

Environmental Master Plan



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DEVELOPED IN PARTNERSHIP WITH



A Unified Approach in Reaching Success

City of Fort Worth | Environmental Quality Division

The Environmental Master Plan demonstrates the value of the City of Fort Worth's environmental quality programs, provides strategies for continued success, and outlines how these programs support the city's pursuit of sustained environmental quality in alignment with the City of Fort Worth's mission, vision, values and strategic goals.

MISSION

Working together to build a strong community.

VISION

Fort Worth will be the most livable and best managed city in the country.

A FOUNDATION OF OUR VALUES

Exceptional Customer Experience

Accountability

Ethical Behavior

Diversity

Mutual Respect

Continuous Improvement

STRATEGIC GOALS

Make Fort Worth the nation's safest major city.

Improve mobility and air quality.

Create and maintain a clean, attractive city.

Strengthen the economic base, develop the future workforce and create quality job opportunities.

Promote orderly and sustainable development.

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CHAPTER 1

Our Environment

PLAN VISION

Fort Worth's environmental quality will be superior, meeting the highest national standards

PLAN MISSION

Working together to build a strong community by protecting public health, safety and the environment

PLAN GOALS

- Promote a safe city and protect public health through environmental monitoring and compliance.
- Improve overall environmental quality in our community with responsible environmental planning and management.
- Create and maintain a clean, attractive city by reducing litter and other environmental pollutants.
- Strengthen the economic base by controlling environmental risks and mitigating environmental impacts.
- Facilitate orderly and sustainable development through technical guidance, outreach and education to encourage responsible environmental stewardship.

OUR ENVIRONMENT AT-A-GLANCE

Our Soil, Groundwater & the Built Environment

Fort Worth has experienced significant change, both in population growth and land use, since it was incorporated in 1873. Land use has evolved with each decade, resulting in a diverse blend of industrial,



PHOTO BY JOSEPH HAUBERT

commercial and residential use throughout the city. Today, this trend continues, which places great emphasis on infill development to maximize land resources. The city strives to improve land quality for development by reducing pollution in soil, groundwater and the built environment. This Environmental Master Plan (Plan) describes how the city's work with community partners addresses potential environmental contamination to facilitate revitalization throughout Fort Worth, safeguard the public and protect the city's real properties.

PROGRAM AREAS

- Land Quality Planning & Management
- Land Reclamation
- Land Quality Compliance
- Land Quality Communication & Collaboration

Our Outdoor Air

Human activity and natural processes can cause air pollutants to be released into our atmosphere. Exposure to such contaminants can cause risks to health, safety and the environment. In 1970, the federal Clean Air Act (CAA) required the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, including ozone. The EPA has designated a majority of the counties in the North Central Texas region as nonattainment areas for ground-level ozone. While some progress has been made to reduce this threat, more work is needed to reduce emissions that contribute to the formation of ozone. Additionally, thousands of other agents can pollute our air. This Plan outlines the city's efforts to improve air quality through air pollution monitoring and regulatory compliance at facilities throughout Fort Worth. Air pollution is a regional problem, and collaborating with regional and local partners to address air quality issues through outreach and education is vital to our mission.



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PROGRAM AREAS

- Air Quality Planning & Management
- Air Quality Monitoring
- Air Quality Compliance
- Air Quality Communication & Collaboration

CHAPTER TOPICS

- Our Soil, Groundwater & the Built Environment
- Our Outdoor Air
- Our Streams, Lakes & the Trinity River
- Our Efforts to Manage Hazardous Materials
- Our Efforts to Control Litter
- Our Efforts with Other Environmental Issues

Our Streams, Lakes & the Trinity River

The City of Fort Worth understands the need to protect water resources for drinking water, flood control, recreation, industrial operations, natural habitat and other uses. As our community continues to grow, the city must act to prevent the degradation of surface water quality in our streams, lakes and the Trinity River. This Plan describes how the city manages Fort Worth's watersheds and protects surface water quality through planning, monitoring, regulatory compliance and education. The city continues to work closely with its partners to develop a comprehensive regional approach to preserving and improving surface waters. Protecting water resources for current and future generations takes the effort of the whole community.

PROGRAM AREAS

- Watershed Planning & Management
- Surface Water Quality Monitoring
- Surface Water Quality Compliance
- Surface Water Quality Communication & Collaboration



PHOTO COURTESY ERIC KELP, 2018

Our Efforts to Manage Hazardous Materials

Handling, storing, transporting and disposing of hazardous materials safely is vital to protecting public health and the environment. This Plan describes the city's efforts to handle its municipal-generated



waste, and to provide a safe and accessible service for residents to dispose of household hazardous waste. Environmental staff serve as the subject matter experts for the proper management and abatement of hazardous materials. They also provide technical guidance, training and recommendations to ensure compliance with regulations at municipal facilities and within the community. These actions/activities help to prevent environmental contamination from hazardous materials and reduces the risk to human health.

PROGRAM AREAS

- Hazardous Materials Planning & Management
- Hazardous Materials Mitigation
- Hazardous Materials Compliance
- Hazardous Materials Communication & Collaboration

OUR ENVIRONMENT AT-A-GLANCE

Our Efforts to Control Litter

Fort Worth is committed to being litter free. With more than 850,000 residents and over 1.5 million visitors each year, litter is a constant challenge. From drop-off stations to trash cans and from street sweeping to citywide clean-up events, the city works diligently to keep our community beautiful by removing litter and floatables (aquatic trash) from our environment. This Plan describes the programs and projects the city is implementing to address the litter issue and actions the city can consider to optimize strategic litter management. These programs support the city's commitment to maintaining a clean and welcoming environment for all those who live in, work in and visit the city.

PROGRAM AREAS

- Litter Planning & Management
- Litter Prevention & Abatement
- Litter Compliance & Enforcement
- Litter Communication & Collaboration



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Our Efforts with Other Environmental Issues

Maintaining excellent environmental quality and conserving natural resources are important to ensuring the health and sustainability of our community. While this Plan focuses on five principal environmental topics – land, air, water, hazardous materials and litter – we recognize that there are other environmental topics which are important to our residents. These issues are part of the city's overarching environmental management activities and are discussed in Chapter 1.

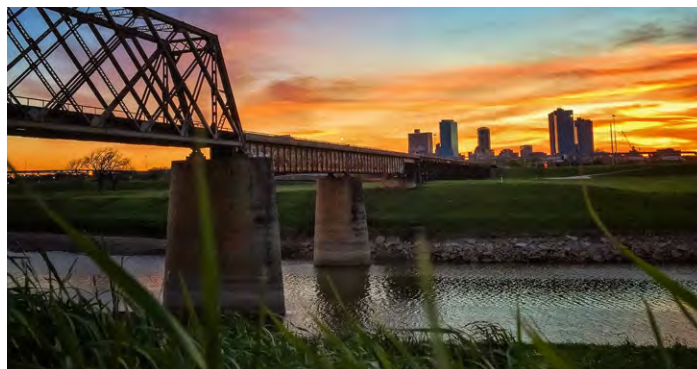


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Environmental staff collaborate with other departments and partners throughout the community to establish sound environmental practices in Fort Worth.

OTHER ENVIRONMENTAL ISSUES

- Urban Heat Island
- Pollinators
- Sustainability
- Endangered Species, Native Plants & Natural Habitats
- Wildlife Corridors
- Greenspaces
- Urban Forestry
- Water Conservation Practices
- Local Food Systems
- Recycling & Composting
- Renewable Energy & Energy Conservation
- Oil & Natural Gas Operations

1.1. Introduction: Welcome to the City of Fort Worth's Environmental Master Plan

The City of Fort Worth's Code Compliance Department – Environmental Quality Division (Division) developed this Plan to be a long-range strategy to protect human health and the environment in Fort Worth, while ensuring fiscal responsibility and outlining future projects and programs that balance social, economic and environmental values.

This Plan has five key objectives:

1. Support economic development by reclaiming contaminated sites and ensuring previously-developed or polluted properties, commonly known as brownfields, are safe to be developed.
2. Minimize Fort Worth's contribution to air pollution and carefully monitor key air contaminants to promote a safe city.
3. Improve surface water quality and minimize the impact of urban development on local bodies of water.
4. Create and maintain a safe, clean and attractive city through litter abatement programs, blight control and hazardous materials management.
5. Assess program resources and needs to support resource acquisition and asset allocation.

To achieve these goals, the Plan is divided into five additional chapters:

- Chapter 2: Land Quality
- Chapter 3: Air Quality
- Chapter 4: Surface Water Quality
- Chapter 5: Hazardous Materials Management
- Chapter 6: Litter Control

Section 1.4 provides an overview of the Plan and describes the chapter format.

Environmental programs must be flexible to expand and adapt to properly protect the community as the population of Fort Worth grows, development increases and environmental regulatory requirements change. The Plan is a tool to help our community ensure that the city continues to provide high-quality services to Fort Worth residents.

OUR ENVIRONMENT

Fort Worth is located in North Central Texas, roughly 30 miles west of Dallas, and incorporates a large portion of Tarrant County, as well as small portions of neighboring Denton, Johnson, Parker and Wise counties. It is the largest city in the western part of the Dallas-Fort Worth metroplex, the fourth largest metropolitan area in the nation (Reference 1-1). The North Central Texas Council of Governments (NCTCOG) estimates that the population within the metropolitan planning area will grow to 9.8 million by 2035 (Reference 1-2).

WHAT THE PLAN CAN DO

This Plan is a living document that is continually edited and updated. It has been developed to:

- Demonstrate the value of Environmental Quality.
- Align environmental goals with overall city strategic goals.
- Provide a framework for the Division and ensure program stability over time.
- Optimize the use of existing resources.
- Define strategies and priorities to guide future success.
- Identify data gaps and program needs.

WHAT THE PLAN CANNOT DO

The Plan is not designed to:

- Obligate future funding or resources.
- Resolve specific environmental issues involving private properties.
- Restrict any actions of future city councils.
- Guarantee timelines for full implementation.

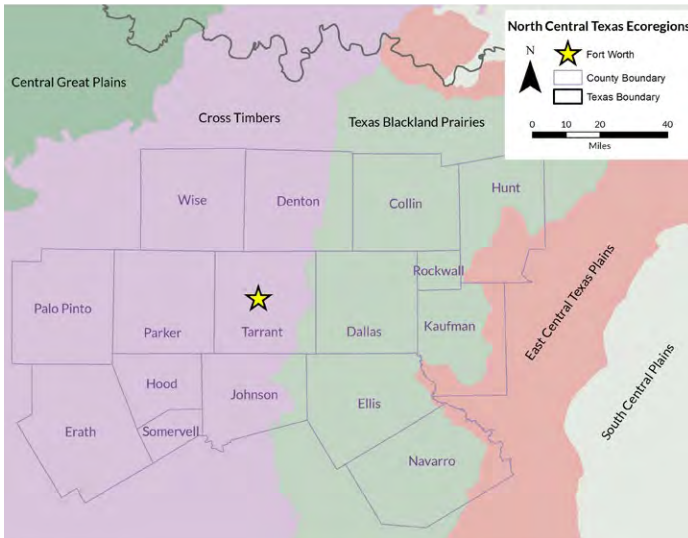


Figure 1-1. Ecoregions of Texas map. Fort Worth is indicated by the star on the map within the Cross Timbers ecoregion of Texas, Texas Parks & Wildlife Department.

Fort Worth lies in the Cross Timbers and Blackland Prairie ecological regions of Texas (Figure 1-1). Prior to development, the area was mostly open prairie with scattered post oak and live oak stands. Much of this original landcover has been changed through development.

The topography of the area varies, with elevations ranging from 500 to 800 feet above sea level (Reference 1-1). There are 31 watersheds that fall entirely or partially within Fort Worth, and some support city water resource capacity and waste treatment. These watersheds comprise numerous lakes, streams and rivers, including the Trinity River and its tributaries. The Trinity River is not only an important wildlife habitat, it also provides stormwater management and recreational opportunities for the community. It connects parks, lakes, activity centers and neighborhoods through nearly 72 miles of trails, some located within the floodplain of the river and its tributaries (Reference 1-2).

Fort Worth has long been a diverse center of agriculture, industry and manufacturing. From its early start as a booming cattle town spurred by the arrival of the railroad in 1876, to the discovery of oil nearby in 1917, Fort Worth has experienced strong economic growth throughout its history. In the early 1990s, the federal government made substantial cutbacks to local defense contractors that prompted the city to begin diversifying its economy, largely through small business development. This resulted in an economy

based in many industry sectors such as services, trade, manufacturing, oil and natural gas, transportation, communication and construction (Reference 1-2). With this growth, both built structures and land uses have changed. Our understanding of historical land use trends impacts Fort Worth’s current environmental programs, because material management and regulations have also changed over time. Our advanced knowledge of chemicals and materials has led us to recognize that many materials once considered safe may now be defined as potential pollutants or hazardous material.

Fort Worth created its first major transportation thoroughfare plan in 1927, beginning with a boulevard and parkway system (Reference 1-2). The city maintains approximately 7,291 lane miles of street surface as of 2018 (Reference 1-2). Three interstate highways serve Fort Worth: Interstate 20 (east-west), Interstate 30 (northeast-west) and Interstate 35 (north-south). Rail access includes an intercity passenger service through Amtrak train lines and the Trinity-Metro commuter rail line. With anticipated increases in the metropolitan area population, the transportation demand generated by this growth and need for expanded service will significantly impact air quality, congestion, land use and infrastructure capacity (Reference 1-2).

DEMOGRAPHIC & LAND USE TRENDS

Fort Worth is a city on the move. In 2018, Fort Worth surpassed Indianapolis, IN, becoming the 15th-largest city in the United States (Reference 1-3). The April 1, 2010, census count for Fort Worth was 741,206 persons, and as of 2017, the city had an estimated population of 874,168 residents. According to the U.S. Census Bureau, between July 1, 2010, and July 1, 2017, Fort Worth’s annual average population growth rate was approximately 2 percent. If Fort Worth continues to grow at the same rate it has since 2000, the city’s population could exceed one million by the year 2025 (Reference 1-2; Reference 1-4).

Along with population, Fort Worth’s land area has also increased to now encompass approximately 350 square miles within city limits. This is more than double the land area held by Fort Worth in 1960 (145 square miles). Similarly, Fort Worth’s land uses have also continued to adapt to changing needs. As of 2018, the majority of developed land is used for housing, with 52 percent of city land zoned for single-family and low-density

residential use, and five percent zoned for multifamily residential construction. Approximately 11 percent of Fort Worth's land is dedicated to commercial use and 19 percent to industrial use. The remaining zoning mix (13 percent) includes manufactured housing, agriculture, mixed-use, community facilities and floodplains. Based on the land annexation trends of the last 15 years, it

is expected that the city limits will expand from 350 square miles to 372 square miles by 2031. Between 2000 and 2032, the population is expected to grow by 50 percent, and the amount of developed land can be expected to increase by approximately the same percentage (Reference 1-2).

FORT WORTH'S INDUSTRIAL AND MILITARY HISTORY



Figure 1-2. Greater Fort Worth city map, 1919 by C. H. Rogers, Tarrant County Archives. Even in the early 1900s, Fort Worth was home to numerous petroleum refineries, as well as the only commercial-scale helium plant in the country, U.S. Argon.



Figure 1-4. B-24 “Liberator” bombers in the Consolidated-Vultee Plant, United States Air Force, 1943. Part of the world's largest double aircraft assembly line in Consolidated-Vultee's Fort Worth plant.

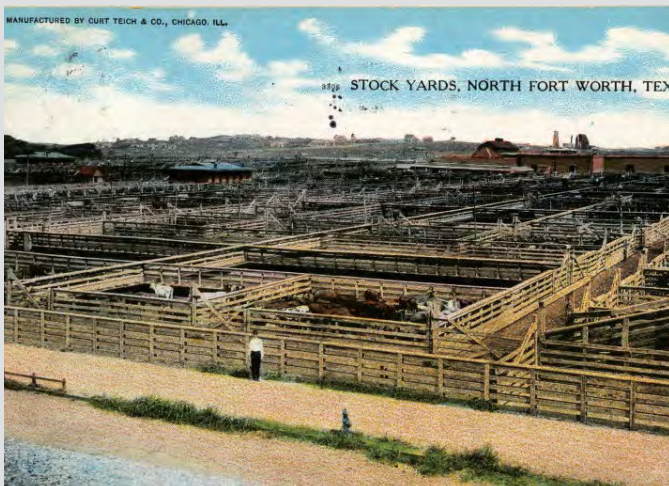


Figure 1-3. Historic stockyards, between 1900 and 1908, Courtesy of Special Collections, University of Houston Libraries. The Fort Worth Stockyards area showcases the city's heritage in the cattle industry and remains a major tourist attraction.



Figure 1-5. Aerial view of the Naval Air Station Fort Worth Joint Reserve Base, United States Navy, 1995. Fort Worth has a long history with the naval air program, dating back to the early 1900s when the Navy used helium from U.S. Argon to support its dirigible program.

FORT WORTH'S TRANSPORTATION HISTORY



Figure 1-6. Fort Worth, Texas, View of Main Street, 1942 by Arthur Rothstein. Library of Congress, Farm Security Administration - Office of War Information Photograph Collection.



Figure 1-7. "Texas Zephyr" leaving Fort Worth, June 28, 1953, by Roger S. Plummer. University of North Texas Libraries, The Portal to Texas History, texashistory.unt.edu; crediting Museum of the American Railroad.



Figure 1-8. Ground-level view of Highway 287 construction near downtown Fort Worth, 1963, TxDOT Archive Library.

1.2. Our History

In the early 1990s, the Office of Environmental Quality resided within the City Manager's Office to support the city's environmental management efforts. The Office of Environmental Quality quickly saw a need for dedicated funding to pay for programs and projects to meet growing environmental responsibilities, while also remediating historical pollution. In 1995, the Environmental Protection Fee was created to support the formation of a stand-alone department that would consolidate environmental programs.

The Department of Environmental Management was formed and it initiated programs for departmental administration, air and water quality, municipal environmental compliance and education and outreach. In early 2002, Solid Waste Services moved under the purview of the department. Solid waste needs grew through the years and in 2010, Solid Waste Services program areas expanded to become an independent division and transitioned into the Code Compliance Department. The Environmental Management Department was consolidated into the Environmental Management Division and transitioned into the Transportation & Public Works Department in 2012.

In 2015, the Environmental Management Division was reorganized from the Transportation & Public Works Department to the Code Compliance Department, where it still resides. The Division also experienced changes in executive staff and leadership and was subsequently renamed to the Environmental Quality Division. These changes have allowed for closer collaboration between divisions, resulting in well-organized, effective and efficient environmental programs and excellent customer service to the community.

1.3. Funding Sources

In the mid-1990s, the Environmental Protection Fee was created to provide the necessary financial resources to support the establishment and development of environmental programs in the city. Revenues generated by the fee go into the Environmental Protection Fund, which is a special revenue fund. This fund supports environmental programs, as well as projects in the Capital Improvement Plan (CIP). By ordinance, the fee is intended to cover the cost of disposal services for hazardous wastes, as well as environmental programs

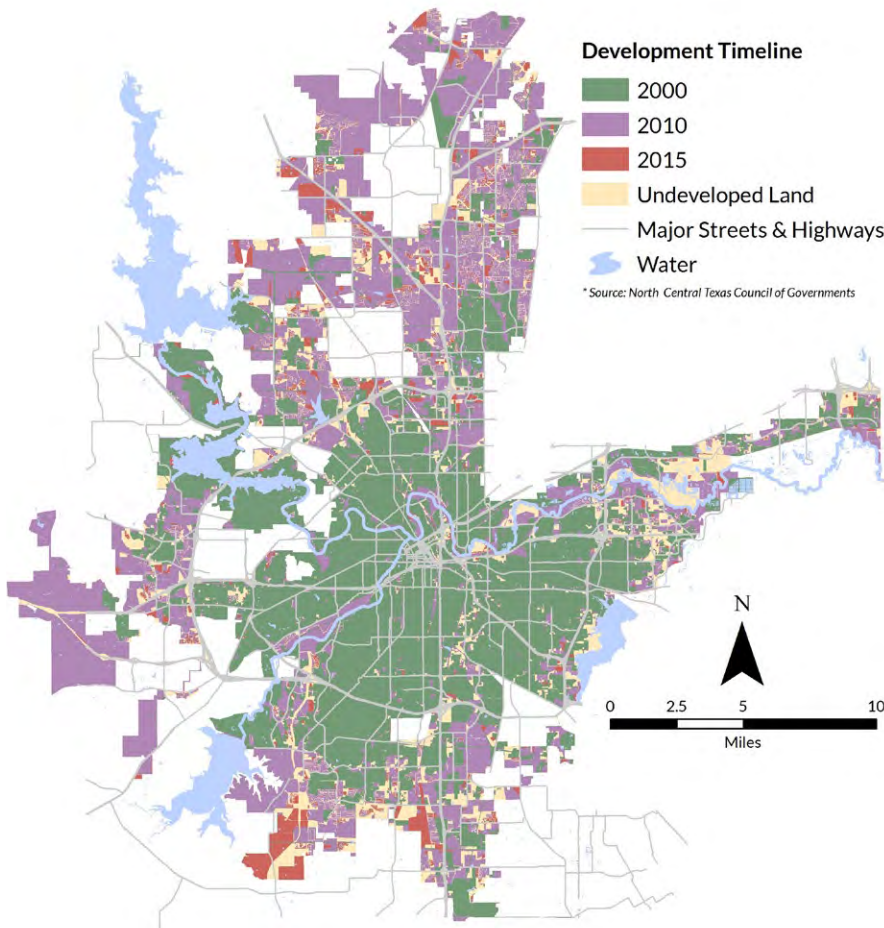


Figure 1-9. Land development timeline map. Between the years 2010 and 2015, Fort Worth experienced substantial development.

and services that meet local, state and federal environmental rules and regulations.

§ 12.5-843 ENVIRONMENTAL PROTECTION FEE

(a) A separate fee at a rate established by the city council by ordinance shall be charged to persons within the city for solid waste disposal services as authorized by Tex. Health and Safety Code.

§ 364.034. Such fee shall be assessed to each customer per service address and included on the monthly water bill. Such fee shall be in addition to any fees for other services regulated by this article, and shall be shown as “environmental protection fee.”

(b) Pursuant to Tex. Health and Safety Code, § 361.013(g), any revenues generated by the fee which have accrued or which may accrue in the future, shall be used for disposal or environmental programs or services that are required by state or federal mandates.

(Source: City of Fort Worth Municipal Code, Ch. 12.5 Environmental Protection and Compliance)

These dedicated funds assist the city in paying for our environmental programs and services, which are designed to address:

- Air pollution.
- Surface water pollution.
- Soil and groundwater pollution.
- Hazardous materials control.
- Pollution cleanup.
- Litter and aquatic trash.
- Environmental emergency response (e.g., spills).

Programs and services also provide for:

- Municipal environmental compliance with federal and state regulations.
- Environmental compliance outreach and technical compliance education.
- Environmental inspections and audits.
- Environmental cleanup projects and site remediation.
- Protection of waters in local creeks, lakes and the Trinity River.

There are five key areas of funding for the Division:

- Environmental Protection Fund (special revenue fund)
- Environmental Grants (e.g., air, brownfields)
- Brownfields Revolving Loan Program Income (repayment and interest)
- Commercial Cosmetic Cleaner (Power-Washer) Operator Permit Fees
- Environmental Enforcement Financial Penalties

ENVIRONMENTAL PROTECTION FUND

The Environmental Quality Division within the Code Compliance Department is responsible for operating and maintaining the Environmental Protection Enterprise Fund. In using that fund, the city is charged with reducing the threat of environmental contamination and supporting sustainability through programs that meet and exceed regulatory standards,

while fostering environmental compliance within the community and improving air, land and water quality.

As of 2018, the annual revenue for the fund was approximately \$3.5 million dollars.

Since 1996, the monthly environmental protection fees have been:

- Apartment Complexes: \$0.50 (per unit)
- Residential: \$0.50
- Multi-residential: \$1
- Commercial: \$10
- Multi-commercial: \$20
- Industrial: \$35
- Municipal: \$0.75
- Nonprofit: \$0.75

GRANTS

The city utilizes environmental grants from state and federal partners, as well as other agencies and organizations, to partially fund some programs and projects, when possible. On an annual basis, air quality program grants awarded through the Texas Commission on Environmental Quality (TCEQ) provide the City of Fort Worth with approximately \$836,000 in funding. As of 2018, the matching value required for this funding is approximately \$187,000 for a total of \$1.02 million.

BROWNFIELDS REVOLVING LOAN PROGRAM INCOME (REPAYMENT & INTEREST)

As of 2018, the City of Fort Worth Brownfields Revolving Loan Program account had a balance of approximately \$850,000, and there are no active, unpaid loans.

OTHER REVENUE SOURCES

Mobile commercial cosmetic cleaner operator permit fees and environmental enforcement financial penalties are collected by the Environmental Quality Division. As of 2018, the annual revenues generated by these activities were negligible. There is a potential for this to change as enforcement options are evaluated and implemented.

1.4. What is an Environmental Master Plan?

MASTER PLAN APPROACH

Fort Worth established itself as a leader in planning early in its history. The city has taken an active approach in preparing for the future since its inception, from the commissioning of the outpost and the original town plan, to the creation of some of the first city plans in the country. Fort Worth is one of the few cities in the nation that provides an annual update to its comprehensive plan to both inform residents and provide guidance and continuity to city departments.

In keeping with this long planning tradition, the Environmental Quality Division has developed this Plan to assess its programs and create a vision for the future that protects and improves Fort Worth's environment. The Plan is the city's long-range strategy to address environmental problems by developing and implementing programs and projects that produce solutions. The environmental problems facing Fort Worth include air pollution, surface water pollution, brownfields and blighted properties, litter and aquatic trash, hazardous materials and land pollution (e.g., contaminated soil, groundwater, structures). The actions outlined in the Plan include pollutant source controls, ensuring compliance with environmental regulations, comprehensive monitoring programs, litter cleanup projects throughout the city and enforcement of the city's ordinances and laws.

MASTER PLAN STRUCTURE

The Plan is formatted so each of the city's five primary environmental services is described in one chapter. Each chapter is divided as follows:

- **Chapter At-A-Glance** – An overview of the section's mission statement, program areas and key goals.
- **Executive Summary** – A short narrative describing how the programs and projects within each program area are developed to address environmental challenges.
- **Key Terms** – A list of acronyms used within the chapter.
- **Introduction** – An overview of the program areas, as well as the programs and projects they include.

- **Structure and Funding** – A summary of the staff structure and funding sources that support the programs and projects for that section.
- **Challenges** – A description of the environmental challenges that the city faces for that section.
- **Strategies** – An explanation of how the specific programs and projects within each program area are developed and implemented to address the defined challenges.
- **Conclusion** – A prioritized list of the development actions that will be evaluated or undertaken to meet the section goals.
- **References** – A list of citations of the information sources reviewed and incorporated into the Plan.

VISION

“Fort Worth’s environmental quality will be superior, meeting the highest national standards”

Our vision, adapted from the 2018 City of Fort Worth Comprehensive Plan, highlights our commitment to be good stewards of our land, air and water resources. As a city, we hold ourselves to a high standard to ensure that our programs and staff are working toward the common vision held by Fort Worth:

“Fort Worth will be the most livable and best managed city in the country.”

City of Fort Worth Vision Statement

MISSION

“Working together to build a strong community by protecting public health, safety and the environment”

Our mission is simple. We are focused on working with other city departments, state agencies, industries and residents to protect Fort Worth’s environment, now, and for generations to come. As we meet our goals, we also help the city achieve the common mission of making Fort Worth the most livable city in Texas:

“Working together to build a strong community.”

City of Fort Worth Mission Statement

VALUE

“To provide a cleaner, safer and more livable city”

The core purpose of the city’s Environmental Quality Division is reducing the threat of environmental

contamination and supporting sustainability by protecting natural resources in Fort Worth. Comprehensively, all of our programs and projects are designed to serve our residents and adhere to the values of our great city. These values, as noted in the 2018 City of Fort Worth Comprehensive Plan, are:

Preservation of western heritage, a friendly small town atmosphere, quality and ethnic diversity of cultural life, the arts, neighborhood vitality, preservation of historic buildings and districts, efficiency and equity in delivery of quality public services, educational and economic opportunity, aviation history and technology, can-do attitude, promotion of free enterprise, protection of property rights, mobility, children and youth, conservation of natural resources and inclusiveness and cooperation: “The Fort Worth Way.”

Protecting Fort Worth’s environment ultimately promotes a cleaner, safer and more livable city.

ENVIRONMENTAL SERVICE AREAS

The Plan is divided into six chapters. Chapters 2 through 6, summarized below, describe the five primary environmental services and the responsible section within the Environmental Quality Division.

Chapter 2: Land Quality – Our Soil, Groundwater & the Built Environment

This Land Quality Section is responsible for many key activities (e.g., environmental site assessments, brownfields development, municipal setting designations, soil and groundwater site remediation, substandard structure demolition, environmental permitting). These functions support the city’s vision that Fort Worth’s environmental quality will meet the highest national standards. Chapter 2 details Land Quality program areas and discusses how implementation of the identified projects and key activities work together to protect our land resources and provide services to residents and developers that promote redevelopment and economic incentives.

Chapter 3: Air Quality – Our Outdoor Air

The Air Quality Section is responsible for protecting the residents of and visitors in Fort Worth by monitoring local ambient air quality and helping the city’s businesses and industries maintain regulatory compliance with the State of Texas and the CAA. In this

chapter, we detail the key activities (e.g., ambient air monitoring, biological air monitoring and air compliance inspections) which comprise a comprehensive approach to addressing air quality in a growing city.

Chapter 4: Surface Water Quality – Our Streams, Lakes & the Trinity River

The Surface Water Quality Section is responsible for monitoring water quality in urban lakes, rivers, neighborhood creeks and storm drains, as well as maintaining compliance with Texas Pollutant Discharge Elimination System (TPDES) regulations and municipal separate storm sewer system (MS4) related permits. In this chapter, we detail the key activities the city developed and implemented to protect valuable surface water resources, including water quality monitoring, stormwater quality inspections, watershed planning and technical education.

Chapter 5: Hazardous Materials Management – Our Efforts to Manage Hazardous Materials

The proper handling and storage of hazardous materials is essential to creating a cleaner, safer and more livable community. As part of regular operations, the city utilizes hazardous materials and generates hazardous waste (e.g., oil, paint, antifreeze, lightbulbs), and the Hazardous Materials Management Section is responsible for overseeing the administration of programs that ensure regulatory compliance for these materials. These key activities include asbestos and lead paint compliance, emergency spill response, petroleum storage tank compliance and hazardous waste compliance.

Chapter 6: Litter Control – Our Efforts to Control Litter

The city is committed to creating a clean and welcoming environment for Fort Worth’s residents and visitors that is free of litter. To achieve this goal, the city takes a proactive approach in addressing the behaviors that lead to littering, and focuses on prevention, awareness and anti-litter education. Litter control services are conducted by interdisciplinary staff across several divisions of the Code Compliance Department who coordinate closely on multi-faceted programs designed to significantly reduce litter. Key activities include street sweeping, litter abatement, volunteer cleanups and litter enforcement. Chapter 6 outlines the programs and projects that address this pervasive and challenging issue.

1.5. Outreach & Community Engagement

The Environmental Quality Division is proud to have staff that are passionate about protecting the city’s air, land and water resources. These men and women live, work and play in this great city alongside other residents and visitors, and recognize the need for strong collaboration between residents and city staff to meet our mission and goals. The Division sought and incorporated public input into the development of this Plan. This input was a vital component to plan development, because no program can succeed without public engagement. As shown in Figure 1-10, the city used several different methods and technologies to reach out to our stakeholders and residents. These included public stakeholder meetings, focus group meetings, online surveys and social media outreach.

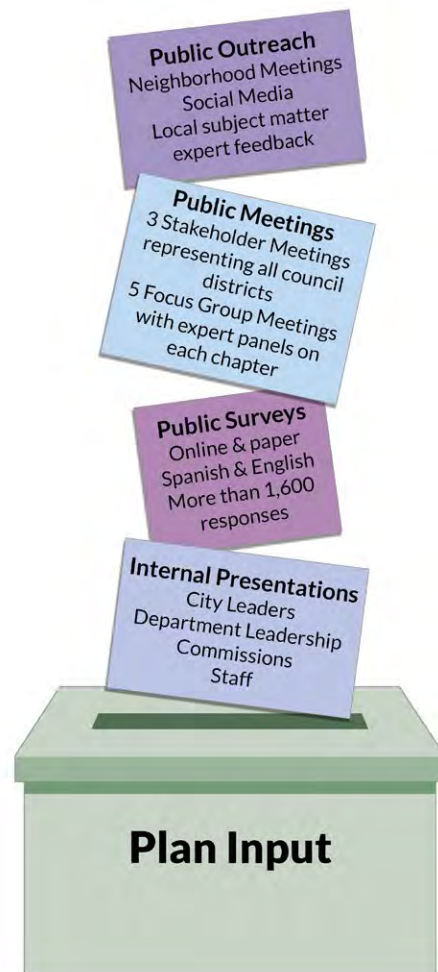


Figure 1-10. Stakeholder and public outreach methods used for development of the Environmental Master Plan.

PUBLIC INVOLVEMENT

The city hosted an online survey questionnaire that was posted on the city’s Environmental Master Plan website from December 1, 2017, through January 31, 2018. This survey received over 1,600 responses. In general terms, the outreach process identified the following:

- The general impression of Fort Worth’s environment was positive, and residents reported that they believe the city does a good job of protecting the environment and reducing pollution.
- Respondents indicated that the city’s rivers and streams have the most to gain in regards to increasing both cleanliness and environmental safety. The majority of respondents indicated that the city parks, greenspaces and public buildings were both clean and safe.

- Familiarity with citywide events (e.g., Cowtown Great American Cleanup, Neighborhood Litter Stomp, Crud Cruiser Mobile Collections) was very high, and approximately 60 percent of the respondents reported involvement in at least one of the listed events.
- Interestingly, the response with the highest score dealt with enforcement. Nearly all of the participating residents (92 percent) indicated that the city should issue citations to facilities or operations to correct environmental violations.
- Over half of respondents were willing to pay over \$2 per month as residents to support the city’s environmental programs and services.

Figures 1-11 through 1-24, below, summarize the participants’ responses to the environmental survey questions.

Figure 1-11.

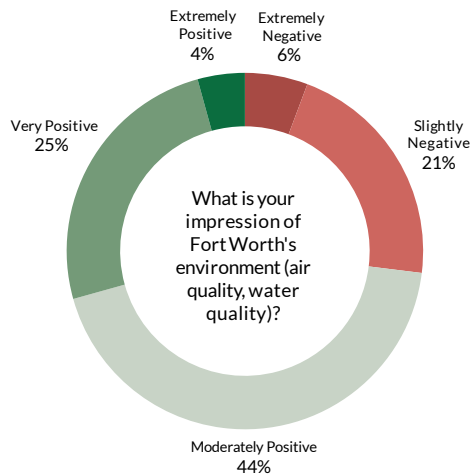


Figure 1-12.

Based on your impression of the City of Fort Worth's environmental efforts, how important are each of these factors?

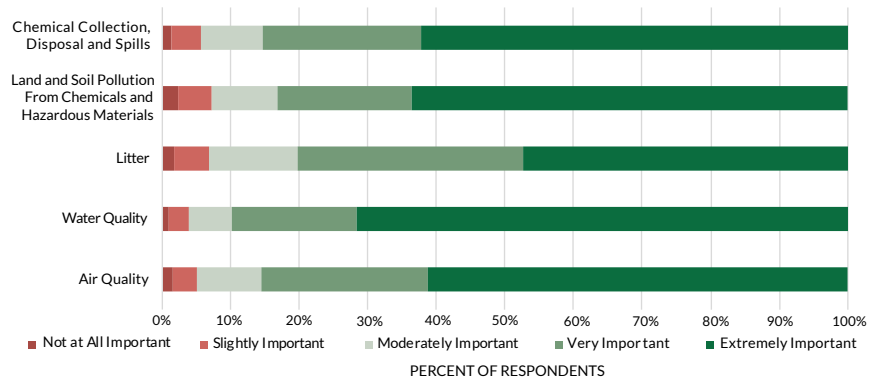


Figure 1-13.

How clean do you feel each of the following are for recreational activities, swimming, fishing and boating?

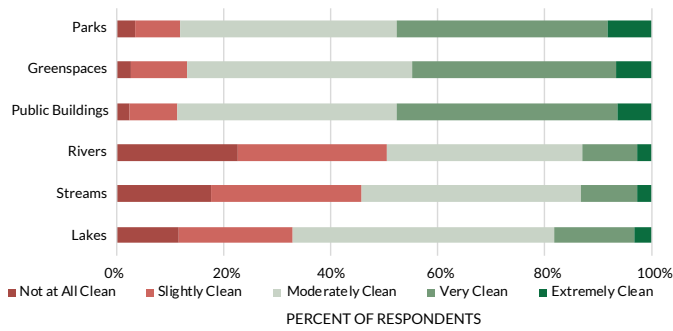


Figure 1-14.

How environmentally safe do you feel the following are for recreational activities, swimming, fishing and boating?

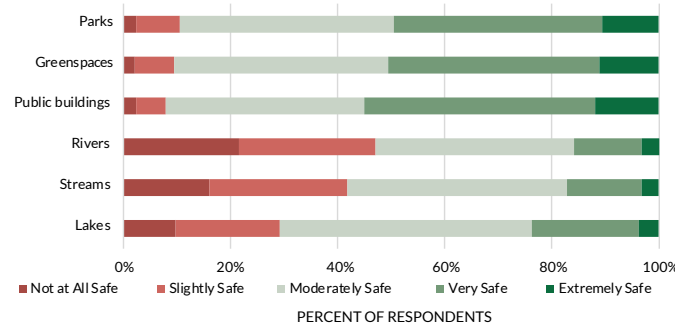


Figure 1-15.

How supportive are you about the city redeveloping polluted properties where chemicals exist so they are environmentally safe?

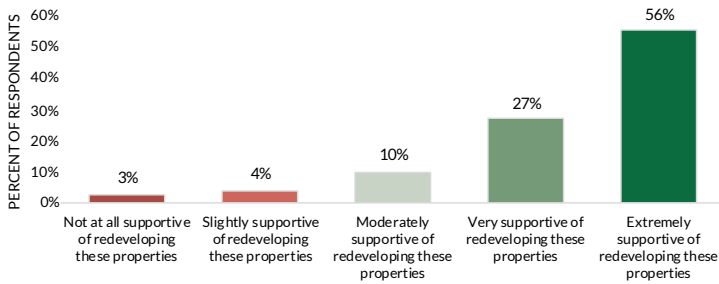


Figure 1-16.

How important is it for the city to manage and dispose of hazardous materials properly?

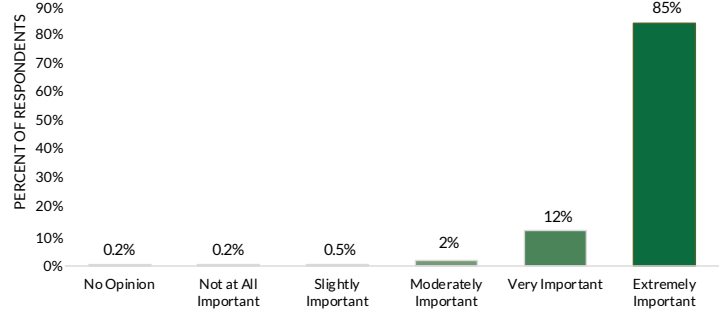


Figure 1-17.

Which of the following events are you familiar with? Mark all that apply.

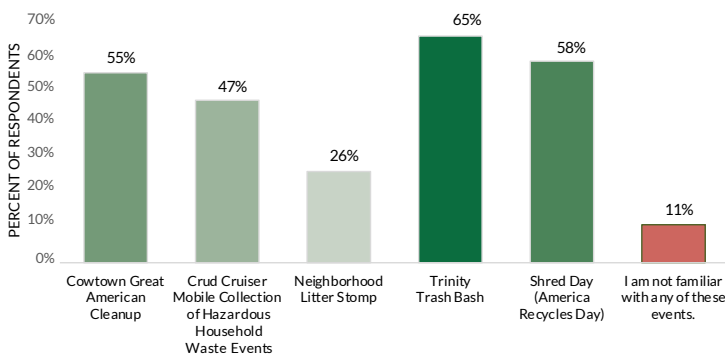


Figure 1-18.

Which of the following events have you participated in? Mark all that apply.

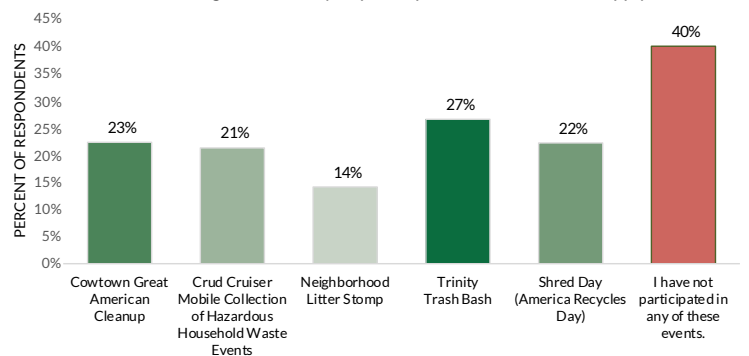


Figure 1-19.

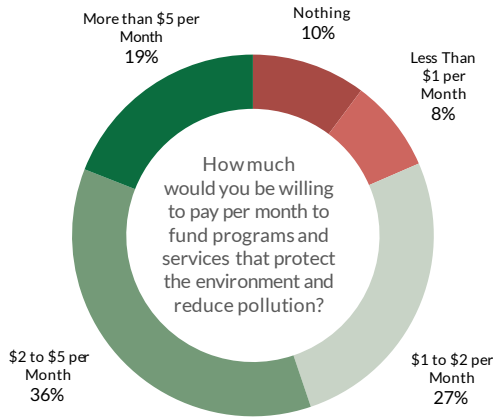


Figure 1-20.

How well do you think the city protects the environment and reduces pollution?

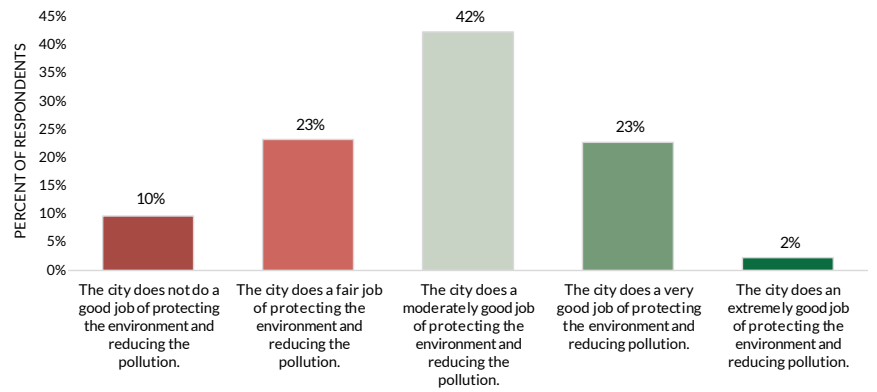


Figure 1-21.

How well do you think the city's environmental programs compare to other cities' environmental programs?

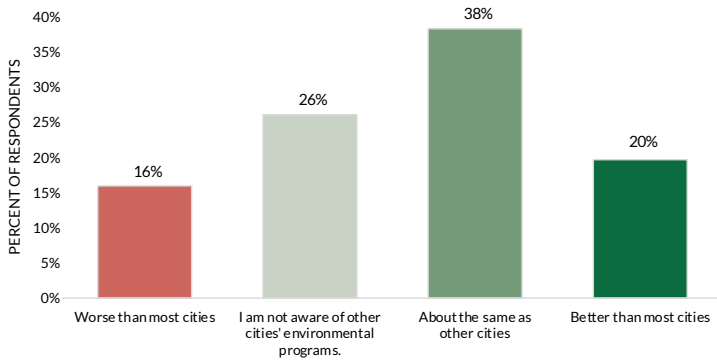


Figure 1-22.

Should the city do more to inspect facilities or operations to ensure environmental compliance?

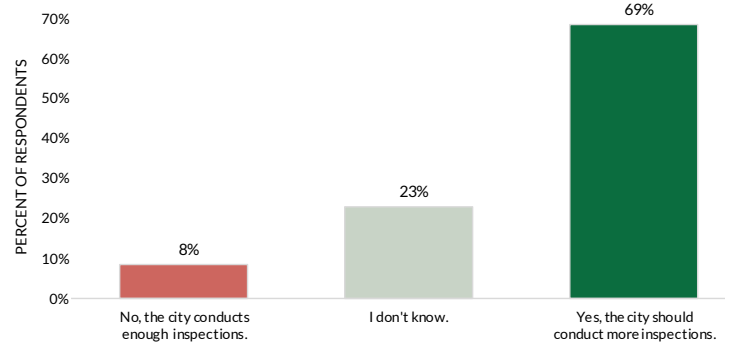


Figure 1-23.

Should the city do more to monitor air quality and water quality?

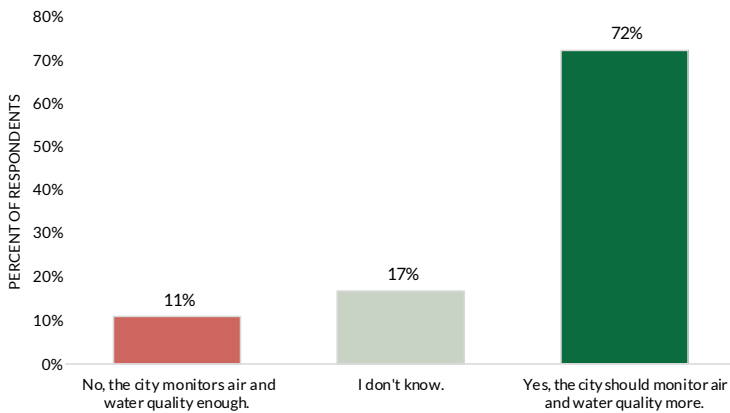
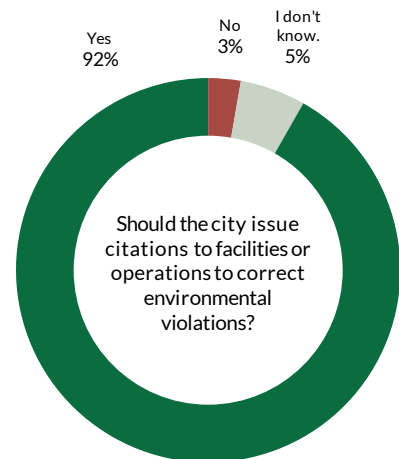


Figure 1-24.



STAKEHOLDER GROUP MEETINGS

Three stakeholder meetings were held on the following dates: October 1 and 2, 2017, and December 6, 2018.

These meetings included a resident from each district selected by the respective City Council District Office, and all meetings were open to the public.

The purpose of the stakeholder group meetings was to discuss the Plan and provide general guidance on plan development. During the October 2017

meetings, short presentations (available on the Plan website) were presented to participants, followed by a discussion period. Participants responded to questions about the quality of Fort Worth’s environment and the city’s environmental programs by selecting the responses they felt were the most accurate, based on their knowledge of the city and its environment. The tabulated stakeholder responses are illustrated in the following tables and figures.

Table 1-1. Stakeholder responses to level of awareness survey questions.

QUESTION	RESPONSES (PERCENT)				
	Mostly Aware	Somewhat Aware	Somewhat Unaware	Mostly Unaware	I'm Not Sure
Are Fort Worth residents aware of the city’s Air Quality programs?	0%	14%	14%	57%	14%
Are Fort Worth residents aware of the option to “Request a Speaker” for neighborhood meetings or community events to discuss air quality?	0%	29%	0%	71%	0%
Are Fort Worth residents aware of the city’s hazardous materials management programs and projects?	0%	25%	38%	38%	0%
Are Fort Worth residents aware that they can dispose of household chemicals, brush, and/or bulk items at the Environmental Collection Center and drop-off stations?	13%	63%	25%	0%	0%
Are Fort Worth residents aware that they can dispose of household chemicals at “Crud Cruiser” mobile collection events?	0%	75%	25%	0%	0%
Are Fort Worth residents aware of the city’s land reclamation programs and projects?	0%	13%	25%	63%	0%
Are Fort Worth residents aware of the option to “Request a Speaker” for neighborhood meetings or community events to discuss land reclamation programs?	0%	38%	13%	50%	0%
Are Fort Worth residents aware of the city’s brownfields programs and projects?	0%	0%	25%	75%	0%
Are Fort Worth residents aware of the city’s litter programs and projects?	40%	40%	20%	0%	0%
Are Fort Worth residents aware of the city’s surface water quality programs and projects?	0%	0%	25%	75%	0%
Are Fort Worth residents aware of the option to “Request a Speaker” for neighborhood meetings or community events to discuss surface water quality?	0%	0%	50%	50%	0%

STAKEHOLDER GROUP MEMBERS

Sam Gunderson (Mayor's Office)
 Tressa Hilburn (Council District 2)
 Loren Baxter (Council District 3)
 Brian Black (Council District 4)
 Danielle Tucker (Council District 5)
 Sally Alsup (Council District 6)
 Susan Urshel (Council District 7)
 Steve Epstein (Council District 8)
 John MacFarlane (Council District 9)



Figure 1-25. Stakeholders gather to discuss the Plan with city staff, photo by City of Fort Worth.

Table 1-2. Selected stakeholder input regarding relative importance of environmental issues.

QUESTION	RESPONSES (PERCENT)				
	Very Important	Somewhat Important	Somewhat Unimportant	Very Unimportant	I'm Not Sure
The city manages dangerous materials, like asbestos, from its own operations, as well as businesses and industry. How important is it to you that the city manages the disposal of these materials properly?	100%	0%	0%	0%	0%
Expanding the existing ambient air monitoring system as the City of Fort Worth's population and land area increases.	75%	25%	0%	0%	0%
Outreach to schools and colleges to increase awareness of the importance of air quality and strategies to reduce impacts.	88%	13%	0%	0%	0%
Outreach to local commercial businesses and industries to increase awareness of the importance of air quality and strategies to reduce impacts.	88%	13%	0%	0%	0%
Using technology, such as a smart phone application, to provide air quality information to residents.	38%	63%	0%	0%	0%
Having the city let the public know the outcome of an air quality complaint.	75%	25%	0%	0%	0%
Using mobile sampling capabilities to monitor air quality.	63%	25%	13%	0%	0%
Requiring buildings to incorporate technologies that increase energy efficiency and reduce air pollution.	88%	13%	0%	0%	0%
Providing incentive programs to reward residents who take action to reduce air pollution.	38%	38%	13%	0%	13%
How important is it to have environmental site information more easily accessible to the public?	50%	38%	13%	0%	0%
How important is it to Fort Worth residents to be able to use surface waters for recreation (fishing, swimming, kayaking, etc.)?	50%	50%	0%	0%	0%

Figure 1-26.

Overall, how do you feel about the quality of Fort Worth's environment, including air, land, local creeks, lakes and the Trinity River?

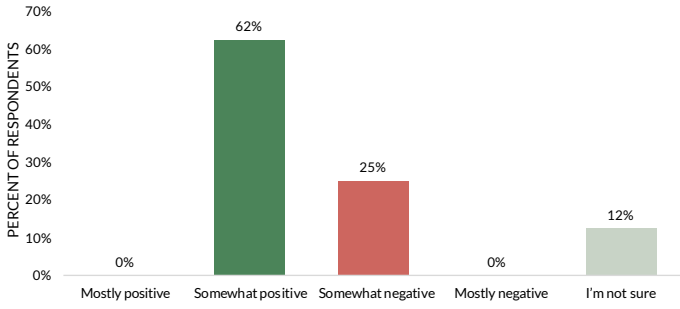


Figure 1-27.

Do you feel that our lakes, rivers and streams are clean and safe for recreation?

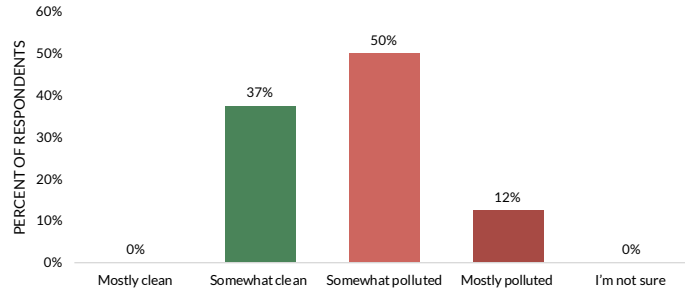


Figure 1-28.

In your opinion, how littered is Fort Worth?

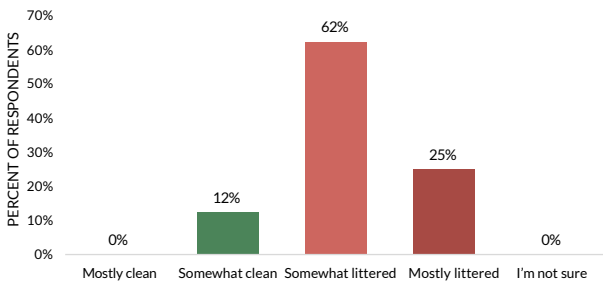


Figure 1-29.

Do you feel our public buildings, greenspaces, and parks are clean and safe for recreation?

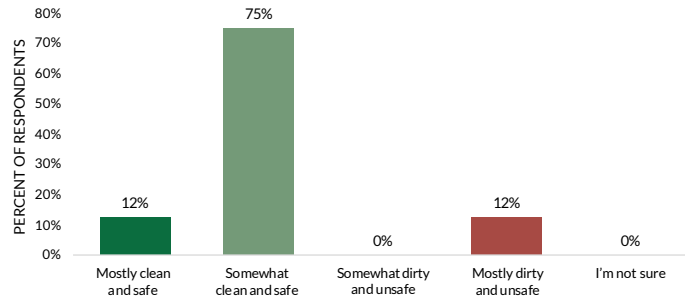


Figure 1-30.

How do you feel about the city's Brownfields Program that takes lots polluted with chemicals and makes them safe for re-development?

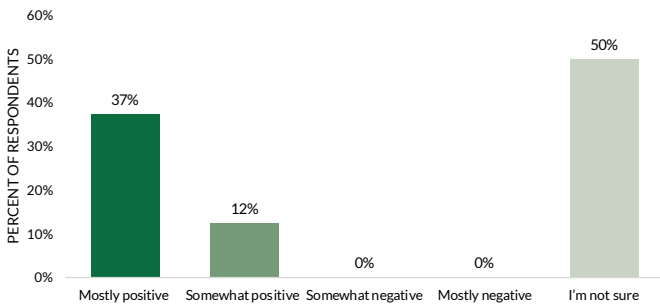


Figure 1-31.

Do you feel comfortable with the outdoor air you breathe?

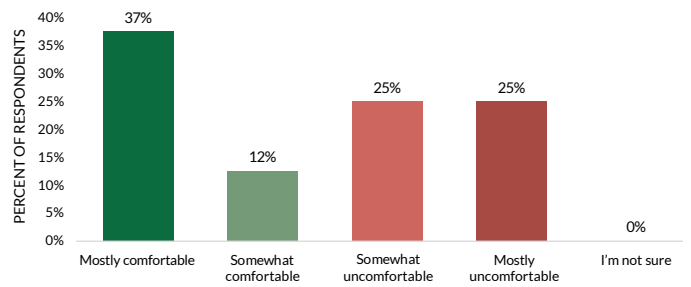


Figure 1-32.

Are you aware of the following city-sponsored events: Cowtown Great American Cleanup, Neighborhood Litter Stomp, Trinity Bash or Shred Day?

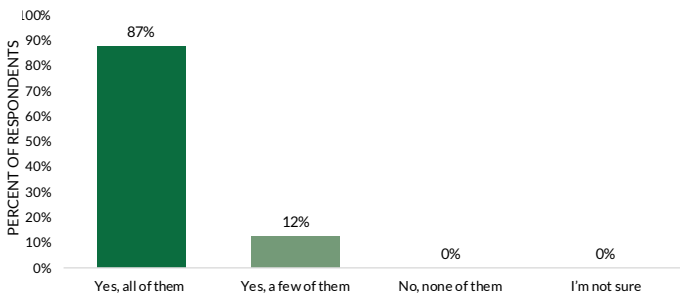


Figure 1-33.

Have you participated in any of the following city-sponsored events: Cowtown Great American Cleanup, Neighborhood Litter Stomp, Trinity Bash or Shred Day?

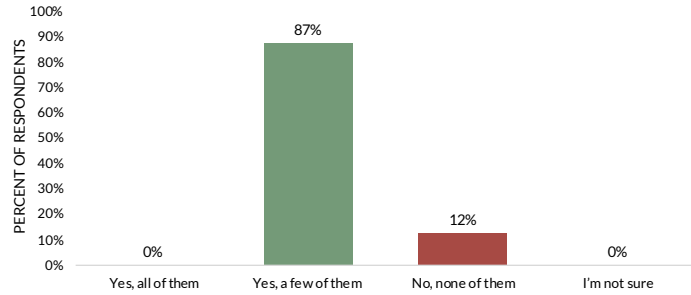


Figure 1-34.

Overall, how is the City of Fort Worth doing in protecting the city's environmental resources and reducing pollution (e.g., litter, polluted sites)?

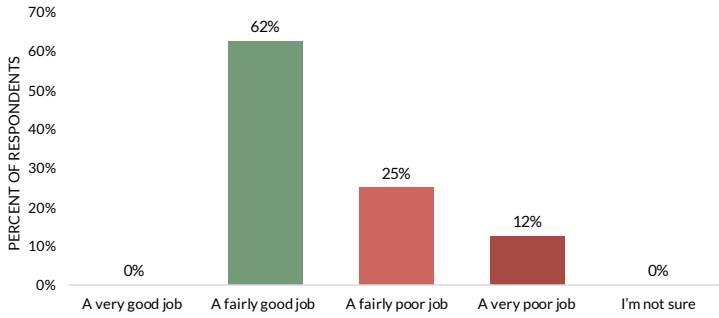


Figure 1-35.

Overall, how do you think Fort Worth's environmental programs compare with other cities?

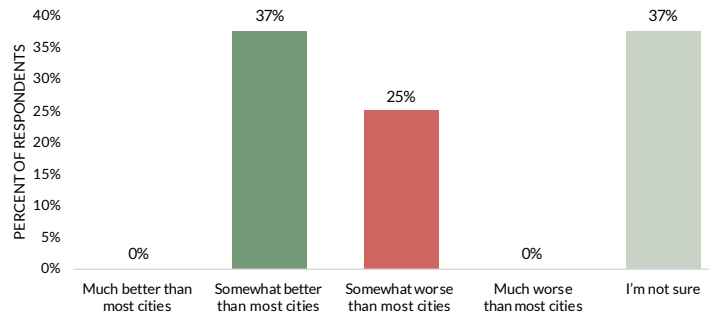


Figure 1-36.

Overall, how do you think Fort Worth's air quality compares with other cities?

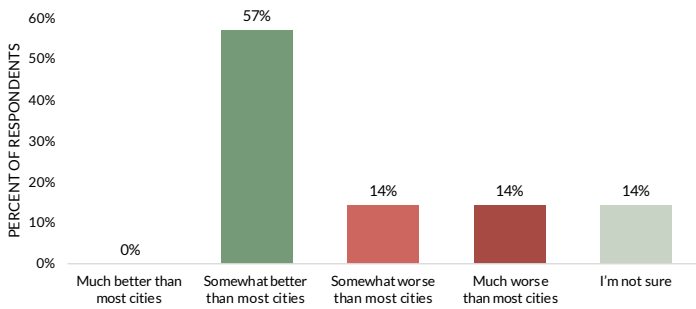


Figure 1-37.

How easy is it to report an air quality complaint?

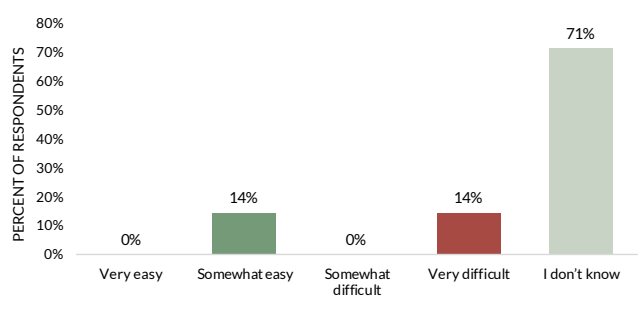


Figure 1-38.

How effective is the city in identifying and removing abandoned, vacant and/or dangerous structures?

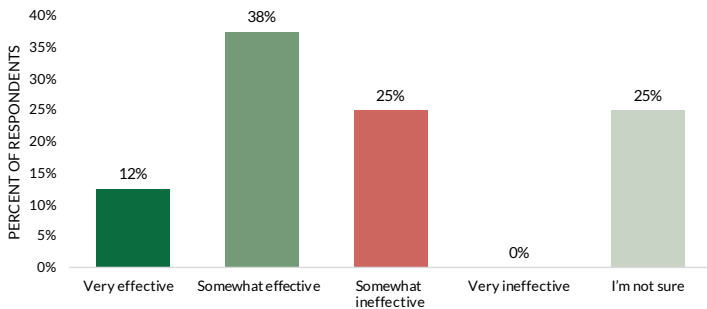


Figure 1-39.

Overall, how do you think Fort Worth's land reclamation programs compare with other cities?

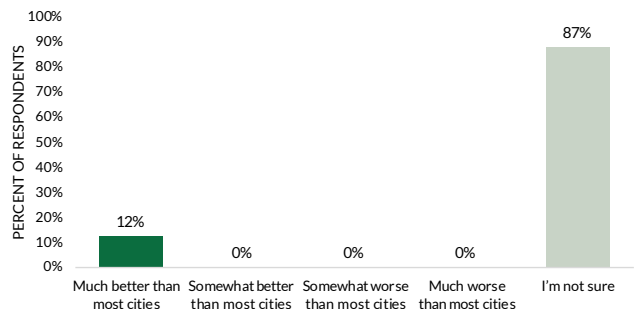


Figure 1-40.

Which of the following Brownfields projects do you think the city should develop first?

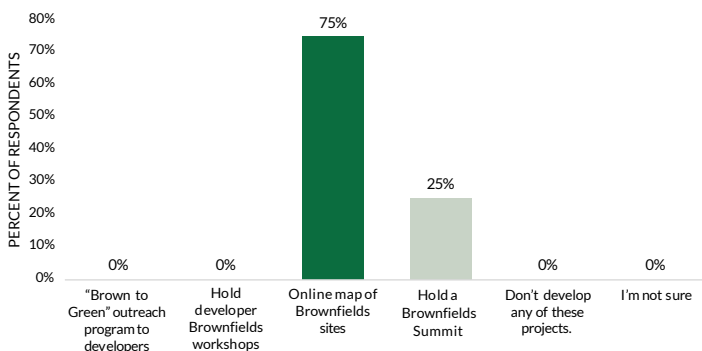


Figure 1-41.

Do you think that performing environmental assessments of properties and making the results available would generate interest in brownfields redevelopment?

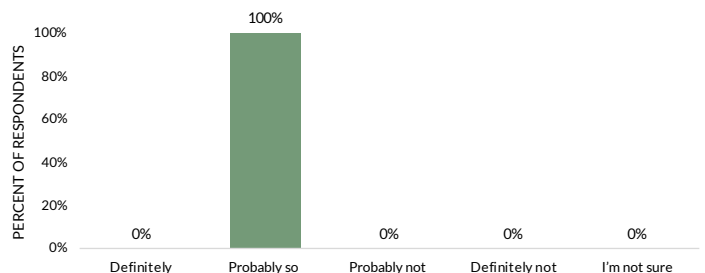


Figure 1-42.

Overall, how do you think Fort Worth's litter management programs compare with other cities?

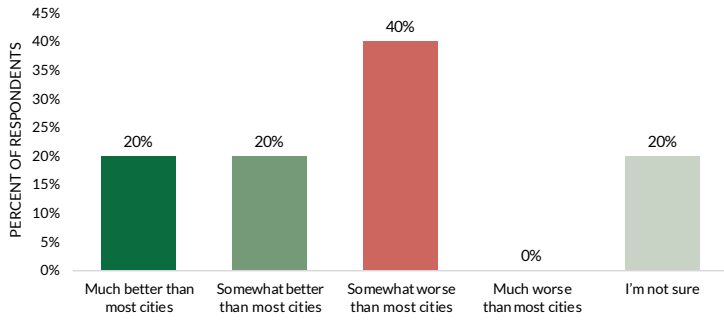


Figure 1-43.

How do residents of Fort Worth follow Keep Fort Worth Beautiful activities?

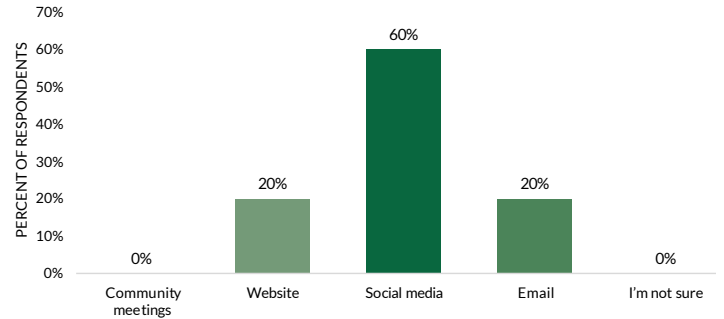


Figure 1-44.

Which of the following litter and illegal dumping prevention initiatives do you think is the most effective?

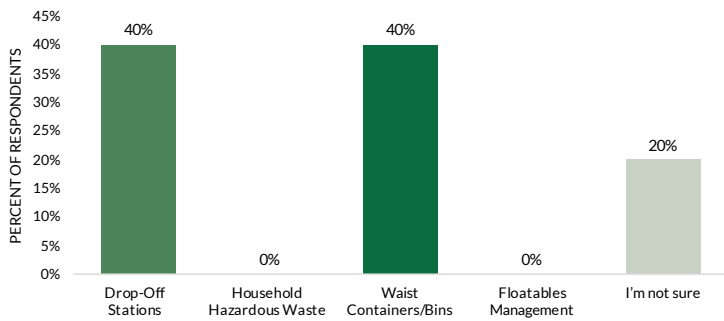


Figure 1-45.

Which of the following litter abatement initiatives do you think should be top priority for expansion?

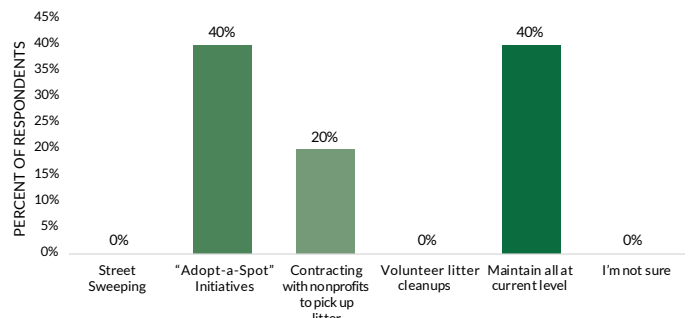


Figure 1-46.

Which of the following litter regulation and enforcement initiatives do you think would be the most effective?

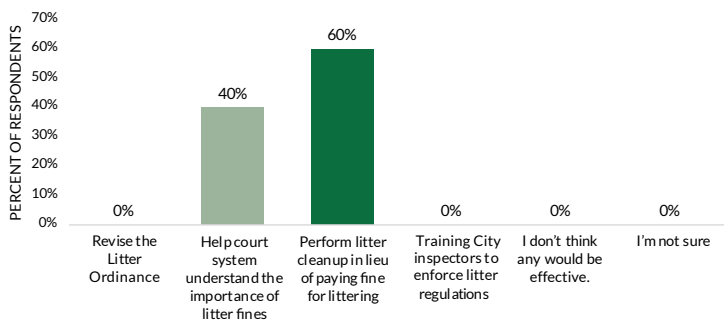


Figure 1-47.

