in shaping public awareness through outreach and planning initiatives that parallel efforts seen in Philadelphia. For example, they have begun the development of a GSI Master Plan, which incorporates evaluation of “triple bottom line benefits including social, environmental, and economic outcomes” (San Antonio River Authority 2026).

Additionally, university partnerships have also taken place in San Antonio through research initiatives from the University of Texas at San Antonio. Additionally, SARA has significantly developed LID and GSI initiatives as they have continued to create and update their LID technical design manual specifically for the San Antonio River basin. Furthermore, they have already contributed to advancing LID strategies, with faculty such as Marcio Giacomoni leading projects focused on improving stormwater mitigation (Stormwater Report 2019).

Rouge River Watershed, Michigan

The Rouge River Watershed covers 466 square miles in southeast region of Michigan, and it discharges through the city of Detroit. The Hughes study (2026) highlights the importance of inter-watershed collaboration since watersheds often cover a vast amount of surface area and may be impacted by a variety of factors throughout the course of a storm event. The research found that cities with higher median household incomes, greater population density, and older housing stock are more likely to implement a wider range of stormwater control measures, such as GSI (Hughes 2026).

However, uneven policy implementation across the watershed can limit the overall effectiveness of these investments and prevent municipalities from realizing their full benefits. In addition, the study emphasizes that incentives encouraging GSI development, such as offering LEED credits for green innovation or implementing stormwater fees for runoff, function as effective market-based tools for municipalities. At the same time, the study highlighted physical constraints to GSI development and found that areas with steep slopes greater than 5% are generally less suitable for constructing new green infrastructure (Hughes 2026). This is crucial to consider when observing the Upper San Antonio River Watershed, where the city of San Antonio is located, which spans 506 square miles.

Sandoval County, New Mexico

Research in Sandoval County provides insight into the hydrologic impacts of impervious surface connectivity in semi-arid environments like those found in parts of Texas. A 2017 study by Schoener found that transportation-related impervious areas had the strongest influence on rainfall–runoff relationships, with DCIA accounting for 28% of the watershed in the study area. Most importantly, roads alone represented 53% of all DCIA, while residential driveways and commercial parking accounted for 20% and 18%, respectively. The study also highlighted the role of unconnected impervious areas, noting that "during the early phase of a storm, or during short-duration storms with low cumulative rainfall amounts, all runoff from UIAs is absorbed by the pervious buffer (Schoener 2017)." The findings confirm that disconnection strategies, such as redirecting roof downspouts or increasing pervious buffers, can play a significant role in reducing urban runoff and improving water quality.

These findings are relevant to San Antonio given its rapid urban expansion, extensive roadway network, and increasing flood vulnerability in a city where flash flooding is a concern. San Antonio's stormwater system is strongly influenced by transportation infrastructure, with roads, parking lots, and commercial and residential development contributing a large share of directly connected impervious surface. This study highlights a similar arid urban environment and suggests that reductions in connectivity through LID could meaningfully reduce peak runoff volumes during intense rainfall events.

Overall, stormwater management strategies across the U.S. demonstrate that policy adoption often depends less on system size and more on institutional opportunity, or a "Policy Window" (Hopkins 2018). Ultimately, cities will pursue GSI for different reasons, ranging from urban flooding to improving water quality (Hughes 2026). In many cases, implementation is further shaped by regulatory frameworks that are already in place.

International Applications

International research further demonstrates the effectiveness of decentralized stormwater management strategies and the importance of policy incentives. Research shows that disconnecting impervious surfaces can reduce flooding and improve water quality, although the effectiveness of disconnection strategies depends strongly on soil infiltrability and local hydrologic conditions (Silva 2019).

Gwangju, South Korea

In 2015, an analysis of a city with approximately 85% impervious cover was conducted to optimize LID through stormwater monitoring and modeling. The study area of Gwangju contained a separate sewer system as well as residential and commercial areas. The pervious area noted was only located near a parking lot and consisted of approximately 15% of the area. Furthermore, the area had an average annual rainfall of 54 inches.

The Beak (2015) study states that scientific computer modeling has been done to observe the impact of impervious surfaces and the "first flush effect" (FFE), which is a major contributor to pollutant transport during storm events. FFE occurs at the early portion of a storm event, within the stormwater runoff, which is characterized by a high

discharge rate, coupled with a high concentration of pollutant mass (Beak 2015). Through the usage of the EPA Storm Water Management Model (SWMM) and MATLAB software, modeling in this area has supported the use of LID strategies.

Research found that throughout all LID methods (green roof, infiltration trench, porous pavement, rain barrel, vegetative swale), implementation resulted in reduced FFE. They found that increasing the coverage of LID infrastructure significantly reduced FFE consistently, except with the porous pavement and vegetative swale methods. In these instances, FFE would decrease initially, but would increase because of an increased size of the infrastructure. Previous research recommends a runoff depth of 4.32 ± 0.13 mm for LID infrastructure. While this study generally aligns with those findings, it suggests that the value is method-dependent and identifies an optimal runoff depth range of 1.2 to 3.0mm, see Figure 2 below (Beak 2015).

Table 4
Optimal LID size estimated from the SWMM.

LID	Optimal size (mm)
Bioretention	1.2
Green roof	3.0
Infiltration trench	2.6
Porous pavement	2.9
Rain barrel	1.5
Vegetative swale	3.0

Figure 2. Optimal size estimate from Beak 2015

Germany

An empirical study of 44 medium- to large-sized cities across Germany, with notable clustering in the Rhine–Ruhr metropolitan region, was conducted to examine differences in institutional stormwater management practices. The study highlights a broader shift toward decentralized approaches and observes regulatory frameworks to identify the most effective systems. In this context, “decentralized” stormwater management encompasses water retention, decoupling of impervious surfaces, and natural processes such as infiltration, evapotranspiration, and rainwater harvesting, which will be referred to as GSI methods (Geyler 2019). Given that Texas contains approximately 1,200 municipalities and similarly favors decentralized governance, these findings offer useful insights for improving stormwater management strategies in San Antonio.

Stakeholder and public collaboration are critical to the successful implementation of stormwater management strategies (Solins 2025). The study on municipalities in Germany identifies four primary approaches municipalities use to manage stormwater. The first, forced decentralization, occurs when property owners are required or strongly encouraged to adopt decentralized systems and provide stormwater services on-site. The second, selective decentralization, involves encouraging property owners to adopt specific local technologies that support targeted objectives, such as water reuse. The third approach focuses on extending the public system, in which property owners are limited in their ability to manage stormwater independently; instead, municipalities expand centralized

infrastructure while establishing conditions for sustainable financing. Finally, maintaining the status quo reflects a system in which property owners have little to no incentive to adopt decentralized methods (Geyler 2019).

The research suggests that GSI may be beneficial for medium to large cities, as it avoids the high costs associated with retrofitting existing centralized drainage systems (Geyler 2019). Among the management approaches examined, forced decentralization was identified as the most effective. Despite its name, this approach does not require compulsory connection but instead relies on high stormwater charges paired with substantial rebates.

Generally, voluntary financial incentives were found to be more effective than strict connection requirements. Policy tools such as stormwater charges support long term financing, while incentives like rebates encourage participation in GSI. Property owner participation increased when municipalities offered rebates, whereas approaches that lacked adequate incentives were largely ineffective (Geyler 2019). These findings align with Solins (2025), who notes that insufficient technical oversight and long-term maintenance can undermine GSI performance and lead to inconsistent stormwater mitigation outcomes. Overall, the research highlights the importance of both public participation and municipal policy implementation in achieving effective stormwater management.

Mississauga, Ontario, Canada

This research examines a form of GSI, permeable pavement (PP), specifically a hydrophobic polyurethane-based material known as PurePave, to address common limitations such as poor durability and stormwater mitigation. Impervious surfaces such as asphalt intensify stormwater runoff and increase pollutant loads during storm events, allowing contaminants to flow directly into nearby water bodies. In contrast, permeable pavement mitigates these effects by using interconnected pore spaces that allow rainwater and air to pass through the material. This function is particularly relevant in San Antonio, where a complex network of rivers and tributaries is vulnerable to pollutants carried by stormwater runoff.

The research identifies multiple types of PP, which vary based on the size of the aggregate used within the material. A primary limitation of PP is clogging, which occurs when debris accumulates in pore spaces over time, reducing infiltration capacity and ultimately decreasing system effectiveness. To address this issue, PurePave utilizes a smaller aggregate, ranging from 2 to 12 mm, which allows for both permeability and structural integrity. The study found that these smaller aggregates increase compressive strength by approximately 50% (Davis 2025). In addition, smaller pore sizes improve resistance to clogging by capturing debris at the surface, which can then be more easily removed through simple maintenance practices such as pressure washing.

It is important to note that the research also indicates that supplementary water storage is still necessary to manage excess stormwater that does not infiltrate into the ground. Overall, the study concludes that replacing as little as 20% of conventional impervious surfaces with PurePave can effectively manage runoff from a 100-year, 24-hour storm event (Davis 2025). This suggests that such systems may help urban areas mitigate stormwater impacts even during extreme weather conditions, including the flash flooding common in the Hill Country.