Overall, how do you think Fort Worth's surface water quality compares with other cities?

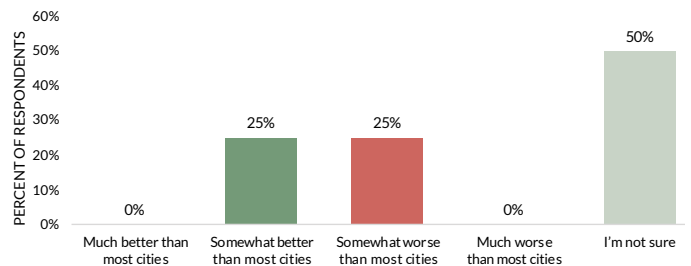


Figure 1-48.

Do you think that the city is responsive in addressing stormwater pollution events?

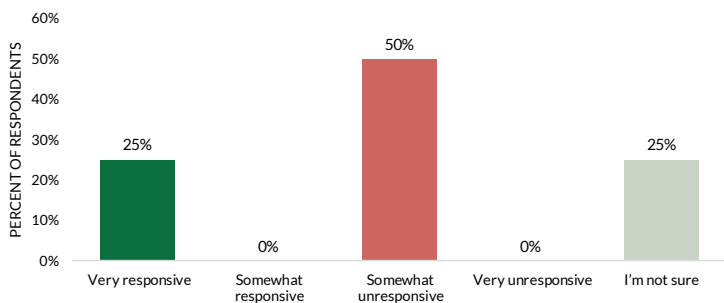


Figure 1-49.

How effective are the city's outreach efforts at informing communities about stormwater pollution prevention activities?

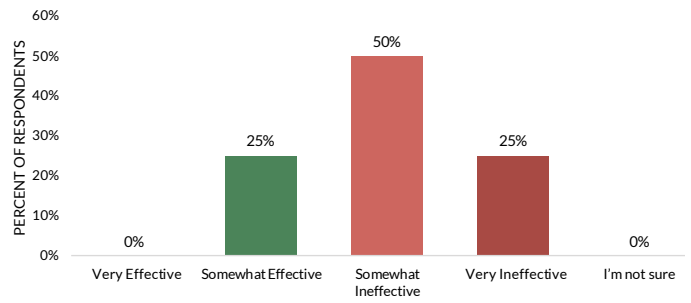


Figure 1-50.

How effective do you feel a citizen scientist program would be at monitoring pollutants in surface water?

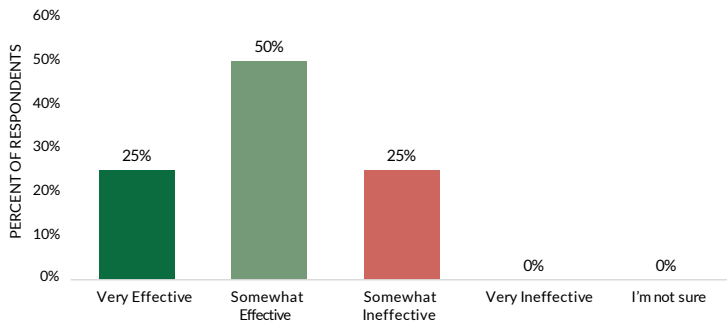


Figure 1-51.

Overall, how is the City of Fort Worth doing in protecting the city's environmental resources and reducing pollution (e.g., litter, polluted sites)?

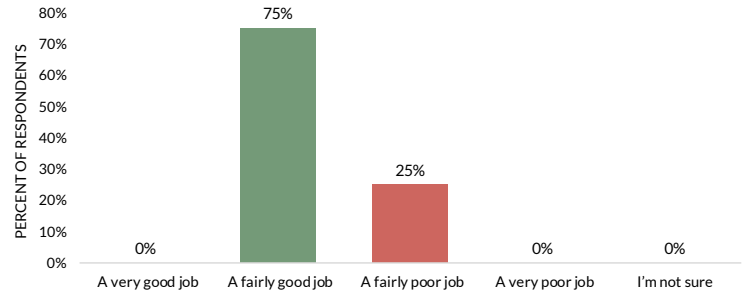
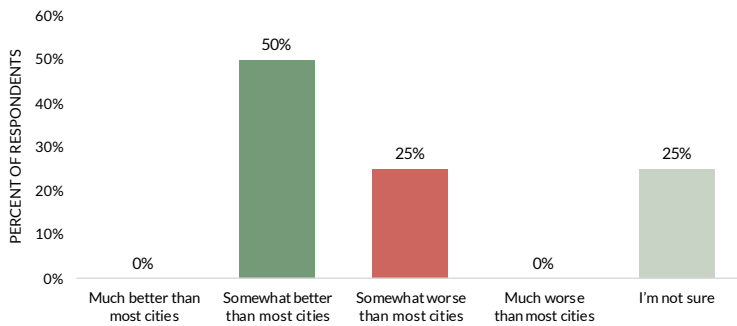


Figure 1-52.

Overall, how do you think Fort Worth's environmental programs compare with other cities?



FOCUS GROUP MEETINGS

The city held five focus group meetings, one for each chapter topic, to gather input from community members who have experience and unique perspectives regarding the environmental issues facing Fort Worth. In total, there were 74 focus group members, listed below, invited to the meetings. Their input to the Plan is tabulated in Tables 1-3 through 1-7 on the following pages.

LAND QUALITY FOCUS GROUP MEMBERS

Claude Brown (Sigma Environmental Solutions)
Jim Austin (Austin Co. Commercial Real Estate)
Katherine Bender (Habitat for Humanity)
Andre McEwing (Fort Worth Metropolitan Black Chamber of Commerce)
Mike Brennan (Near Southside, Inc.)
Donald C. Vestal (E.J. Smith Construction)
Josh Fairbanks (Tarrant County College Northwest Campus)
Bob O'Neil (Industrial Power, LLC)
Camisha Scott (EPA Region VI)
Robert Appelt, P.G. (Weston Solutions)
Erica Merideth (Crossroads Studio Art Gallery)
Margo Herrera (Fort Worth Chamber of Commerce)
Becky Johnson (Texas Christian University)
John Roberts (Historic Fort Worth, Inc.)
Frank Clark (W&M Environmental)

AIR QUALITY FOCUS GROUP MEMBERS

Jose Gonzales, Ph.D. (Center for Children's Health, Cook Children's Health Care System)
Jim Schermbeck (Downwinders at Risk)
Lori Clark (North Central Texas Council of Governments)
David Sterling, Ph.D. (University of North Texas, Health Science Center)
Elizabeth Smith (Texas Commission on Environmental Quality, Region 4)
Lairy Johnson (MillerCoors)
Rebecca Montgomery (Trinity Metro)

Mitch Whitten (Fort Worth Convention & Visitors Bureau)
Roger Duval (Dallas/Fort Worth Airport)
Denise Hernandez (Dallas/Fort Worth Community Health Workers Association)
Emery Lawson (GE Transportation)
Bill Brewer (Federal Aviation Administration)
David Lary, Ph.D. (University of Texas at Dallas)
Sherri Reed (Fort Worth Country Day)
Joel Koentz (Lockheed Martin)
Brad Bassham, RN (Cooks Children's Health Care System)
Sam Sutton (Bell Helicopter)
Shawn Reeder (Citizen's Climate Lobby)
Brandi O'Quinn (Blue Zones Project)
Ann Salyer-Caldwell, RDN/LD, MPH (Tarrant County Public Health)

SURFACE WATER QUALITY FOCUS GROUP MEMBERS

Darrel Andrews (Tarrant Regional Water District)
Carol Johnson (EPA, Region VI)
Rebecca Grassl (Tarrant County Public Health)
Brent Candler (Texas Commission on Environmental Quality)
Ray Drenner, Ph.D. (Texas Christian University)
Gary Havener (AeroCorp, LLC)
Stacy Pierce (Streams & Valleys)
Aaron Hoff (Trinity River Authority)
Derica Peters (North Central Texas Council of Governments)
Greta Bowling (Tarrant County College)
Joon Lee, Ph.D. (University of North Texas, Health Science Center)
Stephanie Coffman (Stantec)
Bill Shur (Stormwater Master Plan Resident Participant)

HAZARDOUS MATERIALS MANAGEMENT FOCUS GROUP MEMBERS

Robert Berndt (Tarrant County Transportation Department)

Greg Hubbard (Texas Wesleyan University)

Ronald Chaney Mills (City of Fort Worth Fire Department)

Ted Wyman (Texas Department of State Health Services)

Maribel Martinez (Office of Emergency Management, City of Fort Worth)

Damon Waresback (SWS Environmental Services)

Stewart Brown (Fort Worth Independent School District)

Ed Bodiford (Texas Department of Transportation, Hazardous Materials Transportation)

Becky Johnson (Texas Christian University)

Howard Maynard (Eagle Remediation and Demolition Services)

Aaron Barth (City of Fort Worth Meacham Airport)

Roger Duval (DFW International Airport)

Mike Delaney (Texas Commission on Environmental Quality)

Dave McCurdy (Tarrant County Office of Emergency Management)

LITTER CONTROL FOCUS GROUP MEMBERS

Debbie Branch (City of Fort Worth Litter Field Operations)

Keith Whitworth (Texas Christian University)

Sarah Clayton (Burlington Northern Santa Fe Railway)

Roger Doddy (North Texas Tollway Authority)

Paul Kerpoe (East Fort Worth, Inc.)

Fran Burns (Keep Fort Worth Beautiful)

Mitch Whitten (Fort Worth Convention & Visitors Bureau)

Wade Chappell (Camp Bowie District, Inc.)

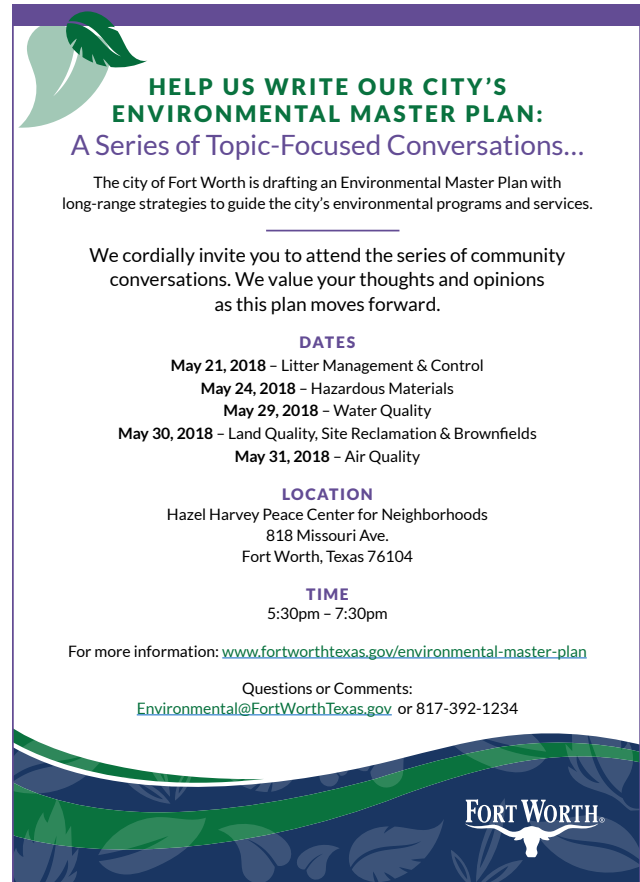
Kirsten Hamm (Presbyterian Night Shelter Clean State)

Matt Beard (Downtown Ft. Worth Inc.)

Mark Olson (Tarrant Regional Water District)

Courtney Carroll (Fort Worth Independent School District)

Ricardo Gonzalez (Texas Department of Transportation)



HELP US WRITE OUR CITY'S ENVIRONMENTAL MASTER PLAN:
A Series of Topic-Focused Conversations...

The city of Fort Worth is drafting an Environmental Master Plan with long-range strategies to guide the city's environmental programs and services.

We cordially invite you to attend the series of community conversations. We value your thoughts and opinions as this plan moves forward.

DATES

- May 21, 2018 – Litter Management & Control
- May 24, 2018 – Hazardous Materials
- May 29, 2018 – Water Quality
- May 30, 2018 – Land Quality, Site Reclamation & Brownfields
- May 31, 2018 – Air Quality

LOCATION

Hazel Harvey Peace Center for Neighborhoods
818 Missouri Ave.
Fort Worth, Texas 76104

TIME

5:30pm – 7:30pm

For more information: www.fortworthtexas.gov/environmental-master-plan

Questions or Comments:
Environmental@FortWorthTexas.gov or 817-392-1234

FORT WORTH

Figure 1-53. Focus group meeting invitation sent to participants and shared with the public.

Table 1-3. Focus group input on Land Quality programs.

QUESTION	RESPONSES (Sorted Highest to Lowest by Score)				
Which ONE Land Quality PLANNING & MGMT service should the city focus to advance first at city properties?	Soil & groundwater remediation planning (47%)	Phase I & Phase II ESAs inventories (27%)	Brownfields planning (27%)	Revised ordinances, rules and regulations (0%)	None of these (0%)
Based on the information discussed, I feel the Land Quality RECLAMATION concepts of the plan are headed in the right direction.	Agree (47%)	Strongly agree (40%)	I don't know (7%)	Disagree (7%)	Strongly disagree (0%)
Which ONE Land Quality RECLAMATION service should the city focus to develop first?	Groundwater remediation & monitoring at city properties (40%)	Brownfields redevelopment (33%)	Soil remediation projects at city properties (27%)	Substandard/hazardous structure demolition (0%)	None of these (0%)
Based on the information discussed, I feel the Land Quality COMPLIANCE concepts of the plan are headed in the right direction.	Agree (85%)	I don't know (15%)	Strongly agree (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE potential area of Land Quality COMPLIANCE should the city prioritize to advance first?	Regulatory reporting for soil & groundwater at city properties (93%)	Municipal setting designations (MSDs) (7%)	Environmental use/license agreements (0%)	Environmental easement vacations (0%)	None of these (0%)
Based on the information discussed, I feel the Land Quality COMMUNICATIONS & COLLABORATION concepts of the plan are headed in the right direction.	Agree (50%)	Strongly agree (50%)	Disagree (0%)	Strongly disagree (0%)	I don't know (0%)
Which ONE age group of residents / visitors should the city prioritize to engage?	College/university & young adult (47%)	Elementary / middle school ages (27%)	Individuals between 30 and 55 (20%)	Individuals over the age of 55 (7%)	High school ages (0%)
Which ONE Land Quality COMMUNICATION service should the city focus to develop first?	Targeted audience campaigns (e.g., commercial real estate agents, developers) (43%)	Website, social media and partner conversations (e.g., brownfields summit) (36%)	General public educ. campaigns (e.g., land quality awareness campaigns, awards & recognitions) (21%)	School education programming (e.g., land quality awareness education development) (0%)	None of these (0%)
Which ONE of the following items should the city prioritize for a campaign development?	Brownfields (69%)	Phase I, Phase II ESAs & cleanup plans / site remediation (15%)	Soil & groundwater pollution & projects (15%)	Substandard / hazardous structures (environmental demolitions) (0%)	Env. use, license & agreements (0%) / None of these (0%)
Based on the information discussed, I feel the Land Quality components of the plan are headed in the right direction.	Agree (85%)	Strongly agree (15%)	Disagree (0%)	Strongly disagree (0%)	I don't know (0%)

Table 1-4. Focus group input on Air Quality programs.

QUESTION	RESPONSES (Sorted Highest to Lowest by Score)				
Which ONE Air Quality PLANNING & MGMT service should the city focus to advance first?	Implement air quality projects/ technologies (50%)	Increased analysis & metrics for monitoring & inspections (31%)	Consider revisions to city ordinances to decrease pollutant sources (19%)	Create local-level air quality permits (0%)	None of these (0%)
Based on the information discussed, I feel the Air Quality MONITORING concepts of the plan are headed in the right direction.	Agree (53%)	Strongly agree (29%)	I don't know (12%)	Disagree (6%)	Strongly disagree (0%)
Which ONE Air Quality MONITORING service should the city focus to develop first?	Particulate matter / dusts (50%)	Ozone (nitrogen oxides & VOCs) (19%)	Carbon monoxide & methane (12%)	Biological threats (12%)	Odor (0%) / None of these (6%)
Based on the information discussed, I feel the Air Quality COMPLIANCE concepts of the plan are headed in the right direction.	Agree (64%)	I don't know (21%)	Strongly agree (14%)	Disagree (0%)	Strongly disagree (0%)
Which ONE potential source of Air Quality pollution should the city prioritize for COMPLIANCE?	Issues at industrial sites (e.g. manufacturing/ processing ops.) (50%)	Issues at commercial sites (e.g., gas stations, automotive repair) (22%)	Issues at construction sites (17%)	None of these (11%)	Issues at residential properties (0%)
Based on the information discussed, I feel the Air Quality COMMUNICATIONS & COLLABORATION concepts of the plan are headed in the right direction.	Agree (56%)	Strongly agree (39%)	I don't know (6%)	Disagree (0%)	Strongly disagree (0%)
Which ONE age group of residents / visitors should the city prioritize to engage?	High school ages (37%)	Elementary / middle school ages (25%)	Individuals between 30 and 55 (25%)	Individuals over the age of 55 (6%)	College/university & young adult (6%)
Which ONE Air Quality COMMUNICATION service should the city focus to develop first?	General public educ. campaigns (e.g., awareness campaigns, awards & recognitions) (41%)	Targeted audience campaigns (e.g., contractors; site operators) (41%)	Website, social media and partner conversations (e.g., air quality summit) (18%)	School education programming (e.g., air education development) (0%)	None of these (0%)
Which ONE of the following Air Quality pollutants should the city prioritize for a campaign development?	Ozone (nitrogen oxides & VOCs) (50%)	Particulate matter / dusts (37%)	Carbon monoxide & methane (12%)	Biological threats (0%)	Odor (0%) / None of these (0%)
Based on the informaton discussed, I feel the Air Quality components of the plan are headed in the right direction.	Agree (76%)	Strongly agree (18%)	I don't know (6%)	Disagree (0%)	Strongly disagree (0%)

Table 1-5. Focus group input on Surface Water Quality programs.

QUESTION	RESPONSES (Sorted Highest to Lowest by Score)				
Which ONE Surface Water Quality PLANNING & MGMT service should the city focus to advance first?	Develop long-range watershed management plans (30%)	Consider revisions to city ordinances to decrease pollutant sources (25%)	Implement surface water quality projects/ technologies (25%)	Increased analysis & metrics for monitoring & inspections (20%)	Create local-level water quality permits (0%) / None of these (0%)
Based on the information discussed, I feel the Surface Water Quality MONITORING concepts of the plan are headed in the right direction.	Agree (58%)	Strongly agree (42%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE Surface Water Quality MONITORING service should the city focus to develop first?	Indicator bacteria (38%)	Stream health (38%)	Dry weather (19%)	Wet weather & regional wet weather (5%)	None of these (0%)
Based on the information discussed, I feel the Surface Water Quality COMPLIANCE concepts of the plan are headed in the right direction.	Agree (60%)	Strongly agree (30%)	Disagree (10%)	I don't know (0%)	Strongly disagree (0%)
Which ONE potential source of Surface Water Quality pollution should the city prioritize for COMPLIANCE?	Issues at industrial sites (e.g., salvage yards, manufacturing/ processing ops.) (61%)	Issues at construction sites (33%)	Issues at commercial sites (e.g., gas stations, automotive repair) (6%)	Issues at residential properties (0%)	None of these (0%)
Based on the information discussed, I feel the Surface Water Quality COMMUNICATIONS & COLLABORATION concepts of the plan are headed in the right direction.	Agree (61%)	Strongly agree (39%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE age group of residents / visitors should the city prioritize to engage?	Elementary / middle school ages (44%)	Individuals between 30 and 55 (22%)	College/university & young adult (17%)	High school ages (17%)	Individuals over the age of 55 (0%)
Which ONE Surface Water Quality COMMUNICATION service should the city focus to develop first?	Targeted audience campaigns (e.g., contractors; site operators) (50%)	School education programming (e.g., surface water education development) (28%)	Website, social media and partner conversations (e.g., water quality summit) (22%)	General public educ. campaigns (e.g., awareness campaigns, awards & recognitions) (0%)	None of these (0%)
Which ONE of the following Surface Water Quality pollutants should the city prioritize for a campaign development?	Bacteria/pathogens (39%)	Pesticides/ fertilizers/ herbicides & yard clippings (28%)	Household hazardous waste (11%)	Automotive fluids (11.11%) / Litter & floatables (11%)	Sediment (0%) / None of these (0%)
Based on the information discussed, I feel the Surface Water Quality components of the plan are headed in the right direction.	Agree (53%)	Strongly agree (47%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)

Table 1-6. Focus group input on Hazardous Materials (HazMat) management programs.

QUESTION	RESPONSES (Sorted Highest to Lowest by Score)				
Which ONE HazMat PLANNING & MGMT service should the city focus to advance first at city properties?	Emergency response (50%)	Petroleum & natural gas (29%)	Mold/biological hazards (21%)	Asbestos & lead-based paint (0%)	None of these (0%)
Based on the information discussed, I feel the HazMat MITIGATION concepts of the plan are headed in the right direction.	Agree (71%)	Strongly agree (29%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE HazMat MITIGATION service should the city focus to develop first?	Asbestos & lead paint removal (41%)	Household hazardous waste disposal (35%)	Spill response & release disposal (12%)	Petroleum & natural gas products removal (6%)	None of these (6%)
Based on the information discussed, I feel the HazMat COMPLIANCE concepts of the plan are headed in the right direction.	Agree (100%)	Strongly agree (0%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE potential source of HazMat should the city prioritize for COMPLIANCE?	Issues at industrial/commercial sites (53%)	Issues in soil & groundwater (24%)	Issues at residential properties (12%)	Issues on roads (i.e., transportation of HazMat) (6%)	None of these (6%)
Based on the information discussed, I feel the HazMat COMMUNICATIONS & COLLABORATION concepts of the plan are headed in the right direction.	Agree (71%)	Strongly agree (21%)	Disagree (7%)	I don't know (0%)	Strongly disagree (0%)
Which ONE age group of residents / visitors should the city prioritize to engage?	Individuals between 30 and 55 (50%)	High school ages (19%)	Elementary / middle school ages (19%)	College/university & young adult (6%)	Individuals over the age of 55 (6%)
Which ONE HazMat COMMUNICATION service should the city focus to develop first?	General public educ. campaigns (e.g., HazMat awareness campaigns, awards & recognitions) (50%)	Website, social media and partner conversations (e.g., HazMat summit) (29%)	Targeted audience campaigns (e.g., commercial waste haulers, building contractors) (14%)	School education programming (e.g., HazMat awareness education development) (7%)	None of these (0%)
Which ONE of the following items should the city prioritize for a campaign development?	Household hazardous waste (75%)	Spills & HazMat release (13%)	Molds & other biological hazards (6%)	None of these (6%)	Petroleum products & natural gas (0%) / Asbestos & lead-based paint (0%)
Based on the information discussed, I feel the HazMat components of the plan are headed in the right direction.	Agree (73%)	Strongly agree (27%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)

Table 1-7. Focus group input on Litter Control programs.

QUESTION		RESPONSES (Sorted Highest to Lowest by Score)			
Which ONE litter PREVENTION service should the city focus to develop first?	Placement of cans/ bins (53%)	Trash racks/booms in rivers & streams (32%)	Litter control fencing (11%)	Drop-off stations & the environmental collection center (5%)	None of these (0%)
Based on the information discussed, I feel the litter ABATEMENT (clean-up) concepts of the plan are headed in the right direction.	Agree (72%)	Strongly agree (28%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE litter ABATEMENT service should the city focus to develop first?	Volunteer clean-ups (e.g., Cowtown Cleanup & site adoption) (47%)	Contractual services (e.g. Clean Slate, mowing contracts) (42%)	Street-sweeping services (5%)	City staff abatement crews (e.g., abatement crew) (5%)	None of these (0%)
Based on the information discussed, I feel the litter ENFORCEMENT concepts of the plan are headed in the right direction.	Agree (76%)	Strongly agree (18%)	I don't know (6%)	Disagree (0%)	Strongly disagree (0%)
Which ONE potential source of litter should the city prioritize to ENFORCE?	Uncontrolled parking lots, fast-food restaurants & convenience stores (63%)	Worksites (loading docks, construction & demolition sites) (16%)	Motorists, pedestrians & unsecured truckloads (11%)	Residential & commercial garbage cans & dumpsters (11%)	None of these (0%)
Based on the information discussed, I feel the litter COMMUNICATIONS & COLLABORATION concepts of the plan are headed in the right direction.	Agree (72%)	Strongly agree (28%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE age group of residents / visitors should the city prioritize to engage?	Elementary / middle school ages (56%)	Individuals between 30 and 55 (25%)	High school ages (19%)	Individuals over the age of 55 (0%)	College/university & young adult (0%)
Which ONE litter COMMUNICATION service should the city focus to develop first?	School Education Programming (e.g., school green teams and after-school programs) (39%)	Website, social media and partner conversations (e.g., Litter Summit) (28%)	Targeted audience campaigns (e.g., commercial dumpsters, fast-food industry) (22%)	General public educ. campaigns (e.g., Reverse Litter, awards & recognitions) (11%)	None of these (0%)
Which ONE of the following items should the city prioritize for campaign development?	Beverage containers (e.g, glass bottles, foam cups, plastic cups/ bottles) (76%)	Containers from restaurants & fast-food (18%)	Bulk items (e.g, mattress, tires, furniture, appliances) (6%)	Cigarette butts (0%)	Plastic bags (0%) / None of these (0%)
Based on the information discussed, I feel the litter components of the plan are headed in the right direction.	Agree (71%)	Strongly agree (29%)	I don't know (0%)	Disagree (0%)	Strongly disagree (0%)
Which ONE volunteer program should the city prioritize?	Volunteer-initiated clean-ups (one-time) (47%)	Citywide special events (e.g. Cowtown Cleanup, Litter Stomp) (24%)	Site adoptions / "Adopt-A" Program (long-term) (24%)	Commercial / corporate one-time clean-ups (18%)	None of these (0%)

1.6. Other Important Topics

There are a wide variety of environmental and sustainability topics that are important to the City of Fort Worth and related to the mission of the Environmental Quality Division that are not specifically addressed within the chapters of this Plan. This Plan is intended to provide guidance on environmental programs with regulatory oversight and compliance requirements. Resources for additional information, by topic, is provided.

URBAN HEAT ISLAND EFFECT

The term *heat island* is defined by the EPA as developed areas that are hotter than nearby rural areas. This phenomenon is a contributing factor to the formation of air pollution and increases ambient temperatures up to 10 degrees Fahrenheit in the urbanized areas. The NCTCOG notes that the urban heat island effect is a growing concern in the region as temperatures rise and greenspaces are cleared for development. To address this concern, the city has conservation initiatives and strategies in place to reduce the effects of the urban heat island on air quality and improve overall environmental quality. These include implementing cost-effective energy efficiency measures and annually reporting progress to the State Energy Conservation Office. Please see the 2018 City of Fort Worth Comprehensive Plan for additional information (Reference 1-2).

POLLINATORS

The Texas Parks and Wildlife Department (TPWD) notes that pollination is a critical ecosystem service that helps to maintain the integrity of native plant communities and ensures production of agricultural crops. The majority of pollination is achieved by four insect orders, bees and wasps (*Hymenoptera* spp.), flies (*Diptera* spp.), butterflies and moths (*Lepidoptera* spp.), and beetles (*Coleoptera* spp.). Every year, billions of dollars in crops are pollinated by honey bees and native pollinators. In recent decades, pollinator populations have declined rapidly due to a variety of reasons, including habitat loss, disease and pesticide use. A concerted effort is underway to increase native habitat that pollinators rely on for food and shelter. Because more than 94 percent of the land in Texas is privately owned, effective conservation can only be obtained through private landowner engagement and involvement. For more information on pollinators and

how to help them, please visit the Fort Worth Nature Center & Refuge: Pollinator Prairie Patch; TPWD; and U.S. Fish & Wildlife Service: Pollinators and your local Texas A&M AgriLife Extension Service Office.



Figure 1-54. Milkweed is critical to the monarch, as it is the only plant on which the butterfly will lay its eggs, photo by Tom Koerner, US Fish & Wildlife Service.

SUSTAINABILITY

Sustainability is balancing the needs of people, the environment and the economy in daily operations in a renewable way that ensures these needs will be met in the future. Sustainability is incorporated into all elements of this Plan. As noted in the 2018 City of Fort Worth Comprehensive Plan, “How the city chooses to grow and develop can significantly affect the quality and sustainability of our environment – in both positive and negative ways.” Implementation of improved planning techniques to account for future growth and development results in more desirable and sustainable neighborhoods, ensures robust economic opportunities and creates long-term value for residents. The city established a sustainability task force to implement a comprehensive sustainability action plan for the city. For additional information on this, please see the 2018 City of Fort Worth Comprehensive Plan (Reference 1-2); or visit the websites for the City of Fort Worth Sustainability; Texas Commission on Environmental Quality; or the EPA: Sustainability.



Figure 1-55. Incorporating trees and vegetation into an urban plaza at Tarrant County College campus is an example of sustainable design, photo by City of Fort Worth.

ENDANGERED SPECIES, NATIVE PLANTS & NATURAL HABITATS

Animal and plant species of conservation concern may be listed as threatened or endangered under the U.S. Endangered Species Act (ESA) or under the authority of Texas state law. In Tarrant County, there are 28 species listed as either threatened or endangered. In the greater Fort Worth area, there are four primary North Central Texas ecosystems, which include the Grand Prairie, Western Cross Timbers, Eastern Cross Timbers and the Trinity River Bottomland. Ensuring the preservation of native plants and natural habitat in these ecosystems, including the endangered Blackland Prairie (less than 1 percent remaining as of 2018), is important for the protection of threatened and endangered species. As one community resource, the City of Fort Worth Nature Center & Refuge includes a 3,621-acre natural area and provides education to residents about the preservation and protection of Fort Worth's natural areas. Additionally, the TPWD is working to be a recognized leader in implementing natural resource conservation programs that effectively manage and protect Texas ecosystems. For additional information about threatened or endangered species in Fort Worth or the conservation of natural habitat, please see the 2018 City of Fort Worth Comprehensive Plan; Preserving Native Texas: A Master Plan for the Fort Worth Nature Center & Refuge; or the Texas Wildlife Action Plan (TPWD). More information can also be found at the Fort Worth Park & Recreation Department, the Native Plant Society of Texas, or TPWD websites, or through your local Texas A&M AgriLife Extension Service.



Figure 1-56. The Texas horned lizard is currently listed as threatened within the State of Texas, photo from TPWD.

WILDLIFE CORRIDORS

Wildlife corridors are defined as continuous tracts of land or habitat that allow wildlife to travel from one location to another for breeding, shelter or food. They are important because they help to ensure genetic exchange between wildlife populations. Challenges to wildlife corridors include urbanization, highways and agriculture. To combat these challenges, state and federal agencies have implemented land management practices to preserve existing and create new wildlife corridors. For example, the State of Texas Department of Transportation (TxDOT), along with private partners and other state and federal agencies implemented a program to create a “monarch highway” to provide native habitat for pollinators and the monarch butterfly as it travels along its seasonal migration route. For more information about these controls and maintenance practices, please read the Wildlife Management Activities and Practices: Comprehensive



Figure 1-57. Wild flowers are planted along TxDOT roads and highways to support the monarch butterfly on its annual migration, photo from TxDOT.

Wildlife Management Planning Guidelines or the Texas Wildlife Action Plan. Additional information is also available at the TPWD, National Fish and Wildlife Foundation or U.S. Fish & Wildlife Service websites.

GREENSPACES

Greenspaces are areas of trees, grass or other natural habitats set aside for environmental, recreational and aesthetic purposes in urban environments. Not only do greenspaces preserve mature trees and natural habitat, they benefit the community through improved air quality, resident health, aesthetics and property value. The city provides greenspaces for its residents through the development of neighborhood parks and trails, and by incorporating natural habitats into public spaces. The city's Park & Recreation Department maintains more than 200 parks and public spaces citywide, including the Fort Worth Nature Center & Refuge, the largest city-owned nature center in the United States. For more information about greenspaces, please visit the Fort Worth Parks & Recreation Department and Trinity River Vision Authority websites, or access the Parks, Recreation and Open Space Master Plan.

URBAN FORESTRY



Figure 1-58. Deer in the Fort Worth Nature Center & Refuge, photo from Fort Worth Nature Center.

Urban forestry is generally defined as the management of tree populations in urban settings for the purpose of improving the environment and providing aesthetic benefits. In Fort Worth, the Urban Forestry Compliance Section within the Planning & Development Department implements and enforces the city's Urban Forestry Ordinance, which protects trees and works to achieve the city's goal of 30 percent canopy cover. This ordinance requires permits to be obtained prior to tree removal or, under some circumstances, prior to obtaining a building permit. The Forestry Section of

the Park & Recreation Department operates the tree farm, where trees are grown from seeds and acorns harvested from the best trees in the city. Crews offer citizen forestry training, volunteer opportunities and grants to provide trees to Fort Worth communities. When they are ready, the trees grown at the tree farm are transplanted to parks and public spaces throughout the city and maintained by the Forestry Section. For more information about Fort Worth's urban forestry initiatives, please visit the Planning & Development - Urban Forestry Compliance Section and the Park & Recreation - Forestry Section on the city's website. For more information on the national urban forest programs, please visit the U.S. Forest Service.

WATER CONSERVATION PRACTICES

Fresh water is a limited resource, making up approximately three percent of the world's water. The city has taken action to ensure the security of Fort Worth's water supply, which includes implementation of a drought management plan, conservation plan, conservation ordinance and irrigation ordinance. Additionally, the Water Department has developed a reuse water program for non-domestic uses, including industrial uses, irrigation of golf courses, cemeteries, playing fields, parks and nonresidential landscaped areas. As part of this plan, the Water Department secured funds from the American Recovery and Reinvestment Act (ARRA) to design and construct a series of water lines and a pump station to distribute reuse water in the eastern portion of the city. For more information about water conservation practices in Fort Worth, please read the 2018 City of Fort Worth Comprehensive Plan (Reference 1-2) or visit the Fort Worth Water Department: Save Fort Worth Water website.



Figure 1-59. Drought-resistant, native landscaping in front of Fort Worth City Hall, photo by City of Fort Worth.

LOCAL FOOD SYSTEMS

A local food system is a collaborative network that provides residents and communities access to healthy, locally produced food. This system benefits the producers as well as the local communities, and strengthens the economic, environmental, nutritional and social health of the region. A strong local food system helps reduce food deserts while promoting stewardship activities through community gardens and urban farming. For more information about local food systems initiatives around Fort Worth, please visit the Grow North Texas and Tarrant County Food Policy Council websites. For information on national initiatives, please see the U.S. Department of Agriculture Alternative Farming Systems Information Center.

RECYCLING & COMPOSTING

Recycling and composting are two environmentally friendly methods of handling waste that help keep material out of landfills and reduce environmental impacts of waste by converting it into a valuable product. The primary difference between recycling and composting is the type of materials involved. Composting is the process by which organic materials, like vegetable clippings, newspapers and grass cuttings are biologically decomposed into compost. Recycling takes manufactured products, such as plastics or aluminum, and converts them into a material for a new use. This process reduces both the quantity of materials going to the landfill and the need for raw materials for manufacturing processes. Fort Worth has implemented both recycling and composting programs within the community, which includes the Environmental Collection Center, four drop-off

stations and the Compost Outpost. The city has a separate green waste program that takes clean tree and bush trimmings and turns them into free mulch for residents. The city also works with the State of Texas Alliance for Recycling (STAR) to host a Master Composting Program for interested residents. For additional information about recycling and composting programs in Fort Worth, please visit Keep Fort Worth Beautiful: Compost Outpost, and the 2017 Fort Worth Comprehensive Solid Waste Management Plan.

RENEWABLE ENERGY & ENERGY CONSERVATION

As noted in the 2018 City of Fort Worth Comprehensive Plan, Fort Worth has nearly doubled its population and its annual energy consumption since 1970. According to the U.S. Department of Energy, in 2009 the state of Texas ranked first in consumption of electricity, petroleum, natural gas and coal. Most electricity in Texas is still generated using fossil fuels and according to the Texas Commission on Environmental Quality, the electric industry is a major source of air pollution in the state. To reduce these impacts, both the State of Texas and the City of Fort Worth have adopted energy efficiency performance standards and energy reduction consumption plans. Texas is also investing in renewable energy. The state is the largest producer of wind energy in the country and has the potential to be the largest producer of solar energy. This sector is growing rapidly and provides significant economic benefits, such as expanding the green job market. For more information about Fort Worth's energy conservation efforts, please see the 2018 City of Fort Worth Comprehensive Plan (Reference 1-2). For



Figure 1-60. Recycling materials sorted and collected in bails at a materials recovery facility (MRF), photo by City of Fort Worth.



Figure 1-61. Solar-powered kiosk at a bike share station, photo by City of Fort Worth.

additional information about the energy conservation policies for Texas, please see the Texas Legislature, Senate Bill 5, the Texas Emission Reduction Plan. For more information regarding the renewable energy industry in Texas, please view The Texas Renewable Energy Industry (2014) report by Texas Wide Open for Business.

OIL & NATURAL GAS OPERATIONS

Hydraulic fracturing, or “fracking,” is an oil and natural gas extraction process by which high-pressure, water-based mixtures are pumped into drilled wells to create fissures in the surrounding rock that releases the stored petroleum products. In Fort Worth, fracking has been restricted within the city limits. For more information about regulations regarding oil and natural gas operations, please see the Texas Railroad Commission, the Texas Commission on Environmental Quality or contact the City of Fort Worth Planning & Development Department.

1.7. City Planning Collaboration

It was a priority to ensure that the Plan incorporated the latest information available and that lessons learned from previous planning activities were incorporated. As such, this plan integrated inputs from a larger cross-functional team of the City of Fort Worth departments that included: the Environmental Quality, Solid Waste and Consumer Health Divisions of the Code Compliance Department, Administrative Services, Neighborhood Services Department, Property Management Department, and Planning & Development Department.

The city master plans reviewed and incorporated by reference in this Plan include:

- City of Fort Worth Comprehensive Plan (2018)
- Comprehensive Solid Waste Management Plan (September 2017)
- Stormwater Management Program Master Plan (2018)
- Fort Worth Public Art Master Plan Update (2017)
- Park, Recreation and Open Space Master Plan (2015)
- Fort Worth Parks & Recreation, Preserving Native Texas: A Master Plan for the Fort Worth Nature Center & Refuge (2003)

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- 1-1. City of Fort Worth Economic Development. 2018. *Overview/Geography & Climate*. Retrieved from <<http://www.fortworthcodev.com/fort-worth-overview>> (accessed on July 5, 2018).
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1.9. Acknowledgements

The City of Fort Worth acknowledges and is thankful for the efforts of all stakeholder group members, focus group members, community survey respondents and residents who provided input during the development of the Plan. In addition to these community members, the City of Fort Worth acknowledges staff members and consulting staff who supported the development of the Plan.

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Cary Moon, District 4
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Jungus Jordan, District 6
Dennis Shingleton, District 7
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Mark Brast, District 4
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Armard Anderson, District 6
Edward Deegan, District 7
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Rich Hyde, Alternate
Robert Kelly, Alternate

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Will Northern, Chair, District 1
Wanda Conlin, Vice Chair, District 8
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CHAPTER 2

Land Quality

*Addressing environmental concerns
in soil, groundwater, and the built
environment*

GOALS

- Ensure city compliance with federal and state environmental regulations for soil, groundwater and the built environment.
- Reduce impacts of soil and groundwater pollution to the environment and human health.
- Mitigate blight and encourage the revitalization of previously-developed properties and brownfields.
- Provide expert environmental inspection and monitoring services for land assets.
- Provide technical guidance, outreach and education to encourage environmental stewardship of land resources.



LAND QUALITY AT-A-GLANCE

Land Quality Planning & Management Program Area

Fort Worth has seen a dramatic increase in both population and land area over the last century; this trend is expected to continue well into the future. Continuous growth has strained available land resources and created a high demand for infill development near the city center. Land Quality Section staff promote responsible land management by analyzing historical land use trends and performing environmental site assessments (ESAs) on impacted properties. This environmental due diligence helps the city make more informed decisions when purchasing property, maintaining compliance with state and federal regulations and developing local ordinances to prevent future soil and groundwater pollution. Data collected from ESAs provide the basis for effective land planning, including prioritizing remediation activities on city-owned properties, which are often large-scale multi-year projects. Section staff stay current on industry practices and technologies that improve the efficacy of these projects and maximize existing resources.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- Land Quality Analysis
- Land Quality Planning
- Land Quality Rules & Regulations
- Land Quality Projects & Technologies

Land Reclamation Program Area

The City of Fort Worth supports responsible growth by encouraging brownfields redevelopment and addressing environmental concerns on city properties. Remediation activities performed by the city include the removal of leaking petroleum storage tanks, remediation of contaminated soils, as well as ongoing testing and monitoring of soil and groundwater. The city also supports residents and community partners through

the demolition and removal of substandard structures. These efforts have resulted in the transfer, development or redevelopment of properties that would have otherwise remained underutilized or blighted. Through brownfields redevelopment, environmental remediation projects and substandard structure demolitions, the city is improving the economic value of land, expanding the tax base and increasing surrounding property values. This promotes community pride by reducing blighted areas, as well as illegal dumping and related crimes.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- Brownfields Redevelopment
- Environmental Site Assessments
- Soil & Groundwater Remediation & Groundwater Monitoring
- Substandard Building Demolitions

PROGRAM AREAS

- Land Quality Planning & Management
- Land Reclamation

- Land Quality Compliance
- Land Quality Communication & Collaboration

Land Quality Compliance Program Area

Land Quality Section staff oversee programs and permits with regulatory requirements at the federal, state and local levels. This includes the application process for municipal setting designations (MSDs), which certify that historically contaminated groundwater at a property is prohibited from future use as potable water. This allows for the development

of properties that would have otherwise required cost-prohibitive remediation activities. Environmental staff work with private land owners and businesses when they need access to city rights-of-way or other public properties to conduct subsurface sampling or install monitoring wells to track any potential migration of pollution between public and private properties. They also process applications from land owners wishing to abandon environmental easements on their properties. Environmental staff audit municipal facilities and provide guidance on compliance with environmental regulations and reporting requirements.



PHOTO COURTESY DAVID WILBANKS, 2007

KEY ACTIVITIES

- Municipal Setting Designations
- Environmental Use & License Agreements & Easement Vacations
- Municipal Facility Compliance
- Regulatory Reporting

Land Quality Communication & Collaboration Program Area

Section staff provide training and technical guidance to other departments to help them achieve and maintain compliance with environmental regulations. Public notices, announcements and other important information are distributed by city communications staff in coordination with section staff to both internal and external audiences. Staff may also

directly communicate information to the public through forums, hearings or door-to-door visits to ensure residents know about demolition operations and redevelopment plans in their neighborhoods. Collaborations with community partners, including developers, academic institutions, government agencies and other organizations, are vital to the success of Land Quality programs. Staff work with these partners, support volunteer efforts and attend outreach events to promote responsible management of the city's land resources.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Why do we need Land Quality programs in our community?

Land Quality programs facilitate the development of impaired properties by reducing or eliminating environmental pollution. This results in improved public safety and health, increased property values, improved aesthetics and reduced crime.

TO PROMOTE PUBLIC SAFETY AND HEALTH.



Protects our community members and visitors from being exposed to pollution in soil, groundwater and the built environment



Removes environmental hazards and unsafe structures from our neighborhoods

TO CREATE AND MAINTAIN A CLEAN, ATTRACTIVE CITY.



Fosters pride in our community



Reduces blight in our neighborhoods

TO PROMOTE QUALITY OF LIFE AND A SUSTAINED ECONOMY.



Reduces illegal dumping and other crimes associated with abandoned structures



Supports development and revitalization, and increases surrounding property values and the city's tax base

Executive Summary

North Central Texas has experienced a rapid increase in population since the turn of the century, spurring economic growth and the development of land resources throughout the region. Fort Worth has already experienced significant growth in population, and incorporated land area is expected to continue to grow significantly in the coming decades, bringing in new residents, businesses and industries. This has increased the diversity of land uses in both urban and suburban areas and resulted in the need to develop or redevelop properties with potential environmental impacts. Land Quality Section staff oversee city programs related to soil and groundwater assessment, remediation and monitoring, as well as environmental rules and regulations concerning municipal properties and community redevelopment. Staff provide technical guidance and information to stakeholders in the community to help them overcome the challenges commonly associated with revitalizing properties that have known impacts, as well as potential historical contamination. Section staff also serve as the internal environmental experts for all city facilities and operations where pollution from the built environment is a concern, and provide training and technical guidance on regulatory matters. The Land Quality Section provides vital services that improve the health and well-being of our community, both economically and environmentally. The Land Quality Section:

- Completes an average of 50 Phase I and/or Phase II ESAs annually, supporting all city operations.
- Facilitates the transfer, development or redevelopment of over 100 properties each year. Since 1999, the Brownfields Program has helped remediate environmental hazards to support redevelopment of Fort Worth landmarks, such as LaGrave Field.
- Plans and executes environmental remediation activities at impacted properties with contaminated soil and groundwater.
- Provides technical assistance to MSD applicants, facilitating 28 MSD regulatory closures and the redevelopment of over 3,000 acres of land with groundwater impacts since 2005.
- Plans and executes approximately 60 substandard structure demolitions each year on residential and/or commercial properties.



Figure 2-1. Environmental staff worked with numerous properties near Vickery Boulevard to ensure proper environmental reviews and remediation occurred in preparation for the Chisolm Trail Parkway project.

2.1 Key Terms

AAI – All Appropriate Inquiry
BRLF – Brownfields Revolving Loan Fund
BSC – Building Standards Commission
CERCLA – Comprehensive Environmental Response, Compensation and Liability Act
CIP – Capital Improvement Plan
EPA – Environmental Protection Agency
ESA – Environmental Site Assessment
FIFRA – Federal Insecticide, Fungicide, and Rodenticide Act
GIS – Geographic Information Systems
GPR – Ground Penetrating Radar
HUD – Housing and Urban Development
IOP – Innocent Owner Program
MSD – Municipal Setting Designation
NEPA – National Environmental Policy Act
NPO – Nonprofit Organization
NGO – Nongovernmental Organization
PCBs – Polychlorinated Biphenyls
PCE – Perchloroethylene
PCLs – Protective Concentration Levels
PST – Petroleum Storage Tank
REC – Recognized Environmental Condition
RFQ – Request for Qualifications
SARA – Superfund Amendments and Reauthorization Act
TSCA – Toxic Substances Control Act
TCEQ – Texas Commission on Environmental Quality
TRRP – Texas Risk Reduction Program
VCP – Voluntary Cleanup Program

2.2 Introduction to Land Quality

Fort Worth has a rich industrial and agricultural history stretching back during a time when the environmental impacts of chemicals and materials used for these activities were not as well-understood or well-defined as they are today, and pollution was less regulated. Over time, pollution from both surface and subsurface contaminants migrates into the soil and groundwater on these sites and neighboring properties, where it can remain for decades. In addition to soil and groundwater issues, many structures, including office buildings, homes and factories, were constructed with materials that are now regulated as environmental contaminants that pose risks to human health, such as lead paint and asbestos. These legacy contaminants have led to current issues on properties that must be addressed before they can be redeveloped or renovated, often at a substantial cost.

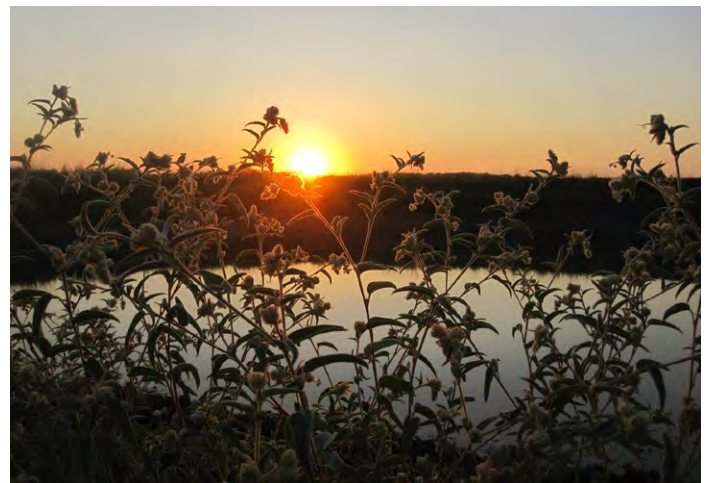


Figure 2-2. A view of the sunset in Fort Worth over wildflowers, photo courtesy Roger Grantham.

In 1976, the Toxic Substances Control Act (TSCA) established the U.S. Environmental Protection Agency's (EPA)'s authority to regulate and restrict the use of chemical substances and mixtures, as well as set reporting, record-keeping and testing requirements (Reference 2-1). The EPA maintains a TSCA inventory of regulated chemicals, including the common environmental contaminants polychlorinated biphenyls (PCBs), asbestos and lead-based paint (Reference 2-1). The TSCA established a foundation for regulating common pollutants to protect human health and the environment, and to prevent future contamination of soil and groundwater. In 2016, the Frank R. Lautenberg Chemical Safety for the 21st Century Act updated

the TSCA to provide clear guidelines, timelines and funding to the EPA for chemical evaluation and other regulatory responsibilities (Reference 2-2). The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), passed in 1996, requires that all pesticides distributed or sold in the U.S. be registered through the EPA (Reference 2-3). These laws were designed to further reduce the risks associated with chemical use and application.

To manage sites with environmental impacts, including legacy contamination, a series of laws were passed establishing remediation guidelines and responsible parties. The 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; i.e. Superfund) governs the remediation of hazardous waste on properties that are abandoned or not properly managed, and the cleanup of spills and other emergency releases of pollutants (Reference 2-4). In 1986, the Superfund Amendment and Reauthorization Act (SARA) established the innocent purchaser defense for purchasers who performed all appropriate inquiries (AAI) into the history of a property and found no environmental concerns (Reference 2-4). In 2002, the Small Business Liability Relief and Brownfields Revitalization Act (i.e. Brownfields Amendments) to CERCLA required the EPA to develop regulations and standard practices for AAI. The AAI Final Rule established ASTM International Standard E1527-13 “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process” (Reference 2-5) as the process to be used when conducting ESAs with EPA brownfields assessment grant funds (Reference 2-6). This is the same standard used by Land Quality staff when conducting ESAs.

The Land Quality Section is responsible for managing environmental activities relevant to soil, groundwater and structural contaminants on city-owned and city-operated properties, as well as in substandard structures during demolition operations. Section staff ensure that Land Quality programs comply with environmental regulations, municipal code and standard industry practices. Staff also provide training and technical guidance on these rules and standards to other departments, and work with stakeholders in the community to redevelop environmentally impacted properties.

2.2.1 Program Areas (PA)

2.2.1.1 PA 1: Land Quality Planning & Management

The Land Quality Section encourages responsible land stewardship in Fort Worth by assessing and remediating environmental impacts on city properties and working with private property owners to connect them with available resources. Section staff gather historical and current data from properties across the city to better understand potential and known contamination issues that affect the community. These data provide the basis for the city to make sound land planning and development decisions. Site remediation and monitoring are often complex, multi-year projects, involving numerous departments and external partners. These projects require careful planning and coordination to ensure regulatory compliance and timely completion. Long-term planning is necessary to effectively prioritize these projects, while short-term site action plans are essential to managing staff and resources efficiently. These efforts are facilitated through the use of technologies and tools that allow staff to manage large and detailed data sets, as well as make programs more transparent by sharing information with the public.

2.2.1.1.1 KEY ACTIVITIES

- Land Quality Analysis
- Land Quality Planning
- Land Quality Rules & Regulations
- Land Quality Projects & Technologies

2.2.1.2 PA 2: Land Reclamation

As Fort Worth continues to grow, a greater emphasis is placed on infill development and reclaiming properties that have potential environmental impacts, while maintaining regulatory compliance. The city encourages the revitalization of contaminated properties through the Brownfields Program, which offers financing for remediation activities for private development. Land Quality staff work with developers to help them understand the resources available and the benefits to re-developing blighted properties. Staff also oversee remediation and monitoring activities on city-owned and city-operated properties. This includes a wide range of activities, from groundwater testing to dredging local water bodies to remove contaminated soils. The Land Quality Section also works with other city staff to address blighted properties in the community and remove substandard structures.

2.2.1.2.1 KEY ACTIVITIES

- Brownfields Redevelopment
- Environmental Site Assessments
- Soil & Groundwater Remediation & Groundwater Monitoring
- Substandard Building Demolitions



Figure 2-3. Heavy equipment is used to remove contaminated soils from sites as part of remediation activities, photo by City of Fort Worth.

2.2.1.3 PA 3: Land Quality Compliance

Given Fort Worth's diverse industrial and commercial land use in the past, there is a higher potential for historical contamination of soil and groundwater in certain areas of our city. The Land Quality Section works with other departments to assess potential contamination and remediate environmental impacts in the soil, groundwater and structures on city property. Throughout this process, staff ensure compliance with federal and state environmental regulations, as well as local ordinances. The Land Quality Section, along with other environmental staff, performs audits of municipal facilities, collects data for regulatory reporting, and oversees remedial activities on city property. When there is contamination on private property that could impact public land, staff assist community partners in installing monitoring wells through environmental use agreements. Staff also review applications for environmental easement vacations and help applicants through the MSD process.

2.2.1.3.1 KEY ACTIVITIES

- Municipal Setting Designations
- Environmental Use & License Agreements & Easement Vacations
- Municipal Facility Compliance
- Regulatory Reporting

2.2.1.4 PA 4: Land Quality Communication & Collaboration

As the subject matter experts on land quality, staff provide training and technical guidance to city staff in other divisions and departments on matters involving soil, groundwater and related programs. This includes providing information and resources on environmental regulations, and encouraging departments to collaborate with staff when they are purchasing property to ensure due diligence is performed. Staff offer technical assistance to external partners and the community at public forums and hearings on plans for specific properties, and work with communications staff to ensure notices are distributed for upcoming meetings. They also host brownfields workshops with stakeholders to identify opportunities and available resources for revitalizing environmentally impacted properties. Public outreach and education is essential in communicating the importance of Land Quality programs and helping residents understand environmental pollution and the positive impact redeveloping impacted properties can have on their communities.

2.2.1.4.1 KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Figure 2-4. A Land Quality focus group meeting held at a city facility on a redeveloped former brownfield site, photo by City of Fort Worth.

2.3 Structure & Funding for Land Quality

As of 2018, the Land Quality Section staff includes six positions: an environmental supervisor, three senior environmental specialists, a management

analyst and a senior code officer. The current team also comprises the Hazardous Materials Management Section. Land quality management for the city consists of four primary program areas. These program areas, listed below and described in Section 2.2, have been implemented to support the city’s vision for a cleaner, safer and more livable city through proper management of land assets.

- One environmental supervisor oversees and manages the Hazardous Materials Management Section and Land Quality Section.
- Three senior environmental specialists provide scientific technical expertise involving specific program areas.
- One senior code enforcement officer provides coordination and expertise involving the city’s nuisance abatement program associated with substandard structures.
- One management analyst provides regulatory guidance, contract management, permit compliance and data analysis.

Funding for Land Quality is primarily provided through the Environmental Protection Fund.

2.4 Challenges for Land Quality

The Land Quality Section will face a number of challenges as Fort Worth continues to grow and develop. While a review of program and staffing data

from 2015 to 2017 determined that the annual workload for the section remained relatively consistent over that period (Reference 2-7), the future capacity of the section depends, in part, on external factors. These include the City of Fort Worth’s overall land area and population, redevelopment trends, future land use and a wide range of historical land uses, all of which impact the complexity of Land Quality projects and programs. With a current focus on infill development and revitalizing previously-developed areas throughout the city, especially industrial zones, it is anticipated that workloads will increase. According to recent staffing analyses, Land Quality programs will require additional resources as the number of projects and activities increases. (Reference 2-7). Although workloads are anticipated to increase, the Land Quality Section is dedicated to providing high-quality services, as it has in the past.

2.4.1 Brownfields

The EPA defines a brownfield as “a property, the expansion, redevelopment or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant” (Reference 2-8). Brownfields pose several unique challenges to the redevelopment process. Developers and property owners must manage previous and future environmental liabilities associated with historical land use and construction practices. Most private lenders will not provide funds to cover site remediation, and may refuse to offer any loans on projects with



Figure 2-5. The property history and redevelopment process for a brownfield site. Images are of the historical Swift meat packing building, an abandoned building on the property and the same site ready for redevelopment.

potential environmental impacts, as remediation costs vary widely and there is high perceived risk of loan default. In addition, the redevelopment timeline may be significantly longer or open-ended, due to the complex nature of remediation projects and the regulatory requirements for cleanup and monitoring activities involved. The EPA has promoted local community brownfields programs through federal grants, which are intended to remove the challenges

that delay or prevent redevelopment. As of 2018, the City of Fort Worth has utilized several EPA Brownfields Program grants, including: brownfields assessment grants, Brownfields Revolving Loan Fund (BRLF) grants, brownfields cleanup grants and brownfields area-wide planning grants (Reference 2-6). These grants help overcome many of the challenges faced by stakeholders during the redevelopment process.

2.4.2 Substandard or Unsafe Structures

There are three types of substandard structure demolitions performed by the Land Quality Section:

- Structures on city-owned property.
- Privately-owned structures held in trust by taxing entities due to tax foreclosure.
- Privately-owned structures with substandard structure violations.

A structure is considered substandard when it does not meet the standards or specifications established in the building, plumbing, electrical or mechanical codes and endangers the life, health and safety of the public.



Figure 2-6. Montgomery Plaza was redeveloped from an abandoned and contaminated Montgomery Ward property, photo by David Hensley.

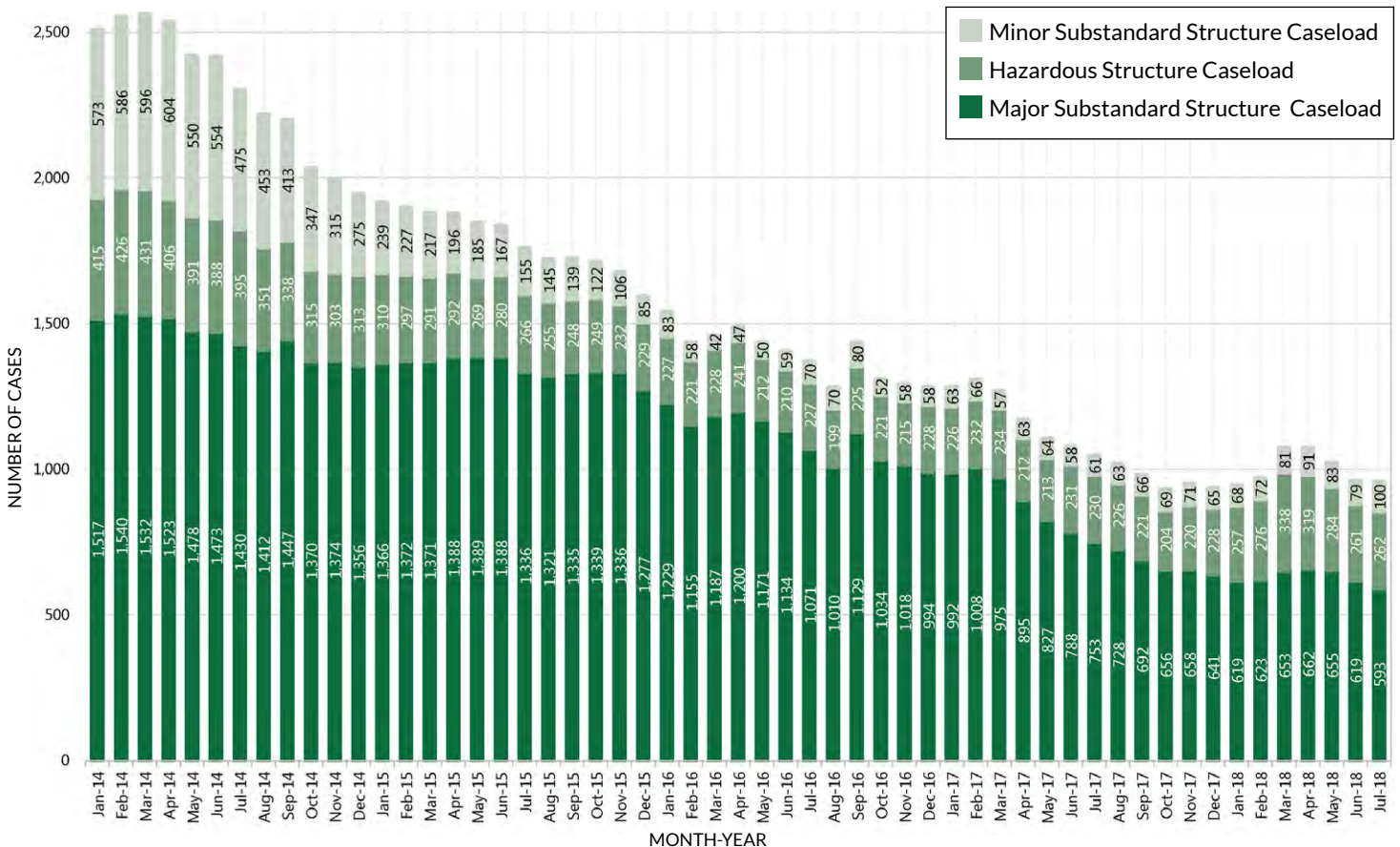


Figure 2-7. Chart of monthly substandard structure/hazardous structure caseload for the Building Standards Division of Code Compliance. Only a small fraction of the cases result in demolition.

Only structures classified as Category 1 under Chapter 7, Article IV of city code are demolished by Land Quality staff (Reference 2-9). Hazardous substandard structures can be defined as “a building or structure whose condition is dilapidated, substandard or unfit for human habitation and which poses a risk or harm to the public health, safety and welfare.” (Reference 2-9).

These demolitions are necessary because abandoned substandard structures pose significant threats to the safety and quality of life of the community. These can include prostitution, illicit substance use and sale, trespassing concerns or public health nuisances, among others. Abandoned structures can also deteriorate and contribute to general urban blight (Reference 2-10).

2.4.3 Contaminated Soil, Groundwater & Properties

Pollutants are introduced to the soil, both knowingly and unknowingly, from a variety of sources. In the past, many chemicals considered safe are now known to pose a threat to human health and the environment. Manufacturers, mechanics and other businesses did not store and manage hazardous chemicals and waste in a way that prevented their release to the environment, as regulations did not exist or were not as stringent as they are today. Site pollution is often industry-specific. For example, properties that once housed dry cleaners are commonly contaminated with chlorinated solvents, such as perchloroethylene (PCE), or petroleum-based solvents if they are older (Reference 2-11). Military installations are commonly contaminated with industrial solvents, such as engine degreasers, and other hazardous pollutants. Some sites may be listed on the national priorities list (NPL) of properties with known releases or threatened releases of contaminants eligible for remediation financed by the Superfund program (Reference 2-12). These are managed at the federal and state levels.

Pollutants can migrate through soil layers and contaminate neighboring properties, resulting in decreased property values. If the contaminated groundwater is used as a drinking water source, it poses a risk to humans and animals. People may also be exposed to contaminants if the soil on the property is disturbed for excavation and construction activities. Remedial activities are often very expensive and can take a prolonged period of time. It can take years to

treat the soil and groundwater on a property, with constant monitoring and sampling throughout that process. The waste removed from the site is expensive to manage, transport and dispose of properly. These factors create challenges for those who own or want to purchase these properties, and the city must work with partners to facilitate the cleanup and redevelopment of such properties to benefit the community.



Figure 2-8. Subsurface soil sampling cores are collected at a site to determine environmental impacts, photo by City of Fort Worth.

2.5 Strategies for Land Quality (by Program Area)

2.5.1 Strategies for PA 1: Land Quality Planning & Management

The Land Quality Section is responsible for overseeing remedial projects that can last years and involve multiple partners, contractors and departments. Thorough research and effective planning are vital to prioritizing these projects and ensuring their success.

2.5.1.1 Land Quality Analysis

Environmental impacts to properties can vary widely, depending on the land use history of the site and any prior remedial actions. Contaminants can persist in soil and groundwater for decades, and may migrate through different soil and rock layers over time. Buildings constructed during certain time periods are more likely to contain hazardous materials, such as asbestos and lead paint. There may even be drums of unknown chemicals, manufacturing equipment and underground storage tanks for petroleum products that remain on properties and in buildings long after they are closed or abandoned. Historical records of land use, contamination and property assessments

are essential to assessing risk to human health and the environment, as well as developing plans to remediate properties. The city must gather historical data to better understand the extent of environmental issues in soil, groundwater and the built environment throughout Fort Worth, especially on municipal properties.

Environmental staff should work with other departments and external partners, including state and federal government agencies, private land owners and academic institutions to build a database of historical land quality information. This includes land use maps and records, field data from site assessments and monitoring activities, remedial actions performed on properties and any contamination not addressed. The city should also work with academic and private sector partners to collect soil, groundwater and well log samples from sites of interest, as well as perform monitoring activities to determine if contaminants

are migrating. Environmental staff should work with other departments to assess current records of city-owned and city-operated properties to determine if there is a need to perform AAI due diligence to assess any potential environmental impacts. It is strongly recommended the city adopt a formal policy requiring Land Quality staff to perform AAI due diligence on any property the city is considering purchasing or obtaining involuntarily (through foreclosure, abandonment, eminent domain, etc.). This will help protect the city from liabilities associated with contamination on a property and allow the city to access the funds designated for remedial activities as a prospective purchaser.

Over time, sediment can accumulate in urban waterbodies, especially ponds and lakes. These sediments can contain pollutants that threaten aquatic ecosystems. The sediment buildup itself may also pose a threat to the health of these waterbodies, as it can cause an increase in water temperature and oxygen levels to drop. The city should strongly consider conducting urban waterbody sediment assessments to catalogue the buildup of sediment and any contamination present in lakes and ponds. This would include measuring existing sediment buildup, as well as the average amount of sediment entering the waterbody each year. Some waterbodies have been assessed, although the ongoing sedimentation rate needs to be determined. These assessments would serve as the foundation for a dredging plan to remove sediments and pollutants, when necessary.



Figure 2-9. A building in Niles City (incorporated into the City of Fort Worth in 1911) shows how historical land use change can hide potential contamination on a property. This building was once a horse collar factory, Patterson’s Garage, a monument company, a broom company, then a storefront, photos from the University of North Texas Libraries, Portal to Texas History.

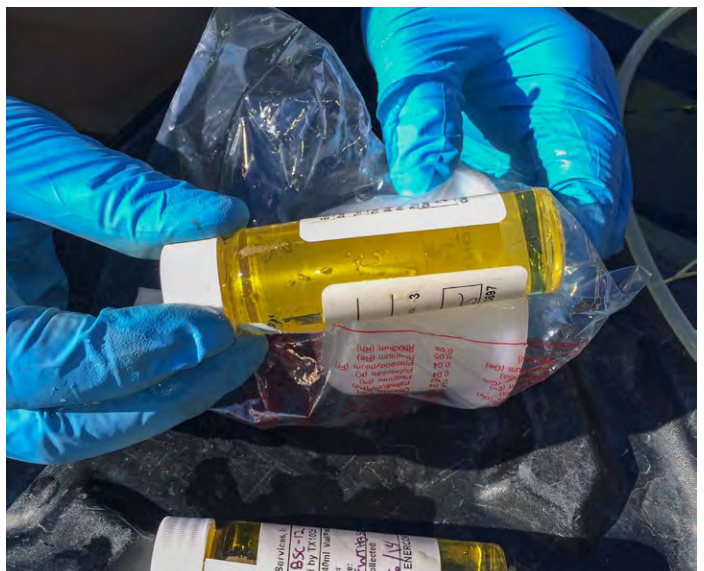


Figure 2-10. Groundwater sample prepared for laboratory analysis, photo by City of Fort Worth.

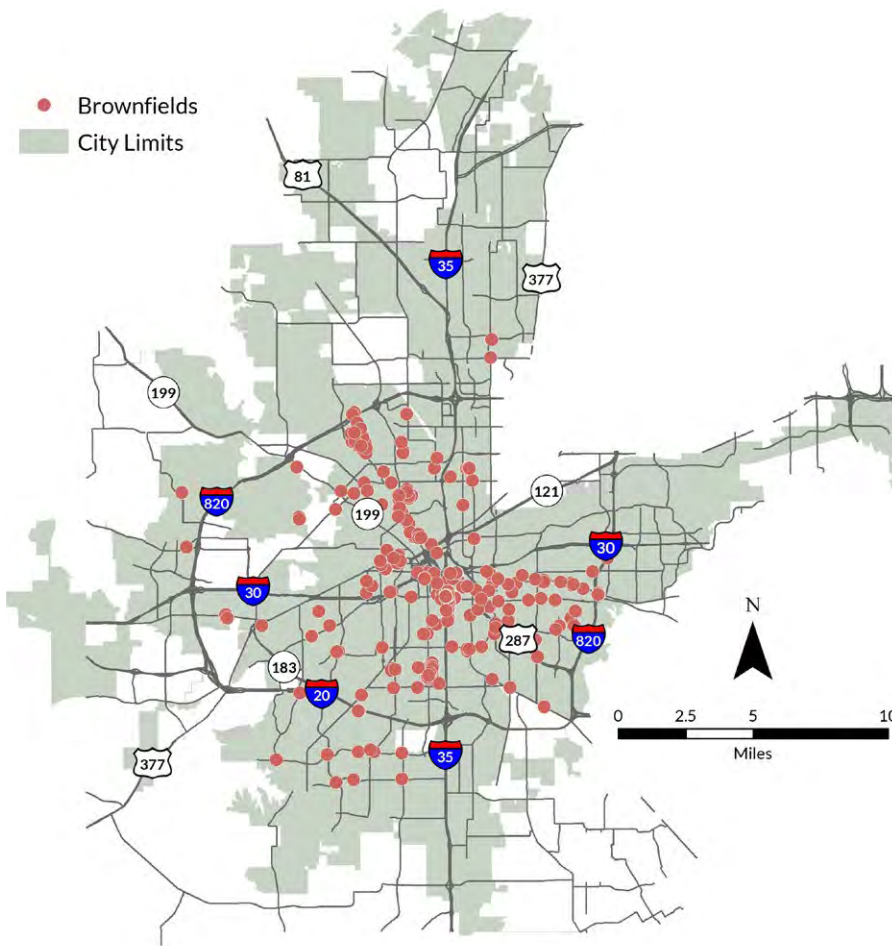


Figure 2-11. A map depicting the inventory of known brownfields, 2019.

2.5.1.2 Land Quality Planning

Land Quality projects are often complex, requiring significant funding and time to complete. Effective planning helps to prioritize projects and manage resources and staff time. Many section projects are managed through the Capital Improvement Plan (CIP) for the Environmental Quality Division, which sets a time frame and outlines funding for large-scale, multi-year projects. This plan is updated on an annual basis with project progress and budget updates, as well as new projects. The Land Quality Section would benefit from developing a property assessment plan that includes a prioritized schedule for preliminary research, AAI due diligence and/or ESAs for all city-owned properties. Section staff should develop a site remediation plan for all city-owned properties with environmental impacts. Major site remedial activities can be added as projects under the CIP. These sites may also require monitoring if there is concern that contamination could migrate or to determine if in-situ treatment activities are effective. Staff should create

a monitoring plan to better allocate resources and ensure sites are sampled at an appropriate frequency.

The city should also consider developing an urban waterbody assessment plan to prioritize sediment and contaminant studies for all major waterbodies in Fort Worth. As part of this plan, environmental staff should determine if dredging is necessary, or will be in the future for each waterbody. Dredging operations are highly disruptive to ecosystems, and remedial activities for pollutants includes dewatering the soil on site, which can result in foul odors that disturb neighboring residents. Environmental staff should determine the criteria and thresholds that trigger dredging operations, and establish best management practices (BMPs) to minimize risks to human health and the environment. The waterbody assessments and any remedial activities would be included in the CIP, as they require significant resources.

Brownfields redevelopment can have significant positive impacts on the surrounding communities, and the city should encourage the revitalization of these properties through a brownfields redevelopment plan. To create an effective plan, the city must collaborate with partners, including real estate professionals, developers and community members to identify potential brownfields and create a citywide inventory of these properties. Environmental staff should work with Planning & Development staff to prioritize properties for redevelopment. Staff can then create an outreach campaign to inform property owners of available resources to obtain site assessments and options for selling or revitalizing the site. Land Quality staff should research and catalogue available grants and incentive programs for brownfields development and related activities to help connect property owners with funding options.

2.5.1.3 Land Quality Rules & Regulations

Federal regulations discussed in the introduction to this chapter establish clear guidelines for ESAs,

remedial activities and responsible parties pertaining to properties with environmental impacts. The Texas Commission on Environmental Quality (TCEQ) oversees environmental programs and regulatory compliance at the state level regarding legacy contamination and site remediation. This includes the state Superfund rules under the Texas Administrative Code and Texas Health and Safety Code (Reference 2-15). It also includes the Texas Risk Reduction Program (TRRP), which establishes protective concentration levels (PCLs) of contaminants as the default cleanup standards for soil and groundwater (Reference 2-16). The TCEQ offers options for property owners with environmental impacts on site who are not responsible for the contamination, as well as for those who want to clean their property voluntarily. If a property owner finds that pollution has migrated from a neighboring property onto theirs, they can apply for the Innocent Owner Program (IOP), which protects them from liability associated with the pollution (Reference 2-17). When a property owner becomes aware of an environmental impact on their site, whether from an old source or current activities, they can choose to remediate the site proactively before the TCEQ has issued an order requiring them to take action. They can apply for the Voluntary Cleanup Program (VCP), which allows them the opportunity to address the contamination (Reference 2-18).

The TCEQ also manages MSD applications and regulatory compliance with MSD rules established in Chapter 361 of the Texas Health and Safety Code (Reference 2-19). Locally, the City of Fort Worth passed an ordinance allowing the use of MSDs, and it is included in Chapter 12.5, Article IV – Division 2 of municipal code (Reference 2-20). Most section operations fall under Chapter 12.5 of the City of Fort Worth Municipal Code, including environmental use agreements (Reference 2-21) and environmental easement vacations (Reference 2-22). Land Quality staff should work with the Property Management Department to review best practices of other cities regarding the use agreements and easement vacations and use them to develop procedures, policies or ordinances, as necessary. An example is the City of Grand Prairie's wellhead protection ordinance, which provides groundwater protection and prevents contamination of water supplies (Reference 2-23). Chapter 7, Article IV of the municipal code addresses the process for substandard structure demolitions

(Reference 2-9), although the enforcement and abatement of the environmental hazards on the structures falls under Chapter 12.5, Article IV – Division 3 (Reference 2-24).

The fee structures associated with environmental permitting (e.g., MSDs, use/license agreements, easement vacations) should be routinely evaluated to ensure fees are appropriate and necessary funds are being collected. This will help provide revenue for the staff and resources needed to perform tasks required by the city's environmental ordinances. Other activities, such as ESAs, may warrant a fee structure to cover associated costs, including site visits, research and document reviews. New ordinances may be proposed, or existing ordinances may be modified to accommodate program improvements.

2.5.1.4 Land Quality Projects & Technologies

Many daily activities performed by the Land Quality Section are part of large, long-term projects. Managing these complex projects and maintaining compliance with all applicable environmental rules and regulation requires careful organization. Utilizing the proper field equipment and technological applications can enhance operations and increase efficiency in these projects.

2.5.1.4.1 LAND QUALITY LABORATORY

The city should consider developing a Land Quality laboratory space within existing facilities or constructing a new laboratory with equipment to analyze soil and groundwater samples, as well as mold and asbestos testing equipment. This space would double as a hazardous materials management laboratory, and could be combined with proposed air quality and surface water quality laboratories, as some of the equipment would overlap, such as gas chromatographs and chemicals used for water and soil samples testing. A laboratory would benefit all the city's Environmental Quality programs and greatly streamline operations. Equipment can be upgraded when new technologies are available. Staff would not have to send off samples for analysis, reducing project costs and lead times. This would also be extremely valuable in the event of an emergency and could help staff quickly determine any risks to human health and the environment. A Land Quality laboratory could also house additional field equipment, including ground penetrating radar (GPR) for locating abandoned underground storage tanks, as well as handheld

sampling and monitoring tools for site assessment, monitoring and compliance operations.

2.5.1.4.2 SOFTWARE AND DIGITAL SOLUTIONS

Data gathered for land quality analysis activities should be used to develop inventories for sites and properties throughout the city with historical land use information, any remedial activities that have been performed, regulatory closure information and any known contamination. These inventories should identify all city-owned properties with known environmental impacts, and systematically evaluate options for effective remedial activities. All site inventories and the results of any property assessments should be kept in a geographic information system (GIS) database and displayed in an online mapping tool that is easily accessible to staff. The map should include layers with other useful project and program information, such as monitoring well locations, environmental use agreement details and any foundations or structures left on sites from demolitions. All urban waterbody assessment data should also be included, along with information on any remedial activities and dredging that have been performed. This Land Quality mapping tool will help facilitate the development of site action plans, prioritize projects and develop staff work plans. It can also be combined with Surface Water Quality program data for a comprehensive understanding of historical pollution, remedial activities and current issues in Fort Worth.

Land Quality staff should collaborate with the Economic Development Department, Planning & Development Department, developers, real estate professionals and other community partners to identify brownfields throughout Fort Worth. This inventory should be comprehensive, including historical data, information on the perceived or actual environmental impacts and any applicable regulatory requirements. To promote the redevelopment of these brownfields, the city should create a public-facing GIS mapping tool to share site information, as well as resources available to potential purchasers. This tool should offer the flexibility to quickly incorporate new site data and denote properties that have been redeveloped. It could also be used to create a “heat map” for brownfields prioritization that includes surrounding parcel data in areas undergoing significant revitalization.

2.5.1.4.3 REMEDIATION PROJECTS

The Land Quality Section is actively involved in monitoring and remediating numerous impacted properties and structures across the city, with the ultimate goal of achieving long-lasting environmental cleanups, promoting safety, economic welfare and sustainable environmental stewardship. City-owned properties with contamination are increasingly addressed through CIP funds, which require special planning and approval. Effective CIP management provides a foundation for the completion of soil and groundwater projects, and Environmental staff should routinely evaluate and prioritize projects listed in the CIP. To effectively manage and complete these projects, staff utilize a wide variety of environmental remediation technologies and techniques. Staff should continue to evaluate new technologies and engineering solutions by reviewing case studies and research related to advancements in environmental remediation, and promote the application of new approaches when appropriate.



Figure 2-12. Abandoned buildings create blight and are good candidates for redevelopment, photo by City of Fort Worth.

2.5.1.5 Development Actions for PA 1: Land Quality Planning & Management

Land Quality Analysis

1. Develop an environmental inventory for municipal properties, MSDs, potential brownfields and all properties with ESA results and RECs.
2. Develop and implement a citywide policy requiring AAI due diligence be performed on all properties the city plans to acquire.

Land Quality Planning

1. Develop a brownfields redevelopment strategic plan.

2. Develop a property assessment strategic plan for municipal properties, which includes individual site action plans for cleanup activities, as applicable.
3. Develop a strategic plan for municipal properties requiring environmental monitoring.
4. Develop an urban waterbody assessment and dredging strategic plan.

Land Quality Rules and Regulations

1. Evaluate environmental ordinances for BMPs, and update the City of Fort Worth MSD ordinance.
2. Review cost recovery options for environmental assessments, site visits, monitoring and other environmental activities at city facilities.

Land Quality Projects & Technologies

1. Create a publicly accessible online GIS mapping tool to share site data.
2. Select and implement a database management software system for tracking field operations, capturing metrics and records management.
3. Prioritize projects through annual updates of the CIP.
4. Develop an inventory management system for Land Quality Program assets (e.g. PSTs, cleanup sites, etc.).

2.5.2 Strategies for PA 2: Land Reclamation

In an effort to reclaim properties by reducing or eliminating environmental risks, the city supports redevelopment, while protecting the environment and promoting public safety. Site assessment and remediation actions may be required on public



Figure 2-13. An example of a brownfield site, abandoned and likely contaminated from previous use.

properties or properties the city is interested in acquiring. Specific activities commonly include contaminated soil disposal and replacement, groundwater monitoring and remediation or similar actions that remove or otherwise fully contain environmental contamination. For reclamation needs on private properties, the city supports the efforts of local stakeholders to reuse land through brownfields redevelopment and by ensuring substandard structures are repaired or demolished. For these underutilized or blighted sites, reclamation efforts lead to transfer, development or redevelopment that may not occur, otherwise.

2.5.2.1 Brownfields Redevelopment

Land Quality staff should review successful brownfields programs from other cities as a benchmark for developing an effective program for Fort Worth. Section staff will prioritize city-owned brownfield properties for ESAs, remediation plans and cleanups. After creating an inventory of brownfields across Fort Worth and prioritizing properties for redevelopment, as discussed in the planning and management section of this chapter, environmental staff should reach out to property owners to inform them of available resources for site assessments and remediation. The TCEQ offers the VCP and a Brownfields Site Assessment Program (Reference 2-25) to encourage brownfields redevelopment. The city previously utilized the EPA brownfields assessment grants, BRLF grants, brownfields cleanup grants and brownfields area-wide planning grants and should continue to work with community partners to promote these options. These grants should be sought during each open grant cycle. The city should also consider creating a program to help brownfield property owners perform ESAs to remove barriers to redevelopment.

The city should standardize and maintain all relevant program documents (e.g., BRLF applications, BRLF contracts). In addition, the city will consider alternative methods for encouraging projects through revolving loans or sub-grants. One method is to issue a formal request for projects for a defined term once or twice each year, providing limited funds to be applied to the best available projects, rather than the traditional, year-round application method. Project screening rubrics and tools to evaluate project submissions are needed, and should measure environmental and financial risks, such as cost projections, project feasibility and

defaulted loans. In addition, loan repayments, the number of properties redeveloped and any related development income dollars can be used to measure Brownfields Program performance. Environmental staff should also work with city communications personnel to develop a communication plan and marketing campaign that incorporates information on the BRLF and other available resources.

2.5.2.2 Environmental Site Assessments

The standard approach to completing environmental reconnaissance and conducting cleanups on parcels of land includes three major steps: ESAs, cleanup action planning and site cleanup. ESAs are performed sequentially, and are commonly referred to as Phase I and Phase II ESAs (Reference 2-5). The Phase I ESA includes conducting research on the history of the property and performing a site visit to identify any potential recognized environmental conditions (RECs). ATSM International defines a REC as “the presence or likely presence of any hazardous substances or petroleum products in, on or at a property: (1) due to release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment” (Reference 2-5). These hazardous substances include a wide range of contaminants within the scope of CERCLA and related environmental regulations. If potential RECs are identified, a Phase II ESA is conducted.

Land Quality staff work with consultants and contractors to perform Phase II ESAs and environmental cleanup activities at contaminated properties. The Phase II ESA includes sampling to



Figure 2-14. Land Quality Section staff evaluating interior of a brownfield site, photo by City of Fort Worth.

confirm the presence or absence of RECs and provides information regarding the extent of pollution. When pollutants are present in soil, soil gas, sediment, groundwater or surface water at concentration levels above the regulatory limits established for human and ecological health, further evaluation and cleanup actions are required. The ESA Phase I and Phase II data serve as the foundation for environmental engineering design and cleanup action planning. Once the cleanup action plan and related engineering designs are complete, they are implemented to mitigate or eliminate the pollution. These analyses are very complex, can be costly and take a considerable amount of time to complete. The resulting projects also require a great deal of technical and regulatory knowledge for completion.

Land Quality should develop standardized criteria to determine the appropriate level of inquiry necessary to evaluate a property to reduce costs associated with assessment activities and improve response times. It is also crucial that environmental due diligence and assessments are completed prior to land transactions to protect the City of Fort Worth from costs and liabilities associated with site contamination. A citywide, formal policy to incorporate this into land and property acquisitions is suggested. The city should also consider developing the resources and investing in staff training to perform more advanced assessments, such as full National Environmental Policy Act (NEPA) reviews or U.S. Department of Housing and Urban Development (HUD) noise assessments, so that Land Quality staff can better serve the community. Staff could also provide more comprehensive internal project support to other departments through higher-level environmental assessments. These assessments could apply to city projects such as neighborhood redevelopment, park and greenspace site selection, as well as public improvements, including new roadways, facilities and trails.

2.5.2.3 Soil & Groundwater Remediation & Groundwater Monitoring

Soil and groundwater remediation is necessary when chemicals exceed regulatory thresholds that protect human health and the environment. Significant property redevelopment and the city’s expanding infrastructure projects require resources be used to control pollution in soil and groundwater. These projects are often located in former or current



Figure 2-15. The former site of the Fort Worth Rifle and Pistol Club is on the CIP project list due to metals and other contaminants in the soil, photo by City of Fort Worth.

industrial areas of Fort Worth, where environmental impacts are common. In most cases, impacts are not known. Some city-owned and city-operated properties and facilities have legacy environmental impacts that have been assessed and stabilized, but cleanup has not occurred, due to cost or other limiting factors. These properties are increasingly addressed through CIP funds, which require special planning and approval. In some instances, emergency funding may be required to quickly address impacted soil and groundwater if they pose an immediate threat to human health or the environment. Standardization is key in maintaining site documentation, developing scopes of work and procuring any professional services to address impacted environmental media on a rush basis. Standard forms can also be used for site assessment programs.

Due to the complex nature of groundwater pollution, long-term monitoring activities may be required at city-owned and city-operated sites. Monitoring is necessary when contaminants are known to exceed the regulatory thresholds in the groundwater located beneath properties. Section staff should evaluate the chemicals present and effects on groundwater using advanced, cost-effective technologies. These groundwater monitoring efforts will help determine whether remediation technologies should be introduced to mitigate pollution. Through continued groundwater monitoring, sites may be deemed eligible for closure by the state regulatory agency, and further redevelopment may proceed. The city should work closely with partner agencies to ensure data and records are carefully maintained and available.



Figure 2-16. Land Quality staff collect groundwater samples from a monitoring well for testing purposes, photo by City of Fort Worth.

2.5.2.4 Substandard Building Demolitions

The city inspects a property when the owner fails to maintain a building to municipal code standards, and Land Quality staff evaluate structures for environmental concerns, such as mold or asbestos. After the inspection, a summary of code violations is sent to the property owner. If the property owner does not make repairs or otherwise resolve violations within an allotted timeframe, the owner may be



Figure 2-17. A substandard structure that has been damaged by fire, photo by City of Fort Worth.



Figure 2-18. The substandard structure pictured above is demolished, photo by City of Fort Worth.

Table 2-1. Summary of substandard structure caseloads and demolitions for the Land Quality Section over a three-year period.

DEMOLITIONS	2015	2016	2017	3-Year Average
Commercial Caseload	35	33	30	33
Commercial Demolitions	16	8	12	12
Residential Caseload	125	92	95	104
Residential Demolitions	67	42	40	50

required to attend a BSC hearing (Reference 2-9). The BSC has the authority to order an owner to remove or abate any nuisance and to comply with all applicable laws and ordinances. This may include the repair or demolition of a structure. If the owner is not able make repairs to meet to minimum building standards, staff support all procurement activities and execution of the substandard building demolition. This includes ensuring compliance with regulations regarding scheduling, applicable notifications, checks and permitting.

Additionally, Land Quality staff identify abandoned or vacant non-industrial structures for demolition, and develop procedures and action plans that outline the processes and responsibilities for the execution of substandard structure demolition services. These services include the removal of equipment, chemicals and structures to achieve successful site closure before demolition. Once this has been completed, staff support the demolition, maintaining close coordination with the Code Building Standards Division or the department requesting the demolition. The city should consider the use of a task order system and standardized procurement documents to streamline the process and facilitate coordination and communication between different divisions. Environmental staff should also work with other Code divisions to develop procedures for the execution of dangerous building demolitions, ensuring compliance with applicable notifications, checks and permitting. Furthermore, staff should review procedures in other municipalities to advance best practices.

2.5.2.5 Development Actions for PA 2: Land Reclamation

Brownfields Redevelopment

1. Evaluate opportunities and provide brownfields-related support to the public (e.g. ESAs, grants, etc.).

2. Develop a standardized brownfields application process, which includes all documents, forms and project screening tools to evaluate applications.
3. Track US EPA brownfields funding opportunity cycle.
 - *Performance Indicator:* Number of BRLF project applications submitted to the EPA and the success rate.
4. Establish a sustainable Brownfields Program.
 - *Performance Indicator:* Number of applicants.
 - *Performance Indicator:* Value of BRLF loans and sub-grants distributed.
 - *Performance Indicator:* Value of repaid BRLF loans with interest.
 - *Performance Indicator:* Number of cleanup plans completed.
 - *Performance Indicator:* Number of ESAs completed.
 - *Performance Indicator:* Number of completed reclamation projects.
 - *Performance Indicator:* Number of sites redeveloped.

Environmental Site Assessments

1. Develop an internal site assessment request protocol and tracking log for AAI due diligence and ESA requests from other city departments.
 - *Performance Indicator:* Number of requests each year.
2. Develop a memorandum of understanding (MOU) template for all contractual services performed for other city departments that clearly defines the scope of work and project objectives.

Soil & Groundwater Remediation & Groundwater Monitoring

1. Develop a procedure that outlines the requirements for the execution of site soil and groundwater remediation services, as well as groundwater monitoring activities, to meet regulatory objectives.
2. Develop standardized professional services documents (e.g., request for qualifications [RFQs], contracts, task orders, etc.) for soil and groundwater cleanup services.
3. Develop an inventory of municipal properties requiring remedial action, the identified RECs,

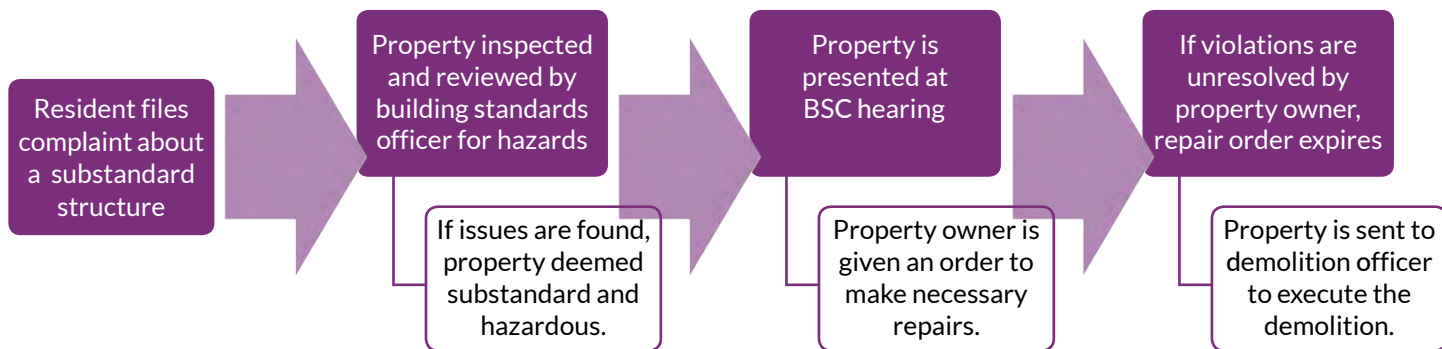


Figure 2-19. Flowchart of the substandard structure demolition process.

applicable environmental regulations, and the cleanup methods applied.

- *Performance Indicator:* Number of municipal properties requiring remedial action and/or monitoring.
- *Performance Indicator:* Percentage of assessed properties for which site action plans have been developed.
- *Performance Indicator:* Number of properties granted regulatory closure status.

4. Develop a memorandum of understanding (MOU) template for contractual Land Quality services performed for other city departments that clearly defines the scope of work and project objectives.

Substandard Building Demolitions

1. Maintain the substandard structure demolition SOP and track project data.
 - *Performance Indicator:* Number and percentage of demolitions performed by the city.
 - *Performance Indicator:* Number and percentage of owner-abated properties.

2.5.3 Strategies for PA 3: Land Quality Compliance

The Land Quality Section oversees programs designed to maintain compliance with state and federal environmental regulations, as well as local ordinances, for all city properties and activities. At all times, section staff work to ensure the health and safety of our residents and our environment.

2.5.3.1 Municipal Setting Designation (MSD)

The City of Fort Worth adopted a local ordinance in

2005 to allow the use of MSDs on properties with historical groundwater contamination, as the city does not use groundwater as a source for municipal drinking water. A restriction is placed on the property that prevents the groundwater from being used as potable water for drinking, irrigation or similar purposes. The Land Quality Section reviews MSD applications and sends a report to the department assistant director detailing any discrepancies or city interests that may be impacted by the proposed MSD (Reference 2-26). Section staff work with the assistant director to schedule a public meeting and a public hearing, as well as mail out notices to anyone who may be impacted by the MSD, as identified in the Texas Health and Safety code (Reference 2-19). This includes property owners with potable water wells within a half mile of the MSD. Section staff also work with city communications personnel to publish a notice in the city's newspaper of record, post a notice at city hall and at the site (Reference 2-26).

The purpose of the public meeting is to acquire public input before the application goes to a formal hearing at a city council meeting. Land Quality staff attend the meeting and the hearing to answer technical questions and address any concerns. City council must adopt a resolution supporting the application to the TCEQ and enact an ordinance prohibiting the potable use of groundwater beneath the property, as well as any other reasonable restrictions on the groundwater use (Reference 2-26). Once evaluated and approved by the TCEQ, MSDs are recorded on property deeds, ensuring that the restrictions on the groundwater remain in place if the property transfers to a new owner. Section staff have assisted MSD applicants on 28 projects since 2005. Staff should review MSD processes and ordinances from other municipalities and suggest

changes to the City of Fort Worth ordinance or application process. This includes an adjustment of the MSD ordinance language to consider application fees based on actual costs to the city, and the development of technical guidance sheets for stakeholders and interested parties. The MSD application needs regular updating to reflect any changes to departmental organization, application procedures or the ordinance.

2.5.3.2 Environmental Use Agreements, Environmental License Agreements & Easement Vacations

Various city departments and public utility companies have a vested interest in rights-of-way and access easements, and environmental staff review applications to make appropriate recommendations to the city manager and city council. Petitions for abandoning an easement require approval by various city departments and public utility companies, as well as review by environmental staff. Section staff currently process environmental use agreements and assist the City Plan Commission with easement vacation requests that require environmental review. Section staff also

approve monitoring well permit applications submitted by the public. These reviews generate revenue and ensure informed decisions related to environmental investigations and cleanups on properties that could impact surrounding public property and natural resources. Section staff may consider developing a review rubric to screen all applications to improve response times in technical assistance and environmental review services. Implementation of standardized procedures, documentation and forms will also improve customer service and consistency.

2.5.3.3 Municipal Facility Compliance

To maintain compliance with all applicable federal, state and local environmental rules and regulations, Land Quality staff oversee activities related to soil and groundwater contamination, as well as structural contaminants, on city properties. Section staff write the request for qualifications (RFQs) for contractors hired to perform any site assessments and remedial activities, and review bids to ensure contractors are qualified to perform the required activities. Section staff also perform municipal facility audits to

Table 2-2. Summary of annual Land Quality Section workload.

LAND QUALITY WORKLOAD	2015	2016	2017	3-Year Average
Substandard Residential Structure Demolitions	67	42	40	50
Substandard Residential Structure Cases	125	92	95	104
Substandard Commercial Structure Demolitions	16	8	12	12
Substandard Commercial Structure Cases	35	33	30	33
Phase I ESA / AAI Due Diligence	21	25	29	25
Phase II Limited Subsurface Investigations	10	15	16	14
Site Remediation (Soil/Groundwater) Sites	6	6	6	6
Groundwater Monitoring Sites	6	6	6	6
Municipal Setting Designations Processed	1	1	2	1
Environmental Use/License Agreements	2	2	4	3
Easement Vacation Requests	58	69	56	61
Brownfields Site Assessment Program Development	20	20	20	20
Technical/ Contract Review & Consultant Coordination	20	20	20	20
Environmental Planning (SOPs, Action Plans & Management Plans)	32	32	32	32
HUD Compliant Noise Surveys Conducted	14	12	8	11
HUD Compliant Explosives Surveys Conducted	14	12	8	11

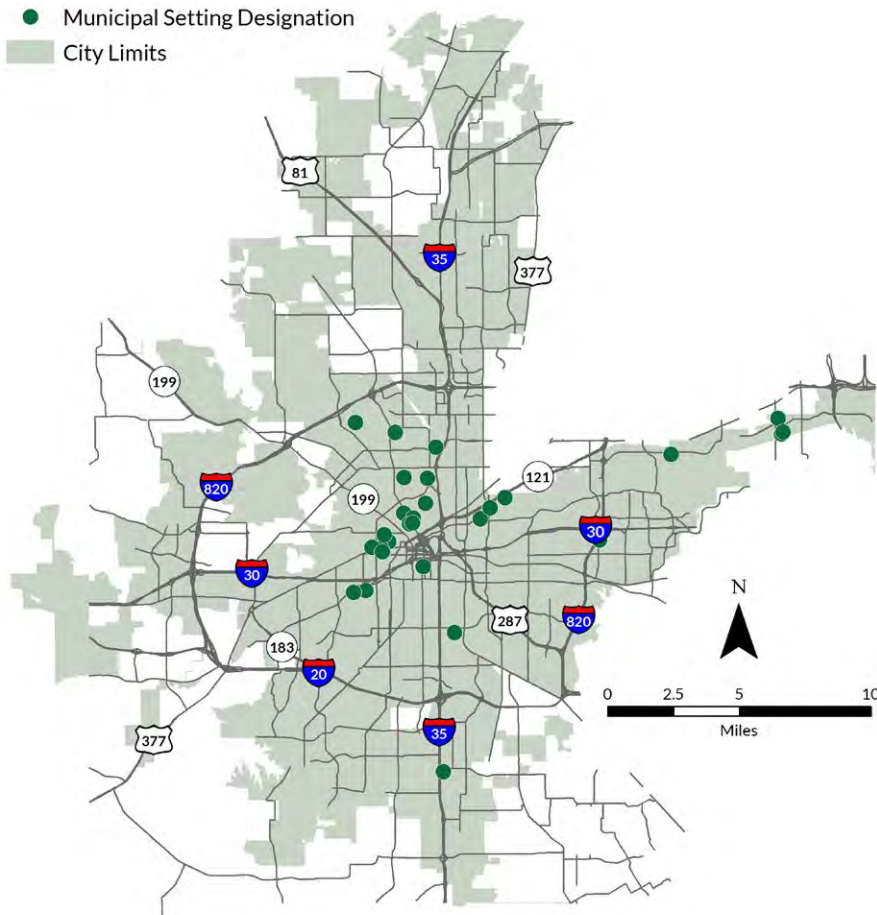


Figure 2-20. A map of all MSD sites in the city, 2019.

inspect petroleum storage tanks (PSTs), look for site contamination and instruct city staff on regulatory matters. It is essential that staff in other departments understand when to involve the Land Quality Section to perform ESAs and investigate structures in order to maintain regulatory compliance, as well as protect human health and the environment. Section staff actively update program information and prepare reports on a routine basis for the EPA, TCEQ and other agencies. These often include reports under the TCEQ PST program when soil is contaminated from LPSTs, and the TCEQ VCP when sites are actively undergoing cleanup. To streamline record-keeping and reporting processes, the city should develop a consolidated regulatory requirement database and update it, as necessary. Digitizing records, creating report templates and developing a schedule of reporting milestones are all best management practices the city should consider to ensure program compliance.

2.5.3.4 Development Actions for PA 3: Land Quality Compliance

Municipal Setting Designations (MSDs)

1. Review the MSD SOP annually, and revise as applicable.
 - *Performance Indicator:* Number of MSDS applications received.
 - *Performance Indicator:* Number of MSD applications approved by the TCEQ.
2. Update the MSD property inventory when new MSDs are adopted and approved by the TCEQ.

Environmental Use Agreements, Environmental License Agreements & Easement Vacations

1. Annually review the procedure for environmental use agreements and revise as applicable.
2. Annually review the procedure for easement vacations and environmental licenses and revise as applicable.
 - *Performance Indicator:* Number of environmental use agreements received.
 - *Performance Indicator:* Number of environmental license agreement applications and easement vacations received and processed.



Figure 2-21. Drilling operations on a right-of-way in downtown Fort Worth to install a groundwater monitoring well, photo by City of Fort Worth.

3. Create a web-based application form for public use for environmental use agreements and environmental license agreements.
 - *Performance Indicator:* Number of submitted online applications.

Municipal Facility Compliance & Regulatory

1. Develop a database of regulatory requirements applicable to municipal facilities and perform annual reviews to identify regulatory updates.
2. Digitize historical environmental records for incorporation into the Land Quality database.
3. Develop detailed environmental compliance audit checklists for municipal facilities.

2.5.4 Strategies for PA 4: Land Quality Communications & Collaboration

The city's Land Quality programs are complex, and environmental staff work with the community and other city staff to share their technical expertise and information on city programs. They provide resources and services through public education, outreach and training, and collaborate with the development community. Land Quality information sent through public notices or announcements may include information regarding risks to human health and the environment, when applicable, and are considered priority communications for both internal and external audiences. In addition, staff engage in outreach events, volunteer efforts and collaborations with stakeholders in the community (e.g., other agencies, colleges and universities, nonprofit organizations (NPOs), private businesses) to build and expand programming for Land Quality while promoting environmental stewardship. To ensure internal compliance with environmental rules and regulations related to Land Quality programs, environmental staff work closely with other city departments to maintain high-level training programs and provide technical guidance. Collectively, these actions provide the framework for Land Quality communication and collaboration programs.

2.5.4.1 City Staff Training & Collaboration

Section staff regularly work with other city departments to eliminate environmental setbacks in order to facilitate development. Establishing a single point of contact within the Land Quality Section for internal requests from city departments would

improve communication, build relationships between departments and facilitate the timely completion of projects. Interdepartmental staff training and resources are needed to build awareness for the importance of performing environmental due diligence. Section staff should educate key departments, such as the Property Management Department, about ESAs, environmental regulations and the liabilities associated with contaminated properties. In addition, environmental staff should work closely with the Planning & Development Department and the Economic Development Department to promote internal collaboration and encourage brownfields identification and redevelopment. Finally, improvements could be made by aligning partners and their respective efforts for successful demolition of all substandard structures.



Figure 2-22. *Employee training and public outreach are key to helping improve Land Quality programs, photo by City of Fort Worth.*

2.5.4.2 Public Technical Guidance & Training

Section staff will continually strive to offer high-quality technical guidance regarding environmental activities related to soil, groundwater and the built environment. Staff can develop and maintained up-to-date guidance materials for environmental CIP projects, brownfields redevelopment resources, MSDs, environmental use/license agreements and other Land Quality programs. In addition, staff can increase efforts to provide training and educational outreach, technical expertise and improved coordination, both internally and externally. Targeted training should be provided to the land development community on brownfields redevelopment financing options and resources available to resolve environmental hazards. This community would also benefit from access to resources that familiarize individuals with current



Figure 2-23. Staff present an environmental award to the city's tire service center, photo by City of Fort Worth.

technologies, methods and regulatory requirements associated with site remediation. Section staff can also promote safety programs to ensure requirements related to environmental agreements are met prior to commencing site activities. Encouraging pre-planning to facilitate construction is important, such as reminders for site personnel to call before digging or drilling on properties.

2.5.4.3 Public Education & Outreach

The general public may not require detailed technical guidance on Land Quality activities, but providing information and outreach is critical in garnering community support for programs and projects. Environmental staff should actively reach out to the community and work with any interested residents to champion awareness for brownfields redevelopment. Staff will continue to strive to reach members of the community through a variety of media, identifying the communications channels best suited to provide different audiences with current program information, as well as best practices to achieve superior stewardship of our lands. Key messages should focus on environmental due diligence, brownfields, soil/groundwater remediation, environmental CIP projects and substandard structure demolitions. Staff should also serve as subject matter experts, and give presentations to the community at events and neighborhoods meetings in an effort to engage them in brownfields redevelopment efforts and other Land Quality programs.

2.5.4.4 Community Partnerships & Volunteerism

Community partnerships are very important for building programs such as brownfields, soil and groundwater remediation and substandard structure demolitions because of the number of parties typically associated with land development projects. Environmental staff play a key role in assessing and mitigating environmental obstacles, collaborating with stakeholders, including real estate agents, lenders, developers, builders and regulators, to bring investments and improvements to the community. Staff should work to expand partnerships with key groups, such as the Real Estate Council, Chambers of Commerce and lenders, by offering guidance on industry-specific environmental challenges. The city should consider hosting local brownfields redevelopment summits to bring key partners together. Other development professionals can also be encouraged to serve as volunteers to cross-educate community partners and stakeholders about their respective roles in land development projects. Ongoing collaborations with key agencies such as the EPA, TCEQ and the Texas Railroad Commission are also critical to securing funding for environmental remediation activities. In general, improved online resources and information are vital to effective public communication.

2.5.4.5 Development Actions for PA 4: Land Quality Communication & Collaboration

City Staff Training & Collaboration

1. Provide environmental due diligence training to city staff in support of municipal land acquisitions.
 - *Performance Indicator:* Number of city staff who have completed the environmental due diligence training.
2. Provide updated information to partnering city departments on the brownfields program and available resources biannually.
3. Coordinate with the Building Standards Division to develop and maintain a publicly accessible web page that provides information on the substandard structure program and available resources.
 - *Performance Indicator:* Number of visits to the substandard structure program web page.

Public Technical Guidance & Training

1. Host a brownfields redevelopment workshop every two years and invite key stakeholders within the community.
 - *Performance Indicator:* Number of people who attend the workshop.
 - *Performance Indicator:* Record of attendee feedback responses.
2. Annually review and update the city's publicly available brownfields web page with new brownfield sites, information on the BRLF and US EPA resources available for developers and land owners.
 - *Performance Indicator:* Number of visits to the brownfields program web page.
3. Annually review and update the city's publicly available MSD web page with updated information on the application process, applicable forms and other technical program information.
 - *Performance Indicator:* Number of visits to the MSD program web page.
4. Annually review and update the environmental use / license agreements and environmental easement vacation web pages with updated information on the application process, applicable forms and other technical program information.
 - *Performance Indicator:* Number of visits to the environmental use / license agreements and environmental easement vacation program web pages.
5. Develop technical guidance sheets for Land Quality programs.

Public Education & Outreach

1. Develop a marketing campaign for brownfields redevelopment targeting stakeholders, such as developers, lenders and land owners.
 - *Performance Indicator:* Number of stakeholders contacted.
2. Annually review and update the Land Quality Section web page.
3. Incorporate environmental CIP project information into the city web page.

Community Partnerships & Volunteerism

1. Coordinate with local stakeholders (e.g. local chambers of commerce, the Real Estate Council of Greater Fort Worth and developers) to identify priority areas and properties that could be considered for the brownfields program.
 - *Performance Indicator:* Number of meetings city staff attend or host annually, including community events attended.
 - *Performance Indicator:* Number of meeting attendees.
 - *Performance Indicator:* Quantity of brownfields program outreach materials distributed.
2. Create a web-based application form for the public to submit information on potential brownfield properties.
 - *Performance Indicator:* Number of submitted online applications.
3. Evaluate the feasibility of partnering with academic institutions to develop student training programs for Land Quality projects.



Figure 2-24. Historical industrial operations have led to present-day site contamination that the City of Fort Worth is addressing.

2.6 Conclusion

Historical land use in Fort Worth, at a time when environmental impacts were not well-known, evaluated or regulated, has resulted in contamination in soil, groundwater and within the built environment. As Fort Worth grows, the city land area expands and infill development increases, the need to redevelop properties and address these environmental challenges will increase. In addition to mitigating and remediating legacy contamination, the city will work to prevent the

release of new contaminants into the environment and structural assets through Land Quality programs.

2.6.1 Summary of Land Quality Development Actions

Land Quality Analysis

1. Develop an environmental inventory for municipal properties, MSDs, potential brownfields and all properties with ESA results and RECs.
2. Develop and implement a citywide policy requiring AAI due diligence be performed on all properties the city plans to acquire.

Land Quality Planning

1. Develop a brownfields redevelopment strategic plan.
2. Develop a property assessment strategic plan for municipal properties, which includes individual site action plans for cleanup activities, as applicable.
3. Develop a strategic plan for municipal properties requiring environmental monitoring.
4. Develop an urban waterbody assessment and dredging strategic plan.

Land Quality Rules & Regulations

1. Evaluate environmental ordinances for BMPs, and update the City of Fort Worth MSD ordinance.
2. Review cost recovery options for environmental assessments, site visits, monitoring and other environmental activities at city facilities.

Land Quality Projects & Technologies

1. Create a publicly accessible online GIS mapping tool to share site data.
2. Select and implement a database management software system for tracking field operations, capturing metrics and records management.
3. Prioritize projects through annual updates of the CIP.
4. Develop an inventory management system for Land Quality Program assets (e.g. PSTs, cleanup sites, etc.).

Brownfields Redevelopment

1. Evaluate opportunities and provide brownfields-related support to the public (e.g. ESAs, grants, etc.).
2. Develop a standardized brownfields application process, which includes all documents, forms and project screening tools to evaluate applications.

3. Track US EPA brownfields funding opportunity cycle.
 - *Performance Indicator:* Number of BRLF project applications submitted to the EPA and the success rate.
4. Establish a sustainable Brownfields Program.
 - *Performance Indicator:* Number of applicants.
 - *Performance Indicator:* Value of BRLF loans and sub-grants distributed.
 - *Performance Indicator:* Value of repaid BRLF loans with interest.
 - *Performance Indicator:* Number of cleanup plans completed.
 - *Performance Indicator:* Number of ESAs completed.
 - *Performance Indicator:* Number of completed reclamation projects.
 - *Performance Indicator:* Number of sites redeveloped.

Environmental Site Assessments

1. Develop an internal site assessment request protocol and tracking log for AAI due diligence and ESA requests from other city departments.
 - *Performance Indicator:* Number of requests each year.
2. Develop a memorandum of understanding (MOU) template for all contractual services performed for other city departments that clearly defines the scope of work and project objectives.

Soil & Groundwater Remediation & Groundwater Monitoring

1. Develop a procedure that outlines the requirements for the execution of site soil and groundwater remediation services, as well as groundwater monitoring activities, to meet regulatory objectives.
2. Develop standardized professional services documents (e.g., request for qualifications [RFQs], contracts, task orders, etc.) for soil and groundwater cleanup services.
3. Develop an inventory of municipal properties requiring remedial action, the identified RECs, applicable environmental regulations, and the cleanup methods applied.
 - *Performance Indicator:* Number of municipal properties requiring remedial action and/or

monitoring.

- *Performance Indicator:* Percentage of assessed properties for which site action plans have been developed.
 - *Performance Indicator:* Number of properties granted regulatory closure status.
4. Develop a memorandum of understanding (MOU) template for contractual Land Quality services performed for other city departments that clearly defines the scope of work and project objectives.

Substandard Building Demolitions

1. Maintain the substandard structure demolition SOP and track project data.
 - *Performance Indicator:* Number and percentage of demolitions performed by the city.
 - *Performance Indicator:* Number and percentage of owner-abated properties.

Municipal Setting Designations (MSDs)

1. Review the MSD SOP annually, and revise as applicable.
 - *Performance Indicator:* Number of MSDS applications received.
 - *Performance Indicator:* Number of MSD applications approved by the TCEQ.
2. Update the MSD property inventory when new MSDs are adopted and approved by the TCEQ.

Environmental Use Agreements, Environmental License Agreements & Easement Vacations

1. Annually review the procedure for environmental use agreements and revise as applicable.
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3. Create a web-based application form for public use for environmental use agreements and environmental license agreements.
 - *Performance Indicator:* Number of submitted online applications.

Municipal Facility Compliance & Regulatory

1. Develop a database of regulatory requirements applicable to municipal facilities and perform annual reviews to identify regulatory updates.
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3. Develop detailed environmental compliance audit checklists for municipal facilities.

City Staff Training & Collaboration

1. Provide environmental due diligence training to city staff in support of municipal land acquisitions.
 - *Performance Indicator:* Number of city staff who have completed the environmental due diligence training.
2. Provide updated information to partnering city departments on the brownfields program and available resources biannually.
3. Coordinate with the Building Standards Division to develop and maintain a publicly accessible web page that provides information on the substandard structure program and available resources.
 - *Performance Indicator:* Number of visits to the substandard structure program web page.

Public Technical Guidance & Training

1. Host a brownfields redevelopment workshop every two years and invite key stakeholders within the community.
 - *Performance Indicator:* Number of people who attend the workshop.
 - *Performance Indicator:* Record of attendee feedback responses.
2. Annually review and update the city's publicly available brownfields web page with new brownfield sites, information on the BRLF and US EPA resources available for developers and land owners.
 - *Performance Indicator:* Number of visits to the brownfields program web page.
3. Annually review and update the city's publicly available MSD web page with updated information on the application process, applicable forms and other technical program information.
 - *Performance Indicator:* Number of visits to the MSD program web page.

4. Annually review and update the environmental use / license agreements and environmental easement vacation web pages with updated information on the application process, applicable forms and other technical program information.
 - *Performance Indicator:* Number of visits to the environmental use / license agreements and environmental easement vacation program web pages.
5. Develop technical guidance sheets for Land Quality programs.

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1. Develop a marketing campaign for brownfields redevelopment targeting stakeholders, such as developers, lenders and land owners.
 - *Performance Indicator:* Number of stakeholders contacted.
2. Annually review and update the Land Quality Section web page.
3. Incorporate environmental CIP project information into the city web page.

Community Partnerships & Volunteerism

1. Coordinate with local stakeholders (e.g. local chambers of commerce, the Real Estate Council of Greater Fort Worth and developers) to identify priority areas and properties that could be considered for the brownfields program.
 - *Performance Indicator:* Number of meetings city staff attend or host annually, including community events attended.
 - *Performance Indicator:* Number of meeting attendees.
 - *Performance Indicator:* Quantity of brownfields program outreach materials distributed.
2. Create a web-based application form for the public to submit information on potential brownfield properties.
 - *Performance Indicator:* Number of submitted online applications.
3. Evaluate the feasibility of partnering with academic institutions to develop student training programs for Land Quality projects.

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CHAPTER 3

Air Quality

Protecting air quality in the outdoor environment

GOALS

- Ensure municipal compliance with federal and state environmental regulations for air quality.
- Monitor air quality and establish practices and plans to minimize air pollution.
- Regulate sources of air pollutants to minimize adverse impact on human health and the environment.
- Achieve air quality compliance through inspections and enforcement.
- Provide technical guidance, outreach and education to encourage responsible actions for air quality.



AIR QUALITY AT-A-GLANCE

Air Quality Planning & Management Program Area

Air quality is a complex issue that requires continual monitoring to better understand the sources of air pollution, changes in air pollutant levels and meteorological conditions that can impact human health and the environment. Air Quality Section staff



PHOTO BY CITY OF FORT WORTH

utilize data generated from monitoring and compliance program activities to analyze trends that inform local and regional planning decisions in transportation, energy and land use. This helps the city and its partners develop strategies to address current regulatory challenges and mitigate air pollution, while preparing for the future. Staff also evaluate new tools and technologies with the potential to more accurately identify emissions sources and emerging pollutants, as well as enhance existing air monitoring networks.

KEY ACTIVITIES

- Air Quality Analysis
- Air Quality Planning
- Air Quality Rules & Regulations
- Air Quality Projects & Technologies

Air Quality Monitoring Program Area

Air Quality Section staff operate and maintain ambient air monitoring stations throughout the city in cooperation with the Texas Commission on Environmental Quality (TCEQ). These stations collect data on meteorological conditions and air pollutant concentrations, and are regulated under National Ambient Air Quality Standards (NAAQS). A separate network of air monitoring stations are maintained and operated in cooperation with the TCEQ and the Department of Homeland Security (DHS). These monitors collect data to evaluate threats of an airborne bioterrorism attack. Local air monitors allow for quick access to data and direct collaboration with city administration and emergency management officials in the event of a threat to human health.

KEY ACTIVITIES

- Ambient Air Quality Monitoring
- Particulate Matter Monitoring
- Biohazard Monitoring
- Mobile Monitoring



PHOTO BY CITY OF FORT WORTH

PROGRAM AREAS

- Air Quality Planning & Management
- Air Quality Monitoring

- Air Quality Compliance
- Air Quality Communication & Collaboration

Air Quality Compliance Program Area



PHOTO BY CITY OF FORT WORTH

Section staff conduct compliance inspections for air quality regulations at industrial, commercial and construction operations throughout Fort Worth. They also audit municipal facilities that generate air pollution emissions. Complaints that involve specific concerns for air emissions, such as odors, smoke, dust and potential health effects, are investigated. Air investigations and inspections of facilities support the protection of local air quality through ensuring compliance with state and federal environmental rules and regulations. The city is also authorized to enforce regulations to reduce environmental impacts to the ambient atmosphere and public health.

KEY ACTIVITIES

- Industrial & Commercial Air Quality Compliance
- Municipal Air Quality Compliance
- Construction Air Quality Compliance
- Complaint Investigations

Air Quality Communication & Collaboration Program Area

Air Quality staff provide training to city employees to help departments maintain regulatory compliance and offer technical guidance on management practices that reduce emissions from municipal operations. Air pollution directly impacts human health, and staff work



PHOTO BY CITY OF FORT WORTH

with partners to ensure that important information on air conditions or hazards from emergency situations is delivered to the public quickly and across multiple communications platforms. To promote key air quality messages, section staff work with city communications personnel to develop educational campaigns that connect the public with resources to reduce air pollution. Section staff also support collaborative efforts to address regional air quality between partners from academic institutions, other municipalities and volunteers from community organizations.

KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Why do we need Air Quality programs in our community?

Air Quality programs protect human health and safety by reducing exposures in the outdoor air we breathe. Programs monitor pollutant levels in the air and encourage air pollutant emissions control and compliance for a cleaner environment, sustained economic value and community aesthetics.

TO PROMOTE HUMAN HEALTH AND PUBLIC SAFETY.



Protects residents and visitors by reducing exposure to air pollutants



Reduces air pollution to support respiratory health

TO CREATE AND MAINTAIN A CLEAN, ATTRACTIVE CITY.



Builds pride in our community



Controls issues like smog and odor in neighborhoods

TO PROMOTE QUALITY OF LIFE AND A SUSTAINED ECONOMY.



Promotes cleaner air to attract businesses and visitors to our city



Reduces public costs for health impacts

Executive Summary

Fort Worth, along with the entire North Central Texas region, has experienced substantial growth in population and industry. As more people and businesses move to the area, vehicular traffic, construction, industry, and other sources of air emissions increase. Some of these emissions, such as ozone and particulate matter (PM), can have significant health impacts, especially for vulnerable populations (children, the elderly, those with chronic diseases, etc.). While TCEQ data from air monitoring stations have shown an overall decrease in regional ozone concentrations since the turn of the century (Reference 3-1), monitors in Tarrant County have shown an increase in recent years (Reference 3-2). The disparity in the regional and local data could be due to localized growth trends in emissions sources, as well as a monitoring network that is unable to capture fine spatial differences in pollutants, because it was designed for regional-scale monitoring, rather than city-level monitoring. Air quality is a regional issue, and addressing it requires the collaboration of all the cities in the area. In the City of Fort Worth, the Air Quality Section of the Environmental Quality Division is responsible for managing air programs and operations. Section staff work to minimize health risks to residents, workers and visitors by monitoring local air conditions, ensuring local businesses and industries meet regulatory standards and minimizing exposure to air pollutants. They also provide emergency response support when there is a possible pollutant release and investigate odors and other potentially hazardous emissions. A specialized team within the Air Quality Section coordinates with the DHS and other agencies to monitor for bioterrorism threats. All section staff are committed to protecting the health of our community by adhering to regulatory standards and providing excellent customer service. The Air Quality Section:

- Completes an average of 420 air investigations annually to help ensure business and industrial compliance with state and federal air quality regulations.
- Performs annual investigations at all U.S. Environmental Protection Agency (EPA)-classified major sources (i.e. Title V facilities) located within Fort Worth.
- Performs an average of 25 permit reviews each year, evaluating site parameters against TCEQ protocols for permit and permit-by-rule registrations.
- Responds to all air complaints within Fort Worth regarding odors, dust, chemical pollutants and permit/regulatory non-compliance. Staff respond to 94 percent of high priority air complaints within 24 hours.
- Operates and maintains five TCEQ regional ambient air monitoring stations and reports air pollutant and meteorological data across Tarrant County.
- Conducts DHS BioWatch Program operations 365 days per year.

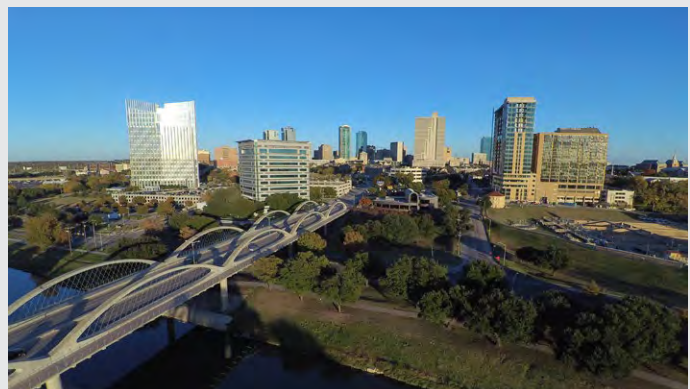


Figure 3-1. Downtown Fort Worth skyline and 7th Street Bridge, photo courtesy of Andrew Driggers.

3.1 Key Terms

AQI – Air Quality Index

BMPs – Best Management Practices

CAA – Clean Air Act

CAMS – Continuous Air Monitoring Station

CO – Carbon Monoxide

DHS – Department of Homeland Security

EPA – Environmental Protection Agency

EMS – Emergency Management System

GIS – Geographic Information Systems

HAPs – Hazardous Air Pollutants

NAAQS – National Ambient Air Quality Standards

NCAMS – Non-Continuous Air Monitoring Station

NCTCOG – North Central Texas Council of Governments

NGO – Non-Governmental Organization

NOAA – National Oceanographic and Atmospheric Administration

NPO – Nonprofit Organization

NO_x – Oxides of Nitrogen

OEM – Office of Emergency Management

PA – Program Area

PM – Particulate Matter

PM₁₀ – Particulate Matter less than 10 microns in diameter

PM_{2.5} – Particulate Matter less than 2.5 microns in diameter

PST – Petroleum Storage Tank

SIP – State Implementation Plan

TCEQ – Texas Commission on Environmental Quality

TxDOT – Texas Department of Transportation

UHI – Urban Heat Island

UTD – University of Texas at Dallas

VOC – Volatile Organic Compound

3.2 Introduction to Air Quality



Figure 3-2. Smog obscures view of the Chrysler Building from the Empire State Building, November 20, 1953. A lack of regulations prior to passage of the Clean Air Act resulted in emissions that were hazardous to human health and the environment. Library of Congress, World-Telegram photo by Walter Albertin.

Federal legislation regarding air quality was first enacted in 1955 with the Air Pollution Control Act, soon followed by the passage of the Clean Air Act of 1963 (CAA). The act has been amended several times to set automobile emissions standards, establish an air monitoring network and allow investigations and inspections of emissions sources. In 1970, Congress greatly expanded the CAA with an amendment requiring federal and state regulations for both stationary emissions sources (e.g., factories, farms, gas stations), as well as mobile sources. It also enhanced the ability of the federal government to enforce standards, which became the purview of the EPA when it was established in December of 1970. The EPA was charged with implementing four revolutionary regulatory programs promulgated by the CAA:

- Establishing the NAAQS, which are concentration standards for certain criteria pollutants in ambient air throughout the country.

- Requiring the development of state implementation plans (SIPs) to ensure state compliance with the CAA.
- Establishing new source performance standards to control air pollutants from new sources.
- Setting the national emission standards for hazardous air pollutants, which are standards applied to 187 congressionally designated hazardous air pollutants (HAPs).

In 1990, the CAA was amended again, giving the EPA the authority to set regional NAAQS attainment levels for criteria pollutants (Reference 3-1). Since these amendments were integrated into the law, the North Central Texas region has been designated by the EPA as being in varying degrees of non-attainment for the pollutant ozone (Reference 3-4). In the City of Fort Worth, the Air Quality Section oversees the programs governed by the CAA and the Texas SIP. Staff monitor air quality and ensure compliance with regulations to reduce air pollution and protect the health of residents and visitors alike. They collaborate with regional, state and federal partners on air quality programs and air planning efforts. They also serve as subject matter experts when communicating air quality initiatives to city staff, as well as to the public.



Figure 3-3. The sky over downtown Fort Worth on a day with good air quality, photo by City of Fort Worth.

3.2.1 Program Areas (PAs)

3.2.1.1 PA 1: Air Quality Planning & Management

In recent decades, the North Central Texas region has experienced a significant influx of people and businesses moving to the area, spurring new development and industries. Air emission sources from transportation, residential, commercial and industrial sectors have increased. Monitoring for NAAQS criteria pollutants and improving air quality in a growing region will become increasingly difficult and require strategic planning and in-depth analyses of pollutant data and emission sources. The city's air planning and management programs address these challenges and ensure regulatory compliance by working to streamline activities and utilize resources more effectively. Staff will continue to evaluate projects and technologies that support air monitoring and compliance activities and look for innovative solutions to protect human health and quality of life.

3.2.1.1.1 KEY ACTIVITIES

- Air Quality Analysis
- Air Quality Planning
- Air Quality Rules & Regulations
- Air Quality Projects & Technologies

3.2.1.2 PA 2: Air Quality Monitoring

The city manages the Ambient Air Quality Monitoring Program in cooperation with the TCEQ to measure criteria pollutants under the NAAQS, as well as meteorological data. City staff operate, maintain and repair monitoring equipment owned by the TCEQ, and perform sampling and data collection activities at five stations throughout Tarrant County. The city is working to expand the air quality monitoring network to better capture data at smaller scales, especially for PM, because concentrations can vary greatly over short distances and with changes in elevation. Staff also manage local field operations of the DHS BioWatch Program for early detection of bioterrorism attacks. Staff are exploring innovative solutions to identify pollutants in emergency situations, including mobile and handheld air monitors. Mobile monitoring can serve to augment stationary monitoring networks and provide vital data during investigations.

3.2.1.2.1 KEY ACTIVITIES

- Ambient Air Quality Monitoring
- Particulate Matter Monitoring
- Biohazard Monitoring
- Mobile Monitoring



Figure 3-4. An Air Quality Section staff member exchanges a filter on an air sampler.

3.2.1.3 PA 3: Air Quality Compliance Investigations

Air quality staff inspect TCEQ-permitted business and industrial facilities with potential air pollutant emissions, including used car lots, gas stations, auto body shops, manufacturing and fabrication operations. Staff also review permit applications under the TCEQ New Source Review Program to ensure the permit requirements apply to the facility. The city is developing a municipal facility audit program to ensure internal compliance with air regulations and prevent violations and enforcement actions against the city. When the city receives complaints regarding air emissions or other air quality issues, such as smoke from burning activities or noxious odors, air quality staff investigate in an attempt to determine the pollutant involved and the source. Priority is given to complaints of emissions that are potentially harmful to human health. Staff also inspect construction activities and respond to complaints of dust that blows off site.

3.2.1.3.1 KEY ACTIVITIES

- Industrial & Commercial Air Quality Compliance
- Municipal Air Quality Compliance
- Construction Air Quality Compliance
- Complaint Investigations

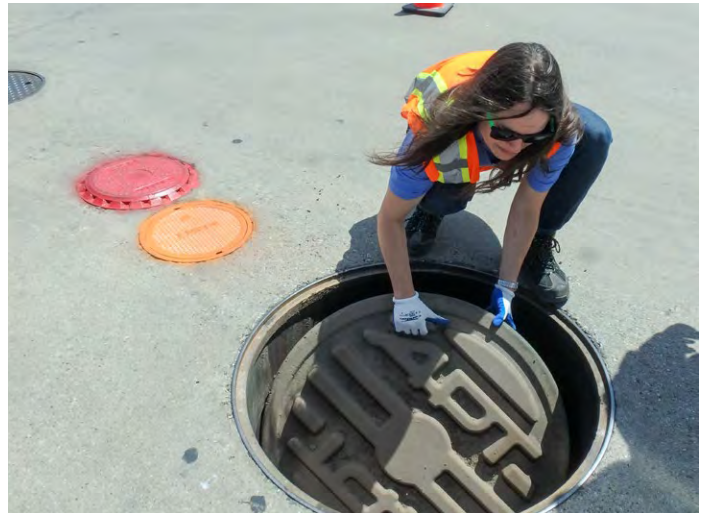


Figure 3-5. An Air Quality Section staff member inspects an underground storage tank at a gas station, photo by City of Fort Worth.

3.2.1.4 PA 4: Air Quality Communication & Collaboration

Air quality staff serve as subject matter experts, providing training to city staff on reducing emissions from municipal operations and regulatory compliance. Staff also work with residents, businesses and industries to offer regulatory guidance and connect them with resources from partner agencies. Staff attend outreach events and give presentations to community organizations and businesses to promote air quality awareness and educate the public on actions they can take to reduce pollution. They also work with the Community Engagement Office and communications staff to develop and deliver air quality messaging through various media. Air quality is a regional issue, and the city coordinates with the North Central Texas Council of Governments (NCTCOG), schools and universities, nonprofit organizations (NPOs), non-governmental organizations (NGOs) and other municipalities to develop strategies to reduce air pollution. These include research and data analysis projects, partnerships for air monitoring activities and regional air quality campaigns.

3.2.1.4.1 KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Figure 3-6. Air Quality focus group meeting, photo by City of Fort Worth.

3.3 Structure & Funding for Air Quality

As of 2018, the section staff includes ten positions: an environmental supervisor, three senior environmental specialists, and six environmental specialists. Programmatic responsibilities, as listed below, have been implemented to support the city’s vision for a cleaner, safer and more livable city through proper monitoring of Fort Worth’s air quality.

- One environmental supervisor oversees and manages Air Quality Section staff.
- Three senior environmental specialists provide technical expertise and team lead functions for the compliance investigations, ambient air monitoring, and DHS BioWatch Program monitoring teams.
- Six environmental specialists perform regulatory and permit compliance inspections, complaint investigations, monitoring upkeep and site maintenance.

The Air Quality Section is partially funded through various grants awarded by the TCEQ, EPA and DHS:

- TCEQ/EPA Grant – Local Air Program Contract
- TCEQ/DHS Grant – Fort Worth Whole Air Monitoring Contract
- TCEQ/EPA Grant – Particulate Matter 10 Monitoring Contract
- TCEQ Grant – Particulate Matter 2.5 Monitoring Contract

Matching funds for grants and additional funding come from the Environmental Protection Fund.

3.4 Challenges to Air Quality

North Central Texas is one of the fastest-growing regions in the country. With that growth comes additional emissions from increased traffic, energy demand, businesses and industries. Fort Worth has seen significant development since the turn of the century, and it is likely that the city will require additional resources, including new equipment and staff, to keep pace with the growing number of emission sources over a larger land area.

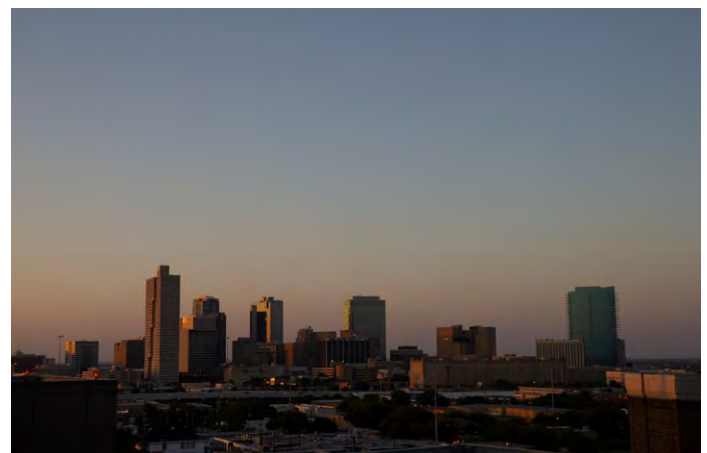


Figure 3-7. Haze from air pollution over Fort Worth, photo courtesy Eric Kelp.

3.4.1 Ozone & Ozone Precursors

Ozone affects the respiratory system by reacting chemically with lung tissue and poses a significant public health risk, especially among vulnerable populations like children and the elderly (Reference 3-5). It can also exacerbate chronic health conditions like asthma, and results in increased emergency room visits (Reference 3-6). Ozone is not emitted directly, but forms when chemicals known as ozone precursors react with ultraviolet light. The primary ozone precursor chemicals are oxides of nitrogen (NO_x) and volatile organic compounds (VOCs). Motor vehicles are the main source of NO_x, as these chemicals are produced during fuel combustion. VOCs come from a variety of sources, including fuels, cleaning agents, paints and even personal care products like perfume.

The population of the North Central Texas region is highly mobile, with people often living, working and

recreating in different cities. Almost all of this travel takes place in personal vehicles, as access to public transit is limited. The region also serves as a major hub for the multimodal transportation of goods, and heavy truck traffic is common. As a result, nearly half the region's NO_x and VOC emissions come from transportation sources. Heavy industry, construction and agriculture also contribute significant emissions (see Figures 3.8 and 3.9). These chemicals are regulated to reduce the formation of ozone and monitored to alert the public when there is a potential for concentrations of ozone that could impact human health. Ozone pollution tends to be highest from March through October, or "ozone season," because it requires sunlight to form and concentrations increase during warm, stagnant weather. Residents throughout the region are alerted when ozone concentrations are predicted to be high through the air quality index (AQI), a simple color index that represents the level of health concern. These alerts warn residents to limit certain activities to protect their health and reduce NO_x and VOC emissions that lead to ozone formation.

3.4.2 Particulate Matter (PM)

PM₁₀ emissions are not specific chemicals, but rather the sum of all organic, inorganic, solid or liquid particles smaller than 10 microns in diameter in the air. PM emissions can result from a variety of natural and human processes, including wind-blown dust and pollen, smoke, metal grinding and cutting, wood

sanding and cutting, concrete and cement production, amongst many other natural and human processes. For example, large wildfires can cause enormous spikes in PM concentrations, resulting in respiratory health problems. The long-term impacts of exposure to lower levels of PM are not well understood. Public concerns over PM pollution are growing, as more studies are published establishing links between PM and health risks. PM emissions inundate the air we breathe and affect the respiratory system by blocking the passage of air into the bloodstream or physically irritating lung tissue, causing inflammation. Some PM is small enough to penetrate deep into the lungs where it can actually be absorbed into the bloodstream. Very small PM can even penetrate the blood-brain barrier (Reference 3-7). The full implications for human health are not

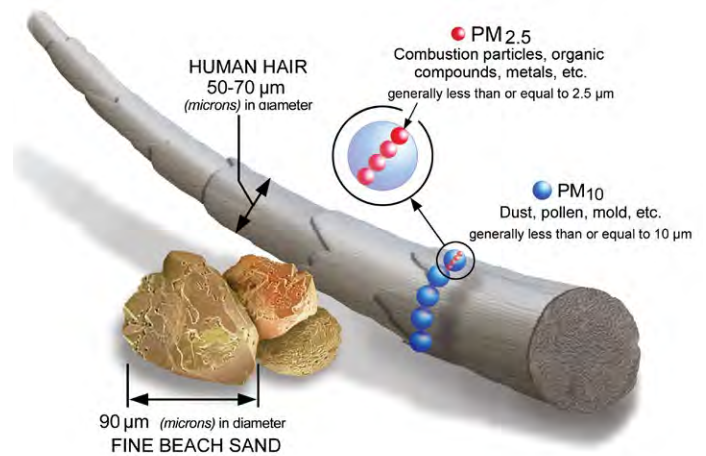


Figure 3-10. Particulate matter size scale (Reference 3-9).