Tehran, Iran

The district 11 area of Tehran is characterized by a high building density, with approximately 56 % of the area covered by impervious surfaces such as roads, parking lots, and sidewalks. This study applied a SWMM model combined with a Multi Objective Evolutionary Algorithm to identify the most cost-effective LID strategy. The analysis evaluated rain barrels (RBs), bioretention cells (BCs), green roofs (GRs), and PP. Notably, GRs are the costliest compared to other LID options, making them the lowest ranked LID to implement. These findings suggest that RBs, BCs, and vegetated swales emerge as the most effective solution in terms of both cost and performance. Specifically, RBs and BCs reduced runoff volume and peak flow rates by 19.34% and 46.53%, respectively, at an estimated cost of $106,964 USD (Javan 2025).

Together, these findings offer a practical framework for designing cost effective LID strategies and underscore the value of GSI in urban stormwater management. In the context of San Antonio, this research supports the adoption of policy and incentive structures that prioritize cost efficient interventions such as rain barrels and bioretention systems.

Methods: Texas Municipal Codes

It should also be noted that the Texas Triangle has been moving towards implementing more language on LID in municipal codes, especially after the economic devastation caused by Hurricane Harvey in 2017, which inspired more discussion on flood mitigation throughout the state of Texas. In the same year as Hurricane Harvey a stormwater policy survey ranked Austin as a leader in LID adoption at 90%, followed by San Antonio (65%), Fort Worth (60%), Houston (50%), and Dallas (40%) (Dimmick 2017). These differences also reflect variations in city size and capacity, which influence how extensively LID is incorporated into local ordinances.

To further analyze the impact of legislation in Texas, a qualitative review of 130 publicly available municipal codes was performed to observe the amount of language in the most up to date legal ordinances. Municipal ordinance data was sourced primarily from the Texas Government website for local ordinances, including the following databases:

- https://guides.sll.texas.gov/texas-law/local-ordinances#s-lg-box-34341836
- https://www.generalcode.com/library/#TX
- https://library.municode.com/tx
- https://codelibrary.amlegal.com/regions/tx

This qualitative review was performed by a key word search within each municipal ordinance using terms such as LID, impervious, stormwater, etc. Thorough analysis was done if it was determined there could be potential ideas that would not fit the strict term and this is documented in Appendix A.

The compilation of codes was organized into a database and grouped by population size. These groupings consisted of population sections of >25,000, >50,000, and >100,000. Populations under 5,000 were not reviewed due to time constraints and applicability for the scope of the research regarding San Antonio. Once analyzed, these municipalities were interpreted to be either “none,” “vague,” or “clear,” based on the language found in the ordinance. *None* would be if there was no mention of any LID or GSI practice or framework. *Vague* would represent if there was a slight mention of a

framework that could potentially be interpreted as a GSI or LID practice but was not explicitly stated. Finally, *clear* would be when the keyword search would confirm the presence of GSI, LID, or the overall goal of disconnection of impervious surface for the specific aim to mitigate stormwater runoff.

Municipal Code Clarity Classification	Count of Municipality
Clear	14
None	102
Vague	14
Total	130

Figure 3. Municipal Code Clarity Classification Table

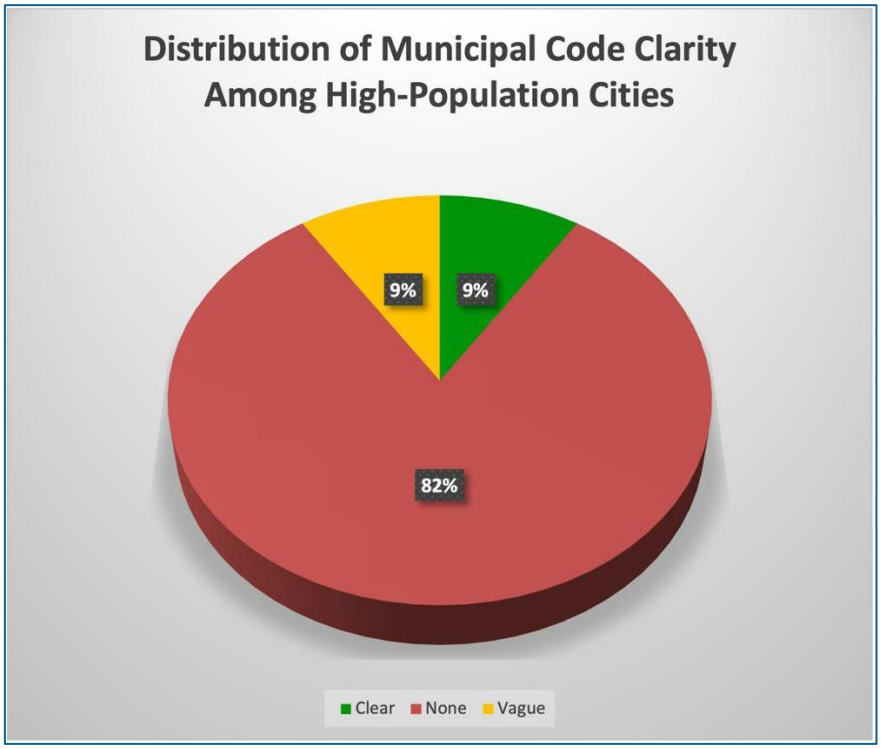

Figure 4. Distribution of Code Clarity Across Cities with a population over 25 thousand.

Discussion on Texas Findings

Preliminary findings suggest that the clarity of policy language regarding the disconnection of impervious surfaces is not strictly correlated with population size. Several mid-sized cities, such as Kyle, Southlake, and Cibolo, demonstrate more explicit and structured regulatory language than larger municipalities like Houston and Sugar Land. It is important to note that cities such as Austin and San Antonio stand out for providing detailed guidance on both LID and GSI within their municipal codes. Also, Bexar County has adopted a guidance document for GSI using the term, Post Construction BMPs.

Additional details on specific code sections are provided in Appendix A, with selected municipalities and their corresponding counties highlighted below.

Clear:

Kyle, Hays County

In Kyle, LID is addressed through “Engineered Natural Treatment” strategies outlined in Appendix A. These approaches emphasize practices such as bioretention, vegetated swales, rain gardens, and reduced impervious surfaces to promote infiltration, evapotranspiration, and on-site water retention. The ordinance highlights these methods as cost effective and practical solutions, particularly when site conditions such as soil type and groundwater levels are suitable, due to their lower lifecycle costs.

Sherman, Grayson County

In Sherman, LID is referenced within parking lot design standards. In Article 14 “Supplementary District Regulation,” rules regarding LID are outlined to ensure that landscaped islands located interior to the parking are protected by six-inch curbs and gutters to provide protection of landscape areas and mitigate soil erosion. The code makes sure to underline that LID components may also be considered to ensure erosion prevention.

Vague:

Port Arthur, Jefferson County

In Port Arthur, LID is considered within post-construction stormwater regulations, particularly for projects located in impaired watersheds or designated buffer zones. The ordinance allows the city to require LID practices at the discretion of the public works director, with an emphasis on reducing the size of impervious features such as roads, sidewalks, and parking areas. While these measures align with strategies that limit directly connected impervious surfaces, the code does not explicitly require disconnection.

Keller, Tarrant County

In Keller, LID is mentioned briefly in Article 5 “Subdivision design and improvement requirement.” Typical of most ordinances reviewed, this mention acts more as a defining term for the relationship between impervious surfaces and stormwater runoff. However, this reference was included because it stated that the municipality will use hydrological analysis to assess drainage impacts and mandates that development plans include any proposed LID features, such as pervious pavement, bioretention areas, and bioswales. This was significantly more definition of LID compared to other ordinances and felt indicative of action towards a planning process rather than treatment as an optional addition.

Lancaster, Dallas County

In Lancaster, Chapter 24 of the municipal code titled “stormwater management policy” emphasizes reducing impervious surface area and preserving natural drainage systems where possible. This language does align with LID practices, however there is no clear language in the ordinance outlining specific guidance on implementation or even GSI processes. The mention of LID seemed to be generalized and not focused on the

goal of disconnecting impervious surfaces.

Implications for San Antonio Unified Development Code

The literature highlights several factors that can influence the success of stormwater management strategies, including local topography, regulatory frameworks, and policy incentives. Multiple studies emphasize the importance of slope in determining the effectiveness of GSI, noting that steep terrain can complicate implementation, while flat urban areas may experience extensive, directly connected impervious surfaces (Hughes 2026; Schoener 2018). These considerations are particularly relevant to San Antonio, which lies within Central Texas's Hill Country and Flash Flood Alley. The region's steep terrain accelerates runoff during storm events, contributing to rapid flooding. In addition, increasing precipitation intensity, associated with changing climate patterns, risks further worsening flood conditions (Peck 2022).

San Antonio's vulnerability to extreme rainfall events is well documented. Take, for example, the devastating 1921 flood, which "washed away dozens and decimated the city." (Harman 2025). Recent projections suggest the intensity of 100-year flood events may now be 10–15% stronger than in previous decades, with an additional 1–3 inches of rainfall expected during such storms (Peck 2022). These findings suggest that flooding in the region is not necessarily random but instead reflects a predictable interaction between geography, the climate, and urban development.

San Antonio's current infrastructure and policy framework reflect both its progress and ongoing challenges. Major engineering projects such as the San Antonio River Tunnel, completed in 1997, have successfully reduced flooding in the downtown area, particularly around the River Walk. However, severe flooding continues to affect other parts of the city, including underrepresented communities. San Antonio must also take into consideration the cost of flood mitigation. For instance, Paul Berry, the spokesperson for San Antonio's Public Works Department, expressed how the city of San Antonio must complete flood projects piece by piece. In 2022, he stated that "if the city completed all 392 of the flood infrastructure projects it has deemed necessary today, it would cost $3.2 billion" (Peck 2022).

However, the literature shows how the implementation of GSI and LID methods coupled with incentives for community support can make stormwater mitigation projects much less burdensome. Organizations such as the San Antonio River Authority have supported LID adoption through initiatives like the Watershed Wise rebate and school grant programs, while individual buildings, such as the Mission Branch Library and the Hipolito F. Garcia Federal Building, have incorporated features such as rainwater cisterns, permeable pavement, and green roofs (Dimmick 2017).

Furthermore, community involvement has been critical for the implementation of GSI and LID projects. Organizations such as the Greater Edwards Aquifer Alliance (GEAA) advocate for stronger protections and increased awareness of stormwater impacts on the Edwards Aquifer, and local groups such as Communities Organized for Public Services (COPS) came together to fund over half a billion dollars for such infrastructure projects in the 1970s (Peck 2022).

Additionally, policy analysis suggests that regulatory frameworks may still constrain broader adoption. Critics argue that San Antonio's Unified Development Code reflects a suburban development model that prioritizes car-centric infrastructure and large lot development patterns (Bailey 2017). This research and the reviewed literature suggest

that vague policy language can weaken implementation requirements. Permissive words like “may” can make enforcement more difficult. Striking through a “may” and replacing it with a directive “shall” can enhance the enforceability of stormwater management policies significantly. (Dimmick 2017). Combined with recent reductions in sustainability funding and climate resilience programs (Harman 2025), these factors suggest that stronger regulatory incentives and clearer policy language are necessary to expand stormwater management strategies.

Recommendations

Currently San Antonio has clear support for utilizing LID practices in the Unified Development code. There is an established technically robust framework supporting LID through incentive-based credits which this research has proven to be beneficial. Additionally, there is clear outline on planning for LID and provisions to treat the water quality volume from the first 1.5 inches of rainfall which addressed FFE. These portions of the code demonstrate a strong commitment to stormwater management; however, the adoption of such practices has been almost non-existent.

This paper aimed to holistically review literature from both regional and international examples to apply this information to the unified development code. Therefore, to address any gaps in the code some recommendations are as follows:

First, policy should require all new development to capture and treat the first flush of stormwater runoff, since it carries the highest concentration of pollutants. For example, any new development project must retain and treat a specified volume of runoff, such as the first 1.5 inches of rainfall, using approved practices like vegetative swales or retention basins.

Second, the Unified Development Code should prioritize the use of cost-effective green stormwater infrastructure. Research has found that RB, BC, and vegetative swales are the most effective in terms of both cost efficiency and stormwater capture. Additionally, in highly urbanized areas with existing infrastructure, prioritizing site-scale implementation of these practices is often more feasible and cost-effective than large-scale development changes.

Finally, long-term operations and maintenance requirements should be strengthened to ensure that implemented stormwater systems continue to function as intended over time. Recent literature indicates that inadequate maintenance of LID practices can result in declining performance and inconsistent outcomes. To address this gap, the city should prioritize legally binding maintenance agreements for on-site GSI or LID, as well as routine inspections, and annual reporting, to ensure compliance and productivity of each site within reason.

Conclusion

Overall, government regulations provide the institutional framework necessary for implementing low impact development, while community participation is essential for long-term maintenance and effectiveness (Taheri 2025; Solins 2025). Management and upkeep are critical for municipalities to keep LID as effective as possible, whether maintaining permeable pavements or simply ensuring there is not debris in retention areas (Solins 2025; Davis 2025).

San Antonio is at an inflection point to determine how it implements more LID and GSI, as the city prepares to update its Unified Development Code (UDC). San Antonio should consider the research outlined within this report and the attached appendix to improve its UDC for an improved and resilient stormwater management practice. By shifting code language toward more enforceable and standardized requirements, San Antonio can enhance the effectiveness of its stormwater management policies in the face of continued urban growth and increasing flood risk.

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Appendix A.

Municipality	Designation	Primary County	Population Estimate 2024-2025	Municipal Code Relating to "disconnecting impervious surfaces for stormwater management." (DIS)	Relevant Code information	Link to information
Houston	City	Harris	2383293	Vague	Sec. 47-632. - General requirements. States " If a parcel subject to the requirements of this section is located partially in the city and partially in the unincorporated area of Harris County and storm water from any portion of the parcel drains into the MS4, a SWQ permit or IAC shall be required for the parcel." Overall very clearly notes that if there is any sort of pollutant it must be notated and not enter the MS4. There is one instance of referring to Green infrastructure but not specific on disconnection of impervious surfaces	https://library.municode.com/tx/houston/codes/code_of_ordinances?nodeId=COOR_CH47WASE_ARTXIISTWADI_DIV1INGE_S47-607NERSUUTSEMSAC
San Antonio	City	Bexar	1554626	Clear	Sec. 34-702. - Prohibited discharges into the MS4 - utilizes clear language that defines multiple pollutants prohbited. Sec. 34-913. - Floodplain buffer zone. States "(b)No impervious cover will be allowed in the buffer zones except as outlined in subsection (c) below.(c)Construction activities in the buffer zones shall be restricted to the activities allowed in section 34-912." In chapter 4 planning it specifically states that the city encourages LID	https://library.municode.com/tx/san_antonio/codes/code_of_ordinances?nodeId=PTIICO_CH34WASE_ARTVIWAQUCOPOPR_DIV6AQREZOWAPR
Dallas	City	Dallas	1338750	Clear	Impervious surfaces stated in relation to charges, language primarily focused on construction discharges. There is a part in SEC. 51A-10.126. LANDSCAPE DESIGN OPTIONS. Where is explains specifically LID provisions	https://codelibrary.amlegal.com/codes/dallas/latest/dallas_tx/0-0-0-92034
Austin	City	Travis	1054007	Clear	Sec 8 is all specifically about storm water. They use "Regional Stormwater Management Program (RSMP)" for best practices.. They also have a green stormwater quality infrastructure document and in landscape it states LID as an alternative compliance	https://library.municode.com/search?stateId=43&clientId=1113&searchText=LID&searchMode=CLIENTMODE&contentTypeId=CODES
Fort Worth	City	Tarrant	1020987	None	Nothing regarding " storm water" or " impervious surface". Primarily focused on sewer logistics and charges.	https://codelibrary.amlegal.com/codes/ftworth/latest/ftworth_tx/0-0-0-31630
El Paso	City	El Paso	680148	vague	Chapter 15.20 - STORMWATER MANAGEMENT. Provides language to support their MS4 and management aims to "Review permit applications to determine whether proposed developments will eliminate or reduce the pollutants entering the MS4;" There is a mention of LID as a definition and there is a term "utility green space" which may be a GSI method.	https://library.municode.com/tx/el_paso/codes/code_of_ordinances?nodeId=TIT20ZO_CH20.10SUUSRE_20.10.557UTGRSP
Arlington	City	Tarrant	413519	None	Ordinaces were oddly divided. However in the primary code for stormwater pollution prevention control there was no mention of LID or impervious cover disconnection	https://www.arlingtontx.gov/files/assets/city/v/2/city-secretary/documents/city-code-of-ordinances/storm-water-pollution-control-chapter.pdf
Corpus Christi	City	Nueces	323178	None	Chapter 14 "ARTICLE X. - STORM WATER QUALITY MANAGEMENT PLANS" highlights how they manage storm water. Very little language on impervious surfaces. Additionally, chapter 55 has comprehensive water management provisions. "ARTICLE XVI. - PROHIBITION OF POLLUTION OF THE MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)" specifically outlines ways this city aims to protect their MS4	https://library.municode.com/tx/corpus_christi/codes/code_of_ordinances?nodeId=PTIIITHCOOR_CH55UT_ARTXVIPRPOMUSESTSESYMS
Plano	City	Collin	292788	None	Chapter 21 "UTILITIES" ARTICLE VIII. - LIQUID WASTE MANAGEMENT[9]. Outlines all offenses for discharges into their MS4.	https://library.municode.com/tx/plano/codes/code_of_ordinances?nodeId=PTIICOOR_CH21UT
Lubbock	City	Lubbock	271895	None	Chapter 22 storm water regulations: " § 22.11.031General prohibition and exceptions." outlines protections for their MS4. The city of lubboc	https://ecode360.com/38872308?highlight=ms4&searchId=10677993726039864
Laredo	City	Webb	265680	None	In Sec. 31-238. - Designated drought response stages and water use reduction measures. It expresses clear concern for impervious surface runoff and prohibits "d.Allowing overspray and runoff during irrigation that runs, flows, or streams in a way that extends into streets, driveways, or other impervious surfaces for a distance of thirty (30) feet or greater or that causes water to pond at a depth of 0.25 inches or greater;" AND Sec. 33-303. - General prohibition. highlight the citites use of an MS4	https://library.municode.com/tx/laredo/codes/code_of_ordinances?nodeId=PTIICOOR_CH31UT_ARTVWACO_S31-238DEDRRESTWAUSREME
Irving	City	Dallas	264403	None	Located in Chapter 51: Stormwater Management and Drainage is very thorough and has very clear regulations for civil design with a focus on impervious surfaces. In § 51-4Design criteria. It states "integrated site design practices for conserving natural features, reducing impervious cover, and using natural drainage systems."	https://ecode360.com/47701034?highlight=impervious&searchId=10859180913513186#47701045
Garland	City	Dallas	249987	None	Chapter 31: Engineering, highlights the MS4 system and storm water drainage improvements Division 8 Stormwater Management and Storm Sewer Requirements highlights impervious surfaces in regards to detention requirements.	https://ecode360.com/40083322?highlight=storm&searchId=10859707229162269
Frisco	City	Collin	240561	None	Highlights MS4 provisions. Only refers to impervious surface here "Water resource zone.A landscape area that receives surface runoff from an adjacent impervious paved surface and uses one or more BMPs such as bioretention to capture and treat the runoff near the source."	https://ecode360.com/38353676?highlight=stormwater&searchId=10952243984707939
McKinney	City	Collin	229734	None	Sec. 110-399. - Credit program. Incentivizes best management practices to protect water resources. Has langauge protecting the MS4. Stormwater regulations primarily located in regards to construction protections. Nothing on impervious surfaces.	https://library.municode.com/tx/mckinney/codes/code_of_ordinances?nodeId=SPAGEOR_CH110UT_ARTVIIMUSUWADRUTSY_DIV3CR_S110-399CRPR
Grand Prairie	City	Dallas	209957	None	Sec. 26-238. - Lawn and landscape irrigation conservation. Highlights the desire to avoid wasting water on impervious surfaces	https://library.municode.com/tx/grand_prairie/codes/code_of_ordinances?nodeId=PTIICOOR_CH26UTSE_ARTXIIIDRCOPL
Amarillo	City	Potter	203860	None	Only refers to pollution rules	https://library.municode.com/tx/amarillo/codes/code_of_ordinances?nodeId=CO_TITXVIIIUT_CH18-3WASY_ARTVSTSE_S18-3-95STWAPOPRPL