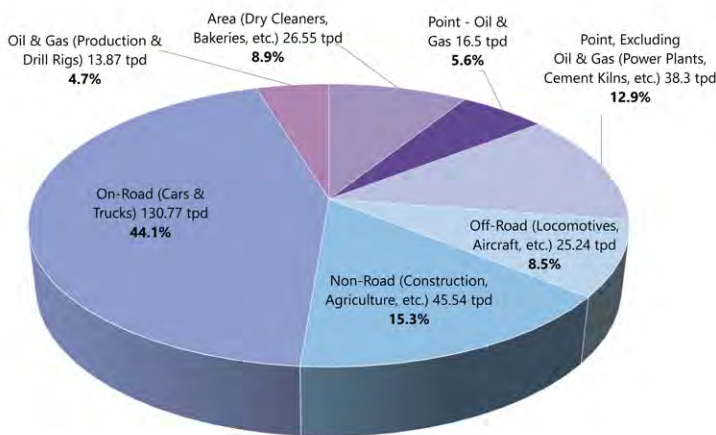


Figure 3-8. Estimated 2017 North Central Texas NO_x emissions inventory (Reference 3-1).

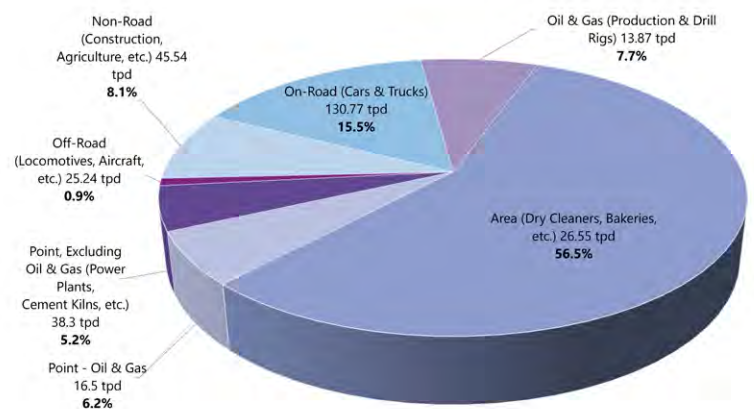


Figure 3-9. Estimated 2017 North Central Texas VOC emissions inventory (Reference 3-1).

yet understood, but epidemiological studies suggest that chronic exposure can lead to cognitive decline, including depression and anxiety (Reference 3-8). Air Quality Section staff have received a greater number of resident complaints about PM, which could be the result of increased construction activity or growing awareness of PM and its associated health risks. In the future, investigations into PM emissions are expected to increase.

3.4.3 Air Nuisances & Hazardous Emissions

Air Quality Section staff respond to all air complaints, and protecting human health and the environment are top priorities. An air emission may present a threat to human health if it is a hazardous substance, and any complaints involving potentially hazardous substances are investigated immediately. Even if an emission is not hazardous to human health, it can still impact quality of life. For example, a foul odor may prevent a resident from enjoying outdoor activities, but not adversely impact their health. This is considered an air nuisance. Common complaints include odor from landfills, smoke from smokestacks, and fumes from metal-cutting torches. Staff respond to these complaints by investigating to locate the emission source and bring it into regulatory compliance. There are cases when an emission and its health risk are unknown, such as during a fire. In these cases, staff must quickly evaluate the situation and work to determine if there is a hazardous emission through research into the operations of the structure or facility. Air complaints may also be vague, as residents are not likely to know potential emission sources or specific chemicals present. This presents a challenge to staff who must attempt to determine the emissions source and if there are any threats to health.

3.4.4 Biological Threats

In response to the anthrax attacks that occurred during the weeks after the September 11, 2001 terror attacks, there has been a heightened level of security to reduce threats and prevent additional biological attacks. In 2003, the DHS established the BioWatch Program to provide early warning of a bioterrorism attack, such as a release of anthrax. According to the DHS, this program can substantially reduce the impact of a biological attack by providing decision-makers the early warning they need to coordinate a rapid and effective response (Reference 3-10). BioWatch is



Figure 3-11. One of the most well-known examples of the impact of air pollution on public health is the Great London Smog of 1952, caused by stagnant air conditions and the burning of coal. The smog lasted five days and resulted in high concentrations of sulfur dioxide and PM, killing thousands of people, photo from University of Saskatchewan and Huron University College.

managed by the Office of Health Affairs and involves a large network of stakeholders from public health, emergency management, law enforcement, laboratory, scientific and environmental health organizations around the country who collaborate to monitor and train for a bioterrorism attack (Figure 3-12).

3.4.5 Greenhouse Gases (GHGs)

Gases that trap solar radiation (i.e. heat) in the atmosphere are called greenhouse gases (GHGs). The most well-known GHG is carbon dioxide, which accounts for about 80 percent of all emissions in the United States. Other common GHGs include methane and nitrous oxide. Carbon dioxide is emitted during the combustion of fossil fuels and the burning of wood and other materials, as well as from chemical reactions in industrial processes, such as cement production. Methane is commonly emitted during the production of natural gas and other fossil fuel sources, from agricultural operations and from landfills as waste breaks down. Nitrous oxide is also produced in

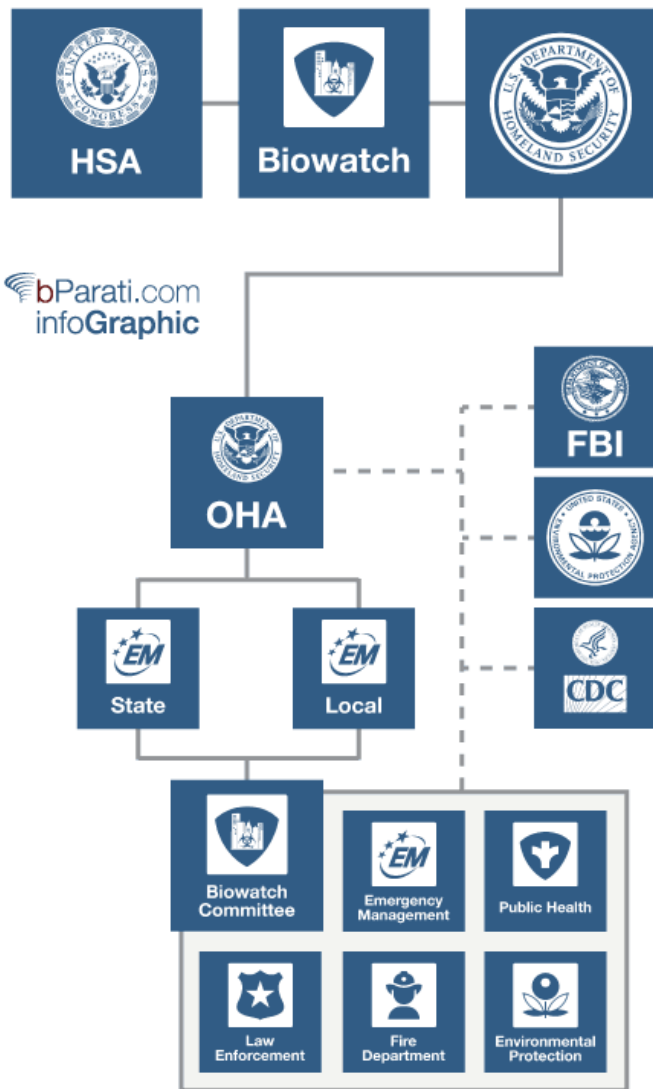


Figure 3-12. Organizational chart of the DHS BioWatch Program from bParati.com by Karl Schmitt.

agricultural and industrial processes, and during the combustion of fossil fuels. Concentrations of GHGs in the atmosphere are rising at an increasing rate, and are the primary drivers of climate change (Reference 3-11). Impacts to the North Central Texas region may include the increased severity of heat waves and droughts, as well as increased flooding events. These weather events put pressure on drinking water supplies and stormwater infrastructure, degrade roads more quickly and damage the built environment. Heat waves increase the risk of heat stroke, and stagnant air conditions that often accompany heat waves raise air pollution concentrations that can have respiratory health impacts. If the concentration of atmospheric GHGs continues to rise, there may be greater impacts to human health and the environment.

3.5 Strategies for Air Quality (by Program Area)

3.5.1 Strategies for PA 1: Planning & Management

A strategic approach to program planning and management is vital to protecting human health and improving air quality as Fort Worth’s population grows. A careful analysis of current and future data needs, coupled with thorough evaluations of new technology and equipment, will help ensure the city has the resources it needs to effectively and efficiently manage programs. Reducing risks to human health and the environment, ensuring regulatory compliance and maintaining a high quality of life for residents will continue to be priority concerns in future planning efforts.

3.5.1.1 Analysis

Staff utilize current research on air quality, climate and technology, as well as historical city data and data from external agencies for strategic planning and program evaluation. This includes information from sources such as the International Panel on Climate Change and the National Atmospheric and Oceanographic Administration (NOAA), and partner data from the EPA, TCEQ and the NCTCOG. The Air Quality Section staff collect air pollutant and climate data from the TCEQ network to monitor pollutant trends over time. These network data illustrate general trends, but are limited in their ability to capture fine-scale geographic variations in pollutants due to the small number of monitoring stations. Staff should track and evaluate available data for pollutant trends to determine where additional monitoring activities or investigations may be necessary. Staff can also compare current climate data with historical climate data to look for changes in trends, which is useful in resiliency planning.

The city should consider working with partners to develop an urban canopy study similar to the *State of the Dallas Urban Forest* report (Reference 3-12), as well as the *Dallas Urban Heat Island Management Study* (Reference 3-13), both prepared by the Texas Trees Foundation. The urban heat island (UHI) effect is the temperature difference between urban and rural areas. Urban areas have more land cover (e.g. concrete, cement, asphalt) that absorbs heat and re-emits it throughout the night, keeping urban areas hotter. This

increasing the risk for heat illness, especially to those without air conditioning. There are also micro heat islands during the day in paved areas like parking lots. Trees help reduce the UHI effect, and an urban tree study could provide the basis for planning efforts to increase the tree canopy and mitigate the UHI.



Figure 3-13. Increasing the urban tree canopy can keep cities cooler, improve air quality and increase property values, photo by City of Fort Worth.

The Air Quality Section staff maintain a compliance investigation database, which includes different facility types, the number of investigations and any findings to better understand which facilities are more likely to have difficulty with compliance. The database will help prioritize investigation activities to ensure high-risk facilities are in compliance. All businesses are classified according to the standard industrial code as defined by the Occupational Safety and Health Administration, and it may be beneficial to purchase a list of all businesses in Fort Worth with their classification codes to help identify any potential emissions sources in the city (Reference 3-14). The city should assess the cost of purchasing such a list to further build out the compliance investigation database. Staff will continue to analyze pollutant and facility data, combined with information from the latest research, to help determine if the monitoring network is sufficient and identify any gaps in air quality programs. This will become more important in reducing air pollution and managing Air Quality programs as the population and emission sources continue to grow.

3.5.1.2 Planning

Pollution and air quality are regional issues, requiring planning at the state, county and local levels. The TCEQ develops a work plan outlining the

monitoring and investigation activities that are to be accomplished by Fort Worth on an annual basis. Air Quality Section staff review this work plan and offer suggestions to maximize resources and improve the value of operations, such as focusing on facilities likely to be unpermitted or out of compliance. Once finalized, staff develop an action plan to ensure work plan targets are met. Every two years, staff submit a quality management plan to the TCEQ to outline the strategies for maintaining the state monitoring network. These planning activities are part of the reporting requirements for the grants the city receives for performing air monitoring activities. The city works with the NCTCOG on regional air quality planning, which is largely focused on transportation, as vehicles are the largest single source of ozone precursor chemicals. Section staff will continue to serve in an advisory capacity to the NCTCOG and city departments involved in regional and local transportation planning.

Air Quality Section staff should advise city departments on other topics related to air quality, such as energy conservation, resiliency planning and climate impacts on infrastructure. Staff will recommend development practices that reduce daily vehicle miles traveled for commuters and promote green infrastructure to help reduce the UHI effect increases. Air Quality Section staff will explore the feasibility of developing an action plan to reduce municipal emissions on ozone action days. This would include all departments and encourage actions such as telecommuting, delaying mowing activities and refueling vehicles in the evening. Staff will also work with the Office of Emergency



Figure 3-14. A fire at a warehouse or other facility can pose unknown threats to human health. Staff must quickly research the property to determine what chemicals or substances may be present, photo by City of Fort Worth.

Management (OEM) to assess current emergency plans for incidents involving potential air emissions to determine if new procedures need to be developed. Staff will also support development of procedures and plans for emergency events to better protect first responders.

3.5.1.3 Rules & Regulations

At the national level, the CAA requires the EPA to set the NAAQS, which govern air quality regulations. The TCEQ is required to submit a SIP, which sets regulatory standards in the state, outlines action plans to improve air quality and ensures compliance with the CAA. The city performs inspections on some types of facilities and investigates complaints at the local level, but enforcement authority lies solely with the TCEQ. The only exception to this is the Locally Enforced Motor Vehicle Idling Limitations rule. Through a memorandum of understanding with the TCEQ, many municipalities, including Fort Worth, have opted to locally enforce anti-idling policies based on the state regulation (Reference 3-15). Staff will review the

anti-idling ordinances and policies of other cities, including penalties and enforcement mechanisms, then evaluate city policies to determine whether they should be amended. Air Quality staff will also review policies and ordinances in other cities that provide for the ability to inspect a wider range of facilities with known or potential emissions, as well as the enforcement authority to issue citations to those out of compliance with state or federal regulations. Staff will then assess current city ordinances to determine if updates or new ordinances are required to support compliance efforts and improve local air quality.

3.5.1.4 Projects & Technologies

As the population of Fort Worth continues to grow, emissions increase, and the city incorporates more land area, additional resources will be necessary to continue to monitor air quality and provide a high level of customer service to residents. By investing in new technologies, equipment and projects, the city can streamline operations and maximize staff efficiency.



Figure 3-15. An anti-idling street sign from the NCTCOG.

local level, but enforcement authority lies solely with the TCEQ. The only exception to this is the Locally Enforced Motor Vehicle Idling Limitations rule. Through a memorandum of understanding with the TCEQ, many municipalities, including Fort Worth, have opted to locally enforce anti-idling policies based on the state regulation (Reference 3-15). Staff will review the

3.5.1.4.1 AIR QUALITY MONITORING NETWORK

The TCEQ ambient air monitoring network is spread over a wide geographic area, and each station collects data on different pollutants and meteorological conditions (Reference 3-16). These stations cannot capture the spatial variability of most pollutants that vary widely from one neighborhood to the next. This makes it difficult for staff to pinpoint hot spots of pollutants and address emission sources. The air monitoring network could be expanded by adding additional TCEQ stations, new city-owned stations or through partnerships with local schools, universities, NPOs and NGOs. The network can be supplemented by equipping vehicles for mobile monitoring activities or through the use of handheld monitors, both of which can be deployed during emergency situations or investigations.



Figure 3-16. PM sampler at a TCEQ monitoring station, photo by City of Fort Worth.

3.5.1.4.2 AIR QUALITY LABORATORY

To streamline air monitoring and investigative operations, the city should consider developing a fully certified air quality laboratory to serve all of its programs, including BioWatch. This would save significant staff travel time and produce quicker results, as samples could be processed locally. A city lab could also be upgraded more easily to incorporate new technologies and support advanced monitoring and sampling methods. Air Quality Section staff will review best management practices (BMPs) from other cities that have deployed these technologies to evaluate the options available to the city. Staff will also explore funding options to develop a laboratory, such as grants, or utilizing capital improvement projects funds.

3.5.1.4.3 SOFTWARE & DIGITAL SOLUTIONS

Since 2015, Air Quality Section staff have worked to digitize records to improve efficiency. Staff will continue to streamline and modernize records reporting and operations. Internally, Environmental Quality Division staff are evaluating software platforms to consolidate field inspection and auditing forms to serve all teams, supporting cross-training efforts. Utilizing a single tool for all staff will reduce the number of personnel needed to perform a facility audit and improve the productivity of trips into the field. Any software platform will need to integrate with geographic information systems (GIS) to provide spatial data for analysis and research.

Staff will use GIS to evaluate monitoring networks and identify priority sites for new monitoring stations or adding monitoring equipment to existing sites. GIS maps of air complaints and inspection findings can help staff identify problem sources or areas within the city that have high pollutant concentrations. Environmental staff collaborate with the OEM to practice drills and prepare for emergency situations, and support the City of Fort Worth Joint Emergency Operation Center when it is activated during major events. Staff will work with the OEM to evaluate dispersion modelling software that can be used during emergency situations to map plumes that could contain hazardous emissions. Access to these tools will enable staff to act quickly to protect human health and the environment.

3.5.1.4.4 FIELD EQUIPMENT

Air Quality Section staff continually evaluate new technologies to upgrade, augment or replace existing equipment and aid in the detection and reduction of air pollution emissions. Many of the TCEQ air monitoring stations would benefit from equipment upgrades. Newer models can collect data on a wider array of pollutants and use new methods of detection that provide more accurate results. Air Quality Section staff can work with partners, such as the TCEQ, to explore options for replacing equipment with better-performing models. As the city works to either expand the TCEQ network or develop a separate city-managed network, new equipment can be tested using existing monitors for calibration and accuracy before deploying to the entire network. New equipment to be evaluated will include mobile, portable and stationary monitors. Mobile and portable monitors can be used in a wider range of studies and to investigate specific sites.

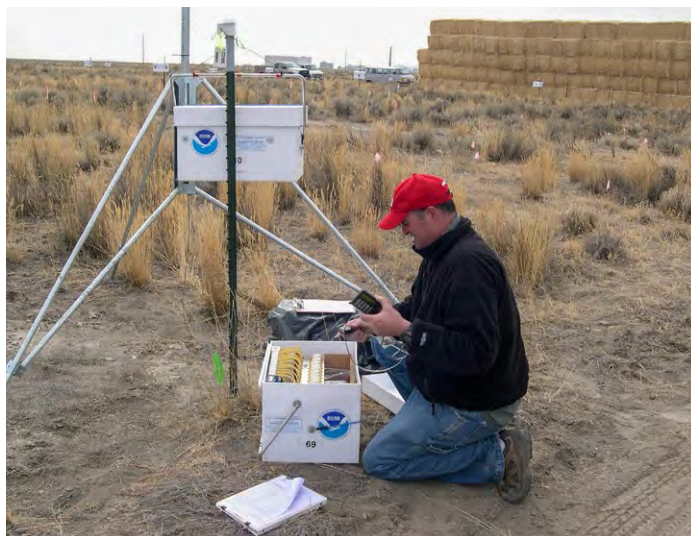


Figure 3-17. A NOAA scientist deploys a portable air monitor to study pollutants near roadways, photo from NOAA.

When a resident or visitor to Fort Worth reports an air complaint, they may not know the specific emission or source and whether or not it is hazardous to their health. Mobile or hand-held monitors can be deployed in this situation to rapidly determine chemicals present in the emissions, and staff can take quick action to protect human health and the environment. Other tools that can aid in investigations and emergency situations include infrared pollutant and radiation detectors and early warning systems. As new technologies and equipment become available, staff should continue to evaluate them for use in monitoring and investigation operations. Additionally, new technology may be used in emission and pollutant studies, as well as climate research. As part of this initiative, staff will explore partnerships to help deploy and evaluate new equipment.

3.5.1.5 Development Actions for PA 1: Air Quality Planning & Management

Air Quality Analysis

1. Build and maintain a comprehensive database for air quality data, including air emissions and pollution data, and historical and City of Fort Worth climate data and trends.
2. Coordinate with partnering city departments and community partners to conduct air quality related studies and use this data to inform policy decisions.

Air Quality Planning

1. Meet annually with partnering city departments to discuss local and regional air quality planning.

2. Participate in NCTCOG meetings and monthly calls on air quality.
3. Develop citywide municipal green building and urban canopy strategic plans.
4. Assess SOPs and coordinate with city emergency management to respond to emergency incidents involving hazardous air emissions.
5. Coordinate a municipal action plan for ozone alert days that defines mitigation activities that city departments and employees can take to reduce ozone emissions.
6. Lead an interdepartmental team to develop a sustainability strategic action plan for the city.
7. Evaluate city ordinances to identify potential revisions that could allow local enforcement of air quality issues.

Rules & Regulations

1. Evaluate air quality ordinances, penalties and enforcement tools.

Projects & Technologies

1. Explore external grant funding opportunities for future air quality projects.
2. Annually maintain the grant tracking system.
3. Prioritize air quality projects through annual updates of the CIP.
4. Coordinate with DHS and TCEQ to perform a feasibility study to identify an alternative Biowatch and air quality laboratory.
5. Select and implement an air quality database management software system for tracking field operations, capturing metrics and records management.

3.5.2 Strategies for PA 2: Air Quality Monitoring

As Fort Worth’s population increases and development spreads over a wider geographic area, monitoring pollutant concentrations becomes a greater challenge. To capture more data over a greater area, the city will need to expand or supplement its current monitoring network. This includes evaluating and testing new types of equipment and technologies, as well as exploring the need for new monitoring programs.

3.5.2.1 Ambient Air Quality Monitoring

The City of Fort Worth has an agreement with the TCEQ and EPA to operate local monitoring stations that collect NAAQS criteria pollutant data. To streamline operations, Air Quality Section staff have worked with the TCEQ to consolidate all sites the city is responsible for to those located exclusively within Tarrant County. There are six CAMS sites, each of which collects a different set of pollutant data, including concentrations of ozone, NO_x, carbon monoxide (CO) and PM, as well as meteorological data. The data collected by these monitors is used by the TCEQ to broadcast the regional AQI, as well as to forecast Air Pollution Action Day alerts for the region. Section staff maintain and repair TCEQ-owned monitoring equipment at the stations, and perform regular sampling and data collection activities.

Staff developed a system to monitor preventative maintenance, verifications and calibrations of equipment to ensure site maintenance and upkeep are performed regularly. This has resulted in very little down time for the monitoring equipment and very few measurements that are not verified by the TCEQ as being within the acceptable range for data collection criteria. Overall, less than 3 percent of the data collected by the city-maintained monitoring network is thrown out (i.e. the data return rate is over 97 percent). The TCEQ’s standard for data return is 85 percent.

Unfortunately, TCEQ stations are too spread out to measure the difference in pollution concentrations throughout the city or capture small-scale pollutant releases. This makes it difficult for staff to pinpoint hot spots for pollutants and address emission sources. The

Table 3-1. Ambient Air Quality team annual workload.

TASK	NUMBER OF TASKS		
	2015	2016	2017
PM _{2.5} Data Collection Equipment Maintenance	335	335	335
PM ₁₀ Data Collection Equipment Maintenance	89	89	89
Meteorological Data Collection Equipment Maintenance	60	60	60
Continuous Air Monitoring Station (CAMS) Site Maintenance	212	212	212
Travel to CAMS Sites and Other Locations	938	938	938

existing TCEQ monitoring network could be expanded to include additional stations, new monitoring equipment and additional types of monitors at existing stations to capture a wider array of data. The city could place stations at priority locations throughout Fort Worth to monitor for particular pollutants or a range of pollutants and climate data. There are also opportunities to work with local partners to expand the monitoring network for research purposes, especially related to human health. Additional meteorological and climate data could be collected with an expanded network to help staff better understand local conditions, such as the UHI phenomenon. Studying smaller-scale patterns in surface temperature and air quality, and their potential impacts on human health, would become possible with a more robust monitoring network.

3.5.2.2 PM Monitoring

Currently, three of five TCEQ monitoring stations operated by the city measure PM concentrations. PM can vary widely over small distances and with changes in elevation or other geographic features. The current monitoring network is insufficient for understanding PM concentrations throughout

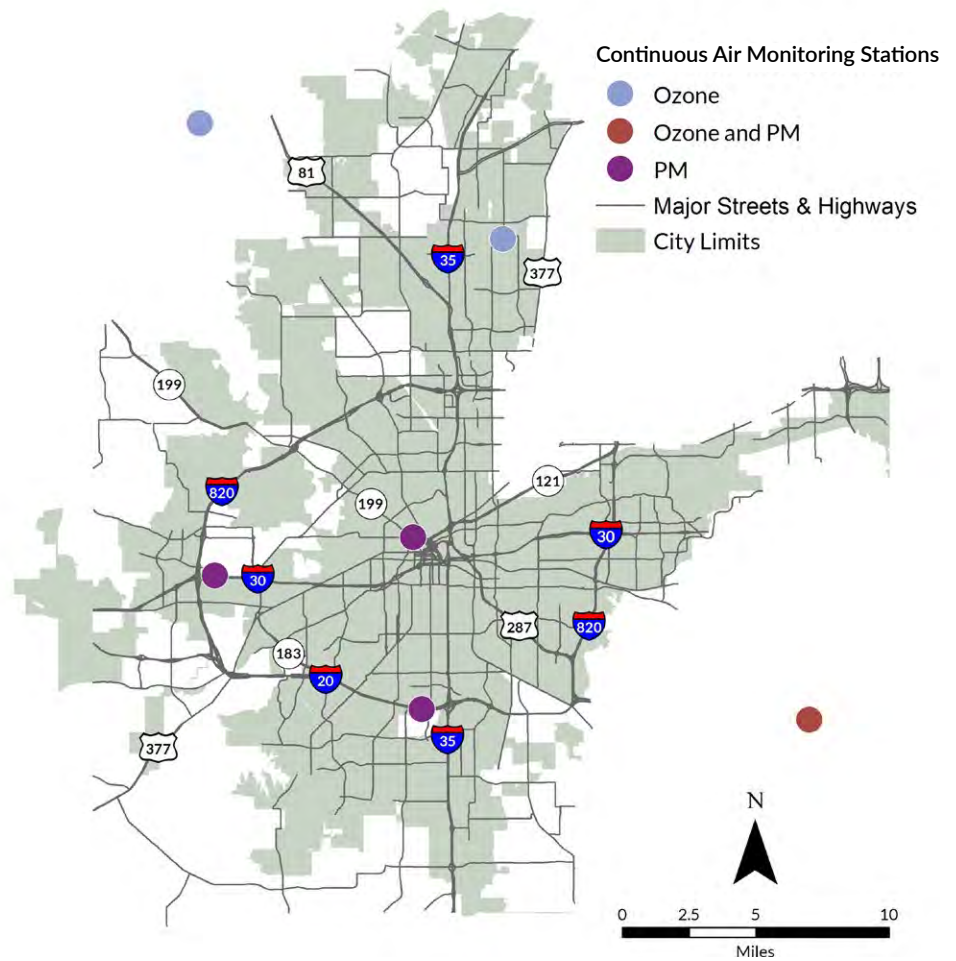


Figure 3-18. Map of TCEQ CAMS in Tarrant County, 2019.



Figure 3-19. An Air Quality Section staff member installs a new filter in a PM monitor, photo by City of Fort Worth.

Fort Worth. Staff are exploring ways to expand PM monitoring by working with the TCEQ and other partners, including the University of Texas at Dallas (UTD). UTD is collaborating with other academic institutions, municipalities and air quality interest groups to develop a more comprehensive regional PM monitoring network for research purposes. The network would consist of monitors collecting real-time data that can be viewed online. These monitors could be deployed throughout the city in key areas, such as local schools, along roadways and near potential PM sources. This network could help cities and decision-makers better understand the challenges associated with PM pollution and how best to address it. Due to the growing health concerns associated with PM, increasing the coverage and effectiveness of the PM monitoring network will likely remain a priority.

Table 3-2. BioWatch annual workload.

BIOWATCH ANNUAL WORKLOAD		
Collection Sites	Visits Per Week	Annual Visits
17	7	6,188

3.5.2.3 Biohazard Monitoring

The BioWatch Program was developed in 2002, and is a collaborative partnership between the city, DHS and the TCEQ to counter bioterrorism and provide early warning of attack. Air Quality Section staff are responsible for the operation, maintenance and repair of the TCEQ portable sampling units and associated DHS and TCEQ sites used in the program. Since 2015, the BioWatch Program has had a dedicated team of specialists operating independently of the Ambient Air Monitoring Program, which supports more efficient and effective program operations and management. Staff conducts operations 365 days per year, with exceptions only resulting from external conditions (severe weather, construction events, power outages). They have historically maintained a data return rate of 100 percent, with minimal avoidable exception reports, indicating a high level of equipment maintenance and repair.

Staff participate in regional mock event exercises with personnel from the OEM and other governmental agencies. BioWatch staff also provide monitoring services at high-attendance special events within Tarrant County, in coordination with the TCEQ and other municipal BioWatch programs. Additionally, a program of cross-training was initiated to reduce the burden of full coverage on BioWatch staff members and allow for their relief during times of extreme workload. There are opportunities to increase coverage and expand the range of collection under the program. Staff are working with DHS to upgrade biodetection technology with the intention of “better addressing a wide range of bioterrorism threats, provide real-time data across the Homeland Security enterprise and improve information-sharing between federal, state and local operators” (Reference 3-11).

3.5.2.4 Mobile Monitoring

Historically, air monitoring programs have depended on stationary equipment placed permanently in the field, as these monitors are accurate and reliable. Technological advancements have led to new equipment small enough to fit on vehicles and

handheld monitors that can be calibrated to accurately collect air quality data. These advancements provide numerous advantages, and staff will evaluate their use for both monitoring and investigation purposes. Air Quality Section staff will explore options for creating a mobile monitoring program, including collaborations with the TCEQ and EPA, as well as local partners. Vehicles outfitted with monitoring equipment would provide field operators with the ability to acquire data across Fort Worth, not just in the areas around TCEQ stations. There are also compact monitors that can be quickly set up in the field that could be used to analyze concentrations of specific pollutants and meteorological conditions throughout the city. Ideally, there would be a mobile air monitoring team with enough vehicles and portable monitors to use in source studies, where the monitors would strategically surround a source and collect emission data. This same strategy could be deployed in emergency situations to track a plume and determine if emission concentrations are hazardous to human health.

Mobile monitors would be well-suited for UHI studies, as they could be deployed separately to detect differences in temperature between urban and rural areas. Mobile monitors could also investigate micro heat islands, such as paved parking lots surrounded by grass or tree-covered areas. Mobile and handheld units would be capable of rapid response for emergencies or when residents report air complaints of potentially hazardous emissions. Instead of relying on



Figure 3-20. The EPA deployed portable air monitors during an oil spill, photo from EPA.

facility research, Air Quality Section staff could quickly determine the compounds in the emissions in real time. Handheld air monitors could be utilized in similar situations, and could be operated by all staff. The city should explore funding options for a mobile monitoring program and evaluate the units available for the best return on investment.

3.5.2.5 Development Actions for PA 2: Air Quality Monitoring

Ambient Air Quality Monitoring

1. Maintain the local monitoring network components to ensure a low incidence of monitoring exceptions and high-quality data return on air quality data.
 - *Performance Indicator:* Percent of data return, number of exceptions and the consecutive runtime per monitor.
2. Assess the feasibility of expanding the existing air quality monitoring system and the geographic placement of monitors to enhance the existing ambient air quality network.
3. Expand upon the existing state monitoring network and develop new networks within the city.

Particulate Matter Monitoring

1. Work with partners to develop a PM monitoring network.

BioWatch Monitoring

1. Maintain 365 day per year coverage for the BioWatch network.
 - *Performance Indicator:* Track the number of BioWatch Program exceptions and the percent of consecutive runtime per monitor.
2. Develop an environmental terrorism monitoring system for biological, toxicological and radiological threats and provide early warning to OEM.
3. Evaluate monitoring resources for use during emergency incidents.

Mobile Monitoring

1. Develop mobile air quality monitoring network.
2. Develop portable monitoring networks.
3. Define monitoring resources for use during emergency incidents.

3.5.3 Strategies for PA 3: Air Quality Compliance

Air Quality Section staff perform routine inspections and complaint investigations to ensure compliance with air permits, laws and ordinances. Currently, the city inspects particular facilities and operations under the direction of the TCEQ; however, staff are working to develop the resources necessary to inspect additional facility and business types. While only certain business types are inspected, staff respond to complaints at any business, residence or operations site. Complaints cover anything from construction dust to backyard burning activities. The city's compliance activities reduce pollution, thereby improving local air quality and reducing health hazards.

3.5.3.1 Industrial & Commercial Air Quality Compliance

Air Quality Section staff perform regularly scheduled site inspections, which ensure that local area businesses and industries are complying with state and federal air quality regulations. The annual investigation work plan set by the TCEQ includes the inspection of: used car lots for vehicular emissions control systems; gas stations for emissions of VOCs from petroleum storage tanks (PSTs); auto body shops for coating and solvent emissions; manufacturing industries for PM, VOCs and HAPs emissions; combustion units for emissions of NO_x; and major sources (Title V facilities) for combinations of substantial emissions. Air Quality Section staff would need to perform around 600 compliance inspections each year within a five-year period to cover all of the roughly 3,000 known regulated entities in Fort Worth.

As Fort Worth continues to grow, the number of permitted facilities will increase, and the number of air complaints will likely rise with the population. The Air Quality Section will need additional resources to address more air complaints and inspect a growing number of facilities. Inspection and investigation equipment is evaluated regularly and upgraded, when possible, to newer technologies that can detect a wider range of pollutants at lower concentrations. Staff have streamlined grant reporting and invoicing and developed digital reporting and data systems, both of which have eliminated paper reporting and saved time. The Air Quality Section staff also implemented an investigation, reporting and enforcement tracking

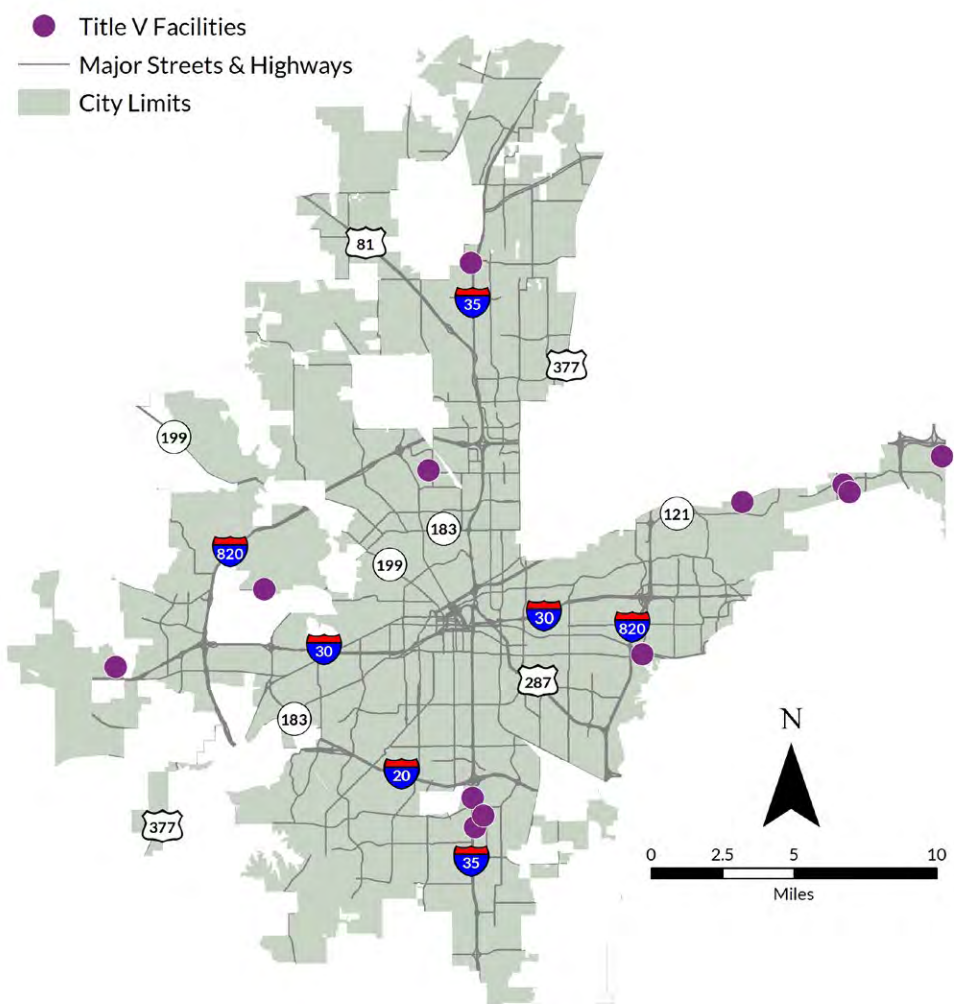


Figure 3-21. Map of Title V major source facilities, 2019.

system to better manage staff workloads and track required metrics. Section staff are responsible for performing site reviews for the TCEQ New Source Review Program. Draft permit reviews ensure requirements are applicable to the nature of the facility, so they can be correctly enforced.

3.5.3.2 Municipal Air Quality Compliance

Environmental staff are working with other city departments to develop a comprehensive facility audit program to ensure municipal regulatory compliance across all Environmental Quality Division programs. This involves cross-training environmental staff and performing audits with staff from all sections, and has been tested at several facilities. Its purpose is to streamline audit checklist forms, develop a reporting system to alert facility operators and managers to potential regulatory non-compliance and work through other issues. As this program continues

to develop, it will be vital to communicate the purpose of the audits to city departments and to offer technical support if there are any findings at facilities. Air Quality Section staff will serve as the internal air regulatory compliance subject matter experts within the city and provide compliance recommendations and instructions to city departments. These audits will be designed to educate and motivate city staff, and to connect departments with the tools they need to achieve compliance with state and federal air quality rules. This program should reduce regulatory non-compliance within municipal operations, as well as the number of fines or enforcement actions taken against the City of Fort Worth.

3.5.3.3 Construction Air Quality Compliance

Air Quality Section staff perform inspections of construction site operations, including asphalt and concrete batch plants, rock crushers and gravel operations. These inspections are performed to determine compliance with the regulatory standards and permitting conditions developed to control PM emissions, as well as NO_x and VOCs. Additionally, permit site reviews are performed to determine site suitability and to provide TCEQ new source review permit engineers valuable data used in determinations for permit issuance and the extent of permit conditions. Staff also respond to complaints regarding dust blowing from construction sites (i.e. fugitive dust), which creates dust nuisance conditions.

3.5.3.4 Complaint Investigations

There are instances when facilities produce emissions that are potentially hazardous to human health and the environment, or negatively impact the quality of life for those who live, work and play in Fort Worth. Any resident, worker or visitor to Fort Worth can contact the city with a complaint, whether they know

the source of the emission or not, and Air Quality Section staff will investigate. Staff respond to all complaints about all facilities, emissions and miscellaneous air quality issues as soon as possible. Complaints alleging potentially hazardous emissions are given the highest priority and promptly addressed. All high priority air complaints are investigated within 24 hours. If an investigation finds a facility is violating air regulations, staff can proceed with a notice of violation or refer the facility to the TCEQ for immediate enforcement action if the issue is serious.

As Fort Worth grows, the number of air complaints and concerns

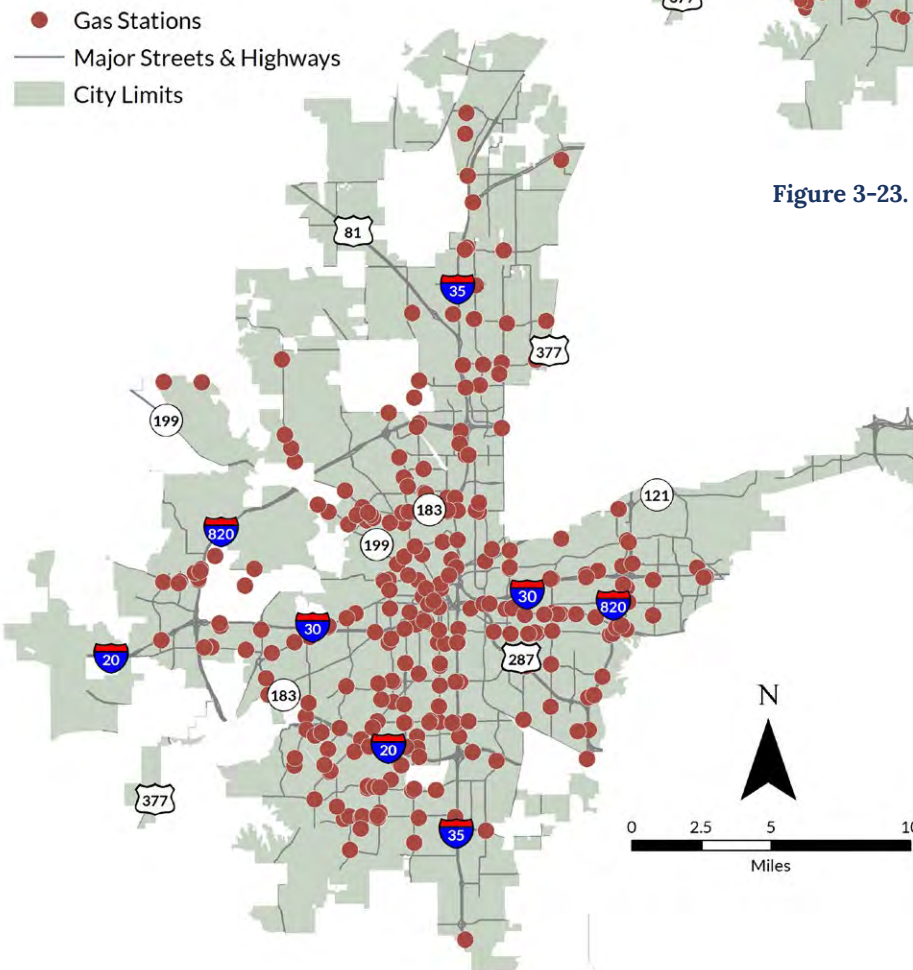


Figure 3-22. Map of gas stations in Fort Worth, 2019. This is only one type of facility inspected under the TCEQ work plan.

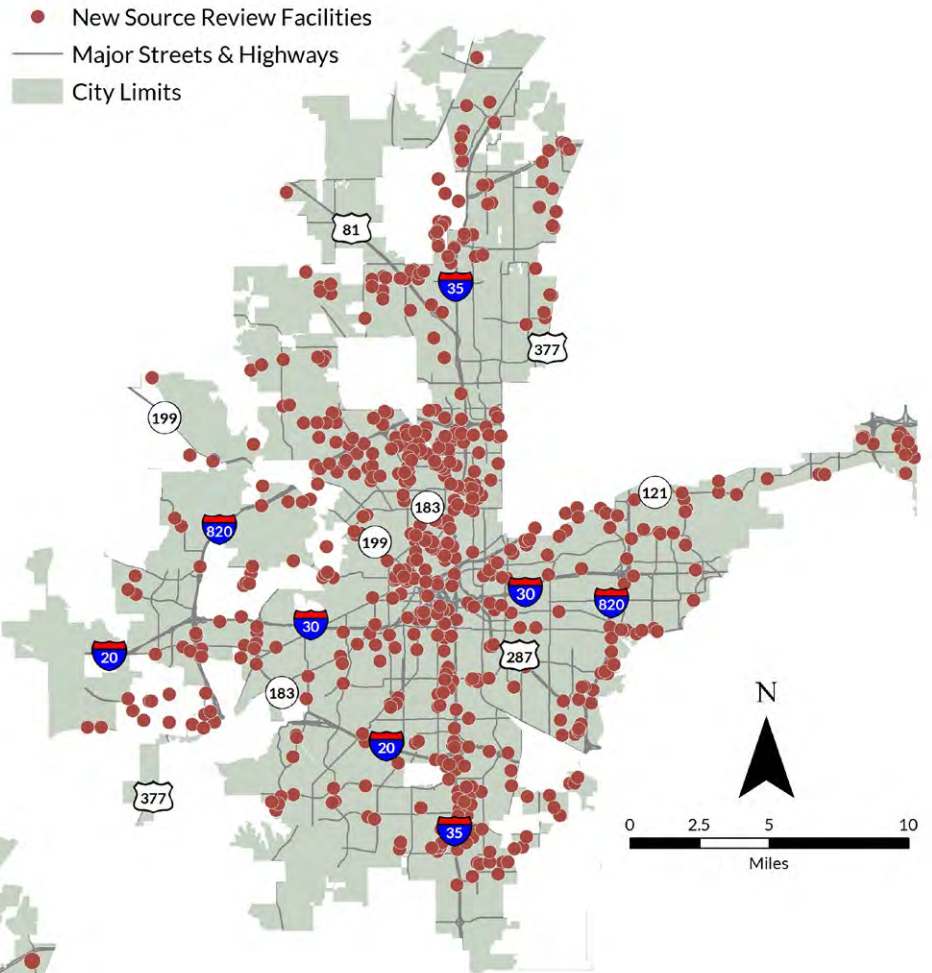


Figure 3-23. Map of new source review facilities, 2019.

increases, and each instance is investigated by Air Quality Section staff. Staff must continue to balance workloads between investigations, inspections and monitoring activities, while all of these programs continue to require additional resources. The city recently centralized all departmental call centers to a single city call center to make it easier for residents to report issues. Residents and visitors can also report via email, web forms and social media. As the city continues to streamline and digitize reporting, environmental staff will work with the city call center and other departments to continue to improve the complaint reporting process.

Table 3-3. TCEQ mandated compliance inspections for fiscal years 2015 through 2017.

TCEQ MANDATED AIR COMPLIANCE INSPECTIONS 2015-2017			
INVESTIGATION TYPE	Number of Investigations Completed		
	2015	2016	2017
Compliance Major Source/Title V Investigations	16	14	12
Compliance Air Complaints	33	50	47
Compliance Non-Major Source Investigations	121	97	76
Compliance Draft Permit and Permit Site Reviews	30	25	30
Compliance Follow-Up Investigations	14	30	19
Compliance PST Investigations	154	175	123

3.5.3.5 Development Actions for PA 3: Air Quality Compliance

Industrial & Commercial Air Quality Compliance

1. Create a five-year inspection schedule for business and industrial facility inspections.
 - *Performance Indicator:* Perform all annual inspections scheduled within the five-year inspection plan. Track the facilities inspected and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
2. Evaluate establishing investigation and enforcement SOPs.
 - *Performance Indicator:* Number of enforcement actions and outcomes.
3. Ensure 100% of investigation workplans are completed annually.
 - *Performance Indicator:* Number of permits reviewed, facility investigations performed and outcomes.



Figure 3-24. Dust blowing from activity on a construction site. If too much dust is generated and escapes the site, it can lead to enforcement action, photo by City of Fort Worth.

4. Annually update the database with new facilities with known air emission sources based on TCEQ and city records.

Municipal Air Quality Compliance

1. Develop a list of municipal facilities that have air emission sources to be audited.
 - *Performance Indicator:* Complete all municipal facility audits annually.
2. Create an annual municipal audit schedule.
3. Maintain a standardized SOP checklist and a form to report findings for municipal facilities.
4. Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations. Audit workplan.
 - *Performance Indicator:* Track the facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.

Construction Air Quality Compliance

1. Develop a tracking system for public complaints associated with construction sites (e.g., dust) to support enforcement findings.
 - *Performance Indicator:* Number of dust complaints.

Complaint Investigations

1. Coordinate with the city call center to improve the complaint reporting process (e.g. update questionnaire as applicable).



Figure 3-25. Rock crushers can cause fugitive dust if they are not operated properly, photo by City of Fort Worth.

Table 3-4. Air quality complaints received and investigated from fiscal years 2015 through 2017.

AIR COMPLAINTS RECEIVED/INVESTIGATED 2015-2017			
	2015	2016	2017
Received	33	50	47
Investigated	33	50	47

2. Investigate and track all complaints relative to the assigned priority and provide a summary of resolution actions to complainant.
 - *Performance Indicator:* Number of investigations performed.
 - *Performance Indicator:* Duration of response time.
 - *Performance Indicator:* Number of completed complainant responses.
3. Respond to all high priority complaints within 24 hours.
 - *Performance Indicator:* Number of high priority complaints received.
 - *Performance Indicator:* Percentage of complaints responded to within the 24-hour period.

3.5.4 Strategies for PA 4: Air Quality Communication & Collaboration

Air pollution does not stay within city boundaries and affects all who live, work and play in Fort Worth, as well as the North Central Texas region. Regional partnerships between municipalities, NPOs and NGOs, residents and the academic community are essential to address the problem. Effective communication of air quality issues and actions the public can take to address these issues are also vital to improving air quality.

3.5.4.1 City Staff Training & Collaboration

Air Quality Section staff work with other city departments to provide training, answer technical questions and provide information on addressing air pollution. Staff work with the communications team to share information through internal channels with all city employees on actions they can take to reduce emissions and improve air quality, both at work and at home. This includes air quality alerts and other helpful information to protect human health and reduce harmful emissions. For example, environmental staff collaborate with Human Resources

and other departments to offer an incentive program to employees to reduce emissions during ozone season. This program encourages all city staff to take actions to reduce ozone by offering compensatory time and rewards. Staff will continue to develop this program and utilize it to promote Clean Air Action Day (discussed in Community Partnerships & Volunteerism) and other air quality activities.

Environmental staff will work in an advisory capacity to other departments to reduce emissions and incorporate air quality improvement practices into planning efforts. Staff should collaborate with fleet procurement and management staff to encourage the use of electric, alternative fuel and high fuel efficiency vehicles. The city should consider options to develop charging infrastructure for both city fleet and privately owned electric vehicles. This may include public-private partnerships, as well as working with the NCTCOG and local NGOs. Staff should also work with all departments to improve energy efficiency in city operations and explore the use of new technology to reduce emissions. By establishing energy use benchmarks for city buildings and facilities, staff can track the city's progress towards improved energy efficiency and conservation. To improve air quality throughout the city, staff will work with the Fort Worth Police Department and the courts to ensure they understand the importance of enforcing anti-idling regulations. If the city passes an ordinance allowing for local enforcement of air compliance violations, staff will create a judicial handbook to provide information to the courts and the city attorney's office on air regulations.



Figure 3-26. Air Quality Section staff members attend specialized technical training, photo by City of Fort Worth.

3.5.4.1.1 STAFF TRAINING

Historically, city staff working at municipal facilities or performing operations regulated under federal and state rules for air quality have been required to take basic training for compliance. To reduce municipal air emissions and ensure regulatory compliance for all city operations, training for city staff could be greatly expanded. Environmental staff will work with other departments and their staff to develop a list of all facilities and city operations with the potential for emissions, such as fueling stations, fabrication shops, and vehicle servicing and repair facilities. This will assist Air Quality Section staff in developing targeted training for specific city operations to help reduce emissions and improve air quality. Specialized training should be provided to first responders and emergency officials to provide guidance on hazardous situations. Air Quality Section staff will work with OEM to identify any training and emergency planning gaps and offer support to ensure the city is prepared to address situations with potentially hazardous air releases. To maximize efforts of city staff, cross-training will be provided to inspectors, code compliance officers and other staff who visit facilities on a regular basis to look for air compliance issues. All city staff have the ability to report potential violations they see in the community. As such, training materials about the reporting process will be distributed to all city staff.

3.5.4.2 Public Technical Guidance & Training

Air Quality Section staff work with local businesses and industries to provide technical guidance and resources to help them achieve and maintain regulatory compliance. The Environmental Quality Division website provides information on TCEQ resources and the air permitting process for different types of operations, as well as city air compliance and investigation programs. The website also provides residents with important technical information on air quality, including how to notify city staff of an air complaint. Air Quality Section staff collaborate with the communications team to develop technical guides for businesses and informational material for residents on reporting air quality complaints. Staff also provide guidance and instructions to both complainants and facility contacts regarding investigation and enforcement protocols, helping them navigate air quality regulations and providing information to assist them in their efforts to reduce emissions.

This includes connecting them with resources from the TCEQ, EPA and local organizations that provide regulatory assistance to businesses. The goal is to provide businesses and industrial operations with the information they need to bring them into compliance. Staff also work with residents to provide information when a complaint has been made and ensure their concerns are addressed. Environmental staff will continue to work with the communications team and other departments to develop new tools to share technical information with the public.



Figure 3-27. An Air Quality Section staff member performing a compliance investigative records review, photo by City of Fort Worth.

3.5.4.3 Public Education & Outreach

The city uses a number of digital communications platforms to provide information internally to staff and externally to residents. Air Quality Section staff assist the communications team in maintaining and updating the Environmental Quality Division website to provide information on city programs, regulatory compliance and actions residents can take to improve air quality. Staff will continue to work closely with the communications team to provide information and air messaging to share on social media and explore other communications tools, such as mobile apps. Environmental staff collaborate with the Community Engagement Office and other departments to attend events and share information about Air Quality Section programs with the public.



Figure 3-28. Staff attend an outreach event to share environmental program information with the public, photo by City of Fort Worth.

When residents or businesses request a speaker on air topics, Air Quality Section staff attend and give presentations as the subject matter experts. This includes attending neighborhood association events, speaking about city programs with local activist groups and attending local government meetings. Air Quality Section staff collaborate with communications staff to develop print material and select promotional products that educate residents on the importance of reducing air pollution and encourage them to take action for cleaner air. They also develop educational materials for local schools and support the School Green Teams Program (discussed in Chapter 6), providing educational opportunities around air quality topics. This program has opportunity for growth and new initiatives to engage students in air quality research and education. Environmental staff will work collaboratively to expand the outreach program, attend more events and continue to provide excellent customer service to the community.

3.5.4.4 Community Partnerships & Volunteerism

Environmental staff work with NGOs, NPOs and other community organizations to promote actions that reduce air pollution emissions. Staff should explore working with these organizations, Code Blue volunteers and students to develop volunteer opportunities. This could include citizen scientist programs for air monitoring and tree plantings, as well as sharing energy conservation and ozone reduction strategies. The Water Department holds an annual awards ceremony for businesses in the pretreatment program who meet or exceed compliance on a regular basis. Air Quality Section staff ensure that these businesses have

remained in compliance with air quality regulations for the awards period. Environmental Quality Division staff are working with the Water Department, as well as other city departments, to host an environmental awards program, as an expansion of the existing pretreatment awards.

Environmental staff consult with partners at the TCEQ, Texas Department of Transportation (TxDOT) and other city departments on air quality initiatives, program collaboration and potential grant and funding opportunities. Staff have also created a dialogue with other local air quality programs throughout the country to share BMPs on topics ranging from air pollutant reduction techniques and attainment strategies to relationship development with state and federal agencies. This collaboration reduces duplication of efforts, provides greater ability to evaluate new research and technology and assists with program development.

3.5.4.4.1 NCTCOG PARTNERSHIP

Regional partnerships are essential when addressing air quality. The city collaborates with the NCTCOG on many air quality initiatives, from regional transportation planning to public outreach. Air Quality Section staff will coordinate with city departments to explore options for adopting and incorporating the NCTCOG programs into city operations. Transportation is a central focus for many of the air pollution reduction plans and programs, because vehicles and construction activities are the largest sources of emissions in the region. There are several vehicle-centric programs aimed at reducing emissions from city fleets and construction equipment, including the Clean Fleet Policy, Construction Fleet Initiative and the Texas Emissions Reduction Plan.



Figure 3-29. TxDOT sign with an Air North Texas message warning of elevated ozone pollution levels, photo by City of Fort Worth.

Air Quality Section staff will work with fleet and equipment procurement personnel to evaluate options for emission reductions from city vehicles and heavy equipment. There are also programs that target individual vehicles and anti-idling messaging. The Air Check Texas Program helps residents replace or repair aging vehicles that do not meet emissions standards or are less fuel efficient than newer models. The Regional Smoking Vehicle Program encourages all residents to report smoking vehicles so the owners can be informed that their vehicle needs servicing to comply with air regulations. The NCTCOG also promotes energy efficiency and renewable energy programs to reduce air pollution. Air Quality Section staff will coordinate with the NCTCOG, as well as city communications and public engagement staff to share information on these programs with residents and businesses in Fort Worth to supplement the city's air quality messaging.



Figure 3-30. The Regional Smoking Vehicle Program.

3.5.4.4.2 AIR NORTH TEXAS

The NCTCOG provides resources for residents, businesses and local governments through the Air North Texas (ANT) program. This program utilizes a designated website, media campaigns, various communications channels, promotional materials and special events to promote air quality awareness and action. The ANT program provides educational material for the general public, including an explanation of the AQI and a sign-up for air pollution alerts. The

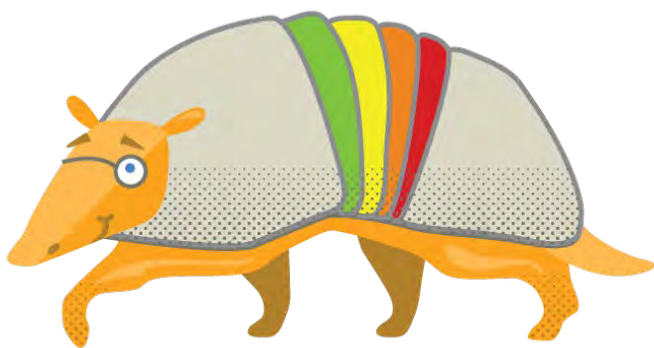


Figure 3-31. Arlo the “Airmadillo” is the NCTCOG Air North Texas mascot for the AQI.

site also promotes Clean Air Action Day in June, asking residents, businesses and local governments to pledge to take specific actions to reduce ozone. Environmental staff promote Clean Air Action Day by sharing information on social media and through internal city communications, encouraging all city staff to take the pledge. The NCTCOG also utilizes campaigns supporting the ANT program, including the “Be Air Aware” and “Arlo the Airmadillo” campaigns. They provide digital campaign graphics and resources to cities to use on websites and social media, as well as promotional materials to use at outreach events.

Environmental staff submit an annual report outlining all outreach efforts utilizing the ANT information and campaigns, as well as any other clean air messaging the city shares. A new tracking system should be developed for this report that can be shared with other departments that perform outreach activities. Air Quality Section staff should work with communications and Community Engagement staff to increase sharing of ANT information and materials on all platforms. Environmental and communications staff should coordinate more closely with the NCTCOG to provide input on the types of messaging and materials that would benefit the city's outreach efforts. This includes attending regular meetings, participating on conference calls and attending events with the NCTCOG and regional partners on air quality issues and programs.

3.5.4.5 Development Actions for PA 4: Air Quality Communication & Collaboration

City Staff Training & Collaboration

1. Identify city staff positions that should receive targeted air quality training based on list of municipal facilities that have air emission sources.
2. Develop air quality training schedules for applicable city staff.
3. Provide targeted air quality training to city staff.
 - *Performance Indicator:* Number of city staff that have completed air quality training sessions.
4. Provide air quality outreach materials to city departments.
5. Identify training opportunities for Air Quality staff (e.g., professional development, regional conferences, etc.).

- Collaborate with city departments to provide incentive programs for ozone emission reduction.
 - Performance Indicator:* Number of city staff participating in incentive programs.

Public Technical Guidance & Training

- Develop customized air quality messaging for communities and neighborhoods, with a focus on communities with historically high air quality complaints.
 - Performance Indicator:* List of communities and neighborhoods included in the outreach program.
 - Performance Indicator:* Quantity of outreach materials used.
- Provide local businesses and industries published regulatory compliance information.
 - Performance Indicator:* Annual list of businesses and industries that received information.
- Provide information to the public through subject matter expert speaking engagements.
 - Performance Indicator:* Number of events conducted by staff annually.
 - Performance Indicator:* Number of people who attend each event.

Public Education & Outreach

- Develop and implement air quality programs for School Green Teams.
 - Performance Indicator:* Number of School Green Teams that participate in the air quality program each school year.
 - Performance Indicator:* Number of School Green Teams that complete the air quality programs.
- Develop and track traditional and social media campaigns to encourage actions that improve air quality and provide air quality information and alerts.
 - Performance Indicator:* Number of traditional and social media communications for air quality distributed annually.
- Explore the development of smartphone applications for air quality education and outreach.
- Promote ozone awareness and reduction practices on the city website and public media, with increased

promotion during the ozone season (May 1st through October 31st).

- Performance Indicator:* Number of persons visiting city website.
 - Performance Indicator:* Number of ozone awareness messages distributed using public media sources each year.
- Annually review and update as necessary the information presented on the city's Air Quality website.

Community Partnerships & Volunteerism

- Develop an annual Clean Air Awards program for local businesses and industries who demonstrate clean air trends in their company and corporate policies, and maintain a clean compliance history.
 - Performance Indicator:* Keep records of the recipients of Clean Air Awards annually.
- Develop an award or recognition program for residents, community organizations and volunteers who demonstrate environmental stewardship promoting air quality.
 - Performance Indicator:* Keep records of award or recognition recipients annually.
- Coordinate with NCTCOG to distribute air quality programs and resources to Fort Worth residents and businesses.
 - Performance Indicator:* Number of events where NCTCOG promotional material is distributed.
 - Performance Indicator:* Number of attendees at each event.

3.6 Conclusion

The Air Quality Section works to improve air quality and the quality of life for all who live, work and play in Fort Worth. Human health and safety remain top priorities for the Air Quality Section programs. The city works to reduce exposures to pollutants and respond quickly to potential hazards. Staff provide regulatory expertise to internal and external partners and strive to deliver excellent customer service to residents through monitoring, compliance and communications programs. These efforts help create a cleaner environment and a healthier place to live.

3.6.1 Summary of Air Quality Development Actions

Air Quality Analysis

1. Build and maintain a comprehensive database for air quality data, including air emissions and pollution data, and historical and City of Fort Worth sustainability data and trends.
2. Coordinate with partnering city departments and community partners to conduct air quality related studies and use this data to inform policy decisions.

Air Quality Planning

1. Meet annually with partnering city departments to discuss local and regional air quality planning.
2. Participate in NCTCOG meetings and monthly calls on air quality.
3. Develop citywide municipal green building and urban canopy strategic plans.
4. Assess SOPs and coordinate with city emergency management to respond to emergency incidents involving hazardous air emissions.
5. Coordinate a municipal action plan for ozone alert days that defines mitigation activities that city departments and employees can take to reduce ozone emissions.
6. Lead an interdepartmental team to develop a sustainability strategic action plan for the city.
7. Evaluate city ordinances to identify potential revisions that could allow local enforcement of air quality issues.

Rules & Regulations

1. Evaluate air quality ordinances, penalties and enforcement tools.

Projects & Technologies

1. Explore external grant funding opportunities for future air quality projects.
2. Annually maintain the grant tracking system.
3. Prioritize air quality projects through annual updates of the CIP.
4. Coordinate with DHS and TCEQ to perform a feasibility study to identify an alternative Biowatch and air quality laboratory.
5. Select and implement an air quality database management software system for tracking

field operations, capturing metrics and records management.

Ambient Air Quality Monitoring

1. Maintain the local monitoring network components to ensure a low incidence of monitoring exceptions and high-quality data return on air quality data.
 - *Performance Indicator:* Percent of data return, number of exceptions and the consecutive runtime per monitor.
2. Assess the feasibility of expanding the existing air quality monitoring system and the geographic placement of monitors to enhance the existing ambient air quality network.
3. Expand upon the existing state monitoring network and develop new networks within the city.

Particulate Matter Monitoring

1. Work with partners to develop a PM monitoring network.

BioWatch Monitoring

1. Maintain 365 day per year coverage for the BioWatch network.
 - *Performance Indicator:* Track the number of BioWatch Program exceptions and the percent of consecutive runtime per monitor.
2. Develop an environmental terrorism monitoring system for biological, toxicological and radiological threats and provide early warning to OEM.
3. Evaluate monitoring resources for use during emergency incidents.

Mobile Monitoring

1. Develop mobile air quality monitoring network.
2. Develop portable monitoring networks.
3. Define monitoring resources for use during emergency incidents.

Industrial & Commercial Air Quality Compliance

1. Create a five-year inspection schedule for business and industrial facility inspections.
 - *Performance Indicator:* Perform all annual inspections scheduled within the five-year inspection plan. Track the facilities inspected and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.

2. Evaluate establishing investigation and enforcement SOPs.
 - *Performance Indicator:* Number of enforcement actions and outcomes.
3. Ensure 100% of investigation workplans are completed annually.
 - *Performance Indicator:* Number of permits reviewed, facility investigations performed and outcomes.
4. Annually update the database with new facilities with known air emission sources based on TCEQ and city records.

Municipal Air Quality Compliance

1. Develop a list of municipal facilities that have air emission sources to be audited.
 - *Performance Indicator:* Complete all municipal facility audits annually.
2. Create an annual municipal audit schedule.
3. Maintain a standardized SOP checklist and a form to report findings for municipal facilities.
4. Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations. Audit workplan.
 - *Performance Indicator:* Track the facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.

Construction Air Quality Compliance

1. Develop a tracking system for public complaints associated with construction sites (e.g., dust) to support enforcement findings.
 - *Performance Indicator:* Number of dust complaints.

Complaint Investigations

1. Coordinate with the city call center to improve the complaint reporting process (e.g. update questionnaire as applicable).
2. Investigate and track all complaints relative to the assigned priority and provide a summary of resolution actions to complainant.
 - *Performance Indicator:* Number of investigations performed.

- *Performance Indicator:* Duration of response time.
 - *Performance Indicator:* Number of completed complainant responses.
3. Respond to all high priority complaints within 24 hours.
 - *Performance Indicator:* Number of high priority complaints received.
 - *Performance Indicator:* Percentage of complaints responded to within the 24-hour period.

City Staff Training & Collaboration

1. Identify city staff positions that should receive targeted air quality training based on list of municipal facilities that have air emission sources.
2. Develop air quality training schedules for applicable city staff.
3. Provide targeted air quality training to city staff.
 - *Performance Indicator:* Number of city staff that have completed air quality training sessions.
4. Provide air quality outreach materials to city departments.
5. Identify training opportunities for Air Quality staff (e.g., professional development, regional conferences, etc.).
6. Collaborate with city departments to provide incentive programs for ozone emission reduction.
 - *Performance Indicator:* Number of city staff participating in incentive programs.

Public Technical Guidance & Training

1. Develop customized air quality messaging for communities and neighborhoods, with a focus on communities with historically high air quality complaints.
 - *Performance Indicator:* List of communities and neighborhoods included in the outreach program.
 - *Performance Indicator:* Quantity of outreach materials used.
2. Provide local businesses and industries published regulatory compliance information.
 - *Performance Indicator:* Annual list of businesses and industries that received information.

3. Provide information to the public through subject matter expert speaking engagements.
 - *Performance Indicator:* Number of events conducted by staff annually.
 - *Performance Indicator:* Number of people who attend each event.

Public Education & Outreach

1. Develop and implement air quality programs for School Green Teams.
 - *Performance Indicator:* Number of School Green Teams that participate in the air quality program each school year.
 - *Performance Indicator:* Number of School Green Teams that complete the air quality programs.
2. Develop and track traditional and social media campaigns to encourage actions that improve air quality and provide air quality information and alerts.
 - *Performance Indicator:* Number of traditional and social media communications for air quality distributed annually.
3. Explore the development of smartphone applications for air quality education and outreach.
4. Promote ozone awareness and reduction practices on the city website and public media, with increased promotion during the ozone season (May 1st through October 31st).
 - *Performance Indicator:* Number of persons visiting city website.
 - *Performance Indicator:* Number of ozone awareness messages distributed using public media sources each year.
5. Annually review and update as necessary the information presented on the city's Air Quality website.