For my information I refered to Texas Government website for Municipal Ordinances.
This incuded these websites:

https://guides.sll.texas.gov/texas-law/local-ordinances#s-lg-box-34341836

Which provided these databases:

https://library.municode.com/tx

https://www.generalcode.com/library/#TX

https://codelibrary.amlegal.com/regions/tx

-- Typically municode will have them all, if not the second best is E code 360, If it is not in either of those will be found in Code Library.

I used Key word searches like
-- LID
-- Low impact development
-- GSI
-- Green infrastructure
--Impervious surfaces
-- Disconnection
-- Stormwater

If there is nothing for those I would look and see if i t was anything regarding protecting the MS4 or information that would be relevant in their stormwater management chapter if they have one (Typically from stormwater search)

Brownsville	City	Cameron	196994	None	Focus is solar energy when searching for impervious surfaces. Section 5.6 - Stormwater Management has comprehensive plan for stormwater management. Has protections for MS4	https://library.municode.com/tx/brownsville/codes/code_of_ordinances?nodeId=PTIICOOR_ART5SURE_5.6STMA	
Denton	City	Denton	166205	None	Nothing regarding impervious surfaces. In the development code it specificially focuses on the "Rayzor Ranch District"	https://library.municode.com/tx/denton/codes/development_code?nodeId=CITY_DENTONDECO_APXARARAOVDI_EXHIBIT_FRARADIWAQUPRPLREDRMA_2.3.1RESTQUCOPR	
Killeen	City	Bell	157201	None	Impervious surfaces only mentioned in zoning ordinances. Outlines both SWPP and MS4 systems and prohibitions	https://library.municode.com/tx/killeen/codes/code_of_ordinances?nodeId=PTIICOOR_CH32MUDRUTSY_ARTIVPONSSTCOOR_S32-48STMASIPL	
Mesquite	City	Dallas	155822	None	Impervious surfaces mentioned in Sec. 11-42. - Municipal drainage utility system rates.	https://library.municode.com/tx/mesquite/codes/code_of_ordinances?nodeId=PTIICOOR_CH11PLDE_ARTVDRFLHAARRE_DIV2AD_S11-149PLRE	
McAllen	City	Hidalgo	153280	None	Stormwater management is located in Article III. oes note that they want to minimize surface water runoff but not specifically impervious surfaces	https://ecode360.com/43367296?highlight=stormwater&searchId=10973788954526332#43367294	
Pasadena	City	Harris	150143	None	Sec. 37-215. goes over the MS4 rules on discharge. There is nothing on impervious surfaces	https://library.municode.com/tx/pasadena/codes/code_of_ordinances?nodeId=COORPATE_CH37WASESEDI_ARTVIIPRPOMUSESTSESYMS_S37-217PRDIINMS	
Waco	City	McLennan	146669	None	ARTICLE X. - MUNICIPAL DRAINAGE UTILITY SYSTEM[8] - has very clear guidance on charging per impervious surface. Sec. 26-98. - Drought or emergency contingency stages.= highlights restrictions on water flowing on to impervious surface. Sec. 22-35. - Diverting natural flow of water. refrences stormwater	https://library.municode.com/tx/waco/codes/code_of_ordinances?nodeId=PTIICOOR_CH22STSICEOTPUPL_ARTIIST_S22-35DINAFLWA	
Midland	City	Midland	143797	None	Sec. 11-12-10. - Stormwater requirements for new developments and redevelopments. "Redevelopment or expansion results in no net increase in impervious area"	https://library.municode.com/tx/midland/codes/municipal_code?nodeId=TITXIIPLDE_CH11-12STMACO_ARTIINGE_S11-121GEPR	
Lewisville	City	Denton	138896	None	Highlights the MS4 provisions and best managemnt practices associated with construction in Sec. 16-379. - Stormwater discharges associated with construction activities.: The operator, owner or contractor shall make every reasonable effort to prevent dirt and sediment from accumulating on paved or impervious surfaces and locations where offsite discharge would occur during storm events. If installing structural control measures in these areas is impracticable, alternative measures such as frequent sweeping shall be implemented.	https://library.municode.com/tx/lewisville/codes/code_of_ordinances?nodeId=PTIICOOR_CH16UT_ARTVIIIDIREMSSTSESY_DIV2STSESYREEN_S16-379STDIASCOAC	
Round Rock	City	Williamson	138730	None	In ARTICLE VII. - STORMWATER DRAINAGE : all development establishing impervious cover or otherwise modifying an existing site shall incorporate on-site drainage facilities to prevent any increase in the peak rate of runoff from storm events having a 50%, 10%, 4%, 2%, and 1% chance of occurring each year. The PDS director may modify this requirement under either of the following circumstances:	https://library.municode.com/tx/round_rock/codes/code_of_ordinances?nodeId=PTIIIZODECO_CH4SUDECO_ARTVIISTDR	
Carrollton	City	Dallas	137137	None	In Chapter 173 Stormwater Pollution Prevention outlines clear rules specific to industrial use but no language on impervious surfaces or disconnection.	https://ecode360.com/45844594#45844594	
Pearland	City	Brazoria	132587	None	Very minimal information regarding stormwater and nothing on impervious surfaces	https://library.municode.com/tx/pearland/codes/code_of_ordinances?nodeId=COOR_CH30UT_ARTVIILDIPR_S30-147PONSSTWARU	
Abilene	City	Taylor	130830	None	Section 3.2.11.4 - Drainage Plans. Section C.1 and C.2 refer to Impervious surfaces not needing to submit drainage plans	https://library.municode.com/tx/abilene/codes/code_of_ordinances?nodeId=PTIIIAPANDECO_CH3SURE_ART2SUST_DIV2DECOREPA_S3.2.2.5ROPAPOMPADPEROUT	
College Station	City	Brazos	130042	None	Sec. 7.14. - Drainage and Stormwater Management: The general permits require that the permittee develop, implement, and maintain a stormwater pollution prevention plan (SWP3) and submit a notice of intent notifying the TCEQ and the MS4 operator (City of College Station).	https://library.municode.com/tx/college_station/codes/code_of_ordinances?nodeId=SPBLADEOR_APXAUNDEOR_ART7GEDEST_S7.14DRSTMA	
Odessa	City	Ector	123984	None	§ 13-2-16Stormwater discharge fee: Impervious coverage consists of roads, parking areas, buildings, pools, patios, sheds, nonresidential driveways, nonresidential sidewalks, and other impermeable construction covering the natural land surface and shall be used in calculating the square footage. And § 13-2-77Water conservation plan: outlines restriction on spraying water on impervious surfaces. Nothing on impervious surface in the stormwater provisions.	https://ecode360.com/39845497?highlight=stormwater&searchId=11919972517519991#39845610	
Richardson	City	Dallas	119151	None	Does state "Irrigation systems shall not spray water over surfaces made of concrete, asphalt, brick, wood, stones set with mortar, or any other impervious material, such as, but not limited to, walls, fences, sidewalks, streets, etc." in Sec. 23-297. - Design and installation: minimum requirements.	https://library.municode.com/tx/richardson/codes/code_of_ordinances?nodeId=PTIICOOR_CH9FLMA	
League City	City	Galveston	117859	None	Does have an MS4 provision. Nothing on impervious surfaces	https://library.municode.com/tx/league_city/codes/code_of_ordinances?nodeId=PAIICOOR_CH43CLWA_ARTISTDI	
Sugar Land	City	Fort Bend	115390	Vague	In STORMWATER QUALITY MANAGEMENT AND DISCHARGE CONTROL: it does state redevelopment may include "Replacement, upgrade, maintenance, or alteration of an impervious surface that results in expansion of the impervious surface."	https://library.municode.com/tx/sugar_land/codes/land_development_code?nodeId=CH11STQUMADICO_ARTIGEPR_S11-1TI	
Beaumont	City	Jefferson	115328	None	Very minimal information regarding stormwater	https://ecode360.com/38656142?highlight=stormwater&searchId=12004704246726555#38656137	
New Braunfels	City	Comal	114642	None	In Sec. 118-51. - Water, sewer and drainage facilities; flood hazards. it states "Storm drainage easements shall provide emergency overflow drainageways of sufficient width to contain within the easement stormwater resulting from a one percent annual chance frequency storm assuming fully developed upstream watershed frequency storm less the amount of stormwater carried in any enclosed system."	https://library.municode.com/tx/new_braunfels/codes/code_of_ordinances?nodeId=PTIICOOR_CH118SUPL_ARTIVDEST_S118-51WASEDRFAFLHA	