Community Partnerships & Volunteerism

1. Develop an annual Clean Air Awards program for local businesses and industries who demonstrate clean air trends in their company and corporate policies, and maintain a clean compliance history.
 - *Performance Indicator:* Keep records of the recipients of Clean Air Awards annually.

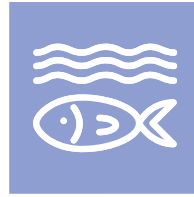
2. Develop an award or recognition program for residents, community organizations and volunteers who demonstrate excellent environmental stewardship promoting air quality.
 - *Performance Indicator:* Keep records of award or recognition recipients annually.
3. Coordinate with NCTCOG to distribute air quality programs and resources to Fort Worth residents and businesses.
 - *Performance Indicator:* Number of events where NCTCOG promotional material is distributed.
 - *Performance Indicator:* Number of attendees at each event.

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CHAPTER 4

Surface Water Quality

*Protecting water quality in our lakes,
streams and the Trinity River*

GOALS

- Ensure city compliance with federal and state environmental regulations for surface water quality.
- Monitor surface water quality and establish watershed management practices and plans in the community.
- Control surface water pollution to support stream health and surface water quality.
- Maintain environmental compliance through inspections, permitting and enforcement.
- Provide technical guidance, outreach and education to encourage responsible environmental stewardship.



SURFACE WATER QUALITY AT-A-GLANCE

Watershed Planning & Management Program Area



PHOTO BY CITY OF FORT WORTH

There are numerous streams, lakes and rivers located within Fort Worth's 31 watersheds. The Surface Water Quality Section gathers the necessary data to analyze these watersheds and establish baselines for pollutants

and environmental conditions. Completing a full analysis of this water system will require significant resources, but it will enable the city to create effective plans to better protect and manage its watersheds. Section staff enforce the stormwater ordinance that prohibits illicit discharges into the stormwater system and provides for the regulation of discharges from various sources through local and state permits. Staff also develop prioritized project lists and identify new tools and technologies that can be deployed in the field to improve data collection, monitoring and pollution prevention.

KEY ACTIVITIES

- Watershed Analysis
- Watershed Planning
- Surface Water Quality Rules & Regulations
- Surface Water Quality Projects & Technologies

Surface Water Quality Monitoring Program Area

For a better understanding of surface water conditions, local waterbodies are sampled throughout the year, including during wet and dry weather. Surface Water Quality Section staff collect not only water samples, but also biological samples from



PHOTO BY CITY OF FORT WORTH

streams, rivers, lakes. These samples are analyzed for pollutants and general conditions indicative of ecosystem health and water quality. Staff also regularly test for pathogens that pose risks to human health and pollutants that can cause serious impacts to water ecosystems. These data can help prevent exposures to hazardous surface water conditions and identify illicit discharges into the stormwater system. This information is also useful for watershed planning at the local and regional levels.

KEY ACTIVITIES

- Wet Weather Monitoring
- Dry Weather Monitoring
- Indicator Bacteria Monitoring
- Regional Wet Weather Characterization
- Stream Health Monitoring

PROGRAM AREAS

- Watershed Planning & Management
- Surface Water Quality Monitoring

- Surface Water Quality Compliance
- Surface Water Quality Communication & Collaboration

Surface Water Quality Compliance Program Area

Local surface water quality is regulated by standards at the federal, state and local levels, and the Surface Water Quality Section enforces these rules within Fort Worth. The city's stormwater system feeds directly into the numerous streams, lakes and rivers that cut across Fort Worth's landscape, and section

staff are authorized to enforce permit regulations for activities that result, or may result in pollution entering the stormwater system. Staff also inspect industrial operations, municipal facilities, construction sites and commercial operations across the city for compliance with their stormwater permits. Complaints regarding discharges into the stormwater system or surface water conditions, such as fish kills, odors or discoloration are also investigated.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- Industrial Stormwater Compliance
- Municipal Stormwater Compliance
- Construction Stormwater Compliance
- Commercial Cosmetic Cleaner Compliance
- Complaint Investigations

Surface Water Quality Communication & Collaboration Program Area

Surface Water Quality Section staff address water quality internally by providing training and regulatory guidance to other departments, and externally with businesses and industries throughout Fort Worth

to improve site conditions and reduce stormwater pollution. Staff also attend outreach events, as public education campaigns are vital to addressing pollution from lawns, vehicles and other common sources. Many watersheds across North Central Texas are connected, and the city recognizes the need to work as a region to ensure the health of surface waters. Staff collaborate with community partners, including academic institutions and nonprofit organizations (NPOs) to engage residents in water quality activities through volunteer initiatives.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Why do we need Surface Water Quality programs in our community?

Surface Water Quality programs protect human health, safety and the environment by reducing pollution in our local lakes, streams and the Trinity River. Programs monitor pollutants in local watersheds and encourage compliance to reduce contaminated stormwater runoff or illicit discharges for a cleaner environment, sustained economic value and improved community aesthetics.

TO PROMOTE HUMAN HEALTH AND PUBLIC SAFETY.



Improves surface water quality to reduce health risks to residents and visitors



Minimizes pollutants entering Fort Worth's streams and lakes

TO CREATE AND MAINTAIN A CLEAN, ATTRACTIVE CITY.



Improves aquatic ecosystems and surface water aesthetics



Returns impacted water bodies to their intended uses

TO PROMOTE QUALITY OF LIFE AND A SUSTAINED ECONOMY.



Maintains waterbodies that are safe for recreation and encourages economic development



Reduces public costs for dealing with pollution and cleanups

Executive Summary

Fort Worth's urban surface waters are a valuable resource used for drinking water, flood control, industry and aesthetics. These lakes, streams and the Trinity River are also playing an increasingly important role in economic development, and the city is seeing more residents and visitors utilizing these water bodies recreationally. Fort Worth is growing rapidly, along with its use of local surface waters and development of the land surrounding them. As land use within the city changes, and manicured landscapes and impervious surfaces spread, stormwater runoff also increases. Stormwater picks up pollution from the urban environment, including sediment, oil and grease, metals, bacteria and pet waste, and is not treated before it enters surface waters. Instead, storm drains serve to convey runoff as quickly as possible to the nearest waterbody to prevent urban flooding. The surest way to improve water quality in Fort Worth is to better manage stormwater and potential pollutants entering our surface water resources. The Texas Commission on Environmental Quality (TCEQ) oversees stormwater quality regulations at the state and local levels through permitting and reporting. The Surface Water Quality Section ensures compliance with these regulations and permits through monitoring, inspections, public education and enforcement, when necessary. The programs outlined in this chapter are designed to improve surface water quality and proactively address pollutants to protect human health and the environment. Surface Water Quality Section staff:

- Conduct construction stormwater compliance inspections at approximately 500 active construction sites each year.
- Conduct approximately 340 industrial stormwater compliance inspections on regulated industrial facilities annually.
- Monitor local creeks, conducting stream health assessments twice a year at 18 different locations throughout Fort Worth.
- Monitor storm drains, creeks and outfalls throughout Fort Worth to identify and eliminate illicit discharges to our surface waters.
- Issue permits to businesses that use mobile commercial cosmetic cleaners to ensure pollution is not being washed into our surface waters.
- Respond to water quality complaints regarding discharges to the storm drain system and creeks.
- Provide 24/7/365 spill response to contain and remediate spills on public property.

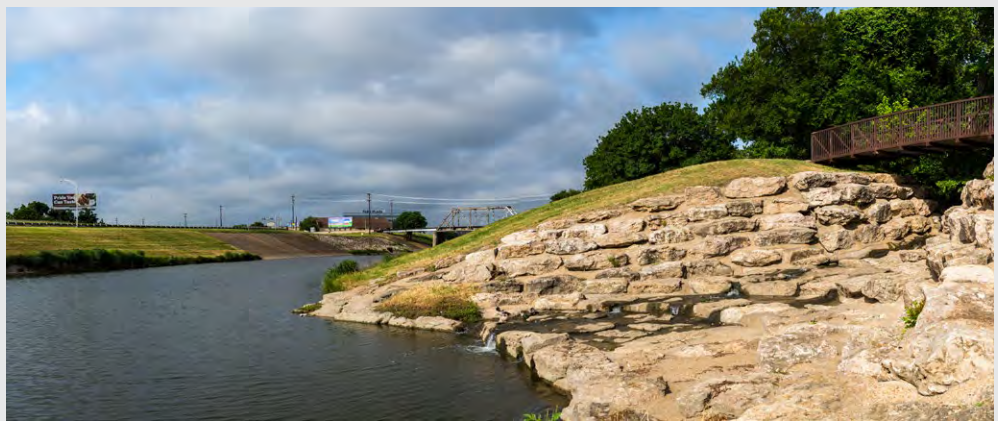


Figure 4-1. A creek flows into the Trinity River, a popular recreation destination, photo by City of Fort Worth.

4.1 Key Terms

BMP – Best Management Practices
CFR – Code of Federal Regulations
CRP – Clean Rivers Program
CWA – Clean Water Act
EPA – Environmental Protection Agency
GIS – Geographic Information Systems
iSWM – Integrated Stormwater Management Manual
KFWB – Keep Fort Worth Beautiful
MS4 – Municipal Separate Storm Sewer System
LID – Low Impact Development
NCTCOG – North Central Texas Council of Governments
NELAC – National Environmental Laboratory Accreditation Program
NGO – Non-governmental Organization
NOV – Notice of Violation
NPDES – National Pollutant Discharge Elimination System
NPO – Nonprofit Organization
PARC – Park & Recreation Department
P&D – Planning & Development Department
RWWCP – Regional Wet Weather Characterization Program
SDS – Stormwater Development Services
SIC – Standard Industrial Classification
SWPPP – Stormwater Pollution Prevention Plan
TCEQ – Texas Commission on Environmental Quality
TMDL – Total Maximum Daily Load
TPDES – Texas Pollutant Discharge Elimination System
TPL – The Trust for Public Land
TPW – Transportation & Public Works Department
TRWD – Tarrant Regional Water District
TRA – Trinity River Authority

4.2 Introduction to Water Quality

In 1948, the United States passed the Federal Water Pollution Control Act to address water pollution. It was heavily amended in 1972 to establish the U.S. Environmental Protection Agency (EPA) as the regulating authority for the waters of the United States, and became known as the Clean Water Act (CWA; Reference 4-1). The passing of the CWA was in response to decades of unregulated wastewater discharges that turned waterways across the United States into toxic wastelands. The largest sources of water pollution during that time were industrial factories and manufacturing plants dumping untreated wastewater directly into waterways. These are referred to as point sources of pollution. Today, nearly all untreated



Figure 4-2. The Cuyahoga River fire of 1952, one of several times the river famously caught fire due to pollution. The last time was in 1969, and spurred the development of the CWA, photo from *The Cleveland Press Collection* via *The Cleveland Memory Project*, Michael Schwartz Library.



Figure 4-3. Pollution can be seen leaving the mouth of the Cuyahoga River and entering Lake Erie before the passage of the CWA, photo courtesy of the Cleveland Museum of Natural History.

point sources of pollution have been eliminated, as factories must now apply for permits under the CWA, treat wastewater on site and utilize the sanitary sewer for discharges. This has resulted in significant improvements in water quality throughout the nation.

In Fort Worth, the stormwater sewer system is separate from the wastewater sewer system and is designated as a municipal separate storm sewer system (MS4), specifically defined in federal rules (Title 40 CFR Part 122.2) as follows:

A separate storm sewer system includes ditches, curbs, gutters, storm sewers and similar means of collecting or conveying runoff that do not connect with a wastewater collection system or treatment plant.

An MS4 is designed to remove stormwater runoff from urban areas as quickly as possible to reduce the risk of flooding. Every time it rains, stormwater and any pollutants it picks up from the landscape, such as fertilizers, pesticides, oil, detergents and animal droppings, flows directly to the nearest body of water without being treated (Reference 4-2). This is considered non-point source pollution, or pollution not coming directly from a specific source (Reference 4-3). Non-point sources of pollution from unmanaged stormwater runoff are, collectively, the largest source of water pollution in urban areas like Fort Worth, and can have devastating effects on surface water quality, as well as aquatic life.

The Surface Water Quality Section is responsible for maintaining compliance with regulations in the TCEQ Texas Pollutant Discharge Elimination System (TPDES), which is the Texas equivalent to the EPA's National Pollutant Discharge Elimination System (NPDES). It is important to note that in the City of Fort Worth, the Transportation & Public Works (TPW) Stormwater Division oversees the infrastructure and maintenance of the stormwater conveyance system (i.e. pipes and drainage infrastructure). This infrastructure is designed to control the quantity of water that flows through the system to limit flooding impacts and stream channel erosion. TPW also reviews infrastructure plans for new developments and handles floodplain and flooding issues. Their focus is on flood control, rather than pollution and the quality of the water sent through the infrastructure. The Surface Water Quality Section works in conjunction with TPW to ensure stormwater

pollution is addressed and the city complies with the MS4 permit requirements.

4.2.1 Program Areas (PAs)

4.2.1.1 PA 1: Watershed Planning & Management

Surface Water Quality Section staff collect data to assess pollution in waterbodies, the health of surface water ecosystems and any potential threats to human health and the environment. Evaluating changes in pollution levels provides the basis for water quality planning, including monitoring plans and management plans for particular waterbodies. Staff also work to prioritize monitoring activities for waterbodies shown to have pollution above allowable levels under the Texas surface water quality standards. Data, reports and plans are shared with the TCEQ and regional partners, including the North Central Texas Council of Governments (NCTCOG), for regulatory oversight. The city works with the TCEQ to ensure compliance with the TPDES permit and Texas surface water quality standards, including any corrective actions that must be taken to improve water quality in waterbodies that exceed limits for pollutants.

4.2.1.1.1 KEY ACTIVITIES

- Watershed Analysis
- Watershed Planning
- Surface Water Quality Rules & Regulations
- Surface Water Quality Projects & Technologies



Figure 4-4. Water flowing on the Trinity River, photo by City of Fort Worth.

4.2.1.2 PA 2: Surface Water Quality Monitoring

The city monitors and assesses the water quality of surface waters throughout Fort Worth on a regular basis to look for changes due to meteorological conditions,

seasonal variations and pollution. The Surface Water Quality Section investigates potential releases into the MS4 and local waters to look for sources of pollution and prevent further damage to the environment. Staff perform monitoring activities under different conditions, such as during wet weather and dry weather, and look at various indicators of stream health and pollutants. Bacteria are a common contaminant in urban waterways and can pose significant risks to human health. Staff monitor chemical, physical, and biological (e.g. macroinvertebrates, fish) factors to get an overall indication of stream health. Monitoring activities help to establish baselines and allow staff to determine if contaminant levels are increasing or if actions taken to improve water quality are working.



Figure 4-5. Surface Water Quality Section staff take water samples to test for different pollutants, photo by City of Fort Worth.

4.2.1.2.1 KEY ACTIVITIES

- Wet Weather Monitoring
- Dry Weather Monitoring
- Indicator Bacteria Monitoring
- Regional Wet Weather Characterization
- Stream Health Monitoring

4.2.1.3 PA 3: Surface Water Quality Compliance

To ensure compliance with the CWA, TPDES and other regulations and permits, the city requires industries and businesses, as well as its own municipal facilities, to obtain and comply with permits for specific activities that could impact stormwater quality. The Surface Water Quality Section regularly inspects industries, businesses and certain operations, including construction, for compliance with permits and ordinances. Staff also audit municipal facilities to ensure internal compliance with state and federal regulations, and work with facility managers to prepare

them for auditing by external entities. For those entities not regulated by a specific TCEQ permit, the operation or facility is still subject to the city's illicit discharge ordinance. Operations such as commercial cosmetic cleaners (i.e., power washers, mobile detailers, mobile floor cleaners) are required to obtain a permit from the Environmental Quality Division. The Surface Water Quality Section responds to all complaints regarding surface waters, such as fish kills, discolored water, unusual odors and illicit discharges into the MS4.

4.2.1.3.1 KEY ACTIVITIES

- Industrial Stormwater Compliance
- Municipal Stormwater Compliance
- Construction Stormwater Compliance
- Commercial Cosmetic Cleaner Compliance
- Complaint Investigations

4.2.1.4 PA 4: Water Quality Communication & Collaboration

All city departments are responsible for their own facilities and operations and must ensure compliance with state and federal permits, rules and regulations. The Surface Water Quality Section provides technical guidance and training to help other city departments and staff understand technical aspects of regulations and prevent water pollution. Staff also offer support to local businesses and industries by providing information on permit rules and working with those who are violating their permits to come into regulatory compliance. The city recognizes that water quality is a regional issue and works with partners, including



Figure 4-6. City staff and members of the public attend the surface water quality focus group meeting, photo by City of Fort Worth.

the NCTCOG and the Tarrant Regional Water District (TRWD), to develop educational campaigns to help the public understand that anything that washes into storm drains will go directly into local lakes, streams and rivers. Staff are working to involve schools and volunteers from the community in water quality projects and activities. The community must make a personal connection to local surface waters and strive to protect them.

4.2.1.4.1 KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism

4.3 Surface Water Quality Structure & Funding

As of 2018, the Surface Water Quality Section is composed of eight positions: an environmental supervisor, five senior environmental specialists and two environmental specialists. Programmatic responsibilities, as listed below, have been implemented to support the city's vision for a cleaner, safer and more livable city through proper monitoring of Fort Worth's surface water quality.

- One environmental supervisor oversees and manages the Water Quality staff and overall permit compliance.
- Five senior environmental specialists provide coordination and scientific technical expertise involving specific program areas.
- Two environmental specialists provide scientific technical expertise.

Surface Water Quality Section staff also coordinate with multiple city departments, such as the Water Department, TPW, Stormwater Development Services (SDS), Planning & Development (P&D), the Office of Emergency Management, Fire, Park & Recreation (PAR), Police other divisions of Code Compliance. Staff also work with the EPA and TCEQ for permitting, compliance inspections, complaint investigations and enforcement issues.

The Surface Water Quality Section is primarily funded through the Environmental Protection Fund.

4.4 Surface Water Quality Challenges

Urban surface waters face numerous issues that impact water quality, including persistent legacy pollution that entered waterways decades ago, frequent droughts, bacteria and illegal dumping. Most of the pollutants that enter surface waters come from sources across the city, making the problem more difficult to address.

4.4.1 Surface Water Pollutants

In urban and suburban areas with ubiquitous pavement, non-native lawns and only small patches of the natural ecosystem left (i.e. the built environment), the majority of stormwater does not soak into the ground where it can be naturally filtered by soil and plants



Figure 4-7. Oil sheen on asphalt.

(Reference 4-2). Instead, it runs off paved surfaces and is conveyed through pipes and drainage ditches to the nearest surface waterbody, bringing all of the collected pollutants and litter with it. Heavy precipitation events are becoming more common in North Central Texas, and stormwater can also overwhelm infrastructure, rushing into streams and rivers where it erodes banks and scours the bottoms, releasing large amounts of sediment (Reference 4-2).

Many types of surface water pollutants from the built environment harm wildlife and pose a threat to human health. There are many pathways by which these contaminants can enter surface waters. When it rains, oil, grease, metals and litter from roadways and parking lots are all carried into the stormwater system. If construction sites are not managed properly, they

can contribute large sediment loads and litter from building materials into the stormwater system. Even during dry weather, activities such as watering lawns and washing cars can result in runoff contaminated with fertilizers, pesticides, soaps and bacteria from pet waste (Reference 4-3). These are all examples of non-point source pollution, which is difficult to quantify and regulate. Unlike point sources of pollution, for which a single contributor can be identified, non-point sources of pollution come from everywhere and everyone. Collectively, all the contaminants throughout the built environment add up to significant pollution that flows directly into our lakes, streams and the Trinity River.

4.4.2 Impaired Surface Water Bodies

Surface water quality standards are set by the state and identify each waterbody's appropriate use, such as providing a healthy ecosystem for aquatic life, recreation or potable water (Reference 4-4). When a waterbody becomes impaired, it no longer supports one or more of these designated uses (Reference 4-5), and is reported by the TCEQ to the EPA on the 303(d) List of Impaired Waterbodies (Reference 4-6). This list is comprised of lakes, as well as river and stream segments, that are categorized as impaired

or threatened based on a variety of parameters. There are three subcategories that can be assigned to an impaired waterbody on the 303(d) list that indicate the water quality condition and appropriate management activities to evaluate or improve water quality. When an impaired waterbody is classified as Category 5a, it indicates that there is currently a total maximum daily load (TMDL), or the state is in the process of establishing a TMDL for that waterbody (Reference 4-7). The TMDL sets the maximum quantity of a particular pollutant that can enter the impaired waterbody without violating water quality standards, and is developed by the TCEQ and approved by the EPA.

A TMDL is similar to a budget that accounts for all sources of pollution within an impaired segment's watershed. A watershed (i.e. drainage basin) is an area of land within which all water flows into a common waterbody, such as a river, lake, sea or ocean. Within a watershed, smaller areas that drain into surface waters that feed into the common waterbody are designated as sub-watersheds. For example, the Trinity River watershed extends from North Texas to the Gulf of Mexico; however, the Trinity River is divided into sub-watersheds of smaller branches and creeks that feed into the

Trinity River. Fort Worth has 31 sub-watersheds, 13 of which are listed by the TCEQ as impaired (Reference 4-8). These sub-watersheds represent eight stream segments and five lakes (Reference 4-9). Ten segments (five stream segments and five lakes) have published TMDLs. The Sycamore Creek watershed characterization resulted in a published TMDL on January 16, 2019.

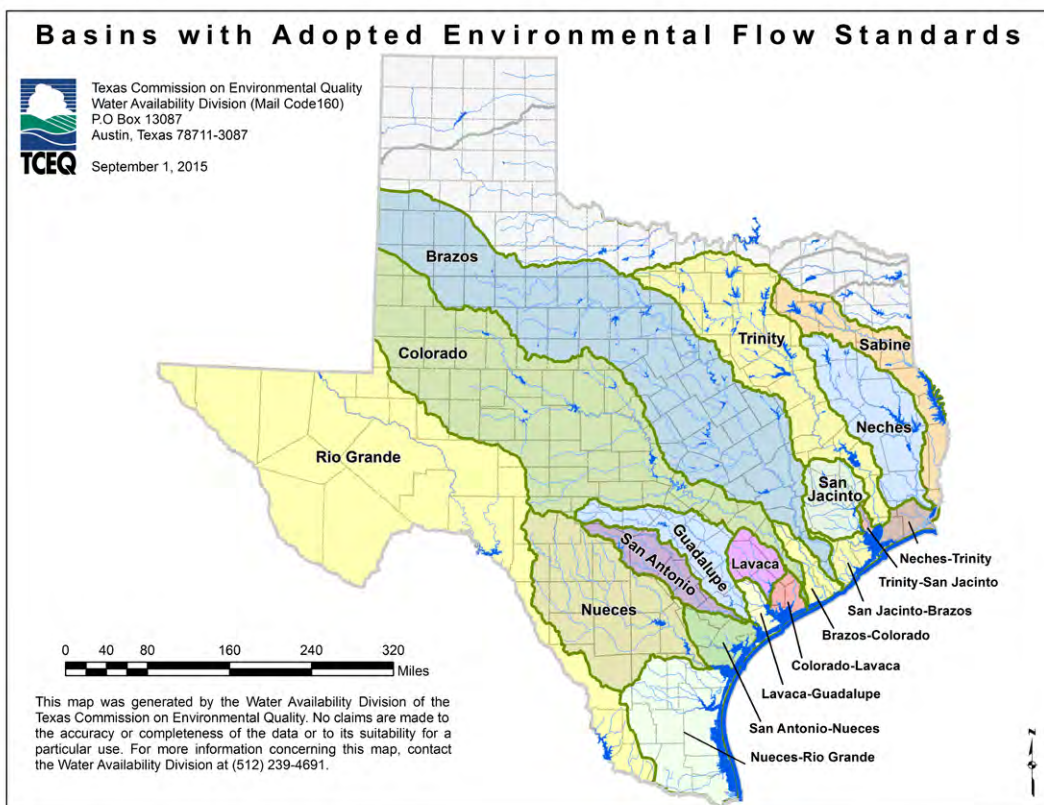


Figure 4-8. Trinity River Basin map from the TCEQ.

4.4.3 Legacy Pollutants

In North Central Texas, the point sources of pollution prior to the passage of the CWA included factories and slaughterhouses that were dumping their waste directly into the Trinity River and other local bodies of water (Reference 4-10). The long-term impact of dumping untreated waste directly into surface waters was not well understood at the time, and many chemicals that we recognize as harmful today were deemed safe when they were being produced or used. This waste often contained heavy metals, solvents and other industrial chemicals. Although Fort Worth's surface waterbodies are generally safe, some are still impacted by these legacy pollutants. This is because they do not break down easily in the natural environment, and may bind to sediment at the bottom of lakes and rivers, remaining there until the sediment is disturbed or removed. They may also be ingested by wildlife, and rather than being expelled, these pollutants remain in fatty tissues or organs. If these animals are eaten by other wildlife, the chemicals are absorbed into the tissues of those animals. This process is called bioaccumulation and can result in very high levels of pollutants in the tissues of top predators. These pollutants have caused the Texas Department of State Health Services to issue fish consumption advisories for two streams and five lakes within Fort Worth (Reference 4-11).

4.4.4 Changing Public Perception & Behavior

In Fort Worth, the sanitary sewer is connected to a water treatment plant, while the storm sewer system connects directly with the closest waterbody. In other areas of the country where older infrastructure exists, stormwater enters a collection system where it is combined with sanitary sewage and taken to a treatment plant. There are many drawbacks to a combined sewer system, not the least of which is that precipitation can overwhelm treatment plant capacity, causing raw sewage to back up and flood streets and homes. Many people are unaware of this distinction. Historically, and still today, storm drains are not seen as direct connections to surface waters, but as convenient dumping locations for pollutants like vehicle fluids, lawn clippings, cigarette butts, paint, cooking grease and even dead animals. Anything other than rainwater that enters the storm drain not only poses a flood risk by clogging the pipes, but also impacts the waterbody

at the end of the system. People are often unaware their individual actions can be detrimental to the environment. For example, the used oil from a single oil change can pollute up to a million gallons of water (Reference 4-12). The irresponsible actions of relatively few people can cause great harm to fish and wildlife, and make local lakes, rivers and streams unusable for recreation or potable water.

4.5 Strategies for Surface Water Quality Management (by Program Area)

4.5.1 Strategies for PA 1: Watershed Planning & Management

To ensure all residents, workers and visitors in Fort Worth have access to safe and clean surface waters, city staff will collect and analyze data on the many watersheds found within the city to develop plans that protect human health and the environment.

4.5.1.1 Watershed Analysis

Under the requirements of the CWA, the state must submit a report to the EPA in the spring of even numbered years (i.e. 2018), known as the Texas Integrated Report. This report provides an analysis of the water quality of all surface waters in or bordering the state, and consists of the 305(b) Water Quality Inventory Report and the 303(d) List of Impaired Waterbodies (Reference 4-7). The Texas Integrated Report includes the extent of point source and non-point source impacts of waterbodies due to conventional pollutants. With each biennial submission, the state indicates which waterbodies have been



Figure 4-9. Surface Water Quality Section staff take water samples at a large stormwater outfall on Lake Como, photo by City of Fort Worth.

added to or removed from the list, and which waterbodies were assessed since the last submission. Several stream segments within Fort Worth have already been listed as impaired waters (due to both legacy pollutants and pathogens/bacteria) and have an established TMDL. The watersheds that drain into the impaired waterbody must also be characterized. Watershed characterization programs describe the physical and natural features, land cover, infrastructure, waterbody conditions, potential pollutant sources and other properties of the watersheds that interact with the city. These assessments are used to determine the steps needed to mitigate water quality issues and return the impaired waterbodies to their designated use. Assessments of impaired watersheds are also required as part of the 303(d) delisting process.

Ideally, the city should perform characterizations for all watersheds in Fort Worth to proactively address

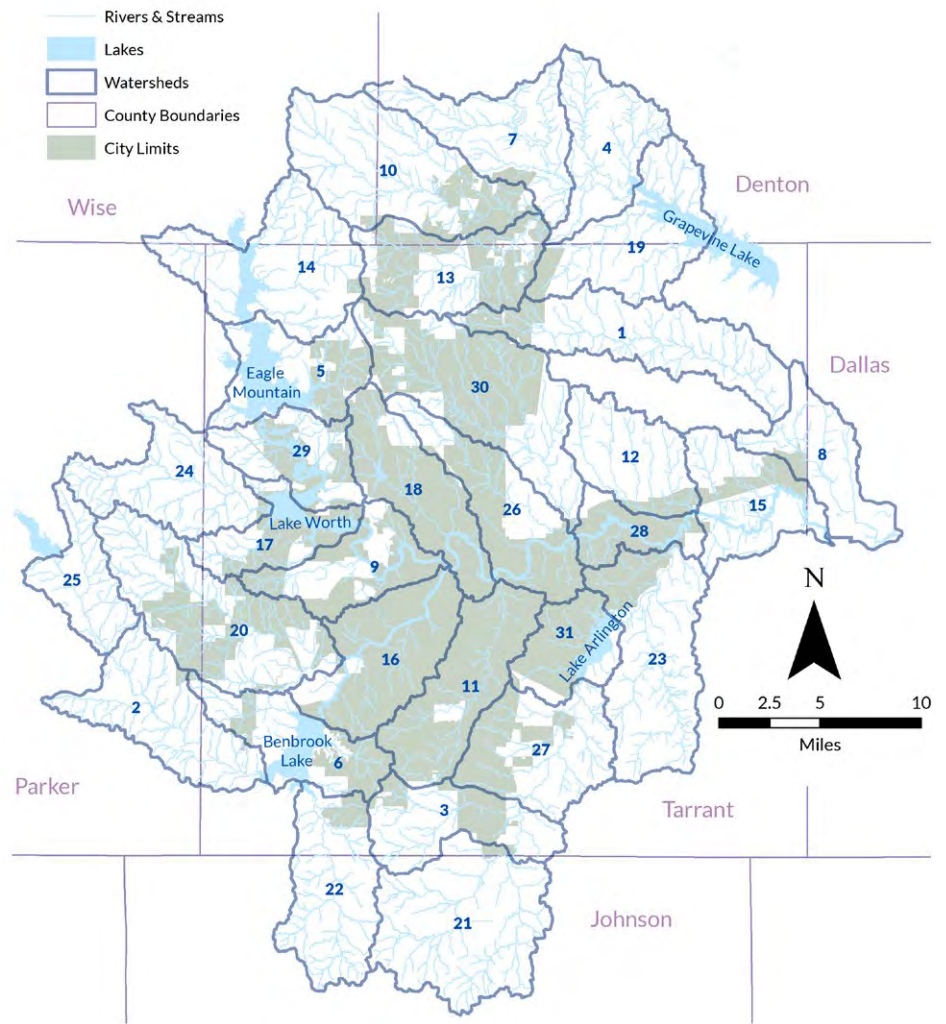


Figure 4-10. Map of all watersheds in Fort Worth, 2019.

ID #	WATERSHED NAME (HUC-12)	ID #	WATERSHED NAME (HUC-12)
1	Big Bear Creek	17	Live Oak Creek-Lake Worth
2	Brown Branch-Clear Fork Trinity River	18	Marine Creek-West Fork Trinity River
3	Deer Creek-Village Creek	19	Marshall Branch-Grapevine Lake
4	Denton Creek-Grapevine Lake	20	Marys Creek
5	Dosier Creek-Eagle Mountain Creek	21	Quil Miller Creek-Village Creek
6	Dutch Branch-Benbrook Lake	22	Rock Creek
7	Elizabeth Creek-Denton Creek	23	Rush Creek-Village Creek
8	Estelle Creek-Bear Creek	24	Silver Creek-Lake Worth
9	Farmers Branch-West Fork Trinity River	25	Squaw Creek-Clear Fork Trinity River
10	Headwaters Elizabeth Creek	26	Sycamore Creek-West Fork Trinity River
11	Headwaters Sycamore Creek	27	Village Creek-Lake Arlington
12	Headwaters Walker Branch	28	Walker Branch-West Fork Trinity River
13	Henrietta Creek	29	West Fork Trinity River-Lake Worth
14	Indian Creek-Eagle Mountain Lake	30	Whites Branch-Big Fossil Creek
15	Johnson Creek-West Fork Trinity River	31	Wildcat Branch-Lake Arlington
16	Lake Como-Clear Fork Trinity River		

water quality issues in waterbodies before they become impaired. A priority list of watersheds to be characterized should be developed, based on available monitoring and assessment data. This historical data includes lessons learned and findings of past projects, as well as environmental data (e.g. sampling results, stream flow and gauging measurements, precipitation, sediment loads). Using these data, staff can create a watershed inventory and identify data gaps to inform future planning, monitoring and assessment prioritization.

4.5.1.2 Watershed Planning

Watershed planning is complex, involving several layers of regulatory authority and shared jurisdiction of watersheds and individual waterbodies. Different watersheds have varying natural characteristics, pollutant loads and sources. Each of the plans outlined in the following section will constitute a project, from plan development to plan implementation, as they will be unique to each watershed or waterbody.

4.5.1.2.1 COMPREHENSIVE WATERSHED PLAN

The Environmental Quality Division will develop a comprehensive watershed plan, composed of a watershed characterization plan and a sampling and monitoring plan. A watershed characterization plan should be developed with the ultimate goal of characterizing all watersheds in Fort Worth, as resources allow. Using historical program data, the city will create a prioritized list of watersheds needing evaluation that targets areas for sampling and monitoring activities. This list should be based on potential impairments, threats to human health and the environment, connection to other watersheds on the 303(d) List of Impaired Waterbodies and needed data. The city should work with the county and other municipalities to characterize shared watersheds. This information allows stakeholders to develop an understanding of important features, pollutant sources and the water quality of their local watersheds, and to identify those watersheds within

Fort Worth that require additional environmental characterization and cleanup.

To maximize resources, the city should develop a sampling and monitoring plan to streamline Surface Water Quality Section operations. Through this plan, sampling conducted for watershed characterizations can be combined with legally required sampling and monitoring activities under the MS4. To develop an integrated and comprehensive water quality monitoring program for the city, all surface water monitoring activities will be incorporated into this citywide plan. Each watershed will be evaluated based on the state standard for its designated use. Typically, the designated use is primary contact recreation, meaning people can safely swim in and utilize the waterbody for recreational use. From this

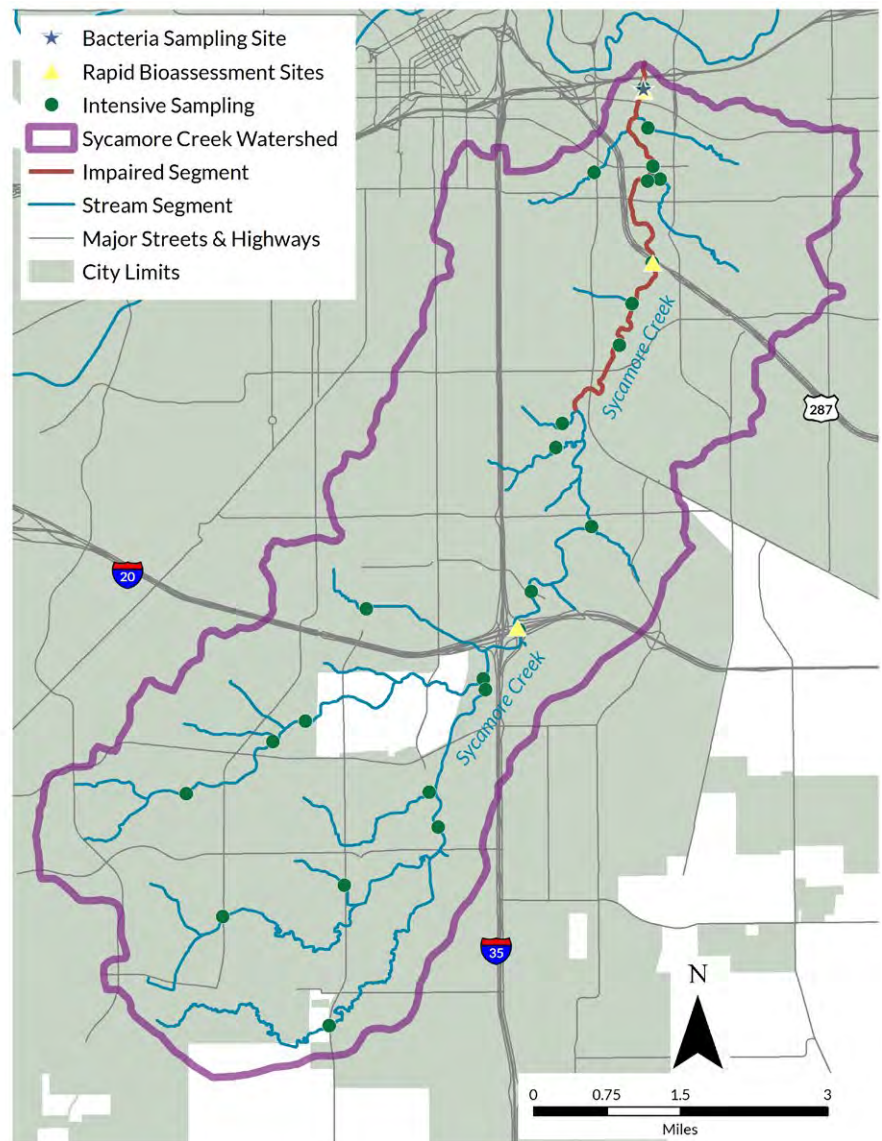


Figure 4-11. Map of the Sycamore Creek impaired segment, 2019.

analysis, individual watershed management plans can be developed to maintain or improve water quality and prevent the issuance of a TMDL. It is anticipated that environmental conditions will change, so the prioritization assessment will be reviewed every five years to determine if any changes in priority watersheds are required.

4.5.1.2.2 WATERSHED PROTECTION PLANS

A watershed protection plan is a voluntary plan, reviewed and approved by the TCEQ and the EPA, to improve water quality in waterbodies that are threatened with impairment. They are typically developed by a regional entity with the support of various stakeholders, as waterbodies tend to span multiple jurisdictions. A watershed protection plan identifies sources of pollution and best management practices (BMPs) to reduce pollutant loads and manage non-point source. It outlines partnerships, stakeholder involvement and funding sources, as well as the education and outreach necessary to achieve non-point source pollution reduction. The plan must include an implementation schedule with milestones, project expectations and evaluation criteria. To track progress and assess BMPs, sampling and monitoring are performed before, during and after plan implementation. The City of Fort Worth is a stakeholder currently working with the Trinity River Authority (TRA) and the City of Arlington to develop a Lake Arlington – Village Creek watershed protection plan. Staff can utilize the EPA manual for watershed plans and other local plans for BMP guidance, including plans on the Trinity River and Joe Pool Lake (Reference 4-14). Section staff will continue to work with partners on watershed protection plans and take a proactive approach to address pollution and water quality issues when opportunities arise.

4.5.1.2.3 IMPLEMENTATION PLANS

Part of the process for issuing a TMDL is developing an implementation plan, which serves as the action plan to reduce the pollutant load on the impaired lake or stream segment. This plan brings together municipalities, counties, regional organizations and other stakeholders to identify resources and funding opportunities for the associated activities, and allocate the TMDL between different pollution sources in the watershed (Reference 4-15). The completed plan outlines both regulatory and voluntary actions the stakeholders must take to achieve the TMDL target loading numbers, as well as the



Figure 4-12. Green infrastructure on the TRWD campus, photo by City of Fort Worth.

timeframe for carrying out the plan, with milestones and evaluation criteria (Reference 4-7). Once the TMDL and accompanying implementation plan are adopted by the TCEQ and approved by the EPA, it is integrated into the state's water quality management plan (Reference 4-15). The City of Fort Worth works with other municipalities, TRA, the NCTCOG and other partners on TMDL planning for watersheds that cross city boundaries and link to larger, regional watersheds. These plans are often incorporated into regional implementation plans for waterbodies within the same watershed that are experiencing similar water quality issues. The City of Fort Worth is a stakeholder in the Greater Trinity River bacteria TMDL implementation plan covering 21 TMDLs in the region, which was amended to include the impending TMDL issuance for Sycamore Creek. Staff will continue to assess resources and BMPs for the development of current and future implementation plans, and to oversee communications strategies and actions that mitigate pollution and reduce the target load on impaired waterbodies.

4.5.1.2.4 GREEN INFRASTRUCTURE & LOW IMPACT DEVELOPMENT

Traditional stormwater infrastructure, such as pipes, storm sewers and gutters (i.e. grey infrastructure), is designed to convey stormwater away from the built environment quickly and without treatment. Green infrastructure incorporates elements like vegetated buffer zones, bioswales, permeable pavement and

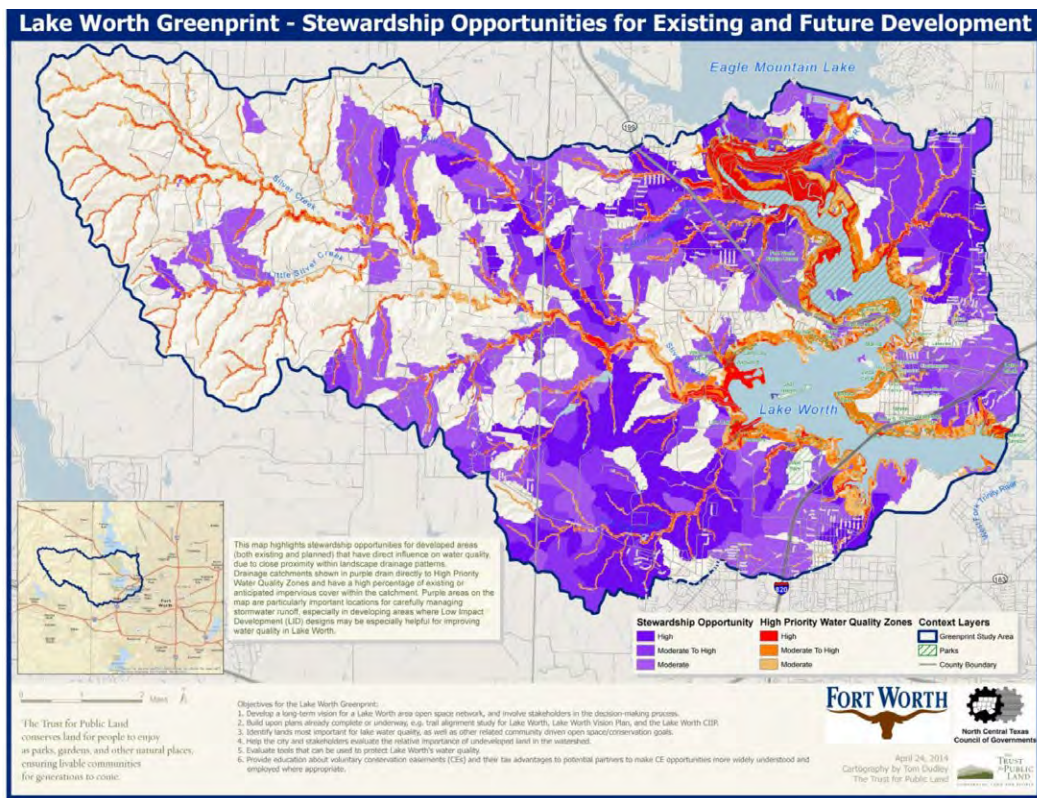


Figure 4-13. Lake Worth greenprint map, 2015.

rain gardens to filter pollutants from stormwater and allow it to naturally infiltrate the soil (Reference 4-17). Low impact development (LID) is sometimes used interchangeably with green infrastructure, although LID generally refers to site-level strategies, rather than community-scale infrastructure. LID may also incorporate grey infrastructure with the goal of mimicking the natural hydrology of a site. Green infrastructure and LID provide flood protection, recreation, natural habitat and improve property value through aesthetics. Environmental staff will work with P&D and SDS to incorporate green infrastructure and LID standards into future plans and city code, especially as new standards for stormwater control and treatment are adopted.

4.5.1.2.5 GREENPRINT PLANS

Greenprint plans are water quality conservation plans that strive to reduce pollutant loads on a watershed, as well as create areas that support recreational and economic uses (Reference 4-18). These plans are developed in coordination with community stakeholders based on local concerns and provide guidance on actions that can be taken to protect resources such as drinking water and greenspaces (Reference 4-19). These actions include creating

wetland buffers for flood control and pollutant filtration, improving parklands and encouraging practices that reduce chemical loads from lawns and agriculture. Utilizing watershed analysis and planning data, surface water quality staff should develop a list of watersheds with impairments or those that may become impaired and prioritize them for greenprint plans. Many of the strategies outlined in greenprint plans would help to achieve the desired outcomes under implementation plans and watershed protection plans, while providing additional benefits that improve

quality of life. The Lake Worth Watershed Greenprint, a partnership between the City of Fort Worth, the NCTCOG, the Trust for Public Land (TPL) and a local citizen advisory committee, can be used as a local model (Reference 4-18).

4.5.1.2.6 GREENSPACE PLAN

Greenspaces improve property values, air quality, water quality and generally improve quality of life in the urban environment. The city should develop a greenspace plan that promotes natural landscape protection and restoration to improve surface water quality and general aesthetics. This would connect greenspaces and return portions of the landscape to natural conditions that can be used for recreation, as well as natural drainage systems. The city's environmental staff will work with SDS, PARD and NPOs, such as Streams and Valleys and TPL, to develop a system to prioritize properties for conservation based on the benefits they could provide for overall stormwater control and filtration. Properties should also be evaluated for potential wetland restoration to improve infiltration of stormwater runoff. This would allow the city to identify properties that would have the greatest water quality benefits if preserved in a natural state or restored to a natural state. The various city departments and other stakeholders

involved should develop a long-term maintenance plan with strategies for managing acquired greenspaces. Environmental staff will also collaborate with SDS to inventory concrete-lined streams and ditches that could be returned to natural, permeable materials. The city should explore funding options for the purchase and maintenance of greenspaces, including Capital Improvement Plan (CIP) project funds, public-private partnerships and mitigation bank credits for wetlands.

4.5.1.3 Surface Water Quality Rules & Regulations

At the federal level, the CWA and NPDES establish rules and regulations for surface water quality. In Texas, the NPDES is locally administered through the TCEQ TPDES program, which has authority over all surface water discharges in Texas, except those from oil, gas and geothermal operations. These are overseen by the Texas Railroad Commission.

4.5.1.3.1 MS4 PERMIT

The City of Fort Worth and TRWD are co-permittees on the MS4 permit, which is designed to reduce impacts to water quality in streams and rivers from urban stormwater runoff (Reference 4-21). Previously the Texas Department of Transportation was an additional co-permittee; however, it now operates under its own permit. The City of Fort Worth has held continuous permit coverage since 1996, originally under the NPDES, and is required to implement minimum control measures that will aid in the improvement of surface water quality. As required by the TPDES permit, the City of Fort Worth Municipal Code, Chapter 12.5 – Article 3, prohibits illicit discharges into the MS4. Illicit discharges include anything that is not rainwater, except for a predefined list of allowable discharges, such as construction and industrial sites that have their own TPDES permits (Reference 4-23).

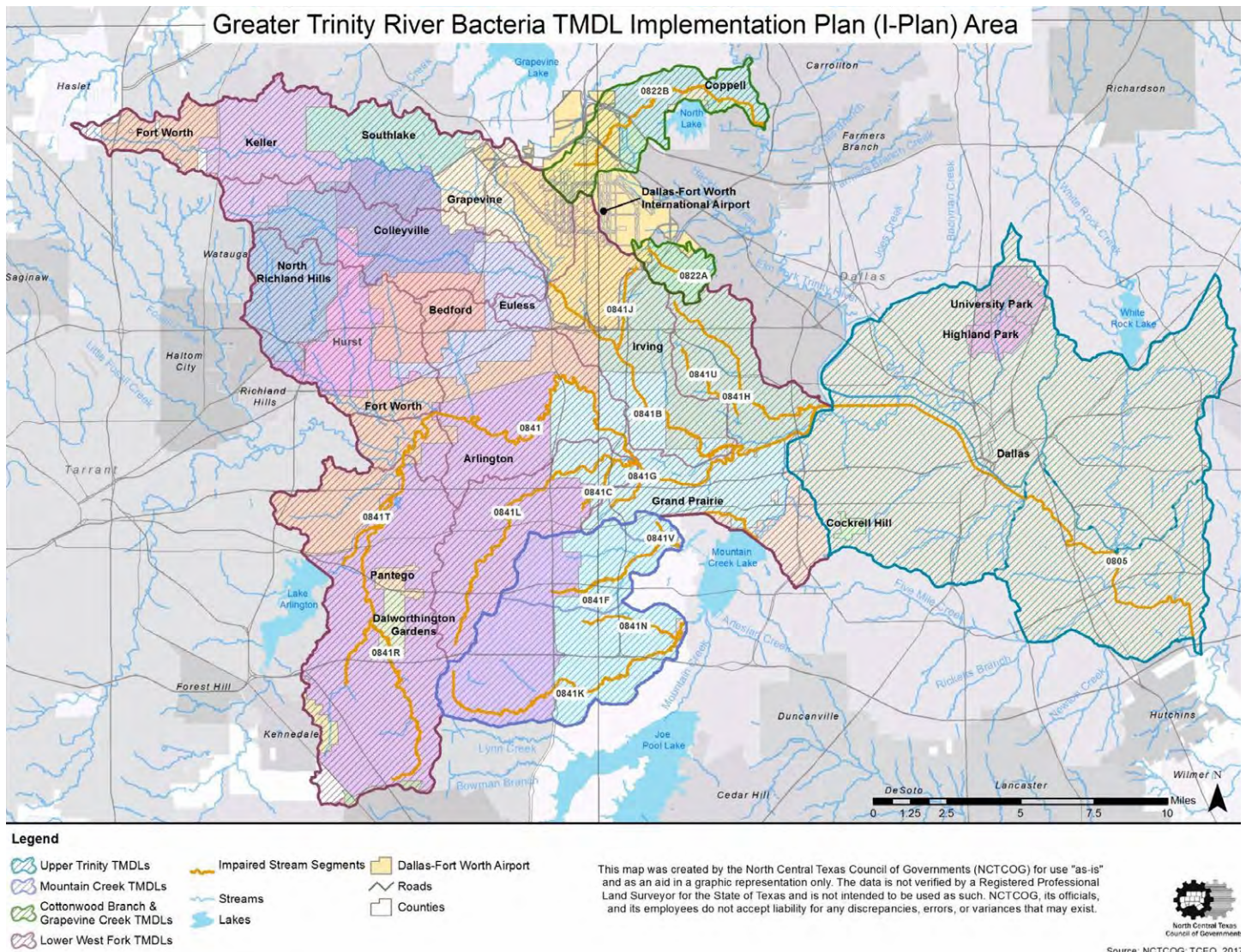


Figure 4-14. Map of the Greater Trinity River bacteria TMDL implementation plan area, 2019.

Under Chapter 12.5 – Article 3 of the municipal code, the Surface Water Quality Section is authorized to inspect and enforce permit regulations for activities that result, or may result, in discharges to the stormwater system (Reference 4-23). This code has not been revised since 1999, and should be reviewed to determine if it should be updated or amended. Currently, there is a permit gap in the municipal code because only certain types of facilities with discharges are regulated at the state level, and the city does not have a local permit requirement for these operations. These include construction sites less than an acre in size, as well as some industrial and commercial facilities. City staff should review BMPs from other municipalities, counties and environmental management systems to develop local permits for these facilities and operations.

4.5.1.3.2 INTEGRATED STORMWATER MANAGEMENT MANUAL

City council adopted some of the standards found in the Integrated Stormwater Management (iSWM) manual from the NCTCOG (Reference 4-24). These standards apply to all new development and redevelopment projects that are greater than one acre, and are designed to manage the quantity of stormwater from these developments to prevent adverse impacts on surface waters, such as erosion and channel scouring. The iSWM manual in its entirety includes additional standards for the treatment of stormwater both during and after construction to improve water quality. Development and redevelopment that fall within the floodway corridor or Panther Island are reviewed by the TRWD. These sites have additional standards for stormwater management and treatment, and pollution reduction must be calculated for the controls on the site. The TRWD permit requires the use of green infrastructure and a post-construction plan for maintaining that infrastructure to ensure it continues to function properly.

It is anticipated that future MS4 permit requirements for the city will include an increased use of green infrastructure, LID and other design elements that improve stormwater quality. The city should consider proactively streamlining requirements for all new construction and redevelopment projects larger than a half acre by adopting the iSWM manual in full, or similar guidelines requiring post-construction controls. These standards would improve stormwater retention,

infiltration and treatment even after construction is complete, providing ongoing benefits to the community. Adopting these standards will require additional staff and resources to review more permits and plans, inspect a greater number of construction sites and provide support for developers and designers. Surface Water Quality staff should evaluate funding sources and collaborate with other departments and external partners to develop the required resources.

4.5.1.3.3 INDUSTRIAL & COMMERCIAL PERMITS

The TCEQ requires businesses that operate using specific standard industrial classifications (SICs) to obtain a TCEQ industrial stormwater permit or concrete batch plant stormwater permit. Industries that do not have a regulated SIC, or choose to identify with a non-regulated SIC code, are not required to obtain permit coverage through the TCEQ. The city should consider developing its own industrial and/or commercial permit for facilities and operations that contribute a substantial pollutant load to the MS4 to protect local surface waters. This would ensure that facilities and operations that either individually or collectively contribute significant pollution to the MS4 meet certain standards.

4.5.1.3.4 GRADING PERMITS

Currently, all development that will disturb an acre or more must obtain a grading permit prior to construction and comply with the grading permit ordinance (Reference 4-23). The permit application is reviewed by P&D, SDS, the Water Department, Urban Forestry Compliance and Surface Water Quality Section staff. Section staff evaluate the permit to ensure developers meet the minimum requirements as set in the TCEQ construction general permit. The city should consider developing a city-specific construction permit that covers smaller construction projects, including infill projects, to ensure that growing development does not adversely impact surface waters in Fort Worth.

4.5.1.3.5 MOBILE COMMERCIAL COSMETIC CLEANER PERMITS

The mobile commercial cosmetic cleaner (power washer) ordinance (Reference 4-23) seeks to improve the quality of dry weather flows that enter surface waters by requiring permits and providing education for operators on chemical cleaners and pollutants that are washed off during cleaning processes. Since the

adoption of this ordinance, the industry has changed, and more businesses are performing cleanup activities that have the potential to discharge to the MS4. An update of the language is required to make it clear that this ordinance also should apply to mobile detailing businesses, floor cleaning operations and other activities that generate waste water, not just those that use a conventional power washer unit.



Figure 4-15. A power washer cleaning pavement.

4.5.1.4 Surface Water Quality Projects & Technologies

The Environmental Quality Division will undertake a number of projects designed to streamline and facilitate Surface Water Quality operations. Section staff will evaluate the use of new technologies, tools and methodologies for reducing and preventing pollution in our waterways, as well as for monitoring legacy pollution. Ultimately, these projects and technologies should contribute toward the goal of providing access to safe surface waters for public use and enjoyment.

4.5.1.4.1 IMPAIRED WATERBODY PROJECTS

Each watershed characterization plan will constitute its own project, as these plans require significant resources and coordination with many stakeholders. The highest priority projects are those watersheds with designated 303(d)-listed impaired waterbodies, such as the Sycamore Creek watershed. Section staff will work with partners to develop watershed-specific strategies to address pollutant loads and manage water quality within the entire watershed, not just the segment receiving the TMDL. These actions may go further than the requirements in an implementation plan, but should make significant progress toward addressing the overall problems and preventing additional segments within the watershed from being listed as

impaired and receiving a TMDL (Reference 4-25). Staff will create a priority list of projects for the CIP to both develop and carry out watershed plans.

Surface Water Quality Section staff will work with partners to develop watershed protection plans for watersheds with potentially impaired surface waters that do not yet have TMDLs. These plans are typically led by an external agency, often a regional entity, so these plans will be developed as the opportunity or need arises. The following are high-priority waterbodies with no designated TMDLs that are currently impaired for bacteria (Reference 4-8): Village Creek (watershed protection plan under development), Marine Creek, West Fork Trinity River and Lower West Fork Trinity River. Watershed characterization projects will be treated similarly to impaired water body projects and should be prioritized based on known or suspected impacts to best protect human health and the environment. Staff should explore the use of CIP project funds, grants, public-private partnerships and other funding sources for these projects.

4.5.1.4.2 FIELD PROJECTS

While the majority of Surface Water Quality Section field work involves sampling, monitoring, compliance inspections and other ongoing activities, there are opportunities to improve Fort Worth's surface water quality through major projects. Environmental staff will explore opportunities to monitor and address pollutants in the sediments of waterbodies with impairments in partnership with other stakeholders, such as the TRWD and the U.S. Army Corps of Engineers. Surface Water Quality Section staff should research the

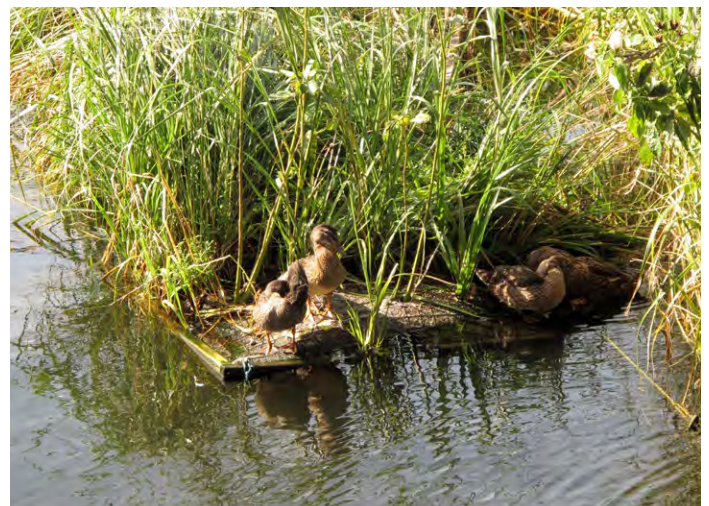


Figure 4-16. A floating wetland helps filter pollution from the Chesapeake Bay in Baltimore and provides a habitat for wildlife.

efficacy of installing fountains in public waterbodies to increase oxygen, improve pollutant degradation and control mosquitoes. Staff will also collaborate with the Texas Parks & Wildlife Department (TPWD) on potential projects, such as creating floating wetlands that help trap litter, filter pollutants and support fish populations. Grants and CIP project funds could be utilized for many of these major projects.

4.5.1.4.3 SURFACE WATER QUALITY LABORATORY

The city should explore options to modernize the surface water quality laboratory, including evaluating potential relocation options. A new or renovated facility with laboratory-grade technology and safety equipment would reduce the amount of time it takes to process and analyze samples. It could also serve as a Texas Stream Team laboratory if the city develops a citizen scientist program (see the Communication & Collaboration program area). Space should be made to store field equipment (e.g., boats and kayaks used to collect water quality data), field chemistry kits and stream team kits. Surface Water Quality Section staff will benchmark practices from other cities and organizations that manage their own laboratories, and identify funding mechanisms for a laboratory, including grants and CIP project funds.



Figure 4-17. A Surface Water Quality Section staff member analyzes biological samples collected from local waterways, photo by City of Fort Worth.

4.5.1.4.4 GREEN INFRASTRUCTURE PROJECTS

New city facilities and those undergoing substantial renovation should be designed using LID principles and connect with other green infrastructure. Existing facilities should be retrofitted with LID, where possible. Often, these green retrofits and design elements cost less than alternatives, especially throughout the



Figure 4-18. The Green at College Park on the University of Texas at Arlington campus boasts green infrastructure that captures 25 percent of stormwater and reduces sediment by 80 percent, photo from University of Texas at Arlington.

life of the facility. Staff should work with other city departments to develop a demonstration facility with green infrastructure to use as a test site where Surface Water Quality Section staff can sample runoff pre- and post-treatment on the property. This would allow staff to field test different methods and technologies for treating stormwater, such as hydrodynamic separators and structural treatment devices with the ability to remove sediment, litter, petroleum products, bacteria and even metals. This site would help to refine recommendations for P&D regarding building codes and ordinances and serve as an educational facility for building inspectors, developers and designers.

4.5.1.4.5 SOFTWARE & DIGITAL SOLUTIONS

Environmental staff will explore software and hardware options to standardize data input for field activities, collect data from continuous stream monitors and simplify reporting. The selected option should integrate with Geographic Information Systems (GIS) and be able to incorporate current and historical data from the Land Quality Section and Surface Water Quality Section programs, as well as data gathered by other city departments. This will allow staff to more easily identify areas with potential legacy pollution, track water quality trends and develop a watershed characterization priority list. All sampling and watershed characterization data should be combined to develop a prioritized Surface Water Quality Section work plan that better supports future projects. Using

GIS, staff can create a streamlined sampling schedule based on the geographic location of monitoring sites and planned projects. This will enable staff to work more efficiently while gathering baseline data for future watershed characterization projects and satisfying the annual sampling requirements for regulatory compliance.

A GIS-based tool should also assist staff with compliance and enforcement activities by incorporating data from inspections, including violations, to identify sites or operations that may pose surface water quality risks. Through the use of historical data and continued sampling, benchmarks should be developed in areas near high-risk facilities to guide monitoring programs and identify hot spots for inspections and sampling. A GIS platform would allow staff to spatially analyze areas of the city and perform basic watershed modelling to identify sources of pollution. This would allow staff to provide targeted education to residents and businesses that may be contributing heavy pollutant loads to nearby surface waters. The city should also develop a web-based GIS tool to make water quality data available to the public. This could be used as an educational tool and to provide critical information to residents, such as fish consumption advisories or hazardous water conditions.



Figure 4-19. A robot deployed on the Gowanus Canal in Brooklyn to collect water quality data, photo from the New York University Polytechnic School of Engineering.

4.5.1.4.6 FIELD EQUIPMENT

The Surface Water Quality Section should develop a prioritized equipment replacement schedule for outdated and retrofitted equipment, as well as a purchasing list to acquire new equipment. New technologies and tools are available that are capable

of detecting pollutants at lower concentrations, collecting better quality samples and allowing staff to analyze them for a wider array of parameters. Staff will review equipment used by other municipalities, and evaluate new technologies, tools and methodologies for field sampling and monitoring. This information will be used to develop a comprehensive list of equipment needed, based on cost and effectiveness. Some tools identified by staff that should be included on the equipment purchasing and replacement list include multi-parameter sondes, Doppler flow meters, backpack shockers and stormwater samplers. The city should expand the use of continuous stream monitors for more efficient water quality monitoring and data collection. The city should also consider the acquisition of a small boat and/or kayaks for water quality sampling, limnology studies and other activities. Remote-controlled devices, such as drones, can be used to survey large sites and gather data in areas not easily accessed by staff to identify specific areas requiring additional investigation. Field cameras and other automated equipment make it possible to gather data outside of business hours and can support enforcement activities. CIP project funds may need to be utilized for large equipment purchases. Other equipment could potentially be funded through grants or partnerships with other agencies, such as TPWD and TRWD.

4.5.1.5 Development Actions for PA 1: Watershed Planning & Management

Watershed Analysis

1. Maintain and annually update a comprehensive database for water quality data, including historical watershed data and current monitoring and compliance data with trends.
 - *Performance Indicator:* Statistics that track the status of stream water quality over time to show improvement or degradation. Include wet weather and dry weather data trends, and a list of any identified issues or potential problem areas for targeted assessments.
2. Evaluate field data gathering SOP and identify improvements.
 - *Performance Indicator:* Number of data gaps.

Watershed Planning

1. Develop a comprehensive watershed plan comprised of a watershed characterization plan and a sampling and monitoring plan. Include a priority list for watersheds to be characterized.
2. Develop a greenspace plan and encourage the incorporation of green infrastructure and LID into city codes and development plans.
3. Collaborate with other city departments and external partners to develop greenprint plans.
4. Coordinate with partners to support the development of implementation plans and watershed protection plans.

Rules & Regulations

1. Benchmark other cities for best practices for surface water quality ordinances and related policies.
2. Review municipal ordinances and make recommendations for changes to meet MS4, TMDL or related surface water quality requirements, as needed.
3. Periodically review federal, state and local permits for construction, industrial and commercial operations to ensure congruency across programs.
4. Review ordinances and permits for power washing and mobile cleaning activities for BMPs, including requirements to recycle process water and procedures for capturing and disposing of process water, to determine if Fort Worth should amend current permits or develop new permits.
 - *Performance Indicator:* Number of power washing and mobile cleaning permits issued.

Projects & Technologies

1. Develop and annually maintain a grant tracking system that includes annual grant cycles, grant due dates, information required to apply, and all grant applications submitted by the Division.
2. Evaluate the feasibilities of updating the Water Quality laboratory and/or constructing a new facility.
3. Evaluate the feasibility of developing a green infrastructure and LID guidance manual and/or demonstration sites.

4. Evaluate database management software options for tracking field operations, collecting field data and records management.
5. Implement a consolidated database management and digital field data collection system.
6. Develop and bi-annually maintain an inventory of equipment and develop a maintenance or replacement schedule for city-owned equipment.
7. Create a web-based mapping application for public use to share watershed and water quality data.
8. Develop and annually maintain a prioritized list of watershed management projects.

4.5.2 Strategies for PA 2: Surface Water Quality Monitoring

As Fort Worth grows, the MS4 network will grow, and an increasing number of outfalls and stormwater inlets will require monitoring. Surface water quality monitoring programs allow the city to better understand the impact of urban runoff on local surface waters, identify potential water quality issues and address them proactively to prevent additional pollution. Sampling schedules have largely been governed by the TPDES permit requirements (Reference 4-22); however, new sampling programs may be required to satisfy conditions outlined in TMDLs and implementation plans. The impaired waterbodies will also require more frequent sampling to monitor improvement or degradation of water quality over time. It is essential for staff to develop a thorough sampling and monitoring plan, along with additional resources, to meet growing demand.

Table 4-1. *Surface water quality assessments.*

SURFACE WATER QUALITY SAMPLES	Minimum Required	Desired Service Level
Wet Weather Field Screens	50	1,056
Bacteria CRP Samples	84	360
Rapid Bioassessment Macroinvertebrate Samples	36	94
Rapid Bioassessment Fish Samples	36	94
Rapid Bioassessment Chemistry Samples	36	94
Surface Water Quality Samples	36	94
Regional Wet Weather Characterization Samples	4	128



Figure 4-20. A Surface Water Quality staff member collects a stormwater sample before it enters the MS4, photo by City of Fort Worth.

4.5.2.1 Wet Weather Monitoring

The Surface Water Quality Section performs wet weather field screenings at various locations, including in-stream MS4 outfalls and inlets across the city. Outfalls are the locations where the stormwater infrastructure empties into surface waters. Staff look for pollutants that are washed into the MS4 during rain events, such as metals, sediment and other pollutants. Primary contaminants of concern vary with surrounding land use, but at minimum, sampling includes pH, specific conductivity and turbidity. Additional analysis may be performed for other contaminants, including ammonia-nitrogen, nitrate-nitrogen, phosphate, chromium, copper, zinc, total coliform and *E. coli*. Water quality data obtained during rainstorms help provide a better understanding of the types and amounts of pollutants carried by stormwater and aid in developing BMPs to improve the quality of stormwater runoff in the city.

These sampling activities can also identify areas within the city that may be contributing excessive levels of pollutants to the MS4, such as fertilizers from lawns or unmitigated runoff from industrial and agricultural operations.

Staff can use additional sampling to pinpoint sources and correct the underlying issue through education or enforcement. Wet weather field screenings are limited by the number of rain events and resources available for sampling, including staff levels. Additional sampling and monitoring locations are needed to establish baselines for watershed analysis and monitor long-term trends as the city grows. Sampling plans should be updated as the Surface Water Quality Section acquires the necessary resources to expand the wet weather monitoring network.