Allen	City	Collin	112748	None	Nothing specific but does acknowledge the impact impervious surfaces have on discharge: Sec. 6-191 (a)It is hereby determined that:(1)Land development projects, construction activities and associated increases in impervious surface area alter the hydrologic characteristics and response of local watersheds. These alterations increase storm water runoff volume and accelerate the rate of flow, which may lead to erosion, flooding, stream channel erosion, and sediment transport and deposition.(2)Storm water runoff and impervious surfaces contribute to increased quantities of water-borne pollutants which are carried to local water bodies via runoff.	https://library.municode.com/tx/allen/codes/code_of_ordinances?nodeId=COOR_CH6HEEN_ARTVIISTWAMA_DIV4PONSRUCO_S6-202USOTNESTWAPR	
Conroe	City	Montgomery	112564	None	Does have clear goals in SWPP. In section Sec. 94-365. - Mitigation of downstream effects of increased runoff. It highlights avoiding paved areas. Nothing specific on disconnection though.	https://library.municode.com/tx/conroe/codes/code_of_ordinances?nodeId=SPBLADERE_CH94SU_ARTXDRFA_S94-365MIDOEFINRU	
Edinburg	City	Hidalgo	112425	None	Only refers to impervious surfaces in relation to it affect on trees. There is generous amount of information on SWPP and best practices used Sec. 98.30 - Stormwater, illicit discharge, and erosion control.	https://library.municode.com/tx/edinburg/codes/code_of_ordinances?nodeId=TITIXGERE_CH98STSI_STILDIERCO_S98.30STILDIERCO	
Tyler	City	Smith	112004	None	**Sec. 19-319. Requirement to prevent, control, and reduce stormwater pollutants by best management practices.**	https://codelibrary.amlegal.com/codes/tyler/latest/tyler_tx/0-0-0-100129	
Wichita Falls	City	Wichita	101686	None	§ 106-988Schedule of charges. Shows distinction between amount of impervious area and its affect on water retention but does not refer to any sort of disconnection plan. In § 106-186Water shortage; authority of department. It states a goal to not waste water on impervious surfaces	https://ecode360.com/39237280?highlight=impervious&searchId=12006976097585952#39237280	
San Angelo	City	Tom Green	101173	None	Nothing on impervious surfaces but does have detailed provisions for drainage "Sec. 12.05.006 - Design of local drainage systems"	https://library.municode.com/tx/san_angelo/codes/code_of_ordinances?nodeId=COOR_CH12PLDE_ART12.05STMA	
Georgetown	City	Williamson	100638	None	Charges fees based on impervious surface impact on drainage. Sec. 13.28.080. - Liability for floods and nonpoint source pollution.	https://library.municode.com/tx/georgetown/codes/code_of_ordinances?nodeId=COOR_TIT13PUUTSE_CH13.28DRUT_S13.28.080LIFLNOSOPO	
OW POPULATION OF 100K							
Temple	City	Bell	96654	None	Does have an MS4 provision and it has drainage rules. Nothing on impervious surfaces	https://library.municode.com/tx/temple/codes/code_of_ordinances?nodeId=Chapter%2027%20-%20Stormwater	
Bryan	City	Brazos	91748	None	Nothing sepcfic on disconnection but it does highlight goals to limit runoff on impervious surfaces Regulate or control filling, grading, clearing, dredging, paving, berming, or other earthwork which may increase stormwater runoff, change drainage patterns, or otherwise increase flood hazard or damage	https://library.municode.com/tx/bryan/codes/code_of_ordinances?nodeId=PTIICOOR_CH46STMA_ARTIIIMUSTMA	
Mission	City	Hidalgo	90848	None	does highlight goals to minimize pollution in Sec. 114-353. - Pollution prevention and erosion control at construction sites.	https://library.municode.com/tx/mission/codes/code_of_ordinances?nodeId=PTIICOOR_CH114UT_ARTVIIIPOPRST_S114-353POPRERCOCOSI	
San Marcos	City	Hays	85901	None	Sec. 86.505. - Establishment and revision of stormwater charges; credits. Outlines specific codes related to impervious surface cover. Sec. 86.058. - Implementation and termination of drought response stages. Also refers to limit water loss on impervious surfaces in regards to drought	https://library.municode.com/search?stateId=43&clientId=11581&searchText=impervious&searchMode=CLIENTMODE&contentTypeId=CODES	
Mansfield	City	Tarrant	85811	None	Only in § 54.073 WATER WASTE PROHIBITION reference to impervious surfaces: (7) Prohibition of designs and installations that spray directly onto impervious surfaces such as sidewalks and roads or onto other non-irrigated areas.Chapter 52 and 54 are descriptions on water management	https://codelibrary.amlegal.com/codes/mansfieldtx/latest/mansfield_tx/0-0-0-40382	
Baytown	City	Harris	85309	None	Sec. 98-575. - Variance to stormwater management requirements outlines regulations on creating more impervious surfaces including charges and drainage restrictions	https://library.municode.com/tx/baytown/codes/code_of_ordinances?nodeId=PTIICOOR_CH98UT_ARTVIST_DIV2STMA	
Pharr	City	Hidalgo	84260	None	Does have a MS4, more general provisions based around discharges and connections	https://library.municode.com/tx/pharr/codes/code_of_ordinances?nodeId=PTIICOOR_CH130UT_ARTVST	
Longview	City	Gregg	83294	None	only has Sec. 19-154. Compliance with local and state regulations regarding backflow prevention and stormwater control on stormwater.	https://codelibrary.amlegal.com/codes/longview/latest/longview_tx/0-0-0-25765	
Leander	City	Williamson	83007	None	Has MS4 enforcements and restrictions on increasing impervious cover. Refers to The City of Austin Drainage Criteria Manual but not disconnection of impervious surfaces.	https://library.municode.com/tx/leander/codes/code_of_ordinances?nodeId=CH10SURE_EXHIBIT_ASUOR_ARTIIIDESTIM_S41DRIM	
Missouri City	City	Fort Bend	82642	Vague	In ARTICLE V. - REGULATION OF DISCHARGES TO THE MUNICIPAL SEPARATE STORM SEWER SYSTEM. It refers to "Nonstructural best management practices are preventative actions that involve management and source controls such as: policies and ordinances that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation; policies or ordinances that encourage infill development in higher density urban areas, and areas with existing infrastructure; education programs for developers and the public about project designs that minimize water quality impacts; and measures such as minimization of percent impervious area after development and minimization of directly connected impervious areas." However this is only in the definitions portion and it is not refered to again in the full document.	https://library.municode.com/tx/missouri_city/codes/code_of_ordinances?nodeId=PTIICOOR_CH30EN_ARTVREDIMUSESTSESY_DIV1GE_S30-205DE	
Cedar Park	City	Williamson	79534	None	Has indication of restriction of wasting water on impervious surfaces but language regarding impervious surface is in regards to tree survey/ preservation.	https://ecode360.com/38618813?highlight=impervious&searchId=12162108917511085#38618808	
Flower Mound	Town	Denton	78840	None	Has provisions for MS4 system. Only refers to impervious surfaces in regards to charges in Sec. 70-777. - Schedule of charges	https://library.municode.com/tx/flower_mound/codes/code_of_ordinances?nodeId=SPAGEOR_CH70UT_ARTXMUSTUTSY_S70-777SCCH	