4.5.2.2 Dry Weather Monitoring

Dry weather surface runoff is the result of people either unknowingly discharging water and/or pollutants into the MS4 through activities like washing a vehicle or watering a lawn, or knowingly discharging into the MS4 by allowing substances to run off their

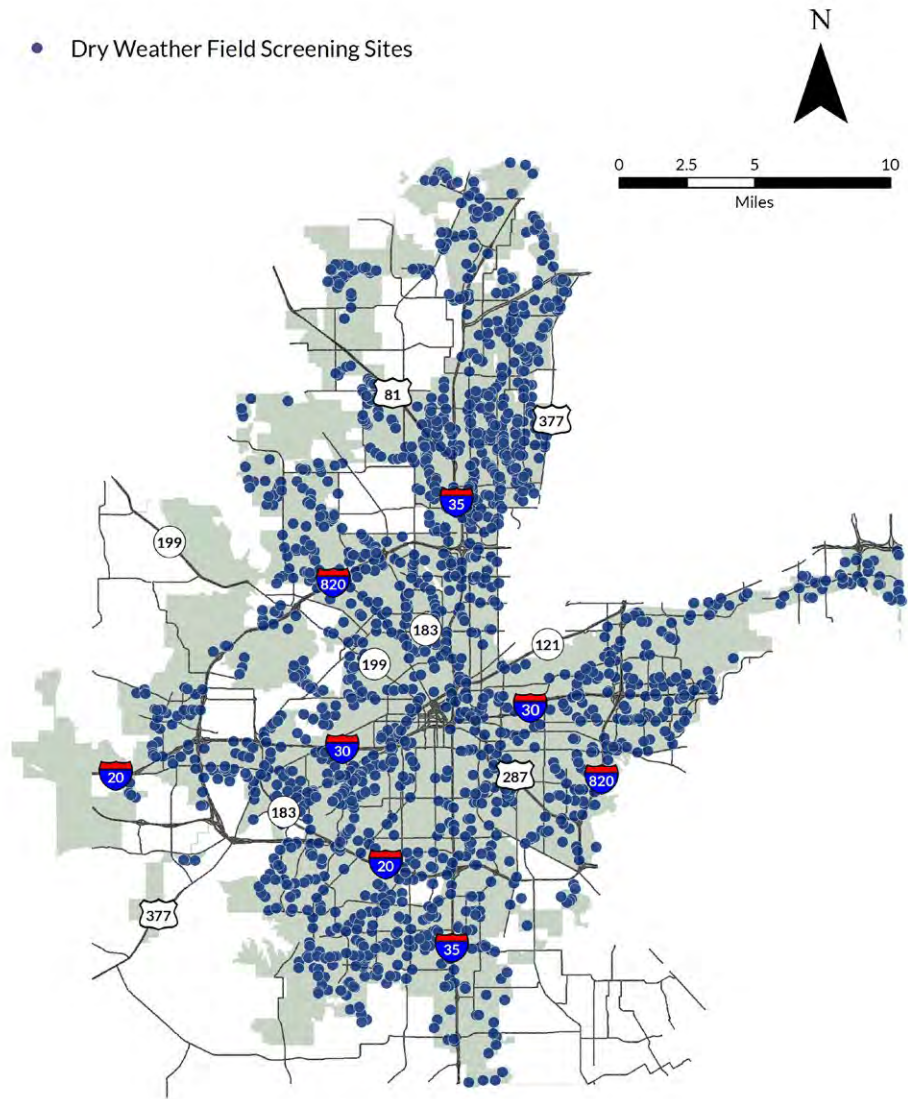


Figure 4-21. Map depicting dry weather field screening sites, 2019.

property or dumping directly into the storm drain. Surface Water Quality Section staff perform dry weather field screenings at major outfalls across the city when flow is not affected by rainfall to detect and isolate the presence of illicit connections and improper discharges to the MS4. At a minimum, dry weather sampling includes temperature, pH, color, turbidity, copper, phenols, chlorine, ammonia-nitrogen and detergents, although primary contaminants of concern vary with the surrounding land use. If sample testing indicates an illicit discharge, Surface Water Quality Section staff traces the source of the discharge and ensures corrective or enforcement actions are taken to eliminate the discharge. This not only ensures compliance with the permit, but protects human health and aquatic ecosystems from potentially toxic discharges. Dry weather screening also helps to find potable water and sewer infrastructure breaks, which conserves water, saves tax dollars and helps eliminate sources of bacterial impacts to creeks and rivers.

Staff sample each outfall once every five years, which is the term length of the TPDES permit (Reference 4-22), and high priority outfalls at least twice during the permit term. This leaves the possibility for issues to persist for years before they are addressed, or to go undiscovered altogether. There are currently over 1,700 major outfalls that require monitoring under the permit, and that number continues to grow with development and as Fort Worth's population increases. The Surface Water Quality Section will need additional staff and resources to increase the frequency of sampling at these outfalls, and to monitor additional outfalls as the MS4 grows.



Figure 4-22. Algae in an MS4 outfall alerts staff of a potential illicit discharge, photo by City of Fort Worth.

4.5.2.3 Indicator Bacteria Monitoring

Staff monitor the concentration of indicator bacteria that serve as a measure for water safety, because they tend to correlate with the presence of fecal matter and pathogens in the water (Reference 4-27). Bacteria are the most common cause of impairments in rivers and streams, and can cause serious illness in humans and pose a threat to aquatic ecosystems (Reference 4-26). Of the 183 identified impaired stream segments in the state of Texas (2014 data), 134 are impaired due to bacterial impacts. When a waterbody is identified as impaired, the city issues necessary warnings to the public and works to return the waterbody to a beneficial and safe use. Staff look for potential pollutant sources, such as breaks in sewage pipes or animal waste from farms, to try and pinpoint and correct the issue. Timely identification of *E. coli* and other pathogens reduces exposure and protects public health.

As part of the TRA Clean Rivers Program (CRP) (Reference 4-28), Surface Water Quality Section staff collect samples on the same day each month from seven locations throughout the city, then analyze them locally. Quarterly samples are taken to the Water Department laboratory, which is certified by the National Environmental Laboratory Accreditation Program (NELAC), or to another NELAC-approved contract laboratory. The results are submitted to the TCEQ for inclusion in the statewide CRP data. Indicator bacteria samples are also collected when complaints are filed, for risk assessments and in combination with other monitoring programs. To better protect surface water quality and public health, additional sampling locations should be added to this program as resources become available. This would allow staff to monitor for improvement in current stream segments under a TMDL and identify other waterbodies that may be impaired. Environmental staff should explore potential partnerships to add sampling locations and provide laboratory resources.

4.5.2.4 Regional Wet Weather Characterization Program

As part of the TPDES permit monitoring requirements, the city participates in the NCTCOG Regional Wet Weather Characterization Program (RWWCP). The objectives of this program are to assess changes that receiving streams may undergo as they pass through urban areas, evaluate long-term trends in receiving water quality and to identify potential concerns from

stormwater runoff. Environmental staff take samples at alternating upstream and downstream locations in two watersheds each year (see Table 4-1), analyzing them for multiple contaminants and parameters of concern, as defined by the TCEQ. These include oil and grease, pH, *E. coli*, sediment, metals and an array of other chemicals. Data from the city and other participating municipalities are compiled annually and at the end of the five-year permit term, when they are reported to the TCEQ by the NCTCOG. At the start of a new permit term, different watersheds are selected for monitoring. Through participation in this program, municipalities can analyze trends to assess the effects of stormwater on regional surface waters, and take a cooperative approach to better address impacts to water quality. Sampling activities for this program can be streamlined with activities for other monitoring programs in an overall sampling and monitoring plan. As additional staff and resources become available, sampling should be expanded to include a greater number of locations and more frequent storm event monitoring. To offer truly comprehensive monitoring, the city will need to identify options to allow samples to be collected and analyzed outside of normal business hours.

4.5.2.5 Stream Health Monitoring

The city has chosen to implement the representative rapid bioassessment monitoring option of the RWWCP to comply with the TPDES permit (Reference 4-22). The objective of this program is to assess the health of aquatic biological communities, which provide an indication of overall stream health. Benthic macroinvertebrates (bottom-dwelling animals without a backbone) are a collection of insects and crustaceans such as dragonflies, mayflies, stoneflies, midges, snails and crayfish. These organisms are commonly monitored to help evaluate water quality. Simply stated, they serve as tiny, living water quality indicators. Different macroinvertebrates and fish have varying reactions to decreased water quality and increased pollutants. Some are very tolerant, and can live in polluted water conditions, but others are very sensitive and can only survive in good water quality conditions. As a result, the presence or absence of specific macroinvertebrates and fish can effectively illustrate the conditions of local streams, rivers and lakes, and assist in showing long-term trends in water quality.

Section staff currently sample six watersheds with land areas that fall primarily within city boundaries. Each watershed is sampled twice per year, in at least one



Figure 4-23. Surface Water Quality Section staff members collect biological samples for the Stream Health Monitoring Program, photo by City of Fort Worth.

upstream and one downstream location, for physio-chemical parameters, macroinvertebrates and habitat evaluation. As resources allow, a third location in the middle of the watershed is also sampled, and sampling for fish communities may also be conducted. Staff will work with regional partners to develop procedures for the program and increase data sharing, as well as incorporate additional metrics from the TCEQ surface water quality monitoring procedures manual. As resources allow, additional locations and watersheds throughout the city should be added to this program.

4.5.2.6 Development Actions for PA 2: Water Quality Monitoring

Wet Weather Monitoring

1. Develop and annually maintain a prioritized list of sites for sampling across the city to increase wet weather monitoring coverage.
2. Evaluate feasibility to install continuous water quality monitors in watersheds across the city for long-term, real-time monitoring.
3. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.

- *Performance Indicator:* Number of watersheds within the city that are sampled annually.
- *Performance Indicator:* Number of wet weather sampling locations sampled.
- *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.

Dry Weather Monitoring

1. Develop and annually maintain a list of high-priority locations for sampling that includes areas currently under a TMDL or watershed protection plan.
2. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of outfalls within the city that are sampled annually.
 - *Performance Indicator:* Number of dry weather sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.

Indicator Bacteria Monitoring

1. Develop and annually maintain a prioritized list of sampling locations based on impairment and areas with high resident use, such as city parks.
2. Evaluate expanding sampling locations beyond those included in the TCEQ Clean Rivers Program to include areas of concern for potential future impairment listings and areas with current bacteria impairments or TMDLs.
3. Incorporate any additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of watersheds within the city that are sampled for bacteria annually.
 - *Performance Indicator:* Number of bacteria sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.
4. Monitor watersheds and stream segments under TMDLs or watershed protection plans to evaluate the effectiveness of implementation plan or watershed protection plan activities.

- *Performance Indicator:* Statistics for all pollution mitigation BMPs applied to include overall status of stream water quality over time to show improvement, degradation or no change.

Regional Wet Weather Characterization Program

1. Expand sampling locations to additional watersheds and increase the frequency of sampling. Incorporate additional sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of regional wet weather characterization sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.
2. Evaluate new laboratory contracts or other options that allow samples to be collected and analyzed outside of business hours.

Stream Health Monitoring

1. Develop and annually maintain a prioritized list of sampling sites across the city to increase stream health monitoring coverage.
2. Assess the feasibility of conducting monthly basic water quality monitoring at select sites throughout the city.
3. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of watersheds within the city that are sampled for stream health parameters annually.
 - *Performance Indicator:* Number of stream health sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.
4. Explore partnerships to update fish sampling studies.
 - *Performance Indicator:* Number of fish sampling activities and findings resulting from partner collaborations.

4.5.3 Strategies for PA 3: Surface Water Quality Compliance

Surface Water Quality Section staff inspect facilities and sites throughout the city to ensure they are in compliance with their TCEQ permit and/or the city's stormwater ordinance. Staff also investigate complaints and respond to emergency situations that could impact the MS4 (emergency spill response is discussed in Chapter 5). As the city grows, maintaining and improving surface water quality will become a greater challenge, and additional resources will be necessary to adequately address pollution and provide a high standard of customer service to the community.

4.5.3.1 Industrial Stormwater Compliance

Surface Water Quality Section staff perform site inspections at industrial facilities that are required to obtain coverage under the TCEQ multi-sector general permit or other permits applicable to industrial discharges. These permits may require the facility to conduct sampling of stormwater runoff from their site that is sent to the state, maintained on site or sent to the city. A permit may also require benchmark data to be collected, which is either sent to the city or collected during inspections. The state sets benchmark levels by industry type that are intended to provide an early warning of potential water contamination. These tests allow the facility to assess the cause and source of the contamination and implement corrective actions. Based on the city's MS4 permit requirements, Surface Water Quality Section staff must inspect a facility at least once every five years, which is the permit term, and perform additional inspections on those facilities identified as high risk. Facilities can be determined to be high risk based on sector, Emergency Planning and Community Right-to-Know Act reporting status,

Table 4-2. *Industrial inspections workload.*

INDUSTRIAL INSPECTIONS	2015	2016	2017	% Change
Industrial Inspections Completed	91	75	38	-58%
Industrial Inspections Required*	122	122	122	0%
Percent Inspections Performed	74.6%	61.5%	31.1%	-58%

*The MS4 permit received in 2018 will impact required number of inspections.

monitoring results, compliance history or other reasons, as determined by each inspector. As of 2018, staff perform approximately 336 inspections per year, not including follow-up inspections or those resulting from a complaint.

An inspection includes a review of permit documents, self-inspection reports and the stormwater pollution prevention plan (SWPPP). This plan includes specific conditions required by the permit, the nature of the activities to be conducted, contact information for site personnel, procedures to be enacted during a spill, monitoring information and inspection information, as well as other information pertinent to the site and applicable permit. Once documentation is reviewed, staff inspect the facility to review site conditions and ensure required best management practices are properly implemented. If the facility is out of compliance with the industrial TPDES permit, a notice of violation (NOV) or citation may be issued that requires the facility to take corrective action to resolve any deficiencies.

The state requires that a facility subject to TCEQ industrial stormwater permitting submit a notification of permit coverage to the city, as the MS4 operator. A complete survey of the city is needed to identify industrial facilities that the city has not been made aware of through that process, or sites that have not obtained coverage from the TCEQ. Surface Water Quality Section staff estimate that this survey would identify a significant number of additional facilities that would require inspections. The Surface Water Quality Section must meet the demands of inspecting a growing number of permitted industrial sites, as well as the sites currently operating in the city that have not yet been identified. Additional resources and staff will be necessary to perform the inspections to ensure regulatory compliance with the TPDES permit.

4.5.3.2 Municipal Stormwater Compliance

The city must ensure its own facilities and operations are in compliance with the MS4 permit through municipal good house-keeping measures that reduce contaminated runoff from city-owned properties. Each department in the city is responsible for ensuring regulatory compliance for all of its own operations, facilities and contractors. Each department is also responsible for managing any compliance deficiencies, including NOVs, corrective action measures and



Figure 4-24. A substance, likely oil, leaks from a facility. Surface Water Quality Section staff respond so that the substance does not enter the MS4. This is an obvious example of a permit or stormwater ordinance violation, photo by City of Fort Worth.

finer. Environmental staff offer guidance to other departments through municipal facility audits to help identify potential compliance issues and provide information on how to address them. Primary stormwater contaminants of concern at municipal sites include oil and grease, metals and process chemicals. The city should develop an inventory of the chemicals and materials used in daily operations at city facilities and on public properties (e.g. pesticides, de-icing chemicals, solvents) and evaluate whether there are alternatives that pose less risk to human health and the environment. Environmental staff will coordinate with other departments to develop any necessary procedures or plans, such as integrated pest management plans, to address chemical use by the city.

Surface Water Quality Section staff evaluate city-owned facilities for stormwater pollution prevention and use of BMPs. Staff provide education to facility managers on practices that can be taken to reduce stormwater pollution, including trainings on topics such as the development of site-specific BMPs, maintenance and structural controls. Staff also work with other departments to provide technical guidance on necessary changes or retrofits to bring a facility into compliance. This program helps

ensure city departments have the information they need to prepare for state and federal audits. Section staff should maintain an inventory of all regulated municipal facilities and planned construction activities, and develop an audit schedule. Municipal facility audits are performed with other environmental staff, when possible, to streamline operations and address all environmental regulations.

4.5.3.3 Construction Stormwater Compliance

Prior to construction, projects that are one acre or greater in scope, or part of a larger common plan of development or sale, are required to obtain a grading permit. Surface Water Quality Section staff review the erosion control plan, the SWPPP and operator(s) permits for details and completeness. These are required by the TCEQ construction general permit before a grading permit is released (Reference 4-23). If a submission is found to be deficient, the grading permit is not approved or released until corrections are made by the applicant and re-reviewed by staff. On average, the Surface Water Quality Section receives one or more new grading permit applications per business day. Fort Worth has experienced a significant increase in construction activities—notably, a 46 percent increase in new construction permits (commercial and residential) from 2012 to 2017. There are approximately 500 active, permitted sites that are one acre or greater in Fort Worth at any given time that require compliance inspections. Sediment is the primary pollutant from construction sites, but other contaminants of concern include sanitary wastes, vehicle maintenance lubricants, concrete washout slurry, equipment fuels and floatables. Control of sediment and erosion has a significant effect on the

Table 4-3. Construction activity and workload.

CONSTRUCTION INSPECTIONS	2015	2016	2017	% Change
Construction Inspections Completed	3,331	3,310	3,878	16%
Construction Inspections Required	5,400	5,400	5,604	4%
Percent Inspections Performed	61.7%	61.3%	69.2%	12%
New Permitted Construction Sites	197	213	215	9%
Total Active Construction Sites	450	450	467	4%

Table 4-4. Complaints and permit review workload.

SURFACE WATER WORKLOAD	2015	2016	2017	% Change
Surface Water Quality Complaints	154	265	210	36%
Grading Permit Reviews	258	253	294	14%

reduction of other pollutants in stormwater runoff. This program results in better awareness, improved stormwater runoff, improved visual appearances and better overall stream and river health.



Figure 4-25. A silt fence with a chain link support is used on a construction site to prevent stormwater pollution, photo from EPA.

A consistent inspection schedule and good working relationship with operators helps to ensure compliance with applicable regulations resulting in the prevention, mitigation and elimination of potential pollutants. During construction, section staff must perform construction compliance inspections on a regular basis to review sediment and erosion control plans, the SWPPP, operator-required self-inspections and on-site conditions, as required by the TPDES permit. Staff also provide operator education, follow-up and enforcement as needed. As conditions can change rapidly on construction sites, the BMP target is to inspect a site every 30 days. Due to staff resource limitations and the increasing number of construction sites in Fort Worth, the Surface Water Quality Section is unable to meet that target. Although expanded monitoring activities can facilitate the identification of stormwater pollution originating from construction sites, ultimately, more staff will be needed to perform adequate inspections and enforcement to proactively address water quality concerns. The pace of construction is anticipated to continue, and future regulations will likely require inspections on sites of one half acre or larger, which will increase the construction inspection workload. To accommodate this growth and continue to provide exceptional customer service to businesses and residents, the

Surface Water Quality Section will need additional resources and personnel.

4.5.3.4 Commercial Cosmetic Cleaner Compliance

In recent years, the number of commercial cosmetic cleaning businesses in operation has grown substantially. Any person or business who engages in mobile commercial cosmetic cleaning is required by city code to obtain a permit for each unit in operation. Under the ordinance, mobile commercial cosmetic cleaning is defined as:

“...power washing, steam cleaning and any other mobile cosmetic cleaning operation, of vehicles and/or exterior surfaces, engaged in for commercial purposes.” (Reference 4-23)

The process water from these activities must be collected and disposed of properly, as it contains pollutants that pose a threat to surface water quality if it enters the MS4. Primary contaminants of concern vary, but include oil and grease, grit, paint and detergents, as well as any impacts that affect temperature and pH in surface water. Staff educate commercial cleaners on allowable discharges to both the stormwater sewer system and the sanitary sewer system through the permitting process, helping to limit detergent and other pollutant discharges into the MS4. The permit also requires environmental staff to coordinate with the Water Department Pretreatment Services Division, as process water is typically discharged to the sanitary sewer system on the site where cleaning is performed. Operators must inform the Water Department if they plan to discharge off site and/or if they recycle process water. In certain



Figure 4-26. Detergents can be harmful to the environment, even if they are labeled as biodegradable.

situations, the operator must submit analytical data to the city for review.

This ordinance has been in place since 1995 and was developed primarily for power washers; however, other operations, such as steam cleaning, mobile carpet cleaning and mobile auto detailers are considered mobile cosmetic cleaning operations. These operators are often unaware of the permitting requirements and associated BMPs. The city should develop an outreach campaign to notify operators of permit requirements, and provide additional training to permittees about the effects of commercial cosmetic cleaner discharges on the environment. As resources allow, Surface Water Quality Section staff should develop routine inspections of commercial cosmetic cleaning businesses in the city and increase enforcement of the permit to ensure compliance with the ordinance. Training should also be provided to city staff who inspect businesses that might engage in this activity, including restaurants and gas stations, to help enforce permit guidelines and prevent pollution.

4.5.3.5 Complaint Investigations

Section staff investigate reports of stormwater violations at facilities and operations across the city, as well as illicit discharges or dumping into the MS4. Complaints may involve construction and industrial sites that are not maintaining their property and implementing their BMPs, as well as non-TCEQ permitted sites and situations that apply to the city illicit discharge ordinance. Other common complaints include residential pool drainage into the MS4 and leaves and landscaping materials being blown or swept into storm drains. Some reports are of conditions in surface waters, such as fish kills, discolored water or odors. On average, Surface Water Quality Section staff respond to one complaint each business day (Table 4-4). Staff also respond to incidents involving spills that could impact the MS4, such as fires, vehicle accidents and train derailments (see Chapter 5). Incidents vary in complexity and might require close coordination with other departments and external agencies for regulatory reporting. Staff work with TPW when there are flooding or infrastructure concerns and the Water Department for sanitary sewer overflows, pipe breaks or conservation issues. As the city grows, the volume of complaints is expected to increase, and additional resources will be needed to address resident concerns promptly, while ensuring monitoring and inspection requirements for regulatory compliance are met.



Figure 4-27. Surface Water Quality Section staff respond to reports of discolored water, photo by City of Fort Worth.

4.5.3.6 Development Actions for PA 3: Water Quality Compliance

Industrial Stormwater Compliance

1. Develop and annually maintain a list of industrial facilities and sites that are regulated (i.e. require a permit), including their current compliance status and compliance history.
2. Develop and annually maintain a list of commercial and industrial facilities, as well as operations, that do not require permits, but potentially contribute contaminants to the MS4, such as fueling stations.
3. Develop and maintain a five-year inspection plan with a schedule of industrial facility inspections.
 - *Performance Indicator:* Number of annual industrial facility audits completed per the audit schedule.
 - *Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
4. Develop and annually maintain a prioritized list of facilities to inspect, based on compliance history and other permit requirements, and incorporate into the inspection schedule.
5. Develop and bi-annually maintain a standard corrective action plan form to provide to industrial facilities that are determined to be out of compliance.

- Evaluate the feasibility of implementing a re-inspection fee for all industrial sites that require follow-up due to a failed inspection.

Municipal Stormwater Compliance

- Develop and annually maintain a list of municipal facilities to be audited, as well as an annual audit schedule.
 - Performance Indicator:* List of municipal facility audits completed annually.
- Develop and bi-annually maintain a standardized audit checklist and a form to report findings for municipal facilities.
- Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations.
 - Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.
- Research BMPs and environmental management systems (EMSs) for facility auditing and develop audit procedures for municipal facilities.

Construction Stormwater Compliance

- Develop and maintain a list of construction sites to be audited, as well as an audit schedule.
 - Performance Indicator:* Number of construction sites inspected and the outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
- Develop and maintain a list of construction companies and developers, including their current compliance status and compliance history, to inform inspections and education activities.
- Evaluate the feasibility of implementing a re-inspection fee for all construction sites that require follow-up due to a failed inspection.
- Develop and annually maintain post-construction inspection procedures, including training and enforcement activities.

Commercial Cosmetic Cleaner Compliance

- Streamline the commercial cosmetic cleaner permit process to allow for more efficient application and renewal.

- Performance Indicator:* Number of commercial cosmetic cleaner permits received and approved.
- Evaluate options to make the commercial cosmetic cleaner permit available online and include a required education component.
 - Performance Indicator:* Number of permits submitted online.
 - Coordinate with the Water Department Pretreatment Services Division to ensure businesses are meeting their permit requirements, disposing of process water properly and recycling process water.
 - Develop and annually maintain a tracking or reporting system for the Water Department Pretreatment Services Division to share information on Commercial Cosmetic Cleaners and their permit compliance status.
 - Performance Indicator:* Number of permittees in compliance.
 - Develop inspection procedures to ensure permit holders are meeting water recycling requirements and are not discharging to the MS4.
 - Performance Indicator:* Number of inspections performed and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
 - Develop and annually maintain a list of all permit holders, including their current compliance status and compliance history, to inform inspections and education activities.
 - Review enforcement procedures for managing non-compliant businesses to improve permit compliance and amend or develop new enforcement procedures, as applicable.

Complaint Investigations

- Coordinate with the city call center to improve the complaint reporting process (e.g. update questionnaire as applicable).
- Investigate and track all water quality complaints relative to the assigned priority and provide a summary of resolution actions to complainant.
 - Performance Indicator:* Number of investigations performed.

- *Performance Indicator:* Duration of response time.
 - *Performance Indicator:* Number of completed complainant responses.
3. Respond to all high priority complaints within 24 hours.
- *Performance Indicator:* Number of high priority complaints received.
 - *Performance Indicator:* Percentage of complaints responded to within the 24-hour period.

4.5.4 Strategies for PA 4: Communication & Collaboration

To protect and improve surface water quality resources in Fort Worth, environmental staff build partnerships that foster collaboration and communication with other departments and external agencies. Environmental staff offer training and technical guidance to city staff and businesses to encourage the use of BMPs as the city grows and develops, and provide education and outreach to residents to help prevent pollution.

4.5.4.1 City Staff Training & Collaboration

Environmental staff coordinate with other city departments to provide education and training on stormwater pollution and how to prevent it. Training topics include proper spill response and reporting, preventing and reporting stormwater pollution, permitting, SWPPs, BMPs, site maintenance and good housekeeping. Many of these trainings are offered online and in-person, with site-specific training as needed. For example, staff work with the Fort Worth Fire Department on vehicle washing and non-emergency related discharges. This program will be closely aligned with the Municipal Stormwater Inspection Program as it is developed and fully implemented. Environmental staff will work closely with other city personnel to create a list of trainings needed for staff at each facility based on site-specific operations and pollutants. This list will also extend to personnel involved in operations with potential impacts on stormwater, such as construction and pesticide application. City departments benefit from maintaining training records for staff by facility to help ensure adherence to environmental regulations. The city should expand general stormwater education and training to all staff in an effort to build behaviors that



Figure 4-28. Surface Water Quality Section staff must be fully trained on all field equipment and laboratory equipment, especially as new equipment is deployed, photo by City of Fort Worth.

reduce non-point source pollution throughout Fort Worth. Incorporating stormwater trainings into the city's larger training network will also allow for more effective distribution and record keeping.

As the stormwater quality experts and internal consultants for the city, all Surface Water Quality Section staff should receive additional trainings and maintain applicable certifications. While there are no industry standard certifications, staff should review trainings and certifications held by industry professionals and staff in other municipalities. At a minimum, this should include training on sampling techniques, monitoring methodologies, performing inspections and audits, as well as enforcement procedures for the city and the TCEQ. Through stormwater inspector and investigator training, staff should know how to identify and report illicit discharges to the MS4, and understand permit requirements of the city, industrial facilities and construction sites. Staff should also receive equipment and safety training for all equipment used in the field, as well as the laboratory. Surface Water Quality Section staff should receive training on planning activities, including the development of watershed protection plans, carrying out implementation plans and creating quality assurance project plans for their own operations.

4.5.4.2 Public Technical Guidance

Environmental staff conduct stormwater trainings and provide industry-specific technical assistance to developers, builders, contractors and other businesses that have potential impacts to the MS4. Surface Water Quality Section staff typically hold workshops twice per year for construction operators and industrial facilities, however, additional trainings are available upon request. These trainings include topics such as permitting, SWPPPs, BMPs, site maintenance, sampling, inspections and enforcement. Surface Water Quality Section staff also offer assistance to industrial facility personnel at these workshops and during the inspection process and at these workshops to help them better understand permit requirements and actions they should take to ensure regulatory compliance. Staff also encourage developers and construction companies to use BMPs that reduce stormwater runoff contaminants. As the TCEQ general permits are renewed, specific workshops are offered to educate operators about the steps required to maintain permit coverage and compliance during the renewal period.

Trainings should be held more frequently and at different locations throughout the city, as staff and resources become available. City staff should collect feedback on these workshops to evaluate additional training needs, improve educational materials, provide appropriate resources and build working relationships with permitted entities. Staff should also assess training provided by mobile commercial cosmetic cleaning companies, and determine if the city should provide a standard training as part of the permitting process. The city should develop educational materials,

including technical guides, for mobile commercial cleaning companies to educate operators on the potential impacts to water quality. The city should consider additional training topics targeting specific industries. Future trainings on stormwater green infrastructure and LID should be developed with input from other stakeholders, such as TPW Stormwater and TRWD, and offered to developers, inspectors and the public. Other topics should be assessed and trainings developed and as resources allow.

4.5.4.3 Public Education and Outreach

Surface Water Quality Section staff collaborate with other departments and the Community Engagement Office to present information about water quality at events and meetings in the community, as well as to our schools and businesses. Section staff will continue to strengthen this partnership to build out robust educational initiatives, revamp existing presentations and offer outreach to a wider audience. Staff will also work with the Community Engagement Office and Keep Fort Worth Beautiful (KFWB) to encourage schools to incorporate stormwater and water quality education into classrooms and after-school programs. Surface Water Quality Section staff should develop new initiatives under the KFWB School Green Team Program, such as installing educational storm drain markers decorating them with artwork. Environmental staff serve as subject matter experts for the city, and frequently attend events and give presentations to residents and businesses on topics including stormwater pollution and general surface water quality. Surface Water Quality Section staff should continue to coordinate with other programs and departments to host and attend events that educate



Figure 4-29. Storm drain art from the University of Arkansas Stormwater Education Program.



Figure 4-30. Surface Water Quality Section staff attend the annual Waterama outreach event and teach Fort Worth students how to prevent stormwater pollution, photo by City of Fort Worth.

and entertain, such as Waterama, KFWB's Earth Party, fish stocking events and career days with local schools.

Section staff should collaborate with communications and public engagement personnel to develop new messaging and revamp the “Only Rain Down the Storm Drain” campaign to educate the public on the importance of preventing stormwater pollution. New campaigns should target specific audiences (e.g. students, homeowners, developers, automotive yards), as well as specific pollutants that are commonly used, such as pesticides, fertilizers and automotive fluids. Staff should also continue to update the Surface Water Quality Section website and provide the latest information and resources. The website and the city's social media accounts are used to share critical information with the public. Staff should work to incorporate a notification system for water quality problems, as well as other enhancements listed in the projects and technologies section of this chapter. To support watershed protection plans and implementation plans, educational initiatives should be developed targeting the people who live or do business in the impacted watershed. Staff should give watershed-specific presentations at neighborhood meetings and other functions to share information on how to reduce pollution. The city should also consider placing signs throughout the watershed with information on water quality issues and help educate residents and park visitors on how they can prevent further impacts to water quality.

4.5.4.4 Community Partnerships & Volunteerism

Section staff work with many partners throughout Fort Worth and the region, including other municipalities, non-governmental organizations (NGOs) and NPOs. Staff regularly participate in meetings and serve on committees at the NCTCOG on stormwater planning efforts, developing regional programs and promoting water quality education. The NCTCOG stormwater education program for children, featuring Freddy the Fish, is used by the Community Engagement Office when talking to schools about water pollution. The NCTCOG also distributes a Doo the Right Thing calendar each year, encouraging residents to pick up pet waste. Section staff should assess other NCTCOG programs that could be used for city environmental education, as well as ways we can better utilize existing campaign material. Staff should also identify opportunities for public-private partnerships and



Figure 4-31. Surface Water Quality Section staff teach University of North Texas Health Science Center students about water quality and ecology, photo by City of Fort Worth.

increasing volunteerism. For example, staff can work with partners and local businesses to utilize kayaks for waterway cleanups and sampling activities.

4.5.4.4.1 STREAM TEAM

Texas Stream Team is a statewide citizen scientist program where volunteers are trained to collect water quality data used to develop reports and improve resources for water quality. The city partners with Texas Stream Team, however, this program is in the early stages in Fort Worth. As it is developed, the program will give volunteers the training and tools to monitor water quality within the MS4, as well as provide education and outreach to residents. The monitoring plan, training material and communications strategies are still under development, and supplies and resources should be procured. Additional stakeholders and potential program sponsors should be identified, along with volunteers who can serve as Texas Stream Team leaders. The city should work with local universities and environmental professionals to develop a volunteer base for the program. Section staff should also work with local schools and youth groups to provide assistance to the Texas Stream Team as an educational opportunity. Environmental staff should partner with Texas Stream Team, PARD and NGOs to hold educational events, such as a bio-blitz or rapid bioassessments.

4.5.4.4.2 COMMUNITY AWARDS

The Environmental Quality Division partners with the Water Department Pretreatment Services Division for the annual environmental excellence awards, which is an event where the city recognizes businesses who have an outstanding track record for environmental

compliance. Currently, this award program is focused on water pretreatment, but will be expanded to include air quality, stormwater pollution prevention, hazardous materials management and other topics after 2019. Environmental staff should work with the Water Department to expand the award, encouraging businesses to implement BMPs and take pride in environmental stewardship. Staff should also work with other departments and community organizations to recognize residents and community groups who have had a positive environmental impact. This may be incorporated into the annual Mayor’s Community Engagement Workshops and Neighborhood Awards Luncheon, or it could become its own stand-alone event, along with other awards for environmental volunteerism. Environmental staff should also recognize other departments and city staff who have demonstrated excellence in environmental compliance. Staff should work with communications personnel to explore ways to recognize award winners and city staff online and through other communications channels.

4.5.4.5 Development Actions for PA 4: Water Quality Communication & Collaboration

City Staff Training and Collaboration

1. Develop and annually maintain a list of city-owned facilities and operations that require permits or could potentially impact the MS4.
2. Identify city staff positions that should receive customized water quality training based on list of municipal facilities that require permits.
3. Develop a water quality training schedules for applicable city staff.
4. Provide customized water quality training to city staff.
 - *Performance Indicator:* Number of city staff who have completed the water quality training.
5. Provide water quality outreach materials to city departments that include information on reducing water pollution and preventing discharges to the MS4.
6. Identify training opportunities for Water Quality staff (e.g., professional development, regional conferences, etc.).
 - *Performance Indicator:* Number of city staff that attend training opportunities.

- *Performance Indicator:* List of events, courses, summits and conferences attended each year.
7. Develop an internal recognition or award program for city departments, staff, facilities and operations that maintain excellent inspection results and consistently employ BMPs.
 - *Performance Indicator:* Record of award or recognition recipients for each year.

Public Technical Guidance and Training

1. Develop customized water quality messaging for individual communities and neighborhoods. Include areas with a high number of complaints to address the root cause of the issue.
 - *Performance Indicator:* Number of communications sent out annually to individual communities and neighborhoods, the message topics and dates distributed.
2. Provide local businesses and industries published regulatory compliance information, as well as best practices for preventing water pollution and discharges to the MS4.
 - *Performance Indicator:* Number of businesses and industries reached through site visits or training workshops annually.
3. Provide information to the public through subject matter expert speaking engagements.
 - *Performance Indicator:* Number of meetings and speaking events attended by staff annually.
 - *Performance Indicator:* Number of people who attend the events.

Public Education and Outreach

1. Develop and implement water quality programs for School Green Teams.
 - *Performance Indicator:* Number of School Green Teams that participate in the water quality program each school year, and whether they complete the programs.
2. Develop traditional and social media campaigns to encourage actions that improve water quality and prevent discharges to the MS4.
 - *Performance Indicator:* Number of water quality-related traditional and social media communications distributed annually.

3. Evaluate feasibility of purchasing or coordinating with partners to obtain a mobile education trailer or vehicle for use at schools, businesses and events.
4. Annually review and update, as applicable, the information presented on the city's Stormwater Quality website.

Community Partnerships and Volunteerism

1. Develop an annual Water Quality Awards program for local businesses and industries who incorporate water pollution prevention into their company and corporate policies, and maintain a clean compliance history.
 - *Performance Indicator:* List of the recipients of Water Quality Awards for each year.
2. Develop an award or recognition program for residents, community organizations and volunteers who demonstrate excellent environmental stewardship promoting surface water quality.
 - *Performance Indicator:* List of annual award or recognition recipients annually.
3. Collaborate with partners to identify Texas Stream Team leaders and stakeholders.
4. Develop a local Stream Team volunteer network and annually maintain the list of participants.
 - *Performance Indicator:* Number of Stream Team volunteers.
 - *Performance Indicator:* Number of stream team sampling sites being monitored by volunteers.



Figure 4-32. Residents and visitors enjoy a concert on the Trinity River, photo courtesy Trinity River Vision Authority.

4.6 Conclusion

Access to safe surface water is vital to the quality of life for residents of and visitors to Fort Worth. The city faces the challenge of not only meeting the ever-increasing demand on both natural resources and city resources, but continuing to find ways to improve affected water bodies and return those streams and lakes to their intended uses. As the city grows, the Surface Water Quality Section will need to maximize resources to ensure Fort Worth's surface waters are clean and safe for all to enjoy.

4.6.1 Summary of Surface Water Quality Development Actions

Watershed Analysis

1. Maintain and annually update a comprehensive database for water quality data, including historical watershed data and current monitoring and compliance data with trends.
 - *Performance Indicator:* Statistics that track the status of stream water quality over time to show improvement or degradation. Include wet weather and dry weather data trends, and a list of any identified issues or potential problem areas for targeted assessments.
2. Evaluate field data gathering SOP and identify improvements.
 - *Performance Indicator:* Number of data gaps.

Watershed Planning

1. Develop a comprehensive watershed plan comprised of a watershed characterization plan and a sampling and monitoring plan. Include a priority list for watersheds to be characterized.
2. Develop a greenspace plan and encourage the incorporation of green infrastructure and LID into city codes and development plans.
3. Collaborate with other city departments and external partners to develop greenprint plans.
4. Coordinate with partners to support the development of implementation plans and watershed protection plans.

Rules & Regulations

1. Benchmark other cities for best practices for surface water quality ordinances and related policies.
2. Review municipal ordinances and make recommendations for changes to meet MS4, TMDL or related surface water quality requirements, as needed.
3. Periodically review federal, state and local permits for construction, industrial and commercial operations to ensure congruency across programs.
4. Review ordinances and permits for power washing and mobile cleaning activities for BMPs, including requirements to recycle process water and procedures for capturing and disposing of process water, to determine if Fort Worth should amend current permits or develop new permits.
 - *Performance Indicator:* Number of power washing and mobile cleaning permits issued.

Projects & Technologies

1. Develop and annually maintain a grant tracking system that includes annual grant cycles, grant due dates, information required to apply, and all grant applications submitted by the Division.
2. Evaluate the feasibilities of updating the Water Quality laboratory and/or constructing a new facility.
3. Evaluate the feasibility of developing a green infrastructure and LID guidance manual and/or demonstration sites.
4. Evaluate database management software options for tracking field operations, collecting field data and records management.
5. Implement a consolidated database management and digital field data collection system.
6. Develop and bi-annually maintain an inventory of equipment and develop a maintenance or replacement schedule for city-owned equipment.
7. Create a web-based mapping application for public use to share watershed and water quality data.
8. Develop and annually maintain a prioritized list of watershed management projects.

Wet Weather Monitoring

1. Develop and annually maintain a prioritized list of sites for sampling across the city to increase wet weather monitoring coverage.
2. Evaluate feasibility to install continuous water quality monitors in watersheds across the city for long-term, real-time monitoring.
3. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of watersheds within the city that are sampled annually.
 - *Performance Indicator:* Number of wet weather sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.

Dry Weather Monitoring

1. Develop and annually maintain a list of high-priority locations for sampling that includes areas currently under a TMDL or watershed protection plan.
2. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of outfalls within the city that are sampled annually.
 - *Performance Indicator:* Number of dry weather sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.

Indicator Bacteria Monitoring

1. Develop and annually maintain a prioritized list of sampling locations based on impairment and areas with high resident use, such as city parks.
2. Evaluate expanding sampling locations beyond those included in the TCEQ Clean Rivers Program to include areas of concern for potential future impairment listings and areas with current bacteria impairments or TMDLs.
3. Incorporate any additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of watersheds within the city that are sampled for bacteria annually.

- *Performance Indicator:* Number of bacteria sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.
4. Monitor watersheds and stream segments under TMDLs or watershed protection plans to evaluate the effectiveness of implementation plan or watershed protection plan activities.
 - *Performance Indicator:* Statistics for all pollution mitigation BMPs applied to include overall status of stream water quality over time to show improvement, degradation or no change.

Regional Wet Weather Characterization Program

1. Expand sampling locations to additional watersheds and increase the frequency of sampling. Incorporate additional sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of regional wet weather characterization sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.
2. Evaluate new laboratory contracts or other options that allow samples to be collected and analyzed outside of business hours.

Stream Health Monitoring

1. Develop and annually maintain a prioritized list of sampling sites across the city to increase stream health monitoring coverage.
2. Assess the feasibility of conducting monthly basic water quality monitoring at select sites throughout the city.
3. Incorporate additional monitoring and sampling activities into the citywide sampling and monitoring plan.
 - *Performance Indicator:* Number of watersheds within the city that are sampled for stream health parameters annually.
 - *Performance Indicator:* Number of stream health sampling locations sampled.
 - *Performance Indicator:* Frequency of sampling and the sampling parameters at each location.

4. Explore partnerships to update fish sampling studies.
 - *Performance Indicator:* Number of fish sampling activities and findings resulting from partner collaborations.

Industrial Stormwater Compliance

1. Develop and annually maintain a list of industrial facilities and sites that are regulated (i.e. require a permit), including their current compliance status and compliance history.
2. Develop and annually maintain a list of commercial and industrial facilities, as well as operations, that do not require permits, but potentially contribute contaminants to the MS4, such as fueling stations.
3. Develop and maintain a five-year inspection plan with a schedule of industrial facility inspections.
 - *Performance Indicator:* Number of annual industrial facility audits completed per the audit schedule.
 - *Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
4. Develop and annually maintain a prioritized list of facilities to inspect, based on compliance history and other permit requirements, and incorporate into the inspection schedule.
5. Develop and bi-annually maintain a standard corrective action plan form to provide to industrial facilities that are determined to be out of compliance.
6. Evaluate the feasibility of implementing a re-inspection fee for all industrial sites that require follow-up due to a failed inspection.

Municipal Stormwater Compliance

1. Develop and annually maintain a list of municipal facilities to be audited, as well as an annual audit schedule.
 - *Performance Indicator:* List of municipal facility audits completed annually.
2. Develop and bi-annually maintain a standardized audit checklist and a form to report findings for municipal facilities.

3. Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations.
 - *Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.
4. Research BMPs and environmental management systems (EMSs) for facility auditing and develop audit procedures for municipal facilities.
4. Develop and annually maintain a tracking or reporting system for the Water Department Pretreatment Services Division to share information on Commercial Cosmetic Cleaners and their permit compliance status.
 - *Performance Indicator:* Number of permittees in compliance.
5. Develop inspection procedures to ensure permit holders are meeting water recycling requirements and are not discharging to the MS4.
 - *Performance Indicator:* Number of inspections performed and outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.

Construction Stormwater Compliance

1. Develop and maintain a list of construction sites to be audited, as well as an audit schedule.
 - *Performance Indicator:* Number of construction sites inspected and the outcomes, including any follow-ups, education provided, re-inspections and enforcement actions.
2. Develop and annually maintain a list of construction companies and developers, including their current compliance status and compliance history, to inform inspections and education activities.
3. Evaluate the feasibility of implementing a re-inspection fee for all construction sites that require follow-up due to a failed inspection.
4. Develop and annually maintain post-construction inspection procedures, including training and enforcement activities.

Commercial Cosmetic Cleaner Compliance

1. Streamline the commercial cosmetic cleaner permit process to allow for more efficient application and renewal.
 - *Performance Indicator:* Number of commercial cosmetic cleaner permits received and approved.
2. Evaluate options to make the commercial cosmetic cleaner permit available online and include a required education component.
 - *Performance Indicator:* Number of permits submitted online.
3. Coordinate with the Water Department Pretreatment Services Division to ensure businesses are meeting their permit requirements, disposing of process water properly and recycling process water.

Complaint Investigations

1. Coordinate with the city call center to improve the complaint reporting process (e.g. update questionnaire as applicable).
2. Investigate and track all water quality complaints relative to the assigned priority and provide a summary of resolution actions to complainant.
 - *Performance Indicator:* Number of investigations performed.
 - *Performance Indicator:* Duration of response time.
 - *Performance Indicator:* Number of completed complainant responses.
3. Respond to all high priority complaints within 24 hours.
 - *Performance Indicator:* Number of high priority complaints received.
 - *Performance Indicator:* Percentage of complaints responded to within the 24-hour period.

City Staff Training and Collaboration

1. Develop and annually maintain a list of city-owned facilities and operations that require permits or could potentially impact the MS4.
2. Identify city staff positions that should receive customized water quality training based on list of municipal facilities that require permits.
3. Develop a water quality training schedules for applicable city staff.
4. Provide customized water quality training to city staff.
 - *Performance Indicator:* Number of city staff who have completed the water quality training.
5. Provide water quality outreach materials to city departments that include information on reducing water pollution and preventing discharges to the MS4.
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 - *Performance Indicator:* Number of city staff that attend training opportunities.
 - *Performance Indicator:* List of events, courses, summits and conferences attended each year.
7. Develop an internal recognition or award program for city departments, staff, facilities and operations that maintain excellent inspection results and consistently employ BMPs.
 - *Performance Indicator:* Record of award or recognition recipients for each year.

Public Technical Guidance and Training

1. Develop customized water quality messaging for individual communities and neighborhoods. Include areas with a high number of complaints to address the root cause of the issue.
 - *Performance Indicator:* Number of communications sent out annually to individual communities and neighborhoods, the message topics and dates distributed.
2. Provide local businesses and industries published regulatory compliance information, as well as best practices for preventing water pollution and discharges to the MS4.

- *Performance Indicator:* Number of businesses and industries reached through site visits or training workshops annually.

3. Provide information to the public through subject matter expert speaking engagements.

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Public Education and Outreach

1. Develop and implement water quality programs for School Green Teams.
 - *Performance Indicator:* Number of School Green Teams that participate in the water quality program each school year, and whether they complete the programs.
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 - *Performance Indicator:* Number of water quality-related traditional and social media communications distributed annually.
3. Evaluate feasibility of purchasing or coordinating with partners to obtain a mobile education trailer or vehicle for use at schools, businesses and events.
4. Annually review and update, as applicable, the information presented on the city's Stormwater Quality website.

Community Partnerships and Volunteerism

1. Develop an annual Water Quality Awards program for local businesses and industries who incorporate water pollution prevention into their company and corporate policies, and maintain a clean compliance history.
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 - *Performance Indicator:* List of annual award or recognition recipients annually.

3. Collaborate with partners to identify Texas Stream Team leaders and stakeholders.
4. Develop a local Stream Team volunteer network and annually maintain the list of participants.
 - *Performance Indicator:* Number of Stream Team volunteers.
 - *Performance Indicator:* Number of stream team sampling sites being monitored by volunteers.

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CHAPTER 5

Hazardous Materials Management

Reducing environmental impacts from hazardous materials

GOALS

- Ensure city compliance with federal and state environmental regulations for hazardous materials management.
- Reduce the amount of hazardous waste generated and maintained at city facilities.
- Minimize exposures and risks to human health and the environment.
- Maintain environmental compliance through inspections and recommendations.
- Provide technical guidance, outreach and education to encourage responsible environmental stewardship at all city facilities.



HAZARDOUS MATERIALS MANAGEMENT AT-A-GLANCE

Hazardous Materials Planning & Management Program Area

The City of Fort Worth is committed to the effective and safe management of hazardous materials generated at municipal facilities, as well as household hazardous waste (HHW) from residents. Environmental Quality Division staff support the city by working with other departments to develop hazardous materials management plans for these waste types.



PHOTO BY CITY OF FORT WORTH

Proper management includes the handling, storing, transporting, disposal and tracking of these materials, while ensuring environmental compliance with local, state and federal regulations. This also includes developing waste minimization plans to reduce the amounts of hazardous materials used and stored at city facilities. Environmental staff also assess city properties for structural hazards, such as asbestos, lead paint and mold. They prioritize city properties for remedial activities and oversee the abatement process.

KEY ACTIVITIES

- Hazardous Materials Analysis
- Hazardous Materials Planning
- Hazardous Materials Rules & Regulations
- Hazardous Materials Projects & Technologies

Hazardous Materials Mitigation Program Area

Hazardous materials can pose a serious threat to human health and the environment if they are not managed and abated properly. Environmental staff reduce the risks associated with hazardous materials by overseeing the abatement of asbestos, lead paint and mold, both on municipal properties, and when required on private properties. They also assess petroleum storage tanks (PSTs) on municipal properties and repair or replace them if they are deficient and outdated. Managing these materials according to regulations ensures the safety of city staff, contractors and the public. Environmental staff work collaboratively with other city departments to respond to spills and emergency incidents throughout Fort Worth, including traffic accidents, fires and uncontrolled releases of hazardous materials from industrial and commercial facilities. Quick and effective response to these incidents reduces impacts to the environment, especially local waterways, because many materials run into nearby storm drains. Staff also work with the Solid Waste Division to manage the collection

of household hazardous waste at the Environmental Collection Center (ECC) and four drop-off stations.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- Asbestos & Lead Paint Abatement
- Mold Remediation
- Emergency Spill/Release Response
- Household Hazardous Waste Collection
- Petroleum Storage Tank Remediation

PROGRAM AREAS

- Hazardous Materials Planning & Management
- Hazardous Materials Mitigation
- Hazardous Materials Compliance
- Hazardous Materials Communication & Collaboration

Hazardous Materials Compliance Program Area



PHOTO BY CITY OF FORT WORTH

The city is committed to ensuring compliance with all applicable environmental regulations and permits at the federal, state and local levels for the hazardous materials it manages. Asbestos is extremely hazardous to human health when disturbed, so the city takes every precaution to reduce the risks associated with these materials and comply with federal and state safety regulations. Environmental staff work with

departments that have PSTs at their facilities and ensure that new PST registrations are submitted to the Texas Commission on Environmental Quality (TCEQ). There are a number of regulatory requirements surrounding the use and storage of chemicals under the Emergency Planning and Community Right-to-Know Act (EPCRA). This includes maintaining chemical inventories and sending in annual Tier II reports for facilities storing chemicals over established thresholds. Environmental staff oversee compliance with TCEQ permits for HHW collected at city facilities, as well as hazardous waste generated through city operations.

KEY ACTIVITIES

- Asbestos Abatement Compliance
- Petroleum Storage Tank Compliance
- EPCRA Tier II Chemical Reporting
- Municipal Hazardous Materials/Waste Compliance

Hazardous Materials Communication & Collaboration Program Area

Effective communication and training are vital to ensuring compliance with hazardous materials rules and regulations. Environmental staff work closely with all city departments to provide technical guidance and identify needed training to properly manage hazardous materials at city facilities. When responding to spills, uncontrolled releases and other emergency events,

rapid communication between departments, first responders and partner agencies is critical to protecting human health and the environment. Any public warnings or announcements related to these incidents take top priority. The city uses several communication channels to conduct outreach to the public, including technical guidance sheets, in-person event attendance, the city website and various social media platforms. Through the use of these channels, the city encourages residents to dispose of household hazardous materials properly at the ECC and drop-off stations located throughout Fort Worth.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Why do we need Hazardous Materials Management programs in our community?

Hazardous Material Management programs protect human health and improve public safety. These programs also reduce pollution to our air, water and land resources and provide for a cleaner environment, sustained economic value and community aesthetics.

TO PROMOTE HUMAN HEALTH AND PUBLIC SAFETY.



Keeps our community members and visitors safe from exposure to hazardous materials



Limits pollution of our air, water and land resources

TO CREATE AND MAINTAIN A CLEAN, ATTRACTIVE CITY.



Builds pride in our community



Remediates blight and toxic illegal dump sites in our neighborhoods

TO PROMOTE QUALITY OF LIFE AND A SUSTAINED ECONOMY.



Reduces risk of exposure to pollutants on properties and natural resources



Reduces public costs for controlling pollution and cleanups

Executive Summary

A hazardous material is defined as any substance or material which can potentially cause harm to humans, animals or the environment (Reference 5-1). The material may pose potential risk by itself or through interaction with other agents (Reference 5-1). Hazardous materials have many applications, and the city uses some of these materials in municipal operations and stores them at city facilities. Once the material has reached the end of its useful life, it is stored and managed as hazardous waste. The city handles hazardous materials and generates hazardous waste on a daily basis through normal operations. The Environmental Quality Division oversees the management of both hazardous materials and hazardous waste for the City of Fort Worth. The city also accepts HHW from residents and surrounding partner cities to ensure that this waste is handled and disposed of properly, reducing the risk to human health and the environment. Environmental staff ensure that environmental hazards on city properties, such as asbestos, lead paint and mold, are abated in accordance with health and safety regulations. Environmental staff also manage the city's PST program to remediate any contamination from old and leaking tanks and to ensure that all city-operated tanks comply with U.S. Environmental Protection Agency (EPA) and TCEQ regulations. The Hazardous Materials Management Section:

- Responds to an average of 60 spills/ incidents per year to prevent uncontrolled releases of contaminants that may pose a risk to life, safety, property or the environment.
- Inspects over 80 city-owned PSTs, both aboveground storage tanks (ASTs) and underground storage tanks (USTs), for regulatory compliance.
- Oversees the abatement of asbestos, lead paint and mold in approximately 80 municipal facilities annually.
- Works with other city departments to develop comprehensive waste management strategies for the city's municipal facility-generated waste, which includes over 174,000 pounds per year of regulated waste and over 24,000 pounds per year of hazardous waste.
- Maintains records in compliance with applicable EPCRA rules and regulations to document the reportable chemicals used or stored at over 400 city-owned facilities.
- Provides regulatory guidance to city staff who handle, collect and dispose of HHW from residents of Fort Worth and more than 50 partner cities. Approximately 25 percent of the waste is recycled annually.



Figure 5-1. Environmental staff perform a facility audit to ensure compliance with hazardous material rules and other environmental regulations, photo by City of Fort Worth.

5.1 Key Terms

ACM – asbestos-containing material
AHERA - Asbestos Hazard Emergency Response Act
ASHARA - Asbestos School Hazard Abatement Reauthorization Act
AST – Aboveground Storage Tank
BMP – Best Management Practice
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CESQG – Conditionally Exempt Small Quantity Generator
CIP – Capital Improvement Plan
ECA – Environmental Compliance Audit
ECC - Environmental Collection Center
EPA – U.S. Environmental Protection Agency
EPCRA – Emergency Planning and Community Right-to-Know Act
EPF – Environmental Protection Fund
ERC - Environmental Resource Center
FWFD - Fort Worth Fire Department
FWPD – Fort Worth Police Department
HAZWOPER - Hazardous Waste Operations and Emergency Response
HHW – Household Hazardous Waste
ISO – International Organization for Standardization
LQG – Large Quantity Generator
MS4 – Municipal Separate Storm Sewer System
NESHAP - National Emissions Standards for Hazardous Air Pollutants
O&M – Operations and Maintenance
OEM - Office of Emergency Management
OSHA - Occupational Safety and Health Act
PA – Program Area
PID - Photoionization Detector
PST – Petroleum Storage Tank
RCRA - Resource Conservative and Recovery Act
SDS – Safety Data Sheet
SPCC - Spill Prevention, Control and Countermeasure
SQG – Small Quantity Generator

TCEQ – Texas Commission on Environmental Quality
TDSHS - Texas Department of State Health Services
TELRR – Texas Environmental Lead Reduction Rules
TPDES - Texas Pollutant Discharge Elimination System
TSCA - Toxic Substances Control Act
USDOT – United State Department of Transportation
UST – Underground Storage Tank
VSQG – Very Small Quantity Generator
WMP – Waste Minimization Plan

5.2 Introduction to Hazardous Materials Management

In 1976, Congress passed the Resource Conservation and Recovery Act (RCRA) to give the EPA the authority to govern the management of hazardous waste, including its generation, transportation, treatment, storage and disposal (Reference 5-2). RCRA applies to currently operated sites, while under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), known as Superfund, applies to abandoned sites and historical contamination (Reference 5-3). Amendments to RCRA passed in 1986 allow the EPA to address contamination issues from USTs (Reference 5-3). The United States Department of Transportation (USDOT) and the EPA developed hazardous waste transportation rules under Subtitle C of RCRA to protect human health and the environment while hazardous waste is in transit (Reference 5-4). Shipments of hazardous wastes are tracked any time it is transferred from one facility to another by highway, water, rail or air through the EPA's manifest system (Reference 5-4). These rules also establish the protocols for discharges and spills of hazardous waste during transit.

The TCEQ administers several programs in Texas under the guidance of the EPA, including the RCRA hazardous waste program, the Texas Underground Storage Tank Program and the Leaking Underground Storage Tank Program (Reference 5-5). The TCEQ and the Texas Department of State Health Services (TDSHS) regulate the transportation of hazardous waste and some nonhazardous waste within the state under RCRA rules (Reference 5-6). The Hazardous Materials Management Section oversees the management and compliance of the City of Fort Worth's municipally

generated hazardous waste and HHW collected from residents and partner cities. Section staff work with other departments to prepare hazardous waste for transportation and sign shipping manifests. Staff also ensure compliance with federal and state regulations for ASTs and USTs during the permitting and remediation process, and provide ongoing support through regular inspections of all city storage tanks.

In 1984, the worst industrial accident in history struck Bhopal, India, when more than 40 tons of methyl isocyanate leaked from a Union Carbide pesticide facility, exposing over half a million people to the toxic gas (Reference 5-7). At least 3,800 people were killed immediately and an additional 15,000 to 20,000 people died prematurely in the following decades, while thousands more suffer from adverse health impacts to this day (Reference 5-7). As a response to this incident, Congress passed the EPCRA in 1986 to require emergency planning and reporting on hazardous and toxic chemicals in our communities (Reference 5-8). These rules guard against industrial disasters from hazardous materials and protect human health and the environment. The Hazardous Materials Management Section works with city staff across many departments to prepare for emergencies and ensure municipal

facilities and operations comply with these regulations.

The EPA regulates other types of hazardous materials under the Toxic Substances Control Act (TSCA), including asbestos and lead found in paint, dust and soil. In 1986, the Asbestos Hazard Emergency Response Act (AHERA) was passed under Title II of the TSCA, requiring the EPA to establish regulations regarding the inspection and management of asbestos-containing materials in schools (Reference 5-9). The Asbestos School Hazard Abatement Reauthorization Act (ASHARA), passed in 1990, expanded training and accreditation requirements to cover all asbestos abatement activities in public and commercial buildings (Reference 5-9). In Texas, asbestos rules and regulations fall under the purview of the TDSHS (Reference 5-10). The Hazardous Materials Management Section ensures compliance with federal and state regulations when overseeing asbestos abatement at municipal properties, as well as the demolition of substandard structures within the community. Federal lead regulations fall under Title IV of the TSCA and provisions in the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Reference 5-11). State lead regulations were established by the TDSHS in 1996 under the Texas Environmental Lead Reduction Rules (TELRR) as part of the Environmental Lead Program (Reference 5-12). Both federal and state regulations regarding lead only apply to residential properties and child-occupied facilities. These rules only impact Hazardous Materials Management Section activities when performing substandard structure demolitions.

While there are no EPA regulations regarding mold in structures, the Occupational Safety and Health Administration (OSHA) established a worker's rights to safe working conditions (Reference 5-13). The TDSHS developed the Texas Mold Assessment and Remediation Rules in 2004 to require licensing for mold inspection and remediation activities (Reference 5-14).

5.2.1 Program Areas (PA)

5.2.1.1 PA 1: Hazardous Materials Planning & Management

Environmental staff conduct proper management of hazardous materials used or stored on city-owned facilities. Additionally, to reduce potential pollution risks and better serve our residents, the city collects residential HHW at the ECC and at four drop-off stations within the city.



Figure 5-2. The plant in Bhopal, India, where the Union Carbide disaster occurred is still contaminated, photos by Julian Nyca.

5.2.1.1.1 KEY ACTIVITIES

- Hazardous Materials Analysis
- Hazardous Materials Planning
- Hazardous Materials Rules & Regulations
- Hazardous Materials Projects & Technologies

5.2.1.2 PA 2: Hazardous Materials Mitigation

The city works to reduce the serious and potentially costly threats to human health and the environment by managing hazardous materials through reduction and disposal of these hazardous materials in accordance with local, state and federal environmental regulations and permits.

5.2.1.2.1 KEY ACTIVITIES

- Asbestos & Lead Paint Abatement
- Mold Remediation
- Emergency Spill/Release Response
- Household Hazardous Waste Collection
- PST Remediation

5.2.1.3 PA 3: Hazardous Materials Compliance

To ensure compliance with applicable environmental regulations and permits for the hazardous materials it manages, the city maintains and updates required reports, registrations, and plans as needed.

5.2.1.3.1 KEY ACTIVITIES

- Asbestos Abatement Compliance
- Petroleum Storage Tank Compliance
- EPCRA Tier II Chemical Reporting
- Municipal Hazardous Materials/Waste Compliance



Figure 5-3. During an internal audit of a city facility, environmental staff review chemical storage areas with site operators, photo by City of Fort Worth.



Figure 5-4. City staff train to respond when emergency situations occur, photo by City of Fort Worth.

5.2.1.4 PA 4: Hazardous Materials Communications & Collaboration

The city is actively communicating with local and state agencies and the community partners to provide support through technical guidance, coordinated training, waste tracking and reporting and outreach for each of the hazardous materials program areas.

5.2.1.4.1 KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism

5.3 Structure & Funding for Hazardous Materials Management

Hazardous materials management for the city is handled by the Environmental Quality Division of the Code Compliance Department and consists of four primary program areas. The current team shares positions with the Land Quality Section. As of 2018, the section staff includes six positions: an environmental supervisor, three senior environmental specialists, a management analyst, and a senior code officer. Programmatic responsibilities, as listed below and described in Section 5.2, have been implemented to support the city's vision for a cleaner, safer, and more livable city through proper management of hazardous materials.

- One environmental supervisor oversees and manages the hazardous materials and Land Quality staff.
- Three senior environmental specialists provide scientific technical expertise involving specific program areas.



Figure 5-5. Peeling lead paint on the siding of a substandard structure, photo by Mike Mozart.

- One senior code enforcement officer provides coordination and expertise involving the city’s nuisance abatement program associated with substandard structures.
- One management analyst provides regulatory guidance, contract management, permit compliance and data analysis.

Funding for the Hazardous Materials Management Section is primarily provided through the Environmental Protection Fund (EPF).

5.4 Challenges to Hazardous Materials Management

5.4.1 Asbestos & Lead Paint

Asbestos was used in many industrial and commercial applications from the late 1800s until about 1980. The potential health effects associated with occupational and non-occupational asbestos exposure can be serious. This risk is taken very seriously by the city. As part of the hazardous materials management program, the city’s primary challenge is identification and prioritization of asbestos materials in city-owned facilities so proper management of these materials can be achieved. Of

Table 5-1. Summary of three-year city-generated wastes.

TYPE OF WASTE	POUNDS			3-Year Avg
	2015	2016	2017	
Non-Hazardous Waste	70,917	97,298	58,554	75,590
Hazardous Waste	14,130	29,275	29,747	24,384
Universal Waste	69,415	54,196	49,159	57,590
Biological & Special Waste	2,925	3,003	2,904	2,944
TOTAL COLLECTED	157,387	183,772	140,364	160,508



Figure 5-6. A sign at the North Service Center welcomes residents to use of services offered at the facility, including HHW disposal, photo by City of Fort Worth.

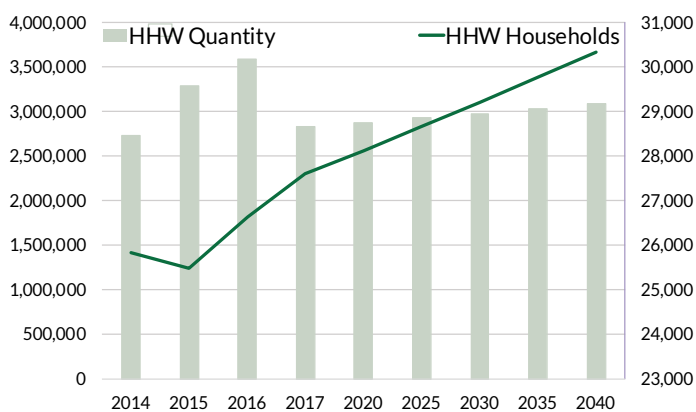
the nearly 400 city-owned facilities, approximately 300 structures were constructed during the period that asbestos was commonly used in certain building materials. Of these facilities, the city has inspected approximately one-third, leaving approximately 200 to be evaluated. Table 5-3 presents historical, annualized data related to asbestos management.

Similarly, lead is highly toxic when taken into the body through breathing, eating or drinking. It was commonly used in paint until 1978, when it was banned for residential use. As old lead-based paint flakes or turns to dust, lead can be released and become an environmental contaminant. The city also evaluates lead-based paint in city-owned facilities to minimize any potential risks to city employees or residents. Currently, four have been evaluated for lead paint, leaving the majority to be assessed.

5.4.2 Household Hazardous Wastes

There has been a dramatic population increase in Fort Worth in the last several decades. As a direct result, there has been significant increases of HHW received by the ECC and the drop-off stations. In 2010 alone,

Figure 5-7. Projection of HHW through 2040.



the ECC collected, disposed of or recycled over 2.5 million pounds of HHW from over 25,000 households. This is waste that otherwise might have ended up in Fort Worth's landfills or waterways. Table 5-1 displays a summary of types of wastes collected from city operations over a period of three years.

To understand how the services of this program will be impacted in the future, the anticipated quantity of HHW and participating households was projected to the year 2040 (see Figure 5-1). Based on this information, it is anticipated that the city can anticipate participating households to reach over 30,000 and projected HHW quantities to reach over three million pounds by the end of the projection period. And these values only represent the materials currently accepted at the ECC and drop-off stations. If additional HHW categories are added in the next twenty-two years, these estimates can be expected to increase.

5.4.3 Mold

Molds are fungi found either indoors or outdoors in warm, moist, and humid environments. Some people are sensitive to molds, and in 2004 the National Academy of Medicine found there was sufficient evidence to link mold exposure to respiratory health conditions (e.g. upper respiratory tract issues, coughing, etc.). To help insure that any potential risk to city employees and visitors is addressed, the Environmental Quality Division evaluates and addresses mold-related concerns at the 400+ city-owned facilities.

5.4.4 Hazardous Materials Emergency Spill/Release Response

Preventing and containing spills in a timely manner so contaminants do not enter surface or groundwater resources presents a challenge to any urban environment, including Fort Worth. Hazardous materials spills can occur along transportation routes, on industrial sites or inside commercial facilities. Fort Worth has an extensive transportation network that includes four major interstate highways, numerous state and county roads, and several rail lines, including commuter rail services. These transportation routes provide numerous benefits to Fort Worth residents and businesses alike; however, they also represent a risk of hazardous material spills due to an accident or improper transport.



Figure 5-8. Abandoned drums of unknown, potentially toxic waste. Environmental staff responds to illegal dumping to control and remediate contamination, photo by City of Fort Worth.