North Richland Hills	City	Tarrant	74449	None	§ 102-372Stormwater pollution prevention plan required. States that no construction may occur without a SWPP. Article III has very clear and hydrological based planning methods.	https://ecode360.com/46058841#46058841	
Pflugerville	City	Travis	72407	None	Only refers to impervious surfaces when in relation to conservation methods during drought or for erosion measures.	https://ecode360.com/47848202?highlight=impervious&searchId=12162992695852351#47848202	
Harlingen	City	Cameron	72067	None	Very minimal information regarding stormwater, mostly about plat writing or discharge restrictions.	https://library.municode.com/search?stateId=43&clientId=2520&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Rowlett	City	Dallas	68213	None	Protects MS4 and highlights Texas Pollutant Discharge Elimination System	https://library.municode.com/tx/rowlett/codes/code_of_ordinances?nodeId=PTIICOOR_CH70UT_ARTIVDRUT	
Victoria	City	Victoria	66794	None	Has very clear objectives for the MS4 and SWPP in article VI	https://library.municode.com/tx/victoria/codes/code_of_ordinances?nodeId=CICO_CH13MUUTSE_ARTVIMUSESTSESYMSDIRECOPONSINAC	
Wylie	City	Collin	62749	None	Limited codes regarding stormwater most are located in chapter 42 "Environment" and refers to impervious surface in regards to water conservation	https://library.municode.com/tx/wylie/codes/code_of_ordinances?nodeId=PTIICOOR_CH114UT_ARTIVWA_DIV3WACOPL_S114-109WACOPR	
Euless	City	Tarrant	61707	None	Many codes were labled as "reserved" and were not able to be viewed. There was minimal codes on stormwater, they primarily focused on construction regulations. § 84-444Stormwater improvement standards. Was clearly organized and prioritized hydrological methods.	https://ecode360.com/39087619#39087700	
Little Elm	City	Denton	60184	None	Only refers to impervious surface in regards to fee charges for drainage systems or in regards to water conservation efforts	https://library.municode.com/tx/little_elm/codes/code_of_ordinances?nodeId=PTIICOOR_CH46EN_ARTVIISTPR	
Fulshear	City	Fort Bend	59725	None	Limited codes regarding stormwater and impervious surfaces. Stormwater codes highlight construction mainly or sewer systems.	https://ecode360.com/FU6966/search?query=stormwater&scope=all&sortOrder=relevance	
Texas City	City	Galveston	58356	None	Has MS4 provisions and focuses on construction and industrial affects on stormwater run off	https://codelibrary.amlegal.com/codes/texascity/latest/texascity_tx/0-0-0-9113	
DeSoto	City	Dallas	57544	None	Primarly refers to impervious surfaces in regards to drought contingency and municipal drainage charges. It does have an attachment in chapter 14 zoning ordinances for the Attachment 1 - Hampton Road Character Code. Which states "This involves incorporating low-impact development strategies that thoughtfully manage stormwater runoff, electric vehicle charging infrastructure, alternative parking solutions, shared parking structures, green or reflective roofs, " which may include disconnection of impervious surfaces however it is not explicitly stated throughout the entire document.	https://ecode360.com/DE6290/search?query=impervious&scope=all&sortOrder=relevance	
Kyle	City	Hays	56442	Clear	There is an attachment in Appendix A -Low Impact Development (LID) has section called "Engineered Natural Treatment" that explains Engineered natural treatment provides depression storage, infiltration, and evapotranspiration. These design options are typically the least costly and easiest to accomplish if site availability, soils and groundwater table are conducive. Site features such as bioretention, vegetated swales, rain gardens, vegetated filter strips, downspout disconnection, reduced impervious area, tree preservation or re-vegetation using native plants, soil amendments, and open space fall under this general category and are advisable due to lower lifecycle costs."	https://ecode360.com/attachment/324566/KY68471-050a%20Appendix%20A%20-%20Low%20Impact%20Development.pdf	
Port Arthur	City	Jefferson	55830	Vague	Sec. 93-8. - Construction stormwater management. States under the post construction phase "iii.Low impact development standards. For construction sites located within watersheds that are considered to be impaired by the Texas Commission for Environmental Quality, or in buffer zones designated by the city, the owner and/or operator of the site, may be required, at the discretion of the city public works director, to utilize low impact development standards that include, but are not limited to:A.Minimization of the width or size of:1)Roads/streets;2)Sidewalks;3)Culs-de-sac;4)Parking lots." which would include disconnecting impervious processes however it does not specifically state a disconnection.	https://library.municode.com/tx/port_arthur/codes/code_of_ordinances?nodeId=PTIICOOR_CH93STQU	
Burleson	City	Johnson	55352	None	Impervious surface primarily refered to regarding irrgation or drought contingency planning. In § 6.2Preliminary stormwater management site plan. It plans to restrict incereasing impervious surfaces.	https://ecode360.com/39937843?highlight=stormwater&searchId=12235441063408778#39937776	
Galveston	City	Galveston	53389	None	Not much language on stormawater. Stormwater information found primarily in Chapter 14 - FLOODING AND MUNICIPAL DRAINAGE UTILITY SYSTEM. Minimal refrences to impervious surface however does highlight best management practices and redevelopment.	https://library.municode.com/tx/galveston/codes/code_of_ordinances?nodeId=PTIICOCI_CH14FLMUDRUTSY_ARTIMUDRUTSY_S14-1LEMA	
Rockwall	City	Rockwall	51395	None	Mininal information on stormwater planning, only referred to in Chapter 20-Floods. It does have an MS4 though.	https://library.municode.com/tx/rockwall/codes/code_of_ordinances?nodeId=PTIICOOR_CH20FL_ARTIIFLHADAPRCO_DIV3FLHARE_S20-81SPFLHAREPR	
Huntsville	City	Walker	50791	None	Only refers to impervious surfaces in relation to stormwater utility fees and acknowledges that it increases stormwater runoff.	https://library.municode.com/tx/huntsville/codes/code_of_ordinances?nodeId=PTIICOOR_CH46UT_ARTIVSTUTSY	
Grapevine	City	Tarrant	50757	None	In APPENDIX E - CONSTRUCTION STANDARDS it outlines rules regarding impervious surfaces in relation to stormwater drainage designs, but notjhing on disconnection specifically. APPENDIX F - EROSION AND SEDIMENTATION CONTROL is the only other instance stormwater is highlighted.	https://library.municode.com/tx/grapevine/codes/code_of_ordinances?nodeId=PTIICOOR_APXECOST_ARTISTDE_ITEM_3STDRSY	

Cedar Hill	City	Dallas	50260	None	Has SWP3 and required best management practices for city.	https://library.municode.com/tx/cedar_hill/codes/code_of_ordinances?nodeId=PTIICOOR_CH13NAENRE_ARTVSTMAOR	
OW POPULATION OF 50K							
Waxahachie	City	Ellis	49972	None	Has protected MS4 system. Does acknowledge impact of impevious surfaces and has fees associated with them.	https://library.municode.com/tx/waxahachie/codes/code_of_ordinances?nodeId=COOR_CH33UT_ARTXIIST_DIV2PONSRUCO	
Bedford	City	Tarrant	49440	None	Has a stormwater utililty fund. Only refers to impervious surfaces in regards to drought conservation.	https://library.municode.com/tx/bedford/codes/code_of_ordinances?nodeId=PTIICOOR_CH118UT_ARTVSTUTSY_S118-154STUTFU	
Sherman	City	Grayson	49381	Clear	In article 14 Supplementary District Regulations: Landscaped islands located interior to the parking lot must include six (6) inch curbs and gutters to provide protection of landscape areas and mitigate soil erosion into paved parking areas. Low impact development (LID) stormwater components may also be considered.	https://ecode360.com/41399509?highlight=lid&searchId=12358373965854496	
Celina	City	Collin	47908	None	Has MS4 and in chapter 14: Zoning it talks about landscaping and minimizing impervious surfaces, although not directly related to stormwater run off	https://ecode360.com/39807975?highlight=stormwater&searchId=12358871997977420#39807953	
Keller	City	Tarrant	46933	Vague	Article 5 SUBDIVISION DESIGN AND IMPROVEMENT REQUIREMENTS has very clear orgnaization on impervious surfaces in regard to it impact to stormwater run off. 3.Drainage System Improvements. Uses hydrological methods to determine impact AND " plans will also show any proposed low impact design (LID) system plans including pervious pavement, bioretention areas, bioswales, etc"	https://library.municode.com/tx/keller/codes/code_of_ordinances?nodeId=PTIIIUNDECO_ARTFIVESUDEIMRE_S5.24DEST	
The Colony	City	Denton	46701	None	Focused primarily on pollution control and outlines guidelines on off site, construction, and erosion control.	https://library.municode.com/tx/the_colony/codes/code_of_ordinances?nodeId=PTIICOOR_CH20STPOPR_ARTIICOERCO_S20-11OTESTCO	
Weslaco	City	Hidalgo	46600	None	Mininal information on stormwater planning, Most information on impervious surfaces is in relation to homes and zoning. In subdivision regulation "Sec. 26-56. - Development guidelines. All development plans shall make due provisions for: Adequate design of grades, paving gutters, drainage and treatment of turf to handle stormwaters and prevent erosion, minimize floodings and formation of"	https://library.municode.com/tx/weslaco/codes/code_of_ordinances?nodeId=PTIICOOR_APXBSUREPO_ARTISU_S26-56DEGU	
Haltom City	City	Tarrant	46579	None	Impervious surfaces mentioned in relation to fee charges or water conservation. In Chapter 98 it outlines the MS4 provisions. Substaintail amount of infromation on water	https://library.municode.com/tx/haltom_city/codes/code_of_ordinances?nodeId=PTIICOOR_CH98WASE_ARTXIISTUTSY_S98-546STUTFU	
Schertz	City	Guadalupe	45742	None	Stormwater primarily written in relation to construction and development however no mention of low impact designs such as disconnecting	https://library.municode.com/tx/schertz/codes/unified_development_code?nodeId=SCUNDECO	
Midlothian	City	Ellis	44897	None	Chapter 13: Stormwater management has MS4 provision but not much else on development on impervious surfaces	https://ecode360.com/39979580#39979660	
Prosper	Town	Collin	44586	None	Chapters past 5 were not accessible however on the greater search it appears there is MS4, there is a maangement plan for stormwater drainage, and a pollution prevention plan	https://library.municode.com/search?stateId=43&clientId=13402&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Hutto	City	Williamson	44022	None	Impervious surfaces mentioned in relation to fee charges only. Chapter 24 has clear management plan that prioritizes limiting pollution.	https://ecode360.com/39881930#45160706	
Coppell	City	Dallas	43133	None	Impervious surfaces mentioned in relation for drainage charge and conservation (Chapter 3, Chapter 9). In chapter 16, section of finding of facts it acknowledge that impervious surface in place on natural vegetation contributes to flood losses.	https://library.municode.com/tx/coppell/codes/code_of_ordinances?nodeId=CO_CH16DICO_ART16-4FLMAOR_DIV1ADTISTAUFIFAPUMESCAUOR_S16-4-3FIFA	
Rosenberg	City	Fort Bend	42574	None	Only mentioned in regards to drought contingency regulations (chapter 10). Minimal ordinances on stormwater.	https://library.municode.com/tx/rosenberg/codes/code_of_ordinances?nodeId=PTIICOOR_CH29UT_ARTIIISASESY_DIV2SEUSRE_S29-95STOTUNDR	
Lancaster	City	Dallas	41423	Vague	There is a mention in Chapter 24 " § 24.08.002Stormwater management policy." That indicates the plan will "Reduce the impervious surface areas as much as possible. (D) Preserve and utilize the natural drainage systems wherever possible" However theres not specific language on disconnection.	https://ecode360.com/38712094?highlight=impervious&searchId=1249074046555349 5#38712042	
Friendswood	City	Galveston	41034	None	Only mentioned in Chapter 86 under the finding of fact: "Land development projects and associated increases in impervious cover alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, and sediment transport and deposition". Chapter 34 highlights floor elevation requirements to minimizing flooding. They also have a Pollution Prevention Plan	https://library.municode.com/tx/friendswood/codes/code_of_ordinances?nodeId=PTIICICO_CH34FL_ARTIIFLDAPR_DIV3AD_S34-31STMA	
Hurst	City	Tarrant	40488	None	Primarly refered to in relation to drainage charges or conservation. However they do have many clear outlined stormwater management goals. They have the integrated Stormwater Management (iSWM) Criteria manual located in Chapter 21. They also outline in Chapter 26 they mention their MS4 and using the Texas Pollutant Discharge Elimination System (TPDES)	https://library.municode.com/tx/hurst/codes/code_of_ordinances?nodeId=PTIICO_CH26UT_ARTIVSTMA	
Copperas Cove	City	Coryell	40393	Vague	In Chapter 20, in zoning it states that they aim to "Reduce the "heat island" effect of impervious surfaces, such as parking lots, by cooling and shading the surface area and breaking up large expanses of pavement;" however it isnt in relation to stormwater. There is minimal information on stormwater and no specific chapter on stormwater management.	https://library.municode.com/search?stateId=43&clientId=1761&searchText=LID&searchMode=CLIENTMODE&contentTypeId=CODES	

Farmers Branch	City	Dallas	40305	None	Only really has a section that refers to BMP and protection to the MS4 from pollutants	https://library.municode.com/tx/farmers_branch/codes/code_of_ordinances?nodeId=PTIICOOR_CH34EN_ARTXIIIILDIDEEL_S34-715BEMAPRBMRESTPO	
Duncanville	City	Dallas	39510	Clear	Sec. 21-8. - Stormwater discharges associated with construction activities. States that Installation of permanent structural measures during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Such installed structural measures may include, but are not limited to, the following:a.Stormwater detention structures (including wet ponds);b.Stormwater retention structures;c.Flow attenuation by use of open vegetative swales and natural depressions;	https://library.municode.com/tx/duncanville/codes/code_of_ordinances?nodeId=COORDUTE_CH21STMA_ARTIISTSESYREEN_S21-8STDIASCOAC	
Socorro	City	El Paso	39385	None	ARTICLE IV. - MUNICIPAL SEPARATE STORM SEWER SYSTEM has informationa bout managing and repairing the stormwater system and outlines permitting requirements. Nothing on LID	https://library.municode.com/tx/socorro/codes/code_of_ordinances?nodeId=PTIICOOR_CH44UT_ARTIVMUSESTSESY_S44-79RESTMAPLAP	
La Porte	City	Harris	39072	None	Actually emphasizes that their processes do not refer to any detention basins "Significant redevelopment shall mean changes of one acre or more to the impervious surface on a five-acre or larger developed parcel, but does not include a stormwater detention basin that includes a water quality feature"	https://library.municode.com/tx/la_porte/codes/code_of_ordinances?nodeId=SPAGEOR_CH34EN_ARTVISTDI_DIV3STDIASCOAC_S34-285MOSTPOPRPL	
Princeton	City	Collin	38613	Clear	Sec. 36-15. - Post construction controls: A post construction water quality protection plan shall be prepared for all developments in accordance with the subdivision ordinance for the preliminary and final submittals. It clearly outlines "The following are some examples of permanent controls: (1)Preservation of natural creeks;(2)Site specific stormwater controls;(3)Vegetated swales;(4)Preservation of the 100-year floodplain;(5)Detention ponds;(6)Retention ponds;(7)Bio-swales;(8)Rain water harvesting;(9)Water resource zones;(10)Other green infrastructure."	https://library.municode.com/tx/princeton/codes/code_of_ordinances?nodeId=COOR_CH36DESTCODE	
Seguin	City	Guadalupe	37937	Vague	It does outline "green fees" in appendix C. There is a section that outlines "Temporary Improvements" = The applicant shall build and pay for all costs of temporary improvements required by the City and shall maintain those temporary improvements for the period specified by the City. temporary subdivision improvement (e.g., a temporary cul-de-sac, alley turnout, drainage swale, erosion control device, etc.) but this is not in specific reference to stormwater. It has a specific section for a stormwater utility fund "A separate fund is hereby created, known as the stormwater utility fund, for the purpose of segregating, identifying, and controlling all revenues and expenses attributable to the stormwater utility."	https://library.municode.com/tx/seguin/codes/code_of_ordinances?nodeId=PTIICOOR_CH102UT_ARTVMUSTUTSY_S102260STUTFU	
San Juan	City	Hidalgo	37270	Clear	Chapter 13. Utilities goes indepth on the stormwater protection plan and explicitly states "Structural controls. A pollution prevention practice that requires the construction or use of a device to capture or prevent pollution in stormwater runoff. Structural controls and practices may include but are not limited to: wet ponds, bio retention, infiltration basins, stormwater wetlands, silt fences, earthen dikes, drainage swales, vegetative lined ditches, vegetative filter strips, sediment traps, check dams, subsurface drains, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins." which are methods of LID that are used in their mapping. Additionally in PARKING AND LOADING REGULATIONS. It does state "Bio-swales shall be designed to support vegetation and handle sheet flow drainage in the parking lot. Plants in the bio-swales should be appropriate to handle temporary excess water as well as drought conditions."	https://ecode360.com/39520952?highlight=stormwater&searchId=16638039159370865#39520952	
Texarkana	City	Bowie	36822	Clear	Sec. 125-63. - Construction stormwater management. They outline Stormwater pollution prevention plan requirements (SWP3). Which includes Installation of structural measures during the construction process to control pollutants in stormwater discharges that will occur after construction operations have been completed. Structural measures should be placed on upland soils to the degree attainable. Such installed structural measures may include, but are not limited to, the following: stormwater detention structures, including wet ponds; stormwater retention structures; flow attenuation by use of open vegetative swales and natural depressions; "	https://library.municode.com/tx/texarkana/codes/code_of_ordinances?nodeId=PTIIILADECO_CH125STMA_ARTIIISTMAPR_S125-63COSTMA	
Weatherford	City	Parker	36792	None	Very minimal information regarding stormwater. The only direct mention is regarding development permits	https://library.municode.com/tx/weatherford/codes/code_of_ordinances?nodeId=COOR_TITXIIZOOR_CH2ZOPR_S12-2-102DEREPR	
Cleburne	City	Johnson	36682	None	minimal information on stormwater protections	https://codelibrary.amlegal.com/codes/cleburne/latest/cleburne_tx/0-0-0-11417	
Harker Heights	City	Bell	35406	Vague	NO direct reference to disconnecting impervious surfaces BUT there is very good outline on stormwater detention ponds and development	https://ecode360.com/48313800?highlight=stormwater&searchId=16640295012964862#48313800	
Cibolo	City	Guadalupe	35214	Clear	Very clear on LID language and Green solutions. Section 19.9 - Drainage and Flood Hazards outlines "Mitigate for the installation of impervious surfaces that result in greater storm water volumes and higher, erosive velocities by allowing parking lots, service roads, and other suitable areas normally covered with concrete and asphalt, such as outdoor storage areas, to utilize porous pavement, pavers, and other "green" design solutions provided that such alternatives designs that are properly designed with highly durable materials in accordance with accepted engineering standards;"	https://library.municode.com/tx/cibolo/codes/code_of_ordinances?nodeId=n2013CIUNDECO_APXAUNDECO_ART19GESUST_S19.9DRFLHA	