Fort Worth also benefits from robust industrial and commercial industries. In 2017, the water department recorded approximately 14,500 commercial sites and over 300 industrial sites within Fort Worth requiring pre-treatment services. It is estimated that there are between 800 and 1,000 industrial facilities operating at a given time within the community. A portion of these industries store or use hazardous materials as part of their activities, which require correct storage, inventorying and reporting. Should an accident or fire occur, it is important that the city is knowledgeable and aware of the on-site hazardous materials so emergency responders and the Environmental Quality Division can respond appropriately to any emergency situation. Table 5-3 presents historical, annualized data related to emergency spill response and release management.

5.4.5 EPCRA Reporting

An important part of management of the hazardous waste generated by the various city-owned facilities and residents includes making sure there is compliance with state and federal regulations to protect human health and the environment. The city keeps track of over 50 different regulated materials at city-owned facilities. For 2017, Fort Worth reported to the TCEQ over 30 chemicals stored over the reporting threshold for 22 of the city-owned facilities. The challenges



Figure 5-9. A reinforced AST has replaced a leaking UST at a city facility, photo by City of Fort Worth.

Table 5-2. Summary of city-owned PST inventory.

PETROLEUM STORAGE TANK TYPE	2015	2016	2017	3-Year Average
Aboveground	73	74	75	74
Underground	21	19	20	20
Temporary	1	1	1	1
TOTAL COLLECTED	95	94	96	95

Table 5-3. Summary of annual hazardous materials section workload.

HAZARDOUS MATERIALS WORKLOAD	2015	2016	2017	3-Year Average
Aboveground Petroleum Storage Tank Inspections	73	74	75	74
Underground Petroleum Storage Tank Inspections	21	19	20	20
Underground Storage Tank and Line Testing (<i>evaluations</i>)	21	18	20	20
City-Owned Hazardous Waste Storage Facility Collection Events	97	97	97	97
City-Owned Biological Waste Storage Site Collection Events	62	62	62	62
City-Owned Universal Waste Storage Site Collection Events	97	97	97	97
City-Owned Non-Hazardous Waste Storage Site Collection Events	106	106	106	106
USDA-Regulated Waste Storage Site Collection Events	1	1	1	1
Electronic, Lighting and Battery Recycling Collection Events	95	95	95	95
City Facility Asbestos Assessments	35	35	34	35
City Facility Mold Assessments	10	16	14	13
City Facility Asbestos Abatements	22	16	21	20
City Facility Mold Remediation	14	10	12	12
Spill Prevention Control and Countermeasure Plan Evaluations	18	18	18	18
Spill Response Activation Incidents	35	25	28	29
City Facility Compliance Inspections, Follow-Up and Training Events	24	24	24	24
City Operations Workplace Chemical List Reviews	46	46	46	46
City-Operated Facility Tier II Reporting Reviews	26	26	26	26
TOTAL	803	785	796	795

associated with EPCRA (or Tier II) reporting are associated with maintaining accurate inventories, tracking material use, and reporting quantities to ensure regulatory compliance. Keeping an accurate account of all the different hazardous materials used throughout the city at the numerous city-owned facilities is a difficult task.

5.4.6 Petroleum Storage Tanks (PSTs)

Proper management of the city’s fuel tanks not only helps keep Fort Worth compliant with both state and federal regulations, but also ensures a cleaner environment and safer community for all residents. A summary of the city’s PSTs that require management is presented in Table 5-2. Determining if a UST is leaking is a challenge because the tank cannot be visually inspected for releases. Additionally, understanding the amount of fuel used by the city (which could indicate a leak) including obtaining inventory control from non-automated sites is also a challenge due to the difficulty of tracking this information. Since the early 1990s, approximately 40 city-owned PST sites were identified as having leaking USTs. Through the

city's PST management program, a total of 133 USTs at 54 different facilities have been taken out of service and removed from the ground. For sites where fuel service is required, the city has currently replaced approximately 30 USTs with ASTs. While the city has made excellent progress addressing USTs, there are still inventory and maintenance activities to be continued and UST compliance challenges to be addressed.

5.5 Strategies for Hazardous Materials Management (by Program Area)

5.5.1 Strategies for PA 1: Hazardous Materials Planning & Management

Hazardous materials are used as part of the normal daily operations at many city facilities, which generates hazardous waste. To protect human health and the environment, as well as maintain regulatory compliance, these materials must be handled, stored, transported and disposed of properly. This requires thorough analysis of facility waste streams and cradle-to-grave planning for these materials.

5.5.1.1 Hazardous Materials Analysis

The City of Fort Worth takes a comprehensive approach to managing hazardous materials and waste from municipal facilities and households throughout the community. The Hazardous Materials Management Section should expand on current analyses to collect data from all city facilities, including office buildings. It may not be immediately apparent that these facilities produce waste that must be managed outside the usual landfill and recycling waste streams, but items like compact fluorescent light bulbs and batteries



Figure 5-10. Batteries and HHW are organized and prepared for proper disposal or recycling, photo by City of Fort Worth.

are classified as universal waste or contain materials that should be diverted from the landfill. The waste generated by all city facilities must be characterized and quantified to determine the facility's generator status. The EPA recognizes three categories of hazardous waste generators, depending on the amount of material generated per month and how long it is stored on site (Reference 5-15):

- Very Small Quantity Generator (VSQG) - generates 100 kilograms or less of hazardous waste per month
- Small Quantity Generator (SQG) - generates more than 100 kilograms, but less than 1,000 kilograms, of hazardous waste per month
- Large Quantity Generator (LQG) - generates 1,000 kilograms or more of hazardous waste per month

The TCEQ permits facilities that generate and store hazardous waste, although some sites are exempt from permitting if they fall under certain thresholds for the amount generated and the time that the waste is stored on site (Reference 5-16). Many city buildings will fall under this "conditionally exempt small quantity generator" (CESQG) status. The Hazardous Materials Management Section will coordinate with other city departments to evaluate the wastes generated at all sites. The city should research the cost-effectiveness of managing this waste and compare this with the cost of switching to a non-hazardous alternative, where one exists. The city should also research options for reducing the use of hazardous materials and recycling hazardous waste. This information will form the basis for waste minimization plans (WMPs) for city facilities.

For every city-owned and operated facility, section staff should evaluate hazardous materials/waste storage and containment areas to determine if improvements are needed. This could include minor changes, such as storing reactive chemicals in separate areas, or large-scale construction projects for new storage and containment areas. These projects would likely need to be included in the Capital Improvement Plan (CIP). The city should periodically survey households regarding HHW use and disposal practices and continue to track the types and amounts of HHW collected at the ECC and drop-off stations. This will help to identify any gaps in services offered and provide the information necessary to create targeted education campaigns. The city should also continue to track where the HHW collected at the ECC and drop-



Figure 5-11. City staff discuss disposal plans and review drums of waste that have been labeled, consolidated and scheduled for collection by disposal vendors, photo by City of Fort Worth.

off stations originates to determine the best locations to open new drop-off stations. These would be major construction projects that may be jointly funded between several departments or fall under the CIP.

5.5.1.2 Hazardous Materials Planning

Storing, handling, transporting and disposing of hazardous waste are very costly and time consuming activities. Waste minimization should be the primary hazardous waste management practice, as this reduces costs associated with managing waste, as well as risks to the environment. The city should develop WMPs for all facilities to reduce the amount of hazardous materials used and the amount of hazardous waste generated by municipal operations. This will require all city departments to coordinate with the Hazardous Materials Management Section to evaluate the wastes generated at all sites and identify ways to reduce those waste streams. Section staff will work with other departments to put a system in place to identify coordinators for each municipal facility to evaluate and develop WMPs, as well as for all regulatory operations, including PST maintenance, hazardous materials/waste management, record keeping and regulatory reporting. Section staff will also work with site coordinators to identify all USTs in the city that need to be converted to ASTs, and develop a replacement plan prioritizing tanks that pose the most risk. Some of these conversions require significant resources and may be included in the CIP. Other major CIP projects may include the construction of new or improved hazardous materials/waste management storage and containment areas, as well as moving or creating new HHW collection centers, based on site evaluations.

Section staff will prioritize these projects based on regulatory requirements, risks to human health and the environment and available resources.

5.5.1.3 Hazardous Materials Rules & Regulations

The majority of rules and regulatory requirements concerning hazardous materials/waste management are established at the federal and state levels, and are discussed in the introduction to this chapter. Most Environmental Quality Division staff responsibilities pertaining are defined in Chapter 12.5 of the City of Fort Worth municipal code. Section staff may review best management practices (BMPs) from other cities regarding hazardous materials/waste management, especially those with International Organization Standardization (ISO) certification.

5.5.1.4 Hazardous Materials Projects & Technologies

The city should develop a database or several databases containing all information of a regulatory compliance nature for each municipal facility. This will require significant collaboration between departments. Safety data sheet (SDS) manuals that include all chemicals managed at a facility must be kept on site and should be updated whenever a new chemical is introduced at that facility. When a chemical is no longer used, the associated SDS should be placed in a discontinued SDS manual. The human resources safety group is working to build a software system to manage SDSs for all city facilities, and is responsible for submitting SDSs to the TCEQ and EPA under EPCRA rules. Hazardous materials management staff, as well as other coordinating staff throughout the city, should have access to this system. Waste classification and disposition tables for each facility should be prepared for hazardous waste management and emergency purposes. The table should include all types of waste the facility may generate, the classification for that waste, where it is stored at the site and where it will be sent for disposal or recycling. The SDSs and waste tables will be provided to first responders to help them understand what kind of chemicals and hazardous materials/waste may be found at each city-owned facility, and where they are stored. This will help protect them and the surrounding community in the event of an emergency.

Waste streams for city departments that generate regulated wastes are currently documented in a database. This information should be shared and readily accessible to staff for site inspection and regulatory

tracking purposes. The database should also contain all documentation and reports required for regulatory purposes for each facility. Section staff must coordinate with departments that submit reports and documentation to the TCEQ and EPA to obtain copies and maintain them for audit purposes. The city should develop or purchase an inspection and audit software staff can use in the field that is multipurpose and preferably the same software used by other environmental staff for site audits. This software should provide the flexibility to inspect municipal facilities for PST compliance, hazardous materials/waste management compliance, asbestos-containing materials, lead paint, mold and other potential hazards. All audit and inspection information should be automatically uploaded to a database with all facility information, any non-compliance items that need to be addressed, photos and other important information. The city should also develop a public-facing map with Tier II facilities for the website and include all community right-to-know information.

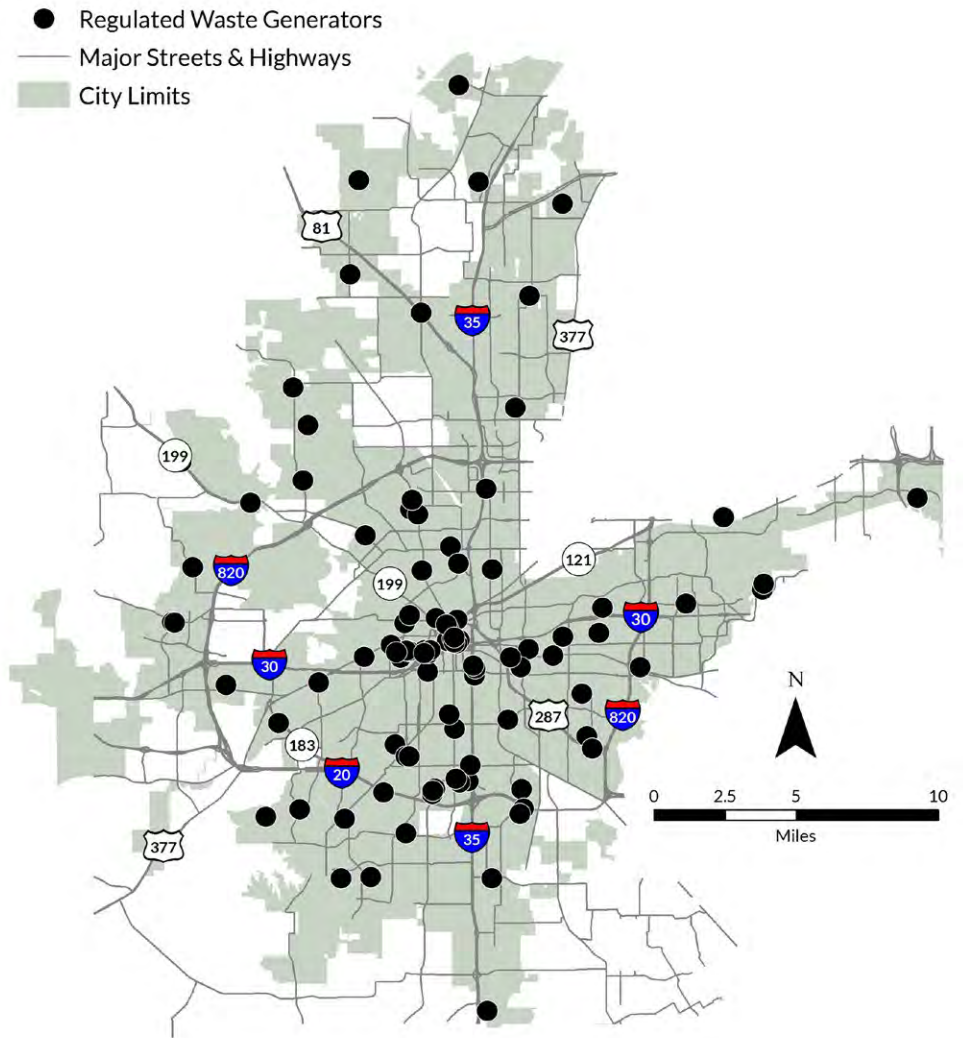


Figure 5-12. Map depicting City of Fort Worth regulated waste generator facilities, 2019.

5.5.1.5 Development Actions for PA 1: Hazardous Materials Planning & Management

Hazardous Materials Analysis

1. Perform annual reviews and update the comprehensive hazardous materials database, which captures information on hazardous materials and waste regulations applicable to city facilities and the inventory of city-maintained hazardous materials.
2. Evaluate the hazardous waste generator status of all city facilities annually to ensure they are classified appropriately.
3. Develop and implement a policy to reduce the use of hazardous materials, utilize non-hazardous alternatives and recycle hazardous waste, as applicable.

4. Evaluate all hazardous material and waste storage areas at city facilities to identify potential improvements.
5. Develop an inspection schedule for city facilities to annually evaluate hazardous materials and waste storage areas.

Hazardous Materials Planning

1. Develop WMPs for city-owned facilities.
 - *Performance Indicator:* Quantity of waste generated by city-owned facilities on a monthly basis.
2. Develop a Petroleum Storage Tank (PST) Management Plan.
3. Perform a feasibility study evaluating the city’s hazardous materials and waste management storage and containment area options.

4. Develop a long-range plan for HHW that identifies expansion alternatives.

Rules & Regulations

1. Develop an SOP that defines the applicable state and federal regulations and outlines the necessary actions to ensure compliance.

Projects & Technologies

1. Organize SDSs at all city facilities and develop an online SDS repository for use by city staff.
2. Develop a waste classification and disposition table for each city facility that includes the number of waste streams, the amount of waste generated per year and the classifications/types of waste.
3. Prioritize hazardous materials and management projects through annual updates of the CIP.
4. Evaluate database management software systems for tracking field operations, capturing metrics and records management.
5. Create a web-based mapping application for public use that shows Tier II facilities in Fort Worth and includes community right-to-know information.

5.5.2 Strategies for PA 2: Hazardous Materials Mitigation

The city conducts mitigation activities for asbestos, lead paint, mold, indoor air hazards, and hazardous materials spills.

5.5.2.1 Asbestos & Lead Paint Abatement

The team lead overseeing asbestos materials management conducts asbestos surveys, asbestos abatements, and operations and maintenance (O&M) plans for city-owned facilities, as well as asbestos awareness training for city employees in support of TDSHS and national emissions standards for hazardous air pollutants (NESHAP) compliance initiatives for nuisance abatements throughout the city.

The primary objective of this program component is to control exposure to asbestos fibers from city-owned buildings for city employees and other visitors by minimizing any potential hazard posed by asbestos-containing materials (ACMs) during cleaning, maintenance, renovation, and general operational activities. Asbestos abatement is handled on an as-needed basis, generally initiated because of building



Figure 5-13. A pipe insulated with asbestos-containing materials, photo by City of Fort Worth.

renovations.

The lead management advisor works with staff during city building renovation projects. Lead paint abatement is conducted on as-needed basis. The main concern involves the evaluation of lead paint in facilities and providing that information to other departments. When remediating a facility that is going to be used for targeted audiences, lead abatement activities are performed. Funding from is the EPF.

5.5.2.2 Mold Remediation

The team lead conducts mold assessments and remediation while also supporting TDSHS-related compliance initiatives related to mold. The indoor air hazardous management lead coordinates with city staff and employees to identify issues related to the workplace environment inside municipal buildings. Mold and moisture impact the indoor air quality of a building, which in turn affects the health of building occupants.

5.5.2.3 Emergency Spill/Release Response

In direct support of the environmental and emergency management programs, an effective emergency spill/release response and management program helps minimize the impact of uncontrolled releases of contaminants that may impact human health, public safety, property, and the environment – most frequently as a discharge to local waterbodies via the municipal separate storm sewer system (MS4). This not only promotes overall water quality for residents to enjoy, but also saves money by preventing worsening conditions and larger remediation projects later. Figure 5-15 provides a flowchart for the city's spill/release response process. The objective of the program

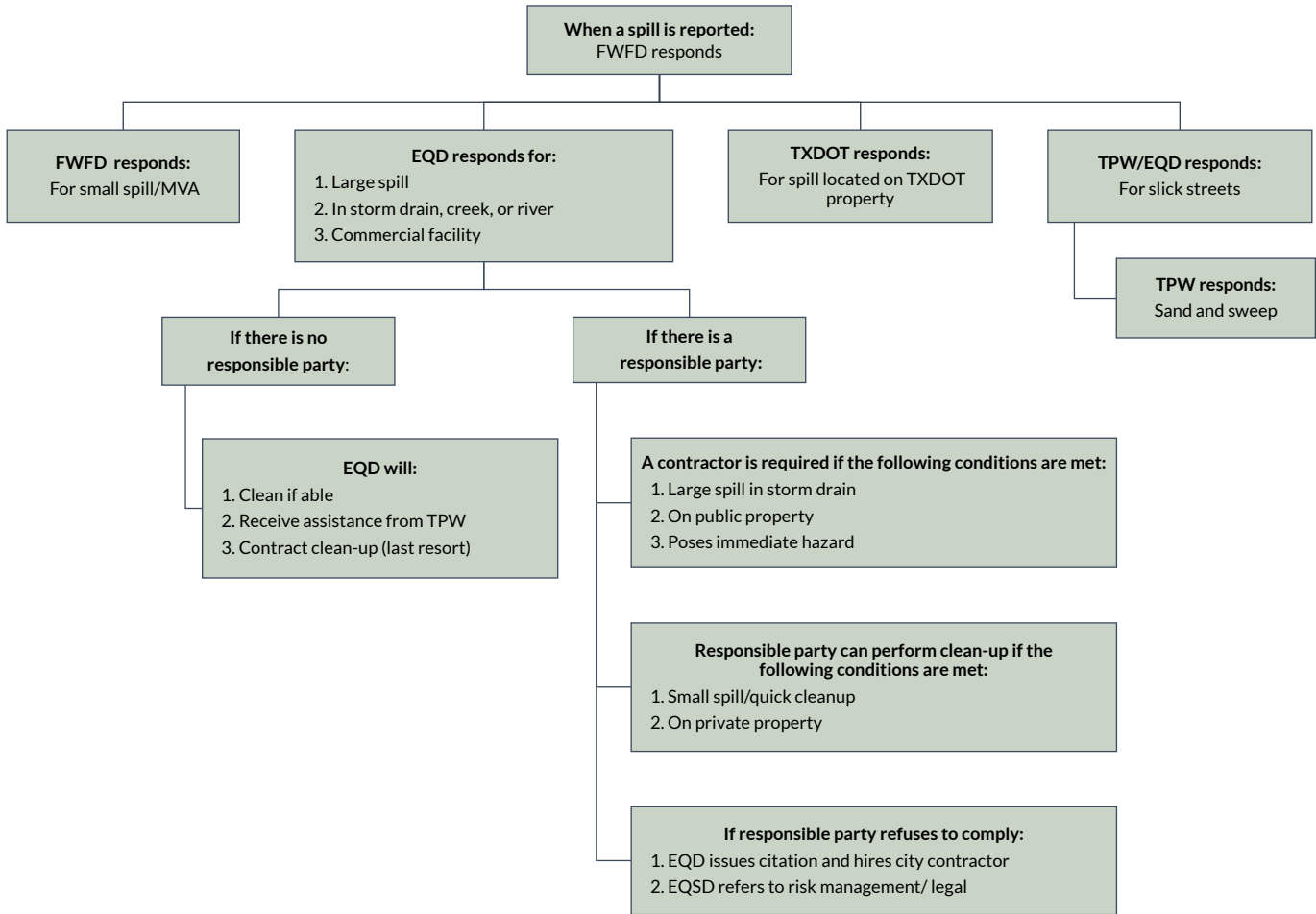


Figure 5-15. Flowchart for multi-level emergency spill/release response actions.

is to respond, contain and cleanup spills or releases. Similarly, the program employs targeted inspections and pollution prevention education to prevent spills and releases from occurring.



Figure 5-14. Environmental staff coordinate with the Transportation & Public Works Department when responding to incidents that require special equipment, photo by City of Fort Worth.

As required by its Texas Pollutant Discharge Elimination System (TPDES) permit (Reference 5-17), Fort Worth has two programs to handle spills: a hazardous materials team within the Fort Worth Fire Department (FWFD) and trained staff within Environmental Quality Division. The division also responds to complaints received regarding discharge or potential discharges to the MS4. This includes the following:

- Assist with the disposal of regulated waste from fire stations to include: motor vehicle accident waste, biohazardous waste and sharps containers and transport to the Environmental Resource Center (ERC) for disposal (on-call contractors).
- Removal and transport of abandoned waste.
- Response to an event located within city jurisdiction and identify needs for responsible party to be identified to solicit immediate response to spill.

The spill response program will be maintained to ensure the city can respond to issues as they arise

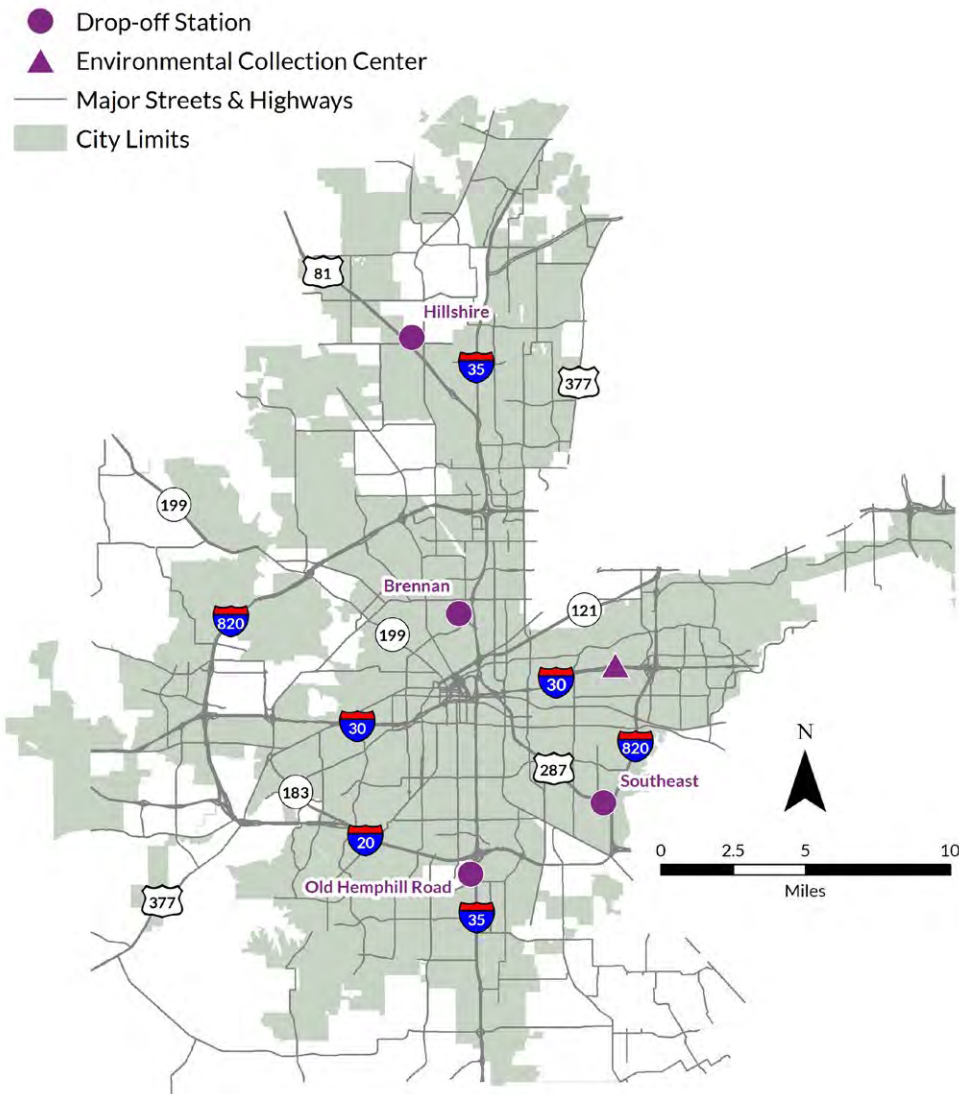


Figure 5-16. A map depicting locations of city drop-off stations and the ECC, 2019.

Table 5-4. City of Fort Worth ECC waste categories.

ACCEPTED	NOT ACCEPTED
Automotive fluids	Business or industrial waste
Batteries	Ammunition and explosives
Cleaners and chemicals	Appliances and electronics
Cooking oil	Building materials
Lawn, garden and pool chemicals	Butane and propane cylinders
Light bulbs	Bulk trash and yard waste
Paint	Medicines and medical waste
Painting waste	Tires
	Asbestos
	Polychlorinated biphenyls
	Radioactive items

while continuing to support prevention of potential issues. This includes collaborating with the Fort Worth Police Department (FWPD), FWFD and other first responders to provide sound technical expertise and guidance to prevent spill hazards from polluting the environment and jeopardizing human health. In addition, the city will ensure all applicable staff are trained as discussed in Section 5.5.4.

5.5.2.4 Household Hazardous Waste Collection

If HHW is not disposed of safely, it can pose a substantial threat to the environment, and can be dangerous if left around the house where children or pets may access it (Reference 5-1). To avoid the risks associated with HHW, it is important that residents properly dispose of items in their home properly. Table 5-4 gives examples of common items accepted at the ECC, drop-off stations and mobile collection events, as well as items that are not accepted.

HHW is accepted at the ECC, mobile collection events, and includes automotive fluids; batteries; cleaners and

chemicals; cooking oil; lawn, garden, and pool chemicals; light bulbs; paint, and painting waste. Under Texas regulations, business or industrial waste cannot be accepted. Other categories of items not accepted are: ammunition and explosives; appliances and electronics; building materials; bulk trash and yard waste; butane and propane cylinders; medicines and medical waste; tires; asbestos; polychlorinated biphenyls; and radioactive items.

To utilize these services free of charge, residents of Fort Worth who receive a water bill from the city can present their driver's license or a current water bill. Residents of participating partner cities are also required to provide proof of residence (a current water bill or valid driver's license) to use the ECC, drop-off stations and mobile collection events. Some partner cities require their residents to obtain a



Figure 5-19. The Help-Yourself shelf at the Fort Worth ECC, photo by City of Fort Worth.

voucher prior to using the ECC and drop-off stations. These disposal facilities and mobile collection events are for residential waste and recycling only. They do not accept business and industrial waste. A Help-Yourself shelf is available at the ECC and drop-off stations. Chemicals, cleaners and paint in like-new condition are offered free of charge. If residents have a product that is still usable, they are encouraged to give it to someone who can use it instead of bringing it for disposal. The Hazardous Materials Management Section provides support in the management of HHW at the ECC and drop-off stations, as well as coordinating the transport and disposal of collected items. Figure 5-17 presents a flowchart for management of HHW at the ECC and drop-off stations.

As the HHW programs and facilities are evaluated, service may be expanded to other municipalities, counties and special districts surround Fort Worth. The following is a list of HHW program partners, as of 2018:

- | | |
|------------------------|------------------------|
| Alvarado | Johnson County |
| Arlington | Joshua |
| Azle | Justin |
| Bedford | Keller |
| Benbrook | Kennedale |
| Burleson | Lakeside |
| Cedar Hill | Midlothian |
| Cleburne | North Richland Hills |
| Colleyville | River Oaks |
| Crowley | Roanoke |
| Dalworthington Gardens | Saginaw |
| Decatur | Sansom Park |
| Euless | Sherman |
| Fort Worth | Stephenville |
| Glenn Heights | Trophy Club |
| Godley | Upper Trinity Regional |
| Grand Prairie | Water District |
| Grapevine | Watauga |
| Haltom City | Waxahachie |
| Haslet | Weatherford |
| Hood County | Westlake |
| Hurst | Westover Hills |
| | Westworth Village |

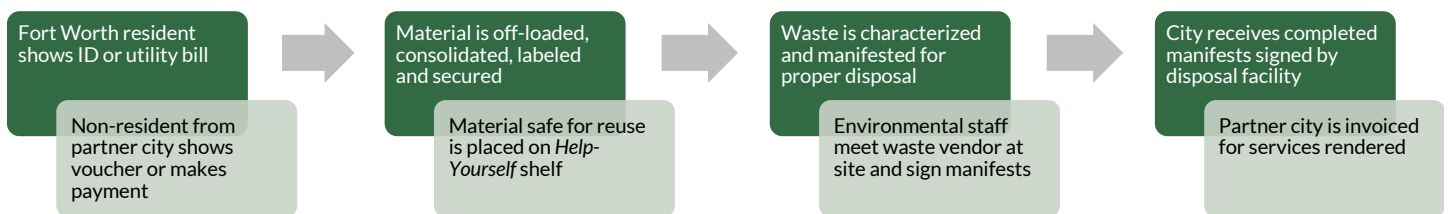


Figure 5-17. Chart depicting the HHW management process at the ECC and drop-off stations.

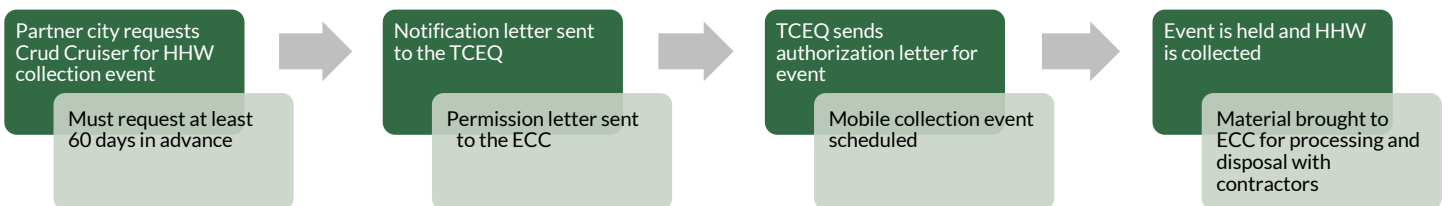


Figure 5-18. Chart depicting the process to schedule a mobile collection event for HHW.

5.5.2.4.1 ENVIRONMENTAL COLLECTION CENTER

The 1995–2015 Comprehensive Solid Waste Management Plan (Reference 5-17) identified the need to construct a collection center for HHW to maintain compliance with the MS4 permit, discussed in Chapter 4, to prevent stormwater pollution from illegally dumped items. When chemicals are dumped or allowed to run into storm drains, they are carried to nearby creeks and rivers without any kind of treatment. This poses a threat to waterway ecosystems and humans who use local creeks, rivers and lakes for drinking water and recreation. These items should not be poured down household drains, as they can damage plumbing and the city’s water treatment plants are not designed to clean these chemicals. Responsible use and recycling of these products helps protect the water quality of our local waterways.

The city created the ECC to provide a permanent facility where Fort Worth residents and the residents of 50 participating cities, counties and districts could properly dispose of HHW year-round (Reference 5-2). When it first opened in 1997, the ECC facility was cutting edge, often used by other cities as a model for their own HHW collection centers. The city should evaluate whether this facility can support an increasing population. It may need to be expanded or a new facility may be required to adequately serve the community, especially as the list of materials accepted at drop-off stations continues to grow. The city will continue work to provide high quality services and expand access to HHW collection facilities and events to our residents and partners.

5.5.2.4.2 DROP-OFF STATIONS

The City of Fort Worth operates four drop-off stations (Reference 5-18) that accept HHW, as well as trash, brush and yard trimmings, recyclables, bulky items, electronics and furniture donations (Reference 5-19). The four stations are spread throughout Fort Worth and are listed below:

- Brennan Drop-off Station, 2400 Brennan Avenue
- Southeast Drop-off Station, 5150 Martin Luther King Jr Freeway
- Old Hemphill Road Drop-off Station, 6260 Old Hemphill Road
- Hillshire Drop-off Station, 301 Hillshire Drive

The Hillshire drop-off station opened in September of 2017 and is the newest facility. The need for additional drop-off stations will be evaluated as the city grows and demand for these services increases.

5.5.2.4.3 MOBILE COLLECTION EVENTS

Mobile collection events are held at locations in Fort Worth and partner cities (Reference 5-19). The “Crud Cruiser” mobile collection trailers travel to neighborhoods to collect HHW from March through November. Proof of residence is required, because these events are only open to residents of the host city. Figure 5-18 presents a flow chart for scheduling mobile collection events.

5.5.2.5 PST Remediation

The city is committed to proper handling and storage of the city’s fuel supply for city-owned vehicles. This program helps ensure city-owned and managed petroleum tanks are safe and environmentally sound. Through the PST Management Program, a total of 133 USTs at 54 different facilities have been taken out of service and removed from the ground. Currently, the city has replaced approximately 33 USTs with ASTs. Eight more USTs, that have been temporarily removed from service, are planned for removal.

5.5.2.6 Development Actions for PA 2: Hazardous Materials Mitigation

Asbestos & Lead Paint Abatement

1. Develop and annually update a database that includes all city properties that have had asbestos surveys. This database will note any post-survey activities and schedule.
2. Develop and annually update a prioritized list of asbestos and lead paint remediation projects.
3. Develop a memorandum of understanding (MOU) for asbestos and lead paint abatement contractual services performed for other city departments that defines the scope of work and project objectives.

Mold Remediation

1. Develop SOPs for mold identification, evaluation and mitigation.
2. Develop a memorandum of understanding (MOU) for mold remediation contractual services performed for other city departments that defines the scope of work and project objectives.

Spill Response

1. Work with the city call center to improve the spill reporting process, bi-annually review and update the spill response questionnaire, as applicable.
2. Respond to spills in a timely manner and follow-up with the party who reported the spill.
 - *Performance Indicator:* Number of incidents.
 - *Performance Indicator:* Length of time for spill response.
3. Maintain and annually update a database that tracks spill response data, including location, spill response time, type of substance, volume, impacted media and contact information of regulatory agencies involved.
4. Develop spill response SOPs and practice spill response drills.

Household Hazardous Waste Collection

1. Evaluate the feasibility of adding new services at the ECC.
2. Maintain and annually update a list of partner cities and their contracts for the Household Hazardous Waste program and mobile collection program.
3. Complete a feasibility assessment of expanding the current ECC or redeveloping for improved efficiency and customer service experience.

Petroleum Storage Tank Remediation

1. Develop and annually update a list of city facilities with PSTs.
2. Develop and annually update a prioritized list of PST projects on city-owned properties.

5.5.3 Strategies for PA 3: Hazardous Materials Compliance

The city's hazardous materials management programs would benefit from a dedicated Hazardous Materials Management Section within the Environmental Quality Division. This would balance and streamline staff workload, allowing development of more expertise within particular skill sets through advanced and targeted training. The current programs for management of hazardous materials will be evaluated periodically and expanded over the next few years based upon these evaluations.



Figure 5-19. Proper storage of waste, such as used light bulbs, is critical for site compliance with regulated waste rules, photo by City of Fort Worth.

5.5.3.1 Asbestos Abatement Compliance

The city will evaluate how many additional staff should be trained to enhance the Comprehensive Asbestos Evaluation Program. More staff are needed for conducting asbestos surveys, asbestos abatements, and O&M plans for city-owned facilities, as well as asbestos awareness training for city employees. Currently only one staff member is trained to evaluate ACMs during municipal building renovation projects. As mentioned in the previous section, the main objective for this program component is to control exposure to asbestos fibers from city-owned buildings for employees and other visitors by minimizing any potential hazard posed by ACMs during cleaning, maintenance, renovation, and general operational activities. A comprehensive inventory of buildings with ACMs and asbestos surveys will be compiled and prioritized. In addition, the comprehensive inventory can list buildings with lead paint surveys and those suspected to contain lead paint. Based upon this evaluation, additional asbestos surveys and lead paint surveys may be conducted to aid in the city's removal efforts to protect city workers and residents.

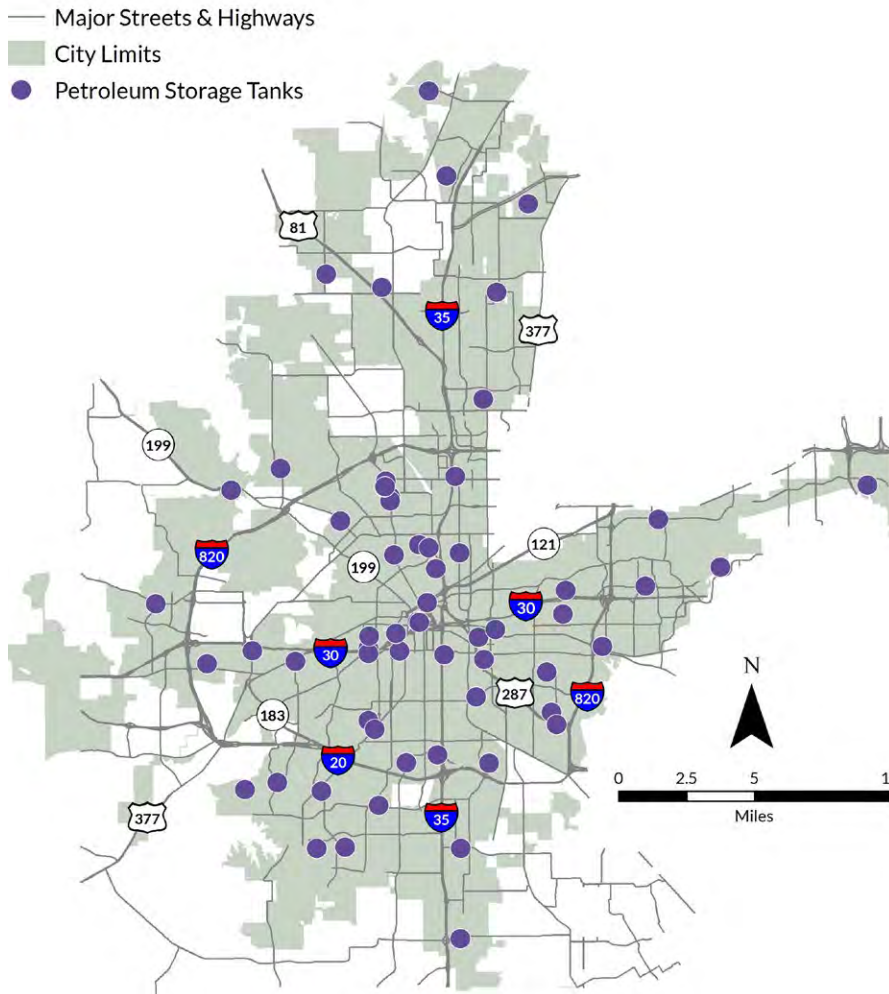


Figure 5-20. City of Fort Worth municipal PST locations, 2019.

5.5.3.2 PST Compliance

5.5.3.2.1 PST PERMIT REQUIREMENTS

The team lead provides ongoing coordination with the Property Management Department, Fleet Services Division, for the city’s PST operations, which include both USTs and ASTs. UST systems require annual testing, current registrations, applicable monthly

maintenance, posting of required signage and delivery certificates, and coordinating with regulatory inspections. The biggest challenge for the PST Management Program is obtaining inventory control from non-automated sites located at fire stations. The Environmental Quality Division is responsible for the regulatory compliance of each PST.

The city will consider developing a fuel management plan to track the amount of fuel used at individual USTs at city facilities. This fuel inventory control could be accomplished by utilizing automatic tank gauging paired with inventory reconciliation. This reconciliation would include recording how much is pumped into city-owned vehicles monthly compared to the fuel inventory. If this reconciliation is found to be outside certain parameters, then a tank leak is indicated and must be investigated. Tank integrity testing will be conducted to investigate the suspected leak. If the tank fails the integrity test, a release report will be filed with the

TCEQ and the tank will be taken out of service.

A PST compliance action plan will also be considered by the city. This plan could include monitoring groundwater monitoring wells with an interface probe or conducting vapor monitoring with a photoionization detector (PID) on a regular basis (possibly monthly or quarterly). Other parts of the plan would include ensuring that all tanks (depending on storage capacity



Figure 5-21. Environmental compliance is critical for ASTs like this fuel tank at a FWFD fire station, photo by City of Fort Worth.



Figure 5-22. Environmental staff must inspect fuel ports on USTs to verify tank compliance, photo by City of Fort Worth.

based on EPA definitions) are registered with the TCEQ.

5.5.3.2.2 BMP CONTROLS

The city will evaluate BMPs that can be used as pollution control measures. These BMPs include:

- Replacing USTs with ASTs.
- Developing and implementing an audit checklist for PSTs.
- Adding a subsurface barrier.
- Develop staff training.
- Maintaining spill prevention, control, and countermeasures (SPCC) plans.

The city will replace some of its smaller and older USTs with ASTs to reduce regulatory requirements for compliance, thus increasing safety, reducing the risk of having a leak, and increasing personnel productivity. In addition, several USTs have been identified for permanent removal. A list identifying the older USTs will be compiled to organize and prioritize UST removals and replacements. A goal of replacing at least half of the USTs by 2030 will be pursued.

A PST audit checklist will be developed for city-owned facilities to assess compliance with regulations or identify any areas that need improvement. These checklists will include objectives such as reviewing SPCC plans, employee training, record-keeping (inspections, other records, etc.), site evaluations, and reporting. Internal audits can be conducted on an annual basis. Staff will incorporate a third-party auditor to conduct audits every three years. The internal audits will be conducted by dedicated PST management team members. The feasibility of installing a subsurface

barrier to provide additional containment for any new city-owned and managed ASTs will be evaluated for effectiveness and cost.

Training will be developed to facilitate the management of PSTs and is discussed in Section 5.5.4. The city will ensure that municipal facilities with ASTs have a current SPCC plan or spill plan in place. An SPCC plan is updated any time physical changes occur at the site such as replacing an AST with an UST or adding an additional PST. Site inspections will be conducted as needed, in accordance with the site SPCC plan. As previously mentioned, PST audits will be conducted on a regular basis to identify any noticeable gaps or omissions that require corrections or updates.

5.5.3.3 EPCRA Tier II Chemical Reporting

The city supports and participates in the EPCRA Tier II Chemical Reporting Program. This program focuses on providing comprehensive records of applicable EPCRA Tier II reportable chemicals used and stored at city-owned facilities. The team lead provides expertise and coordination in compiling lists of hazardous chemicals stored at city-owned facilities. Chemical inventory lists are used for tracking the type and amount of hazardous chemicals stored at each facility. Hazardous chemical volumes stored over the limits specified in EPCRA are reported to the TCEQ on an annual basis. Figure 5-27 provides a flowchart of the city's EPCRA Tier II reporting program. Funding for this program is from the EPF.

Conducting EPCRA Tier II reporting provides vital information for emergency response planning conducted by first responders and Fort Worth emergency management agencies. Participating in this

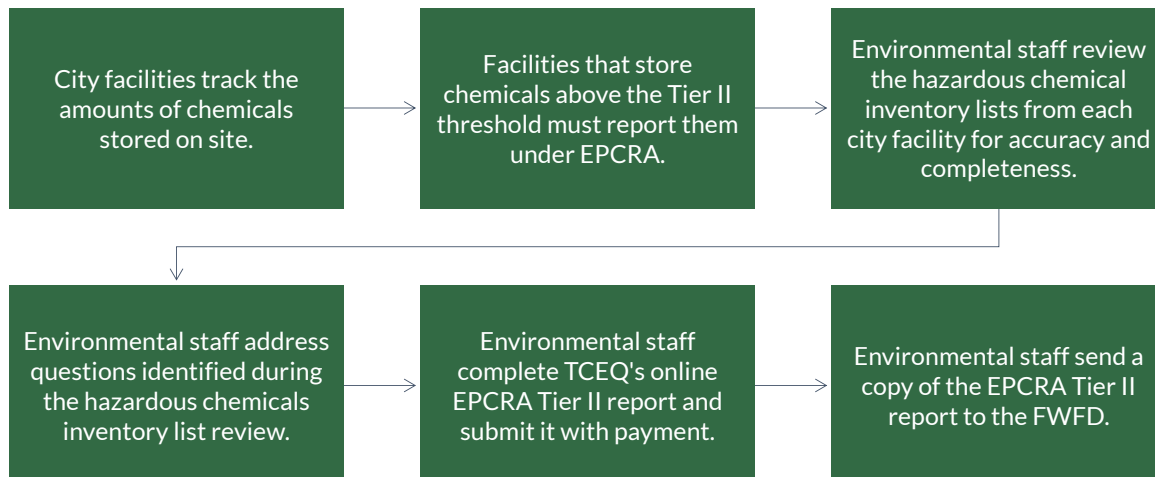


Figure 5-23. Flowchart of the city's EPCRA Tier II reporting program.

program will help the city provide a safer community and work environment for city personnel, residents and first responders. It will also allow Fort Worth to provide transparency and be compliant with applicable regulations. The city keeps track of over 52 different regulated materials at their facilities. For 2016, the city reported to the TCEQ, 41 chemicals stored over the reporting threshold for 25 of the municipal facilities and in 2017, 34 chemicals stored over the threshold for 22 of the city-owned facilities.

The city will continue to provide expertise and coordination in compiling lists of hazardous chemicals stored at city-owned facilities and conducting EPCRA Tier II reporting annually for hazardous chemicals stored over the EPCRA limit. The chemical inventory lists will be updated at least annually, along with making sure the SDS manuals are complete.

The Environmental Quality Division will also collaborate with emergency response teams to provide sound technical guidance for handling the hazardous chemicals when needed. The city will evaluate educational programs for residents on handling and disposing of hazardous chemicals through the ECC or drop-off stations as discussed in the next section.

5.5.3.4 Municipal Hazardous Materials/Waste Compliance

5.5.3.4.1 EXPAND HHW MANAGEMENT PROGRAM

A hazardous materials/waste audit checklist will be developed to be used by staff for internal facility inspections. The checklist will include regulatory activities, such as the proper labeling and storage of hazardous materials/waste, current employee training records and reporting. Municipal facility hazardous materials/waste audits will be conducted to identify any compliance issues and recommend BMPs to facility managers for improvement. Internal audits should be conducted by staff annually, while a third-party auditor should conduct an audit every three years. All city facilities will be prioritized for audits over the three-year time period, based on risk assessments and past compliance records.

The city provides ongoing, as well as on-call, management of hazardous waste streams, medical and biohazardous waste streams, and special waste streams generated by different city-owned facilities throughout Fort Worth. The following are examples of municipal



Figure 5-24. Typical flow for processing city-generated wastes for disposal.

facilities that generate hazardous waste:

- municipal court facilities
- police facilities
- libraries
- water and wastewater treatment plants
- municipal laboratories
- drop-off stations and the ECC
- public event facilities
- municipal airports
- fire stations and operations
- parks and community centers
- city fleet maintenance facilities
- municipal office buildings

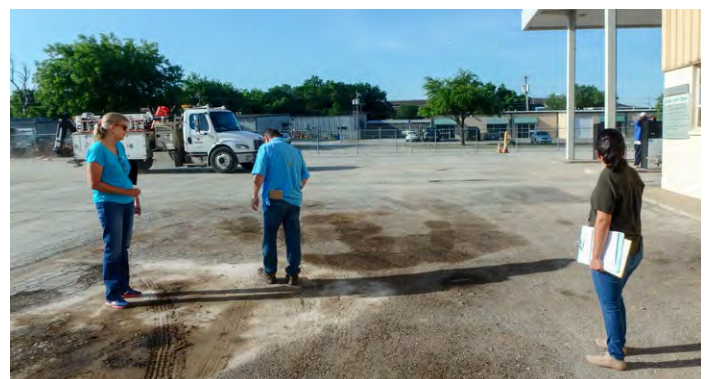


Figure 5-25. Environmental staff review staining on an asphalt surface to verify that permitted HHW operations at a facility are in compliance with environmental regulations, photo by City of Fort Worth.

Each departmental site is provided with the appropriate collection containers for the individual waste streams, and employees at each site are given comprehensive training dealing with the storage, handling, documentation requirements and inspection activities. When a waste stream requires disposal, the coordinator at the facility sends a request to staff, who then contact the contracted waste vendor to schedule the pick-up. Staff meet the vendor at the facility to ensure the waste has been properly packaged and to sign the appropriate documents for shipment to a state-permitted disposal facility. The disposal process is not complete until the city (generator) receives a manifest signed by the disposal facility. Figure 5-10 presents the flowchart for the management of municipal-generated hazardous waste.

5.5.3.5 Development Actions for PA 3: Hazardous Materials Compliance

Asbestos Abatement Compliance

1. Develop operations and maintenance plans for all city-owned facilities that have asbestos-containing materials and potential lead paint.

Petroleum Storage Tank Compliance

1. Develop a standardized audit checklist and form to report findings for PSTs.
2. Identify the responsible department at each site with a PST and annually update contact list.
3. Implement automatic tank gauging and inventory reconciliation for USTs.
4. Develop tank integrity testing SOPs.
5. Develop and implement a UST action plan to ensure compliance with regulations and proper maintenance activities.
6. Review and update SPCC plans.

Tier II Chemical Reporting

1. Maintain and annually update a list of all city-owned facilities that store hazardous and extremely hazardous substances per EPCRA Tier II reporting thresholds.

Municipal Hazardous Waste Compliance

1. Develop a list of municipal facilities to be audited, as well as an annual audit schedule.

- *Performance Indicator:* Number of municipal facility audits conducted annually.
2. Develop a standardized audit checklist and form to report findings for municipal facilities.
 3. Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations.
 - *Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.
 4. Research BMPs and environmental management systems (EMSs) for facility auditing and develop audit procedures for municipal facilities.
 5. Develop a list of facility contacts for each municipal facility storing hazardous materials and waste.

5.5.4 Strategies for PA 4: Hazardous Materials Communication & Collaboration

5.5.4.1 City Staff Training & Collaboration

Currently, employees at each city-owned facility are given hazardous materials comprehensive training dealing with the storage, handling, documentation requirements, and inspection activities. Additional training will be developed for spill response and other critical areas.

The city will ensure all applicable staff are trained for spill response. This training should include 40 hours of hazardous waste operations and emergency response (HAZWOPER), and periodic spill response drills. These spill response drills will be developed and implemented,



Figure 5-26. Used light bulbs are carefully stored before being processed as waste. All city staff must be trained to ensure they know how to properly dispose of items that cannot be traditionally recycled or thrown away in regular trash bins, photo by City of Fort Worth.

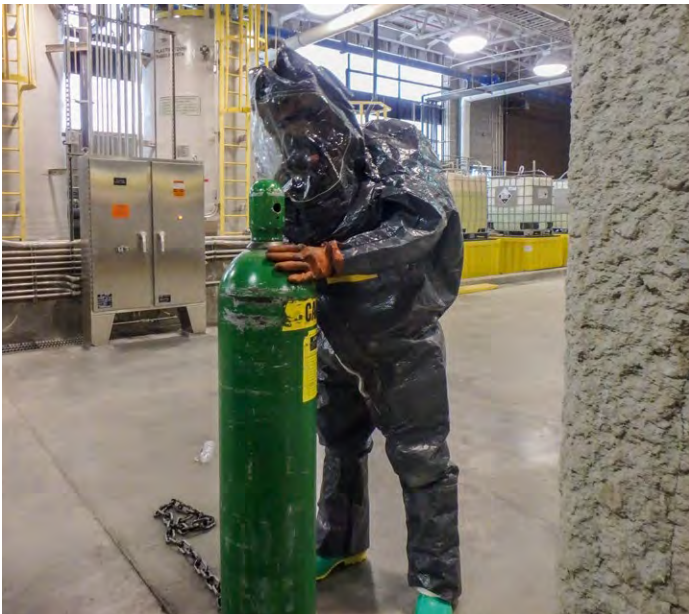


Figure 5-27. A staff member participated in a field training exercise to gain knowledge related to proper handling and disposal of waste items that have special requirements, such as compressed gas cylinders, photo by City of Fort Worth.

and all city employees who should be involved in this training will be identified. Once developed, the spill response drills should be held annually or as needed for new employees.

Training materials will be developed to facilitate the management of PSTs. Training will be held for employees involved in oil handling transfer, storage, and maintenance of oil equipment or spill response. Training for key PST management staff will be held on an annual basis or immediately for any new hires or a significant change to the SPCC plan. This training will include utilizing the SPCC plan where applicable. These training materials can be developed so that the training can be taken online and can be updated every five years.

Asbestos awareness training will be continued for city employees who are could be exposed to asbestos-containing materials during cleaning, maintenance, renovation, and general operational activities.

Internal stakeholders are members of city staff who store, handle, contain or otherwise interact with hazardous or potentially hazardous materials. The city should work to ensure readily-available guidance and training is available for staff throughout the city. Hazardous materials training topics may include, but are not limited to: mold, asbestos, lead, petroleum products and city-generated waste disposal. The city should work closely with the Safety Division

of the Human Resources Department in instances where messages overlap or become interrelated. It is recommended that the city utilize electronic media such as videos or web-based interactive lessons to efficiently and effectively communicate messages on a variety of staff schedules.

5.5.4.2 Public Technical Guidance

To meet technical guidance objectives related to hazardous materials, the city should provide technical guidance to two key audiences: internal and external. For external stakeholders, such as industry operators or property owners, the city should make general information and resources available online and continue to offer technical guidance to connect individuals with private property issues to resources. In many instances, the city will need to offer the same information multiple times. As such, technical sheets are recommended. Direct online resource links and readily-available summaries of contact information for resource partners in the community are also critical.

5.5.4.3 Public Education & Outreach

The city will consider developing educational programs for residents on handling and disposing of hazardous chemicals through the ECC or drop-off stations. Fort Worth and Goodwill Industries have recently expanded on their successful partnership to include an attended donation center within each of the city's drop-off stations to help reduce and divert reusable items from landfills and into the hands of individuals who can benefit from giving them a second life. Goodwill relies upon the sales of donated items to create local jobs and fund workforce training programs for people with disabilities, disadvantages, and other barriers to employment.



Figure 5-28. The new Crud Cruiser trailer the City of Fort Worth uses for mobile HHW collection events, photo by City of Fort Worth.

Residents with items to donate will be guided to the Goodwill area for unloading assistance by employees at the check-in window of the drop-off station.

5.5.4.4 Community Partnerships & Volunteerism

Building and maintaining strong relationships with partners within the city and within the greater community are vital to a strong hazardous materials management program. Internally, environmental staff in the division should focus on sustained relationships with the FWFD, Fort Worth Office of Emergency Management (OEM), FWPD, and the Property Management Department. Externally, key partnerships to foster include: Tarrant County Local Emergency Planning Committee, TCEQ, TDSHS, local higher education institutions, environmental contractors and local media partners.

5.5.4.5 Development Actions for PA 4: Hazardous Materials Communication & Collaboration

City Staff Training and Collaboration

1. Develop and annually update a list of city-owned facilities and operations that generate, store or handle hazardous materials, and identify city staff positions that should receive targeted training.
2. Develop and maintain a training matrix quarterly that identifies the annual hazardous materials training requirements for each position and tracks training status.
 - *Performance Indicator:* Number of city staff that have completed training.
3. Provide targeted hazardous materials training to city staff and guidance on regulatory compliance.
 - *Performance Indicator:* Number of trainings given annually.
 - *Performance Indicator:* Number of staff in attendance.
4. Provide city staff members and departments with information on reducing pollution from hazardous materials.
 - *Performance Indicator:* Number of internal communications sent out annually regarding hazardous materials.

5. Identify opportunities for staff to attend conferences, summits and other activities for professional development.
 - *Performance Indicator:* List of conferences, summits and other engagements attended by city staff annually.
6. Develop an internal recognition or award program for city departments, staff, facilities and operations that maintain excellent inspection results and consistently employ BMPs.
 - *Performance Indicator:* List of award or recognition recipients annually.

Public Technical Guidance and Training

1. Develop targeted household hazardous waste messaging for individual communities and neighborhoods.
 - *Performance Indicator:* Number targeted communications sent out annually to individual communities and neighborhoods, including print material distributed and messaging delivered through digital communications channels, the message topics and dates distributed.

Public Education and Outreach

1. Develop traditional and social media campaigns to encourage residents to properly dispose of household hazardous waste.
 - *Performance Indicator:* Number of traditional and social media communications for household hazardous waste distributed annually, the message topics and dates distributed.
2. Update and annually maintain the Household Hazardous Waste website.
3. Annually review and update, as applicable, the Captain Crud campaign.

Community Partnerships and Volunteerism

1. Maintain and annually update a contact list of emergency response partners.
2. Work with the local Emergency Planning Committee, OEM and emergency personnel to prepare for potential emergency incidents.

5.6 Conclusion

The Environmental Quality Division has had significant success in managing hazardous materials to achieve regulatory compliance and ensure the health and safety of residents and visitors. With continued efforts and implementation of the development actions noted below, the city can both improve the hazardous materials programs and implement strategies to ensure that the city is positioned to meet the anticipated future needs as well. The comprehensive list of development actions below has been prioritized based upon need and relative importance.

5.6.1 Summary of Hazardous Materials Development Actions

Hazardous Materials Analysis

1. Perform annual reviews and update the comprehensive hazardous materials database, which captures information on hazardous materials and waste regulations applicable to city facilities and the inventory of city-maintained hazardous materials.
2. Evaluate the hazardous waste generator status of all city facilities annually to ensure they are classified appropriately.
3. Develop and implement a policy to reduce the use of hazardous materials, utilize non-hazardous alternatives and recycle hazardous waste, as applicable.
4. Evaluate all hazardous material and waste storage areas at city facilities to identify potential improvements.
5. Develop an inspection schedule for city facilities to annually evaluate hazardous materials and waste storage areas.

Hazardous Materials Planning

1. Develop WMPs for city-owned facilities.
 - *Performance Indicator:* Quantity of waste generated by city-owned facilities on a monthly basis.
2. Develop a Petroleum Storage Tank (PST) Management Plan.
3. Perform a feasibility study evaluating the city's hazardous materials and waste management storage and containment area options.

4. Develop a long-range plan for HHW that identifies expansion alternatives.

Rules & Regulations

1. Develop an SOP that defines the applicable state and federal regulations and outlines the necessary actions to ensure compliance.

Projects & Technologies

1. Organize SDSs at all city facilities and develop an online SDS repository for use by city staff.
2. Develop a waste classification and disposition table for each city facility that includes the number of waste streams, the amount of waste generated per year and the classifications/types of waste.
3. Prioritize hazardous materials and management projects through annual updates of the CIP.
4. Evaluate database management software systems for tracking field operations, capturing metrics and records management.
5. Create a web-based mapping application for public use that shows Tier II facilities in Fort Worth and includes community right-to-know information.

Asbestos & Lead Paint Abatement

1. Develop and annually update a database that includes all city properties that have had asbestos surveys. This database will note any post-survey activities and schedule.
2. Develop and annually update a prioritized list of asbestos and lead paint remediation projects.
3. Develop a memorandum of understanding (MOU) for asbestos and lead paint abatement contractual services performed for other city departments that defines the scope of work and project objectives.

Mold Remediation

1. Develop SOPs for mold identification, evaluation and mitigation.
2. Develop a memorandum of understanding (MOU) for mold remediation contractual services performed for other city departments that defines the scope of work and project objectives.

Spill Response

1. Work with the city call center to improve the spill reporting process, bi-annually review and update the spill response questionnaire, as applicable.
2. Respond to spills in a timely manner and follow-up with the party who reported the spill.
 - *Performance Indicator:* Number of incidents.
 - *Performance Indicator:* Length of time for spill response.
3. Maintain and annually update a database that tracks spill response data, including location, spill response time, type of substance, volume, impacted media and contact information of regulatory agencies involved.
4. Develop spill response SOPs and practice spill response drills.

Household Hazardous Waste Collection

1. Evaluate the feasibility of adding new services at the ECC.
2. Maintain and annually update a list of partner cities and their contracts for the Household Hazardous Waste program and mobile collection program.
3. Complete a feasibility assessment of expanding the current ECC or redeveloping for improved efficiency and customer service experience.

Petroleum Storage Tank Remediation

1. Develop and annually update a list of city facilities with PSTs.
2. Develop and annually update a prioritized list of PST projects on city-owned properties.

Asbestos Abatement Compliance

1. Develop operations and maintenance plans for all city-owned facilities that have asbestos-containing materials and potential lead paint.

Petroleum Storage Tank Compliance

1. Develop a standardized audit checklist and form to report findings for PSTs.
2. Identify the responsible department at each site with a PST and annually update contact list.
3. Implement automatic tank gauging and inventory reconciliation for USTs.

4. Develop tank integrity testing SOPs.
5. Develop and implement a UST action plan to ensure compliance with regulations and proper maintenance activities.
6. Review and update SPCC plans.

Tier II Chemical Reporting

1. Maintain and annually update a list of all city-owned facilities that store hazardous and extremely hazardous substances per EPCRA Tier II reporting thresholds.

Municipal Hazardous Waste Compliance

1. Develop a list of municipal facilities to be audited, as well as an annual audit schedule.
 - *Performance Indicator:* Number of municipal facility audits conducted annually.
2. Develop a standardized audit checklist and form to report findings for municipal facilities.
3. Provide summaries of municipal facility audit findings and make recommendations to the city department that oversees the audited facility or operations.
 - *Performance Indicator:* Number of facilities inspected and outcomes, including any follow-ups, education provided and re-inspections.
4. Research BMPs and environmental management systems (EMSs) for facility auditing and develop audit procedures for municipal facilities.
5. Develop a list of facility contacts for each municipal facility storing hazardous materials and waste.

City Staff Training and Collaboration

1. Develop and annually update a list of city-owned facilities and operations that generate, store or handle hazardous materials, and identify city staff positions that should receive targeted training.
2. Develop and maintain a training matrix quarterly that identifies the annual hazardous materials training requirements for each position and tracks training status.
 - *Performance Indicator:* Number of city staff that have completed training.

3. Provide targeted hazardous materials training to city staff and guidance on regulatory compliance.
 - *Performance Indicator:* Number of trainings given annually.
 - *Performance Indicator:* Number of staff in attendance.
4. Provide city staff members and departments with information on reducing pollution from hazardous materials.
 - *Performance Indicator:* Number of internal communications sent out annually regarding hazardous materials.
5. Identify opportunities for staff to attend conferences, summits and other activities for professional development.
 - *Performance Indicator:* List of conferences, summits and other engagements attended by city staff annually.
6. Develop an internal recognition or award program for city departments, staff, facilities and operations that maintain excellent inspection results and consistently employ BMPs.
 - *Performance Indicator:* List of award or recognition recipients annually.

Public Technical Guidance and Training

1. Develop targeted household hazardous waste messaging for individual communities and neighborhoods.
 - *Performance Indicator:* Number targeted communications sent out annually to individual communities and neighborhoods, including print material distributed and messaging delivered through digital communications channels, the message topics and dates distributed.

Public Education and Outreach

1. Develop traditional and social media campaigns to encourage residents to properly dispose of household hazardous waste.
 - *Performance Indicator:* Number of traditional and social media communications for household hazardous waste distributed annually, the message topics and dates distributed.

2. Update and annually maintain the Household Hazardous Waste website.
3. Annually review and update, as applicable, the Captain Crud campaign.

Community Partnerships and Volunteerism

1. Maintain and annually update a contact list of emergency response partners.
2. Work with the local Emergency Planning Committee, OEM and emergency personnel to prepare for potential emergency incidents.

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CHAPTER 6

Litter Control

Eliminating litter and illegal dumping throughout our community

GOALS

- Increase public awareness of litter issues and encourage behavioral changes to prevent litter.
- Support volunteer efforts to reduce litter.
- Improve the appearance of the city through the removal of litter and illegal dumps.
- Achieve city ordinance compliance through education, investigations and enforcement.
- Provide technical guidance, outreach and education to develop a culture against litter and illegal dumping.



LITTER CONTROL AT-A-GLANCE

Litter Planning & Management Program Area

Litter is a pervasive and unsightly problem that is costly to clean, impacts neighborhood aesthetics, lowers property values, pollutes our environment and poses a threat to wildlife. The city performs research to determine the most common types of litter, as well as the primary sources of litter. While litter can be found throughout Fort Worth, some areas tend to be more



PHOTO BY CITY OF FORT WORTH

heavily littered than others, such as major roadways and urban lakes. It is also essential to understand the behaviors that lead to littering and illegal dumping. The city uses this research to develop litter reduction plans that outline projects and implement effective Litter Control programs aimed at preventing and reducing the occurrence of litter and illegal dumps. The city also tests and deploys technologies to collect data and help catch offenders in the act. Ultimately, the city aims to create the long-term, positive behavioral changes in our community needed to establish Fort Worth as a litter-free city.

KEY ACTIVITIES

- Litter Analysis
- Litter Reduction Planning
- Litter Rules & Regulations
- Litter Control Projects & Technologies

Litter Prevention & Abatement Program Area

The best way to reduce litter is to ensure items are disposed of properly. The city uses information from litter research to develop prevention programs that target frequently littered items and common sources of litter. Residents are encouraged to utilize resources offered by the city to dispose of items that are at risk of being dumped, such as tires and bulk waste. When prevention efforts fail, the city employs several strategies to abate litter. City staff remove litter and illegal dumps from the community, perform street sweeping operations and clean litter before mowing. The city manages contracts for litter removal along heavily littered corridors and waterways and requires mowing contractors to remove litter before mowing. Residents and volunteers do their part by participating in citywide litter cleanup events and beautification projects. They also lead their own cleanups throughout the year, and some adopt sites for regular cleanup and maintenance activities.

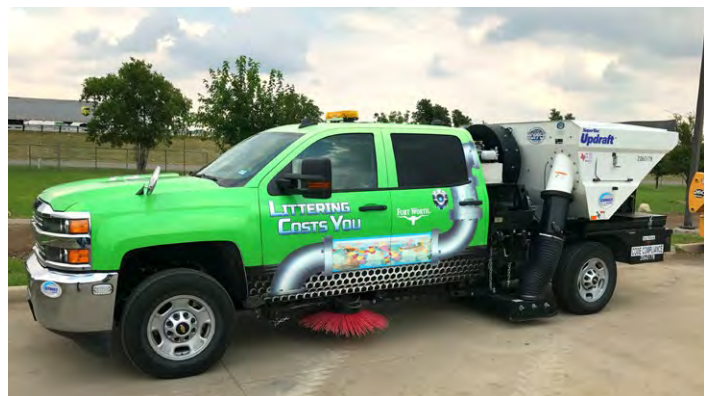


PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- Litter Prevention
- City Litter Abatement
- Contractual Litter Abatement
- Volunteer Litter Abatement

PROGRAM AREAS

- Litter Planning & Management
- Litter Prevention & Abatement

- Litter Compliance & Enforcement
- Litter Communication & Collaboration

Litter Compliance & Enforcement Program Area



PHOTO BY CITY OF FORT WORTH

The city's Litter Control programs are designed to encourage businesses and residents to comply with litter laws through incentives and recognition, with enforcement used as a last resort. City staff work with local businesses to reduce litter on their properties

through prevention and cleanup. Residents are reminded to set waste and recycling out properly to prevent litter, and to keep their yards litter-free. Code enforcement officers respond to nuisance litter complaints on private property, and Solid Waste Division staff investigate illegal dumps and work with the police to prosecute offenders. While it is preferable to engage the public to address litter issues proactively, police officers can issue citations to anyone they witness littering or dumping within Fort Worth.