Del Rio	City	Val Verde	35125	None	minimal information on stormwater protections only really referred to in regards to subdivision development	https://library.municode.com/tx/del_rio/codes/code_of_ordinances?nodeId=COOR_CH26SU_ARTISURE_S26-14STALDEST	
Deer Park	City	Harris	34328	Vague	In chapter 106 utilities: DIVISION 4. - STANDARDS FOR ASSESSMENT OF STORMWATER MANAGEMENT states " Sec. 106-310. - General performance criteria: All site designs shall establish stormwater management practices to control the peak flow rates of stormwater discharge associated with specified design storms and reduce the generation of stormwater. These practices should seek to utilize pervious areas for stormwater treatment and to infiltrate stormwater runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to the maximum extent practical to provide treatment for both water quality and quantity" but not specific on LID or disconnection of the impervious surfaces	https://library.municode.com/tx/deer_park/codes/code_of_ordinances?nodeId=PTIICOOR_CH106UT_ARTVIPONSSTRU_DIV4STASSTMA	
Greenville	City	Hunt	34306	None	§ 5.9Storm Drainage & Water Quality Controls. Outlines the goals for Stormwater Pollution Prevention Plan (SWPPP).	https://ecode360.com/39600609?highlight=stormwater&searchId=16641344719516795#39600609	
Lufkin	City	Angelina	34216	None	No refrence to LID, GSI, and minimal stormwater provisions. There is some information that focuses on drainage in section 5.8Storm Drainage.	https://ecode360.com/39368325?highlight=stormwater&searchId=16647955989861518#39368325	
Forney	City	Kaufman	32467	None	Some information on stormwater drainage, nothing directly on LID or disconnection	https://ecode360.com/40319011?highlight=stormwater&searchId=16648118452607188#40318999	
Anna	City	Collin	32345	None	minimal information on stormwater protections	https://ecode360.com/43364037?highlight=stormwater&searchId=9142270616404325#43364037	
Converse	City	Bexar	32237	None	They use a municipal stormwater utility system (MSUS). No language specific to disconnection of impervious surfaces	https://library.municode.com/tx/converse/codes/code_of_ordinances?nodeId=PTIICOOR_CH46UT_ARTIIISTMA_S46-59ESMUSTUTSYMS	
Nacogdoches	City	Nacogdoches	31939	None	Very minimal information on disconnecting impervious surfaces. Code focuses on drainage	https://library.municode.com/tx/nacogdoches/codes/code_of_ordinances?nodeId=PTIICOOR_CH14BUBURE_ARTXSTDRSY_S14-859STDE	
Southlake	City	Tarrant	31712	Clear	In divison 3 "Water conservation" it explains "The Water Efficient Recognized Green Professional Program (Green Pros) was developed in 2016 with the Texas A&M AgriLife Extension Service in Tarrant County and Tarrant Regional Water District. Topics include water conservation, low impact design, turfgrass, irrigation, and low-water-use plants"	https://library.municode.com/tx/southlake/codes/code_of_ordinances?nodeId=SPAGEOR_CH19UT_ARTIIWA_DIV3WACO_S19-55PLAD	
Alvin	City	Brazoria	30713	None	No language on disconnecting impervious surfaces but does refer to MS4: Sec. 25-286. - Storm water quality plan. (a)The storm water quality plan shall be prepared in accordance with the Brazoria County Storm Water Quality Coalition MS4 Construction Guidance Document and Best Management Practices (BMPs).	https://library.municode.com/tx/alvin/codes/code_of_ordinances?nodeId=PTIICOOR_CH25WASE_ARTIXSTWAQU_DIV3COSTWAMAONSSTWAMA_S25-286STWAQUPL	
Sachse	City	Dallas	29174	Clear	In the 2017 comprehensive plan it clearly "Promotes the use of Low Impact Development (LID) concepts and practices" additionally in § 3-17Drainage and stormwater control. It outlines using structural stormwater control which would include GSI methods	https://ecode360.com/39965278?highlight=stormwater&searchId=16670089324769881#39965278	
Eagle Pass	City	Maverick	28817	None	They do have a stormwater drainage utility fund however nothing noteworthy on GSI mehtods.	https://library.municode.com/tx/eagle_pass/codes/code_of_ordinances?nodeId=PTIICOOR_CH27WASE_ARTVISTDRUTFU	
Fate	City	Rockwall	28747	Clear	In the Unified Development Code: section 9.2.4. Non-Residential and Multifamily Landscaping. It specifically outlines "All landscaped areas shall be protected by a raised concrete curb. The Administrator may approve a curbless design for stormwater BMP or Low Impact Design (LID) purposes." Futhermore the code does highlight prevention plan and using BMP	https://library.municode.com/tx/fate/codes/code_of_ordinances?nodeId=SPBLADERE_CH36UNDEOR_ARTIXLASCTRPR_S36-9.2LARE	
Lake Jackson	City	Brazoria	28701	None	Chapter 38: Environment there is a division specifically on stormwater constructionSec. 38-142. - Stormwater quality plan.However minimal mention on disconnection of impervious surfaces	https://library.municode.com/tx/lake_jackson/codes/code_of_ordinances?nodeId=PTIICOOR_CH38EN_ARTIVSTRUDI_DIV3COSTMA_S38-142STQUPL	
Katy	City	Harris	28121	None	There are fees regarding stormwater development planning as well as having provisions for protecting the MS4 system	https://library.municode.com/search?stateId=43&clientId=2801&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Balch Springs	City	Dallas	27612	None	Impervious surfaces only referred to regarding irrigation or conservation measures. There is a erosion control section which typically has GSI mentioned but there was nothing specific in Sec. 14-453. - Erosion control and stormwater pollution prevention plans.	https://library.municode.com/tx/balch_springs/codes/code_of_ordinances?nodeId=PTIICOOR_CH14BUBURE_ARTIXSTPOPR_S14-453ERCOSTPOPRPL	
Colleyville	City	Tarrant	26311	Vague	Impervious surfaces only referred to regarding irrigation or conservation measures. There is mention in definition section that explains developmemt efforts should not increase impervious cover but nothing specifc to GSI or LID projecs. Furthermore in Sec 14.170 - Drainage and storm sewer improvements. there are practices that could be interpretted as LID such as vegetative swales but not definative.	https://library.municode.com/tx/colleyville/codes/code_of_ordinances?nodeId=PTIICOOR_APXBLADECO_CH14ENDEST_S14.170DRSTSEIM	
Melissa	City	Collin	26198	None	There is a maximum impervious rate of 80% located in the zoning ordinance.Code is clear on protection of pollution in stormwater and MS4.	https://library.municode.com/search?stateId=43&clientId=12060&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Corsicana	City	Navarro	26183	None	minimal information on stormwater protections	https://library.municode.com/tx/corsicana/codes/code_of_ordinances?nodeId=CH9SU_ART9.2800DRDEST	
Saginaw	City	Tarrant	25982	None	There is a stormwater utility fee. Minimal information on disconnecting impervious surfaces	https://library.municode.com/search?stateId=43&clientId=4174&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	

Belton	City	Bell	25906	Vague	There are a variety of fees for increasing impervious surfaces as well as clear acknowledgement on impervious surfaces on water quality. In ARTICLE I. - GENERAL STORMWATER MANAGEMENT REQUIREMENTS AND EROSION AND SEDIMENTATION CONTROL it is clear that "In the event impervious area is proposed or added, drainage infrastructure and BMPs shall be in place in order to maintain zero net increase in stormwater runoff rates and to insure no negative impacts attributable to new development and redevelopment." However no LID or GSI methods are outlined.	https://library.municode.com/tx/belton/codes/code_of_ordinances?nodeId=PTIICOOR_CH25STMA_ARTIGESTMAREERSECO	
Kingsville	City	Kleberg	25214	Vague	There is mention of detention which may be interpreted as a GSI method in Sec. 15-3-107. Detention design is up to the Maintenance of detention areas shall be the responsibility of the property owner or home owner's association as applicable. They do have a stormwater utility fund	https://library.municode.com/search?stateId=43&clientId=2857&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Big Spring	City	Howard	25176	None	stormwater drainage is prioritized but no GSI/LID solutions outlined	https://library.municode.com/search?stateId=43&clientId=1285&searchText=stormwater&searchMode=CLIENTMODE&contentTypeId=CODES	
Denison	City	Grayson	25155	Clear	Neighboorhoods have a maximum of 80% impervious surface cover. Specifically in the stormwater management plan "Low impact development. For developments with a total impervious cover of twenty (20) percent or greater, the city encourages the use of low impact development techniques to manage stormwater rate, volume and quantity. Provision of these practices in accordance with the criteria and runoff volume requirement in the city's Storm Drainage System Design Manual will negate the 2-year stormwater detention requirement."	https://library.municode.com/tx/denison/codes/code_of_ordinances?nodeId=COOR_CH22SURE_ARTIVREPUIMDE_DIV5DRSTFA_S22-94STMAPL	
University Park	City	Dallas	25091	Clear	In chapter 14 zoning ordinances: § 4.5PD, Planned Development District. Clearly states "Best management practices in stormwater management, including low-impact development (LID) approaches that provide aesthetic, flood protection and water-quality benefits;"	https://ecode360.com/40061509?highlight=lid&searchId=1719636729563264 7#40061509	
OW POPULATION OF 25K							