KEY ACTIVITIES

- Commercial Litter
- Residential Litter
- Litter from Other Sources
- Litter Enforcement

Litter Communication & Collaboration Program Area

Addressing litter in Fort Worth takes the effort of city staff across many departments, in collaboration with community groups, businesses and residents. Environmental staff work with other city departments and communications personnel to develop outreach messages, inform the public of upcoming events and provide education to the community. The city

coordinates anti-litter campaigns and major events with the support of Keep America Beautiful (KAB), Keep Texas Beautiful (KTB), the Tarrant Regional Water District (TRWD) and other partners to maximize the reach and impact. Volunteers play an essential role in Litter Control programs. The city recognizes the need to engage youth in litter cleanups, mural paintings and other positive activities to create lasting change in the community. Staff supporting the city's Keep Fort Worth Beautiful (KFWB) program work closely with neighborhood groups, schools, community groups and businesses to encourage recycling and beautification efforts.



PHOTO BY CITY OF FORT WORTH

KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism



Why do we need Litter Control in our community?

Litter Control programs improve overall environmental quality, community appeal, safety and property values.

TO PROMOTE HUMAN HEALTH AND PUBLIC SAFETY.



Limits pollution of our water and land resources



Decreases risk of fire, personal injury and spread of disease in our neighborhoods

TO CREATE AND MAINTAIN A CLEAN, ATTRACTIVE CITY.



Reduces littered areas and blight in our neighborhoods



Fosters pride in our communities

TO PROMOTE QUALITY OF LIFE AND A SUSTAINED ECONOMY.



Increases tourism and improves property values through enhanced aesthetics and safety



Reduces public costs for controlling litter-based pollution and cleanups

Executive Summary

Fort Worth is home to more than 850,000 residents, and thousands more commute to the city each day for work, recreation and education (Reference 6-1). Additionally, the city attracts over one and a half million tourists each year. While vital to the economic health of the city, some of these commuters and visitors contribute to the litter problem by tossing trash from their motor vehicles or dropping garbage on the sidewalk as they walk to work. Our own residents and businesses also litter and dump items, although not always intentionally. To adequately address this pervasive issue, the city seeks to better understand the common sources of litter and the types of social dynamics and behaviors that lead to littering. Litter is considered one of the most important environmental concerns facing Fort Worth (Reference 6-2), and the city plays a crucial role in preventing and mitigating litter and illegal dumping within its jurisdiction. Litter is not only prevalent throughout the city, it is also persistent – an area can be cleaned only to become littered again within days. As such, the city’s Litter Control programs span multiple departments and involve many community partners. The Code Environmental Quality Division is charged with planning and coordinating these efforts and serving as a centralized repository for Litter Control program information and data. Environmental staff oversee many of the litter programs the city currently implements, and are actively developing initiatives to optimize strategic litter management. These include programs administered through the city’s KAB and KTB affiliate, KFWB, as well as other Litter Control programs through the city and its partners.

The KFWB mission is to educate and engage Fort Worth residents and businesses to take responsibility for improving their community environment. The program:

- Engages over 10,000 volunteers who collectively pick up over 100,000 pounds of trash annually at citywide and neighborhood litter cleanup events.
- Is consistently recognized as a President’s Circle affiliate with KAB and a gold-star affiliate with KTB. These are the highest levels an affiliate can achieve with each of these organizations.
- Won the Governor’s Community Achievement Award (GCAA) several times in the past two decades and the KAB Affiliate of the Year Award in 2017.

The city manages litter and beautification programs that:

- Have adopted out over 100 sites in Fort Worth to community groups who volunteer over 10,000 hours annually on regular litter cleanups and beautification projects.
- Abated nearly 700 illegal dump sites each month in fiscal year 2018.
- Remove graffiti from over 4,500 sites every year with the help of hundreds of volunteers and partner organizations.
- Contribute to the regional Reverse Litter Ten on Tuesday campaign that has garnered over 25,000 pledges from individuals to pick up ten pieces of litter every week.



Figure 6-1. Volunteers from the Como Senior Center pick up litter, photo by City of Fort Worth.

6.1 Key Terms

BMPs – Best Management Practices
Code – Code Compliance Department
ECC – Environmental Collection Center
EIU – Environmental Investigations Unit
EPA – Environmental Protection Agency
EPF – Environmental Protection Fund
FWISD – Fort Worth Independent School District
GCAA – Governor’s Community Achievement Award
GIS – Geographic Information System
HHW – Household Hazardous Waste
KAB – Keep America Beautiful
KFWB – Keep Fort Worth Beautiful
KTB – Keep Texas Beautiful
MS4 – Municipal Separate Storm Sewer System
NGO – Non-Governmental Organization
NPO – Nonprofit Organization
OGC – Open Channels Group
PARD – Park & Recreation Department
PID – Public Improvement District
PNS – Presbyterian Night Shelter (of Tarrant County)
TRWD – Tarrant Regional Water District
TxDOT – Texas Department of Transportation

6.2 Introduction to Litter Control

Litter control programs directly support the city’s commitment to create a clean and welcoming environment for all those who live, work and play in Fort Worth. For many years, various departments and divisions within the city, as well as external organizations, have made individual efforts to address litter. The city is working to align, integrate and build upon these existing efforts, and create new Litter Control programs. The city utilizes interdisciplinary and multi-faceted programs aimed at significantly reducing litter in Fort Worth. This chapter also outlines the roles of environmental staff, along with partners in other departments, divisions and external agencies, who are responsible for managing these programs. Litter control programs are grouped into four main program areas (PAs): Planning & Management, Prevention & Abatement, Compliance & Enforcement and Communication & Collaboration. The city is drawing on previous research and planning efforts around litter to combine resources and leverage data-driven solutions to litter management. This includes litter prevention initiatives, which address human behavior and the social aspects of littering, along with the proper management of materials with the potential to become litter.

City staff work diligently to remove litter already on the ground, but engaging volunteers and neighborhood organizations in cleanup efforts is essential to changing perceptions and creating a litter-free community. State law and the city’s litter ordinance provide the basis for enforcing litter programs. Departments must work closely with one another to ensure compliance



Figure 6-2. A city employee pulls an old can out of Echo Lake during the annual Neighborhood Litter Stomp, a citywide litter cleanup event, photo by City of Fort Worth.

with these regulations and establish Fort Worth as a community that does not tolerate litter and illegal dumping. This message is reinforced through training, education and outreach, including awareness campaigns and collaborations with schools and community leaders to foster anti-littering behavior. The Litter Control programs described in this chapter create a holistic approach to litter management that brings litter awareness to the public, prevents littering, improves litter abatement and supports enforcement of litter regulations.

6.2.1 Program Areas (PAs)

6.2.1.1 PA 1: Litter Planning & Management

Litter can be found throughout Fort Worth and is costly to remove. Research has shown that littered and blighted areas continue to attract more litter and illegal dumping. It is a complex problem rooted in cultural norms and learned behavior. The city has invested in studies to better understand the local causes and sources of litter, and collects data on its Litter Control programs. This information was initially compiled into the Draft Comprehensive Litter Management Plan in 2017, and this chapter expands on the programs and initiatives outlined in that draft. These include evaluation of current litter rules and regulations, as well as technologies utilized to prevent and reduce litter. More detailed data collection on all aspects of Litter Control programs and advanced analysis will also help staff create more effective planning and management strategies.

6.2.1.1.1 KEY ACTIVITIES

- Litter Analysis
- Litter Reduction Planning
- Litter Rules & Regulations
- Litter Control Projects & Technologies

6.2.1.2 Litter Prevention & Abatement

Many of the city's litter prevention initiatives focus on materials management and commonly littered items, as well as providing locations for residents and visitors to properly dispose of these items. These prevention methods include everything from providing public trash and recycling receptacles to offering household

hazardous waste (HHW) and electronics disposal at drop-off locations throughout Fort Worth. City staff perform street sweeping operations and abate litter and illegal dump sites. These initiatives also help prevent litter and illegal dumping, because people are less likely to litter or dump in clean areas. The city also works with contractors to remove litter before mowing and contracts with nonprofit organizations (NPOs) for litter removal. Volunteers are the greatest allies the city has in the fight against litter. Residents, employees from local businesses and students clean more litter every year than the city could possibly remove on its own.

6.2.1.2.1 KEY ACTIVITIES

- Litter Prevention
- City Litter Abatement
- Contractual Litter Abatement
- Volunteer Litter Abatement



Figure 6-3. Volunteers display the litter and dumped items collected at Eugene McCray Park, photo by City of Fort Worth.

6.2.1.3 Litter Compliance & Enforcement

Code staff in the Consumer Health, Code Enforcement and Solid Waste Divisions work together on litter and illegal dumping compliance. City staff address debris and waste violations, and try to work with property owners before writing citations and carrying out enforcement activities. When enforcement is necessary, such as in cases of illegal dumping, staff work with local law enforcement and the Tarrant County District Attorney's Office, as well as any witnesses to the violations to identify the responsible party and recoup cleanup costs. As part of this Plan, environmental staff will review compliance and enforcement procedures, and suggest needed

changes. They will work with municipal courts to develop a handbook to help legal personnel understand environmental issues associated with litter and illegal dumping. Staff will also recommend potential citation alternatives, such as community service, to deter littering and illegal dumping.

6.2.1.3.1 KEY ACTIVITIES

- Commercial Litter
- Residential Litter
- Litter from Other Sources
- Litter Enforcement

6.2.1.4 Litter Communications & Collaboration

The city uses a variety of methods to share anti-litter messages, and educate staff and the community on the economic, social and environmental problems associated with litter and the actions they can take to be part of the solution. Staff in the Environmental Quality and Solid Waste divisions of Code offer training to other city staff and community members on a range of topics, including litter programs, composting



Figure 6-4. KFWB attends the volunteer celebration for the Trinity Trash Bash, a city partner cleanup event, photo by City of Fort Worth.

and volunteering with the city. Division staff give presentations and bring together businesses and community stakeholders to engage them in litter prevention and cleanup activities that benefit Fort Worth. The Code Communications Team uses various media outlets and works with our local and national partners to target messages for different audiences and deliver clear, consistent messaging. The city also collaborates with neighborhood associations, faith groups, schools and other organizations to promote Litter Control programs and volunteerism.

6.2.1.4.1 KEY ACTIVITIES

- City Staff Training & Collaboration
- Public Technical Guidance
- Public Education & Outreach
- Community Partnerships & Volunteerism

6.3 Structure & Funding for Litter Control Activities

Currently, Litter Control programs are managed by staff from other sections within the Environmental Quality Division, primarily the Administrative Section, but no staff are dedicated full time to litter administration. Overall, the city's litter programs are managed by staff working collaboratively with other departments, as well as external partners, including neighborhood associations, businesses, local schools and NPOs/non-governmental organizations (NGOs), on prevention and abatement activities. City staff in the Code Compliance and Police departments, as well as the Tarrant County District Attorney's Office assist in ensuring compliance with litter ordinances and enforcing violations. There are also city staff in other departments who manage beautification programs and support proper waste management, which helps prevent litter. Litter control programs managed by Division staff are funded by the environmental protection fund (EPF), and funding for beautification initiatives including graffiti abatement, mural painting and other activities come from the departments that manage them.

KFWB is a government affiliate of KAB and KTB housed within the Division, and does not have 501(c)(3) NPO status. It is supported by the KFWB coordinator, who is also the Division's environmental planner, and an administrative technician, as well as an external

15-member volunteer board. KFWB duties represent about half of the full-time workload of the KFWB coordinator and administrative technician. KFWB programs are also supported by city staff across multiple departments who serve as advisors to the board and administer litter, beautification and recycling programs. Litter Control programs, including KFWB, are supported through the Solid Waste Fund and the EPF. Occasionally, special projects or programs are funded through grants and awards, such as the GCAA. While KFWB programs receive donations and in-kind services, these amounts have historically been small compared with the overall operating budget.

Table 6-1. Keep Fort Worth Beautiful annual workload

TASK	HOURS PER YEAR
Cowtown Great American Cleanup	200
Neighborhood Litter Stomp	95
Board Retreat	20
Data Management	26
Annual Reporting and Award Applications	64
Training and Conferences	96
Supply Order	40
KFWB Governance	20
Litter-Free Lots Program	24
School Green Teams	50
Litter Free School Zones	58
Summer Community Center Litter Free Program	16
Trash Free Texas	34
Website Updates	56
Communications Plan	56
Outreach	162
Social Media	72
Training	72
Volunteer Coordination	156
TOTAL HOURS PER YEAR	1,317

6.4 Challenges to Litter Control

Litter and illegal dumping are costly problems. The City of Fort Worth spends more than \$3 million annually to clean up litter and illegal dumps (Reference 6-3). The city and its partners spend a combined total of over \$8 million per year on all litter-related programs, including education and outreach efforts (Reference 6-3). Litter is found throughout Fort Worth, although some areas experience higher frequencies and amounts of littering than others, including major roadways,

commercial corridors and waterways, especially after heavy rain. There is seasonal variability to litter – parks often experience heavy litter on major holidays, such as the Fourth of July. Some items are littered more frequently than others, including straws, plastic utensils and fast food containers. There has been an increase in littered cardboard, polystyrene foam and other packing materials in recent years, as more people shop online and have items delivered. Division staff must consider these challenges as they evaluate current litter control practices and propose new initiatives to reduce the costs associated with litter management.



Figure 6-5. Volunteers clean litter out of the Trinity River during the Cowtown Great American Cleanup, KFWB's largest annual cleanup event. Litter often accumulates in areas near major roads and gets washed into nearby waterways, photo by City of Fort Worth.

6.4.1 Microplastics, Cigarette Butts and Other Small Litter

Microplastics are the very tiny (smaller than 0.04 inch) pieces of plastic that come from decomposing plastic products and products that used to be manufactured with them, such as face wash and toothpaste (Reference 6-4). Since most litter eventually finds its way into waterways and the oceans, that is where much of these microplastics are found. In samples collected from tributaries of the Great Lakes by the U.S. Geological Survey and State University of New York Fredonia, more than 70 percent of the microplastics found were fibers from synthetic textiles, cigarette

butts, nets, etc. (Reference 6-4). Other sources included fragments of plastic bottles, foam, film from plastic bags and beads from cosmetics, which were banned by the Microbead-Free Waters Act of 2015 that went into effect in 2018 (Reference 6-4). Microplastics are extremely difficult to remove from the environment, due to their size. They persist for a long time, releasing harmful chemicals and working their way up the food chain. It is critical to prevent litter and remove larger pieces of litter from the environment before they break down. Even small pieces of litter that are not microplastics are difficult to remove, as they are often hard to see and time consuming to clean. This includes cigarette butts, fragments of plastic bottles that have been run over by vehicles or mowers, bottles caps and other small litter. Cigarette butts are of great concern, because they contain dangerous chemicals and are often littered in areas where they are easily washed into storm drains. They also pose a fire hazard, especially during periods of high heat and drought. Environmental staff must consider the challenges surrounding microplastics and other small litter as they evaluate current litter control practices and propose new initiatives to reduce the costs associated with litter management.

6.4.2 Controlling Litter at the Source

Trash does not become litter on its own – it becomes litter when people do not dispose of it or manage it properly. Addressing litter at its source through prevention and reduction initiatives greatly reduces the amount of staff time and equipment needed for abatement activities. Some of the largest generators of litter include (Reference 6-5):

1. Pedestrians or cyclists who do not use receptacles
2. Motorists who do not use car ashtrays or litter bags
3. Business dumpsters that are not screened from public view or properly covered
4. Loading docks and commercial or recreational marinas with inadequate waste receptacles
5. Construction and demolition sites without tarps or receptacles to contain debris and waste
6. Trucks with uncovered loads on local roads and highways
7. Household trash scattered before or during collection

Some of these challenges are related to people's habits and the behavior they deem acceptable, as well perceived convenience, discussed in more detail below. Researching best management practices (BMPs) and effective strategies for litter prevention is essential for program success.

6.4.3 Changing Public Perception & Behavior

Litter begets more litter. People use a variety of cues from their surrounding environment to determine the commonly accepted behavior for a city, neighborhood or block. The presence of litter or illegal dumping in an area communicates to anyone nearby that the social norm is to litter or dump items (Reference 6-6). Individuals are substantially more likely to litter in blighted or already littered environments than in clean ones. Additionally, once an area is used for illegal dumping for a period of time, people tend to continue to dump at that site, even if it is cleaned. This means that once litter or illegal dumping is established in an area, it is very difficult to change the public's perception of that space. It takes considerable time and effort to repeatedly address the issue until the social norm changes, and an area is recognized as a litter-free environment. Often, people do not understand the personal impact litter has on them or their community, and they become apathetic to the problem. Consistent and ongoing community cleanup activities and beautification efforts that foster community pride are necessary to reducing the rate of littering and changing behavior.



Figure 6-6. A chronically littered area. The city has made a concerted effort to continually clean this site since this photo was taken to try to change behavior in the area, photo courtesy of Eric Kelp.



Figure 6-7. An illegal dump site with bulk items and potentially hazardous waste, photo by City of Fort Worth.

6.4.4 Receptacle Placement & Maintenance

The placement of trash and recycling bins and cigarette butt receptacles directly impacts the rate of littering, as many people will not cross the street or take extra steps to dispose of items properly. If there are not enough bins available in an area, the ones that are there tend to fill quickly and overflow, creating a situation where items blow away in the wind or wash away in the rain, and people leave items near the bins instead of seeking out another disposal location. While it may seem like the answer to this problem is to significantly increase the number of receptacles in public spaces, this would require additional crews to empty and maintain them. It may be more effective to employ education campaigns to encourage people not to litter or increase enforcement of litter laws. The city must evaluate these options and balance the cost of additional bins and containers, as well as the cost to hire additional staff, with that of education campaigns and abatement activities.

6.4.5 Illegal Dumping

Illegal dumping costs the city over \$1 million annually, and the number of dump sites abated each year is increasing. This may be due to increased dumping or increased diligence of city staff in finding, reporting and cleaning these sites. Catching culprits in the act of dumping is difficult, requiring an investigative

team to work with law enforcement in catching and prosecuting individuals after the fact. Illegal dumping also poses great risks to human health and safety, as well as the environment. Common sources of illegal dumping include contractors, auto body and tire shops and other commercial operations that produce large-scale and/or hazardous waste. There are increased costs and fees associated with properly disposing of these items, so some individuals and businesses avoid these costs by dumping items illegally, risking penalties and fines. Hazardous waste, including household chemicals like paint, oil and antifreeze, are commonly poured down drains or dumped because residents are unsure what to do with them. These items harm the city's water infrastructure or leach into soils and waterways where they pose a threat to drinking water, human health and local ecosystems. Sometimes illegal dumping is unintentional, such as when a person uses a dumpster that does not belong to them. Many people do not realize that this is still illegal dumping, because they cause the owner of the dumpster to have to pay for increased trash service and maintenance.

6.4.6 Aquatic Trash & Floatables

The Texas Commission on Environmental Quality issued the city's Texas Pollutant Discharge Elimination System permit renewal on March 8, 2018 (Reference 6-7). This permit authorizes discharges from the city's Municipal Separate Storm Sewer System (MS4;



Figure 6-8. The TRWD litter boom and trash collectors across from the Clear Fork pump station, photo by City of Fort Worth.

see Chapter 4 for details). The permit requires the city to address litter that may enter the MS4 or local waterways, as well as floatables in surface waters:

2. a. ii. *Floatables. The permittees shall continue to implement a program to reduce the discharge of floatables (for example, litter and other human generated solid refuse) into the MS4. The permittees shall include source controls at a minimum and structural controls and other appropriate controls where necessary (Reference 6-7).*

Storm drains lead to the nearest body of water, and about 18 percent of litter, usually traveling through the MS4, ends up in local streams, rivers and waterways. The TRWD maintains two floatable (i.e., floating aquatic trash) collection sites on the Clear Fork branch of the Trinity River to remove litter and debris from the water in compliance with the MS4 permit. While additional collection devices can be added to waterways, other trash found below the surface of the water and along the bottom of our rivers and lakes is not as easy to remove.

6.5 Strategies for Litter Control by Program Area

6.5.1 Strategies for PA 1: Litter Planning & Management

Litter is pervasive and persistent throughout Fort Worth, despite the negative public perception of litter and the city's efforts to reduce it. In 2016, the TRWD commissioned Open Channels Group (OCG) to conduct a survey of North Central Texas residents regarding their perceptions of litter (Reference 6-8).

- 70% of survey participants reported observing litter on a very frequent basis.
- 80% felt their city should do more to keep general public areas clean.
- 52% of residents admitted to littering in the past year.

Litter is often seen as a simple problem to solve; however, this study highlights some of the complex and seemingly contradictory perceptions and behaviors that result in littering. Many people believe, incorrectly, that someone will come behind them to collect any trash they throw on the ground, when in actuality, most of this trash ends up in local waterways. By performing additional studies similar to the OCG

survey and other types of research into litter and the behaviors that drive it, the city can provide effective solutions to the problem. Continued and improved data collection will also allow the city to perform the type of detailed analysis required to understand the full scope of the issue and develop strategic plans to address the root causes of littering.

6.5.1.1 Litter Analysis

Numerous studies over the last 40 years have shown that environments that are already littered tend to attract more litter and illegal dumping. These studies show that communities with beautification programs typically have lower rates of littering, and support the use of ongoing cleanups, beautification activities and assessing receptacle location and appearance as litter prevention strategies. Historically, KFWB programs have focused on littering and recycling, with less emphasis on beautification projects. Division staff should coordinate with other departments on city programs, such as the Cowtown Brushup, as well as organizations within the community to develop new beautification programs. These may include tree plantings, community gardens, public art, street sign toppers and other projects that foster community pride. Another established research finding is that littering rates decrease as the convenience of using a proper receptacle increases (i.e., people will throw garbage into a bin if it is nearby). Furthermore, the appearance of a receptacle can also decrease litter rates, and a brightly colored or decorated receptacle attracts considerably more use than does a plain or



Figure 6-9. Beautification activities, such as this mural painting, help to reduce instances of littering, photo by City of Fort Worth.

ordinary receptacle. Staff should research programs in other cities and develop a list of potential pilot projects to increase bin utilization, including targeting bin locations, gamification, voting with trash and wrapping bins with different designs.

A review of these litter studies also found that the most frequently littered items are (Reference 6-6):

1. Cigarette butts
2. Takeout food packaging
3. Snack wrappers
4. Miscellaneous paper
5. Miscellaneous plastic
6. Vehicle debris
7. Beverage containers
8. Napkins, bags, and tissues
9. Miscellaneous metal and glass
10. Other beverage-related litter
11. Construction debris

These studies suggest that the city should consider targeting specific items for anti-litter messaging. The city can utilize data on the types of litter collected locally from litter abatement programs to prioritize development of campaigns around commonly littered items. Staff will research successful campaigns in other cities to develop messaging and outreach strategies.

KFWB conducts an annual Community Appearance Index (CAI) for KAB reporting, which looks at the occurrence of litter, graffiti, abandoned vehicles and other indices of blight, in eight different areas of the city. The CAI measures progress in these areas and helps staff understand major issues that need to be addressed. Staff can review past indices and use the results of the CAI to prioritize areas and activities for future planning. KFWB also tracks the results of litter cleanups throughout the year, including the geographical location, the types of litter found and the amounts collected. These cleanup results should be analyzed to determine not only where volunteers are collecting the most litter, but the areas with little to no volunteer cleanup activities. The city call center tracks reports of litter and illegal dumping, which can be used to identify hot spots throughout the city. Staff will utilize geographic information systems (GIS) to

map location data from litter cleanups and the city call center to identify areas of the city that are highly littered and/or underserved by volunteer efforts. All of this data should be utilized to prioritize cleanup projects and direct city staff and volunteers to areas of greatest need.

6.5.1.2 Litter Reduction Planning

In 2017, environmental staff developed a Draft Comprehensive Litter Management Plan, which outlined over 25 litter initiatives, including existing programs, pilot programs and those that needed to be developed. The programs and actions described in that draft became the foundation for this chapter, which aims to transition the public from litter awareness to engagement, increase litter prevention and develop advance reduction strategies. Continual litter planning efforts will include action plans for pilot programs and the implementation of new projects and technologies, along with timelines to manage priority programs and projects. Division staff will work closely with Planning & Development to incorporate litter control measures into community plans through creative design elements, public bins and other methods. The city should also explore whether to require litter abatement and control activities in public improvement districts (PIDs) and developments utilizing tax increment financing. Division staff will also work with external agencies, such as the Chambers of Commerce and PIDs to develop litter control plans for specific locations and specific business types. The Downtown Fort Worth, Inc. PID can be used as a model for litter control strategies, as this area is widely recognized to be very clean due to the efforts of the litter abatement and street sweeping crews employed by the PID.

Many of the city's litter programs are administered through KFWB, which manages litter awareness programs, organizes litter cleanup events, provides support and supplies for community cleanups and engages volunteers. A strategic, long-term plan for KFWB management and governance should be developed to grow the volunteer base and support an active board. This should include a board handbook



Figure 6-10. Keep Fort Worth Beautiful is an affiliate of Keep America Beautiful and Keep Texas Beautiful.

and required regular reviews of the KFWB coordinator and board, as well as periodic updates of governing documents, such as bylaws. Historically, volunteers have been recruited for large events, but have not been contacted and engaged on a regular basis. The board has also not been involved in the daily activities of the organization, partly because KFWB is a government affiliate, rather than a NPO. The city may consider whether an alternative structure would be beneficial to KFWB programs.

6.5.1.3 Litter Rules & Regulations

Current litter enforcement activities are governed by state laws and local ordinances. The Texas Health and Safety Code §365.012 establishes littering as illegal within the state and establishes penalties, including fines and jail time, based on the weight and type of litter (Reference 6-9). In 2017, the law was amended to require community service picking up litter, as well as fines, in certain situations. In addition, Fort Worth has several ordinances in place to enforce litter issues (Reference 6-10):

- (Ord. 14676, § 1, passed 6-26-2001) § 11A-27 LITTERING PROHIBITED states that anyone who allows litter to be deposited on a property is committing an offense.
- (Ord. 14676, § 1, passed 6-26-2001; Ord. 17522, § 5, passed 4-24-2007) § 11A-28 DUTY TO MAINTAIN PROPERTY FREE FROM LITTER states that it is an offense if an owner or occupant fails to keep a litter-free property, and that construction sites must also remain litter-free with all debris properly contained.
- (Ord. 12931, § 1, passed 3-25-1997) § 11A-26 STORAGE OF DISCARDED, USED AND BROKEN ITEMS states that a person commits an offense if they allow the accumulation of discarded and broken items on a property, including items on rooftops and porches if they are visible from a public right-of-way or neighboring property.
- (Ord. 19255-08-2010, § 1, passed 8-3-2010) § 20-443 PENALTIES sets the penalties for litter offenses, including fines up to \$2,000 for violations involving fire safety, zoning, public health or dumping and up to \$500 for other violations, and establishes that a person is guilty of a separate offense each day they are in violation of the ordinance.

Environmental staff will conduct a thorough assessment of these ordinances and a review of the litter policies and ordinances of other cities, including penalties and enforcement tools. Staff should evaluate the penalties outlined in Fort Worth's ordinances to determine whether they are adequate to deter littering and illegal dumping. Emphasis should be placed on penalties and enforcement strategies that include community service requirements to pick up litter. Upon completion of the review, Division staff will work with partners in the city to amend Fort Worth's existing ordinances or draft new ones, as necessary.

6.5.1.4 Litter Control Projects & Technologies

Analysis and planning will be used to determine prioritize Litter Control projects, such as those in the Capital Improvement Plan (CIP) and smaller-scale projects in targeted neighborhoods throughout the city. Environmental staff should also evaluate litter control technologies and cleanup tools. This includes everything from litter collection systems on waterways to advanced containers and receptacles that automatically track waste collection data to something as simple as utilizing nets and rakes in waterway cleanups. Technologies and tools should be evaluated for up-front costs, ease of deployment, operation and maintenance requirements and overall return on investment.

6.5.1.4.1 DATA COLLECTION & SOFTWARE

Some of the more pressing needs in Litter Control programs are associated with data collection and reporting. Data collection is essential in evaluating the efficacy of litter programs and monitoring progress toward goals and targets. Increased data collection and ensuring data accuracy are essential to proper reporting, as well as evaluating programs and determining where resources should be allocated. KFWB has additional reporting requirements as an affiliate of KAB and KTB that requires collecting data from volunteers on their litter cleanup efforts, as well as multiple city departments, including Park & Recreation (PAR), police, the Community Engagement Office and the Code Solid Waste Division. Environmental staff have explored the use of different software tools to collect these data, manage volunteers on a day-to-day basis and set up registration for citywide litter cleanup events. This includes creating web-based forms to replace paper forms for more streamlined and efficient data collection, as well as integrating cleanup information into a GIS-based web

tool for better data visualization. There is also a need for external communication tools, because KFWB board members do not have access to internal city systems and files. Staff have piloted different platforms for sharing information and documents with board members, and will continue to evaluate options.

6.5.1.4.2 TARGETED LOCATION PROJECTS

Staff will utilize mapping data to strategically target neighborhoods with high rates of litter and illegal dumping for litter control projects. The city has had success prioritizing specific communities for code enforcement activities, including litter and illegal dumping abatement and outreach activities. Staff from several divisions of Code Compliance, including Solid Waste, Code Enforcement and the Environmental Division, along with other city departments, devoted substantial resources to these neighborhoods for an extended period of time. The city performed substandard building demolitions, removed illegal dump sites, coordinated with the contracted waste hauler to collect items with the potential to be dumped and worked with community members to reduce instances of code violations. These efforts achieved a visible reduction in litter and improvements in other appearance indices, and residents have expressed increased pride in their neighborhoods and become more involved in their communities. Staff should assess these efforts for best practices and continue to develop successful strategies for future projects, including incorporating more litter awareness outreach and volunteer cleanup events.

6.5.1.4.3 TRASH BIN INVENTORY

Environmental staff are working with other city departments on a project to develop a comprehensive mapping inventory using GIS for public trash containers placed at various locations throughout the city. These include bins in the downtown core managed by Downtown Fort Worth, Inc., receptacles in parks maintained by PARD and bins on university campuses. The map will be placed on the city website as an interactive tool that residents and visitors can use to find convenient bins when planning activities in parks and other public area. Environmental staff will work with project partners to identify additional data needs,



Figure 6-11. When the city took ownership of Echo Lake Park, some of the trash bins were in bad shape. Using the inventory, the city can set a replacement schedule for bins to ensure this does not happen in the future, photo by City of Fort Worth.

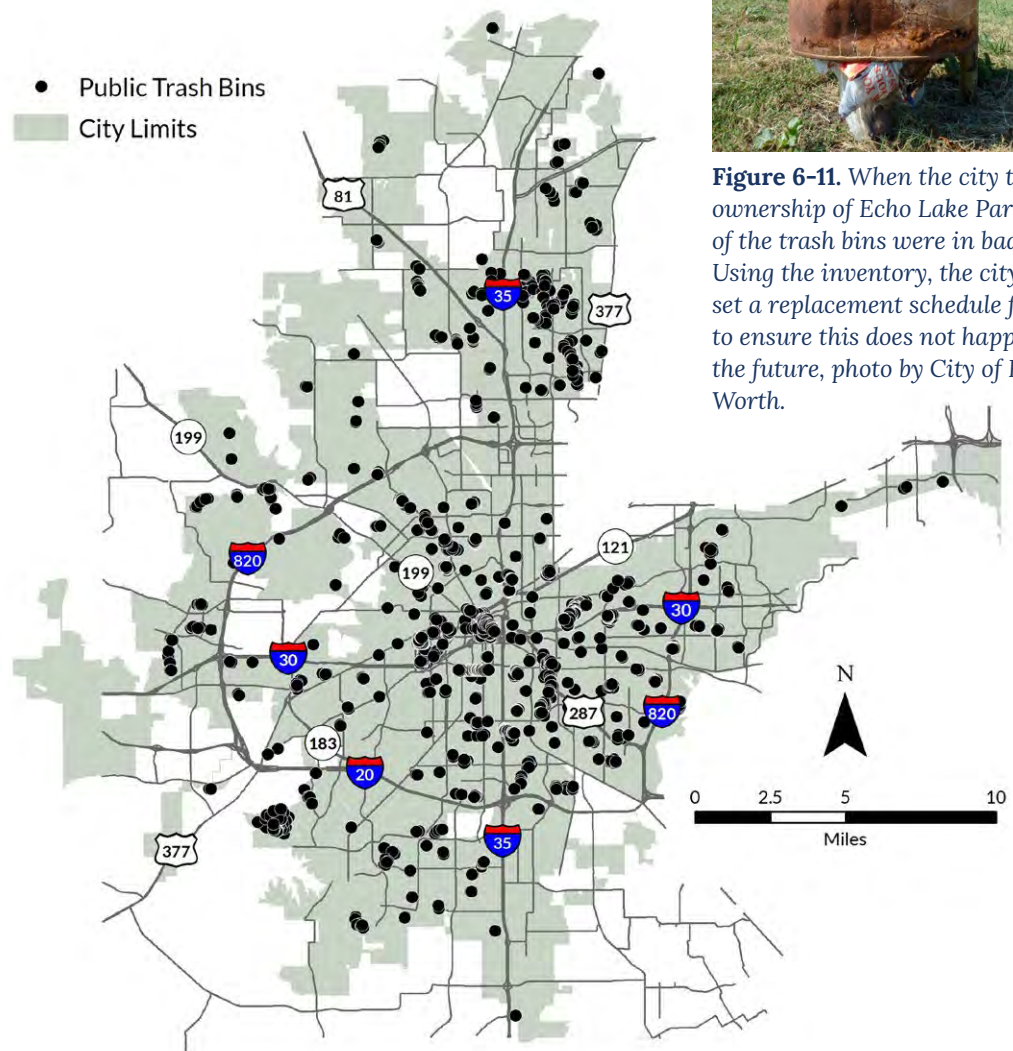


Figure 6-12. Map of public trash bins, 2019.

such as developing a replacement schedule for existing bins, the frequency of container service and the volume and weight of waste collected. This information could be used on pilot projects to determine how bin placement and aesthetics impact waste collection. Eventually, other container types can be added to the database, such as cigarette butt receptacles. Data analysis can also help determine where additional bins should be placed, which will assist staff in reducing litter and maintaining a cleaner city.

6.5.1.4.4 ILLEGAL DUMP CAMERAS

Since 2013, trash removed from illegal dump sites in Fort Worth has increased by 50 percent, and in 2018, approximately 2,900 tons of trash and debris were collected. This could be the result of increased vigilance of dump site reporting and abatement, an increase in dumping activities or a combination of the two. To combat this issue, the Code Environmental Investigation Unit (EIU) has installed more than 70 cameras at known dump sites for the surveillance of perpetrators of illegal dumping. The EIU uses camera evidence to find violators and issue citations. The evidence is shared with the Fort Worth Police Department. The city invested around \$500,000 for the new technology with the idea that some or all of this cost can be recovered by forcing perpetrators to pay for abatement activities and preventing further dumping. The cameras have proved to be useful tools in helping the EIU officers identify the dumping violators, and is slowly leading to an increase in citations. City staff will continue to evaluate the success of these cameras and their impact on chronic dumping. Staff will also explore whether to



Figure 6-13. It is difficult to deter illegal dumping once it has occurred in an area. The city is considering a technological options like cameras to catch perpetrators, photo by City of Fort Worth.



Figure 6-14. This TRWD trash basket traps debris and allows water to pass through, photo by City of Fort Worth.

expand the camera program and hire additional staff to monitor the network.

6.5.1.4.5 FLOATABLES MANAGEMENT

TRWD maintains floatable collection devices that remove litter and debris from the water at two separate locations on the Clear Fork branch of the Trinity River. Collectors were installed across from the Clear Fork Pump Station under Rosedale Street. These devices employ a litter boom to direct floatable debris toward the collection units. A trash basket collector was installed at a major outfall to catch floatables where water entering the main channel of the Clear Fork must pass through. These trash collectors are included in the TRWD routine floodway maintenance program. After a ½-inch rain event, the trash collectors are visually inspected for capacity and damage. The cleaning schedule for the trash rack is dictated by the frequency of storms. Additionally, low water dams naturally collect debris and litter, which is then removed (Reference 6-11). Environmental staff are working with TRWD to identify locations of additional outfalls and low-head dams along the Trinity River and determine the areas with the greatest trash accumulation (details in Chapter 4). Furthermore, city staff will work with TRWD to develop additional BMPs to manage trash accumulations and collect data on the amount of trash removed from surface waters.

6.5.1.5 Development Actions for PA 1: Litter Planning & Management

Litter Analysis

1. Research successful components of beautification programs, as well as KAB and KTB beautification programs.

2. Research BMPs for bin placement and design that encourages use.
3. Develop and annually maintain a prioritized list of frequently littered items to inform anti-litter campaigns.
4. Develop and annually maintain a prioritized list of areas in the city for litter cleanup projects and activities based on the CAI and the litter and illegal dumping hot spots map.
5. Develop and maintain a database of KFWB documents.

Litter Reduction Planning

1. Work with the KFWB board to develop a strategic plan for KFWB management and governance, which includes goals that support the mission, and update it annually.
2. Create a volunteer management plan that includes the resources necessary for daily coordination, and work with KFWB board and city staff to implement it.

Litter Rules & Regulations

1. Review litter ordinances, penalties and enforcement strategies and revise existing ordinances or draft new ordinances to better address the litter problem in Fort Worth.

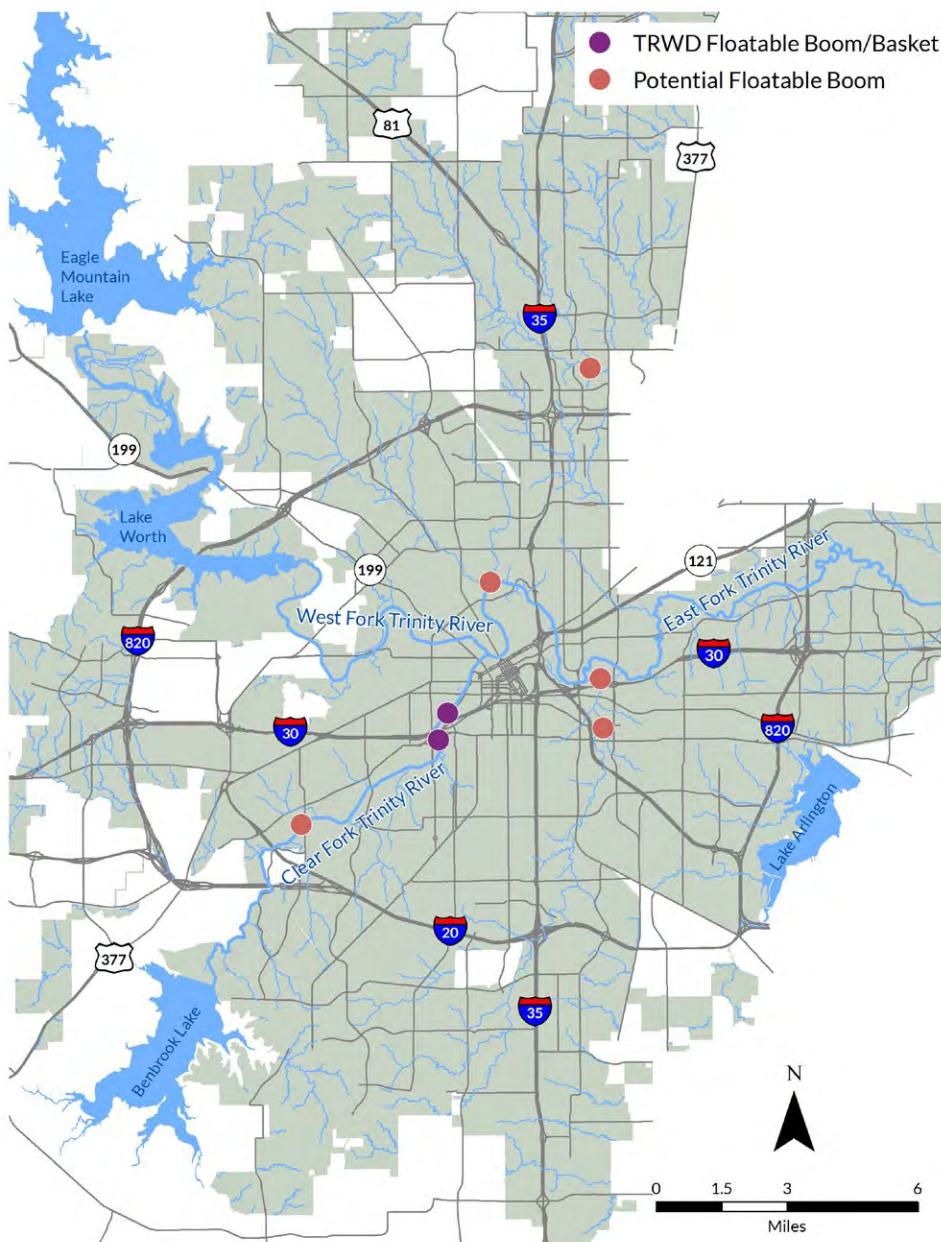


Figure 6-15. Map of current and potential litter boom locations, 2019.

Litter Control Projects & Technologies

1. Evaluate litter control technologies and tools for potential pilot projects and field deployment.
2. Launch long-term, neighborhood-specific litter control projects. Incorporate increased anti-litter messaging and outreach into projects.
3. Evaluate litter control projects upon completion and develop lessons learned to inform future projects.
4. Continue to automate the litter cleanup supply request and event registration processes.
5. Explore options to collect litter cleanup and other KFWB program data online.
 - Create a web-based mapping application for public use that tracks litter clean-up projects. *Performance Indicator:* Number of visitors to the website.
6. Maintain the trash bin inventory database and include information on bin maintenance, replacement timelines and amount of trash collected.

7. Evaluate the need for additional illegal dump cameras and staff to monitor them.
 - *Performance Indicator:* Number of incidents captured by illegal dumping cameras.
8. Continue the collaboration with TPW/Stormwater Management Division and TRWD to identify opportunities to install litter control devices along local streams and the Trinity River.
 - *Performance Indicator:* Number of litter control devices installed.
9. Collect data on the amount of litter removed from waterways.
 - *Performance Indicator:* Quantity of floatable debris removed from waterways by collection devices.

6.5.2 Strategies for PA 2: Prevention & Abatement

Litter programs in Fort Worth have historically focused on complaint-driven reactive abatement due to resource limitations. As staff, resources and partnerships have expanded, the focus has moved toward proactive abatement, coupled with litter awareness programs. There is still substantial room for growth in the abatement programs, but the city also recognizes the need for prevention as a primary litter reduction strategy. Prevention and abatement work in tandem; prevention efforts reduce the need for abatement, and litter abatement establishes an area as litter-free, helping to prevent further litter.

6.5.2.1 Litter Prevention

The best litter control strategy is to prevent trash and debris from being littered in the first place. This includes encouraging people not to litter by making it easy for them to do the right thing and dispose of items properly. The city does this by providing several facilities where residents can take garbage, recycling, HHW and other common items. The city and its partners also provide bins and receptacles throughout the city where visitors can dispose of trash and recyclables. These are often found in areas of high foot traffic, near locations where people might litter. Environmental staff are collaborating with other departments and divisions, as well as external partners, to find ways to provide receptacles for commonly littered items, such as cigarette butts. Below are details for these litter prevention initiatives.



Figure 6-16. The City of Fort Worth Hillshire Drop-off Station, photo by City of Fort Worth.

6.5.2.1.1 DROP-OFF STATIONS & THE ENVIRONMENTAL COLLECTION CENTER (ECC)

Residents with an active Fort Worth water account can take trash, brush, recyclables, HHW and other items to drop-off stations located around the city for free and easy disposal. HHW can also be taken to the ECC, which collects, consolidates, transports and properly disposes of HHW while following federal, state and local environmental regulations. The city opened its fourth drop-off station in September of 2017 and expanded the list of items that are accepted at these sites to include electronics and furniture donations. In the fall of 2018, secured document shredding and destruction services were added to all drop-off stations. Combined, the stations have over 210,000 visits annually, helping prevent illegal dumping and littering. The city plans to open additional drop-off stations to serve more areas and evaluate the demand for additional services to offer and items to accept. More information about the drop-off stations and the ECC is provided in Chapter 5, as well as the Comprehensive Solid Waste Management Plan: Rethinking Waste for a Greener Fort Worth (Reference 6-1).

6.5.2.1.2 CONTAINERS & BINS

Providing easily identifiable and convenient receptacles is key to preventing litter. Research has found that when people are observed littering in public spaces, the nearest trash receptacles averaged about 29 feet away. The rate decreased to 12 percent when people were within about 10 feet of a trash receptacle (Reference 6-6). The city and its partners will use the data from the trash bin inventory to target areas for additional bins and consider the use of wraps or artwork on the bins and surrounding areas to attract attention and encourage people to properly dispose of their trash. Accessible recycling containers also help



Figure 6-17. A Bigbely solar trash and recycle compactor in Trinity Park, photo by City of Fort Worth.

prevent littering, and the city is collaborating with partners and utilizing grants to fund the placement of recycling containers in parks and other public spaces. Additionally, the city and its partners have placed Bigbely solar trash compactors throughout Fort Worth to reduce windblown trash and bin overflow. As of 2018, the Solid Waste Division had placed over half of the 125 Bigbely compactors for this project in public spaces, and some of those units have companion recycling containers. The Solid Waste Plan includes expansion of public recycling, and eventually, organics collection (Reference 6-1). Staff will continue to evaluate BMPs around public receptacles and incorporate them into these programs as they are rolled out and expanded.

6.5.2.1.3 SPECIAL COLLECTION & RECYCLING EVENTS

To prevent illegal dumping, the city offers events throughout the year where residents can bring items like HHW and electronics for proper disposal. These include Crud Cruiser mobile collection events, which



Figure 6-18. City employees helping residents unload items for the America Recycles Day-Shred Day event, photo by City of Fort Worth.

accept cooking oil, lightbulbs, automotive fluids and other HHW. The Solid Waste Division holds an event every year for America Recycles Day in November. Historically, this event has been branded locally as Shred Day, and has focused on secure document shredding, as well as collecting other items like clothes and electronics. After 2018, city drop-off stations will offer shredding services, and target hard-to-recycle items and waste reduction activities. This event serves nearly 1,200 people every year, and the city can capitalize on its success to prevent litter and dumping in our community by targeting a wider range of items with high dump risk.

Community organizations and local businesses also offer their own events throughout the year to accept items, and the city supports these efforts by advertising through social media channels and assisting with special event recycling. City staff should consider developing a calendar of these events to further promote them, and collaborate more closely with event sponsors to gather data on the types and amounts of items collected.

6.5.2.1.4 TARGETED ITEM LITTER PREVENTION

The city will consider the eleven most commonly littered items, listed in the PA 1, when developing new programs and outreach campaigns. Currently, there is a focus on cigarette butts and single-use plastic items, although targeted items may change with time as public perceptions and behaviors change.

Environmental staff are collaborating with other departments, divisions and external partners, including our PIDs, to develop a pilot program to reduce cigarette butt litter. This includes funding and placing specialized receptacles at key locations and wrapping them with city anti-litter campaign graphics. PIDs will work with their crews and local businesses to empty and maintain the receptacles, as well as gather data on the amount collected. The city will explore working with the Chambers of Commerce and business organizations to target specific industries, such as bars and restaurants that are natural partners for these programs. The city will also evaluate the KAB Cigarette Litter Prevention Program to determine if it should be utilized or adapted for use in Fort Worth.

Single-use plastic items are the other commonly littered item the city is focused on. Every bit of plastic ever made still exists. Between 2000 and 2010, the



Figure 6-19. A special receptacle for collecting cigarette butts, photo by City of Fort Worth.

world produced more plastic than during all of last century. The city will consider promoting Plastic Free July or a similar initiative to reduce plastic litter. This involves pledging not to use disposable plastic products during the month of July by substituting reusable alternatives. The pledge is designed to encourage people to think about the single-use plastic items they consume every day, and find ways to reduce that waste. It also encourages businesses to evaluate their impact on litter and pollution. They city staff should work with them to find alternatives, such as compostable utensils, which help prevent litter and reduce waste. The city can also engage advocacy groups and decision-makers in trash and plastic pollution public policy education (Reference 6-12) to support the initiative, and highlight the most commonly littered plastic items: plastic bags, water bottles, takeaway cups and straws (Reference 6-13). These targeted item strategies will include education and outreach that have a litter prevention message and encourage people to take action.

6.5.2.2 City Litter Abatement

The different divisions of Code work together to address all aspects of the litter problem, from planning and prevention to abatement and enforcement to education and outreach. While environmental staff manage volunteer cleanup activities and most of the city's public-facing litter programs, solid waste is the division primarily responsible for the city's cleanup activities and illegal dumping investigations.

6.5.2.2.1 SOLID WASTE FIELD OPERATIONS TEAM

The Solid Waste Field Operations Section for litter and illegal dumps is comprised of five teams: the EIU, Illegal Dump Cleanup, Litter Abatement, Street Sweeping and Dead Animal Pickup. The Litter Abatement team cleans littered sites, performs nuisance abatement duties and removes litter from homeless camps when complaints are received. This team has five crew leaders, one senior maintenance worker and three maintenance workers, and is supplemented by community service workers, when they are available. There are not always enough community service workers to form five crews, and crew leaders must work with one another to clean sites. To adequately address litter as the city grows, this team should be expanded to fully staff five crews without relying on community service workers. The illegal dump crew cleans large-scale sites proactively and when complaints are received. The EIU writes citations for smaller dump sites, investigates illegal dumping and provides case information to Fort Worth detectives, who forward cases to prosecutors. The dead animal crew removes approximately 50 tons of dead animals annually. The street sweeper crew sweeps major Fort Worth arterial roadways and certain intersections on a set schedule, as well as other non-residential roadways upon request. City staff will continue abatement efforts and collaborate with one another to address litter. This includes assessing ways to improve communication between departments and divisions, as well as the public, when handling litter abatement requests and illegal dumping. More information on Solid Waste Field Operations is available in the Solid Waste Plan (Reference 6-1).

6.5.2.2.2 STREET SWEEPING

The city street sweeping program is a cooperative effort between environmental staff, who assist in planning and setting the routes, and Solid Waste Field Operations who perform sweeping and litter collection activities. The city purchased two street sweepers to remove debris from streets and curbs, as well as five portable vacuum litter collectors to facilitate efficient litter cleanup around Fort Worth. Municipal street sweeping programs provide several benefits to communities. Street sweeping protects stormwater drainage by preventing storm drains from becoming clogged with debris and reducing contaminants that would otherwise enter local waterways. Reducing litter and debris enhances the visual appeal of an area and improves safety for vehicles, bicycles and pedestrians.

With current equipment and crews, the city swept 3,817 gutter miles in fiscal year 2018. Environmental staff will evaluate current and new routes for sweeping and litter collection activities, and explore options for funding additional equipment and crews. Ideally, the city should increase the number of sweepers to 25 with two shifts of drivers to cover more areas on a regular basis.

6.5.2.3 Contractual Litter Abatement

Collaborative efforts help extend the impact of city services, and the city contracts with different companies and organizations to expand its litter abatement capacity. Although PIDs contract their own litter abatement, street sweeping and power washing services, city staff coordinate with them to avoid duplication of efforts and ensure compliance with

city ordinances. The city will explore ways to expand litter control through contractual agreements and partnerships.

6.5.2.3.1 MOWING CONTRACTS

A majority of public spaces in Fort Worth are mowed by contractors, although PARD staff are responsible for mowing park land, medians and right-of-ways. While TxDOT is responsible for litter cleanup and mowing operations along highways and major roads, the Solid Waste Division manages a supplemental mowing and litter abatement contract along the I-30 and I-35 corridors. City staff and contractors, as part of their agreement with the city, are required to remove litter and dispose of it prior to mowing activities.

Mowing littered areas creates micro-litter that is very difficult and time-consuming to remove from an area, and can scatter into streets and gutters where it is washed into stormdrains. Removing litter before mowing reduces labor time and costs and makes the cleanup process more efficient. City staff will review mowing contracts to ensure litter removal and disposal are included, and require language to this effect in all future contracts. PARD and environmental staff should consider auditing the mowing process to ensure contract compliance.

6.5.2.3.2 NPO & NGO PARTNERSHIPS

The Solid Waste Division has an annual contract with Presbyterian Night Shelter (PNS) of Tarrant County for litter collection services along East Lancaster, from Interstate 35 to Riverside Drive. PNS offers assistance to homeless persons, and this program provides compensation, work skills, room and board, meals and clothing. The overall goal of the program is to

2016-2017 Illegal Dump Activity

Incidents

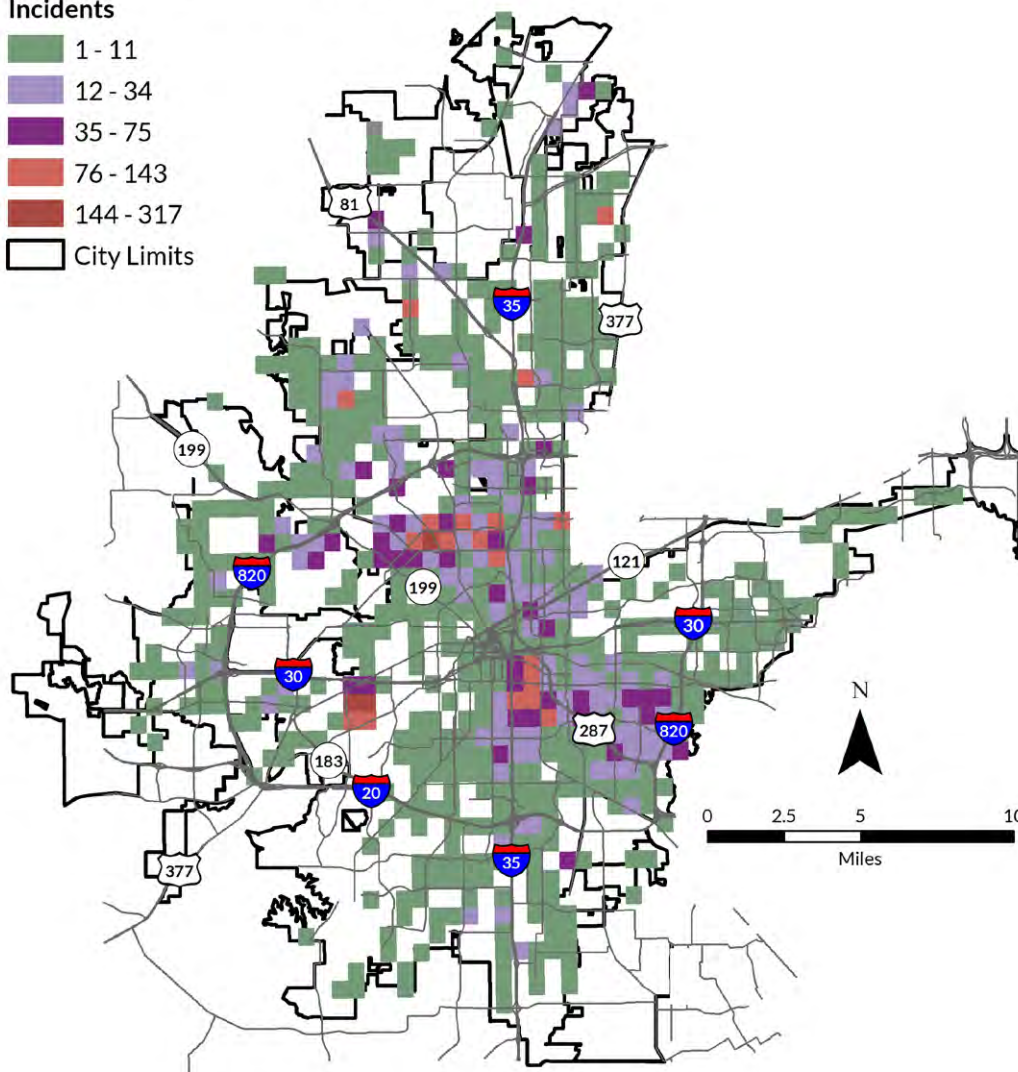
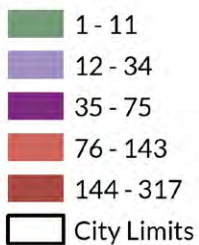


Figure 6-20. Map of the average number of illegal dump sites abated in 2016 and 2017.



Figure 6-21. A PNS worker cleans litter at Echo Lake Park, photo by City of Fort Worth.

reduce homelessness in Fort Worth while providing a beneficial service to the community. This program has already helped transition people out of homelessness and has been expanded to include heavily littered waterways. The city will continue to look for ways to partner with NPOs and NGOs to create programs that reduce litter and have positive community outcomes.

6.5.2.4 Volunteer Litter Abatement

The city recognizes that it cannot solve the litter problem on its own. Volunteers have an enormous impact on litter in Fort Worth, donating tens of thousands of hours picking up hundreds of thousands of pounds of trash every year. Environmental staff work closely with other departments, including PARD and the Community Engagement Office, to organize cleanup events and volunteer efforts across the city. These partnerships within the city increase efficiency and reduce duplication of efforts. Increase interdepartmental communication and cooperation have reduced logistical problems and facilitated the coordination of large-scale volunteer events. City staff should develop procedural documents for these programs to ensure their continuity through staffing changes.

6.5.2.4.1 “ADOPT-A” PROGRAMS & PARTNERSHIPS

The city and its partners have several initiatives promoting environmental stewardship and litter removal. PARD manages the contracts for three “Adopt-a” programs: Adopt-a-Park, Adopt-a-Median, and Adopt-a-Street. Volunteers, often neighborhood associations, NPOs and businesses agree to maintain a particular location through litter cleanup and beautification efforts. These groups give over 9,500

volunteer hours annually, which supports the city’s efforts to eliminate litter. The city partners with TRWD on the Adopt-a-Drain, an awareness campaign to ensure the public knows litter on our streets ends up in our rivers. Over 110 storm drains have been adopted throughout the city. TRWD also manages the Adopt-a-River program that encourages individuals and organizations to volunteer to adopt a section of the Trinity River and pick up litter along the riverbank. The Texas Department of Transportation (TxDOT) administers the Adopt-a-Highway program, which allows businesses and groups to either adopt or sponsor cleanup activities along a section of roadway managed by TxDOT. This program is part of the Don’t Mess with Texas anti-litter campaign. The city will continue to promote adoption of public areas throughout Fort Worth by engaging local community groups and businesses. Environmental staff will also review the current contracts with PARD and compare them to contracts for “Adopt-a” programs in other cities to see if they need to be updated or rewritten.

The U.S. Environmental Protection Agency (EPA) manages the nationwide Trash-Free Waters program, which aims to prevent trash and litter from entering U.S. waterways. The EPA collaborated with the city and other partners to develop a local initiative, Trash-Free Trinity, a GIS web mapping platform to connect volunteers with locations that need to be adopted along the Trinity River. Since its inception, the program has expanded statewide, with all major watersheds in Texas on the map. The city is working with the EPA, KTB and other partners across the state to collect data for adopted sites and sites that need to be adopted. Environmental staff have created a plan for the next steps of program development, and will continue to assess program needs, including funding, and evaluate



Figure 6-22. An adopted storm drain with an anti-litter message, “Don’t Trash the Trinity”, photo by City of Fort Worth.

whether creating a 501(c)(3) NPO or moving the program under an existing statewide NPO would be beneficial.

6.5.2.4.2 CITYWIDE LITTER CLEANUP EVENTS

KFWB and TRWD each host citywide litter cleanup events twice a year in a coordinated effort to eradicate litter in neighborhoods and waterways. TRWD holds the biannual Trinity Trash Bash in the spring and fall. The larger of the two events is in the fall, with over 8,000 volunteers picking up litter, and includes a volunteer party. The Neighborhood Litter Stomp is KFWB's fall cleanup, and usually has around 1,500 volunteers. In the past, these events have been combined on the same day, but at the request of volunteers, the event was split starting in 2018. This could result in greater attendance for both

organizations. KFWB's largest litter cleanup event is the Cowtown Great American Cleanup and Earth Party, held every spring. Around 6,500 volunteers pick up over 100,000 pounds of litter throughout Fort Worth, and about 2,000 people attend the volunteer celebration at Earth Party. Environmental staff and the KFWB board will look at events from other KAB and KTB affiliates to develop strategies to increase participation in these cleanup events. KFWB also supports a summer cleanup challenge at the city community centers that promotes the TRWD "Ten on Tuesday" pledge. Community centers compete to see who can pick up the most litter for a chance to win prizes for the kids who participate. This program could be modified and expanded to school summer programs or citywide.

6.5.2.4.3 VOLUNTEER-LED LITTER CLEANUP SUPPORT

KFWB has made it easy for residents, businesses and local organizations to organize their own litter cleanups. The volunteer-led cleanup program utilizes an online form to gather information on the cleanup, then KFWB provides supplies, including bags and gloves, for volunteers. In addition, KFWB provides a voucher to dispose of the litter at any of the drop-off stations, as some groups do not have access to them for free. To track results of these individual efforts, KFWB provides a form to track the results. Currently, this process is largely manual and involves paper and email forms. Environmental staff are working with IT specialists in the city to automate part of the process through web forms to provide enhanced customer service and more efficient data tracking. KFWB also aids groups with logistical support when organizing large community cleanup events, including connecting them with resources from partner organizations such

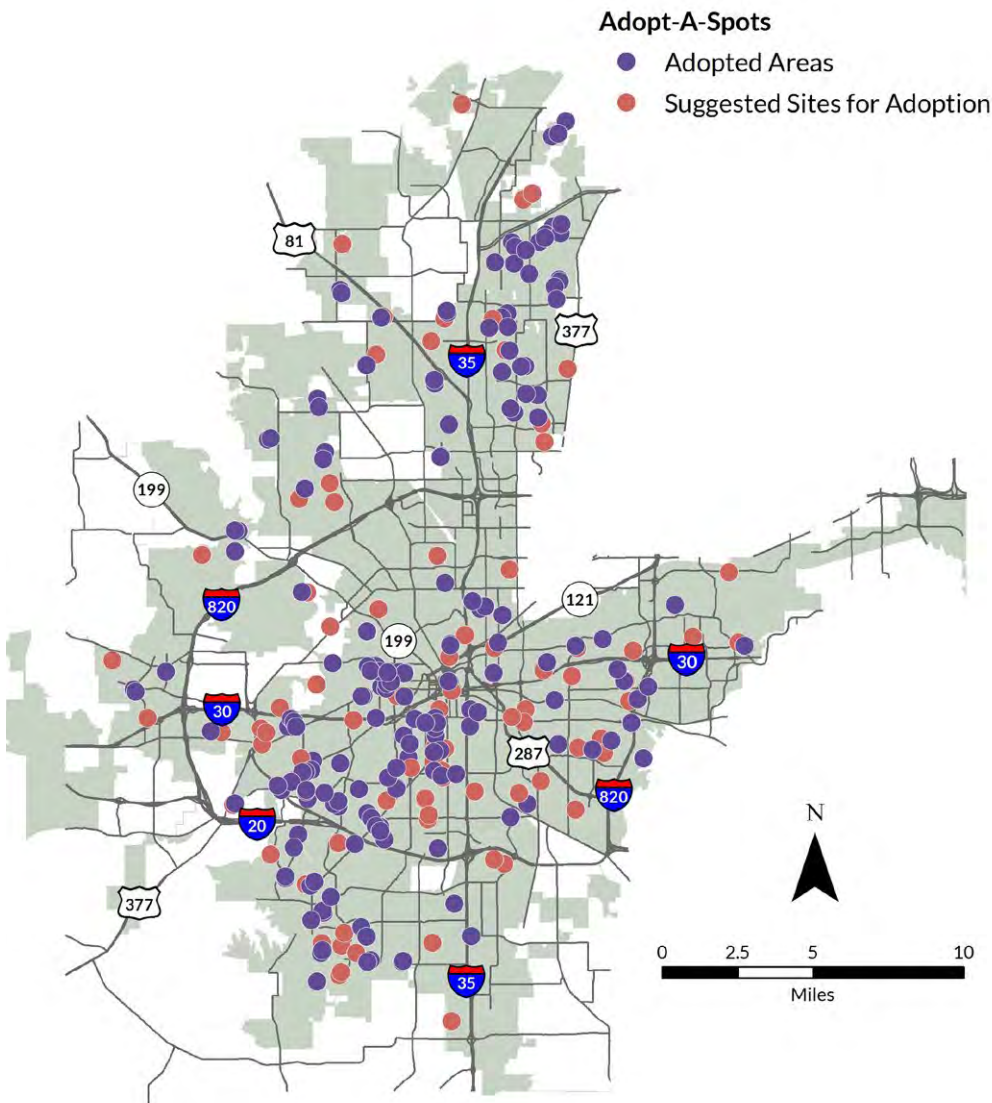


Figure 6-23. Map of adopted locations and sites identified as needing adoption in Fort Worth, 2019.



Figure 6-24. Students participate in the annual Cowtown Great American Cleanup, photo by City of Fort Worth.

as KAB and KTB. Occasionally, businesses and very large groups request additional support and media opportunities. KFWB works with staff in PARD and the Solid Waste Division to organize cleanups in multiple areas throughout the city to accommodate groups of anywhere from 50 to 1,000 volunteers. Staff are working to create procedures for these large cleanups that require more coordination and showcase the impact of our volunteers through different media channels.

6.5.2.5 Development Actions for PA 2: Litter Prevention & Abatement

Litter Prevention

1. Encourage the use of the drop-off stations by offering additional services and opening more drop-off stations throughout the city (per the Solid Waste Plan).
 - *Performance Indicator:* Number of people visiting drop-off stations.
 - *Performance Indicator:* Amount of the different materials collected.
2. Develop and annually maintain a prioritized list of areas that need public trash bins and work with partners to place and maintain new bins.
 - *Performance Indicator:* Number and location of new bins.
 - *Performance Indicator:* Amount of trash or recyclables collected.



Figure 6-25. KFWB provides litter cleanup supplies to volunteers, photo by City of Fort Worth.

3. Research the use and effectiveness of bin art and other creative strategies and develop a prioritized list of recommended actions for the city.
4. Coordinate with partners to host events focused on the collection of hard to recycle items.
 - *Performance Indicator:* Number of people who participate in the events.
 - *Performance Indicator:* Amount and type of material collected.
5. Work with partners to develop a pilot program to test the effectiveness of public cigarette butt receptacles.
 - *Performance Indicator:* Number and location of installed receptacles.
 - *Performance Indicator:* Volume or weight of cigarette butts collected at each one.

City Litter Abatement

1. Increase the number of littered sites abated or the total volume of litter collected by expanding the number of litter abatement teams and/or utilizing community service workers.
 - *Performance Indicator:* Number of sites abated.
 - *Performance Indicator:* Amount of litter collected by abatement teams.
2. Expand the city's street sweeping fleet and/or add more crews on different shifts to increase the amount of time sweepers are in operation.
 - *Performance Indicator:* Number of curb miles swept by the city along each route.

Contractual Litter Abatement

1. Perform regular audits of areas mowed by contractors to ensure they are removing litter before mowing and provide additional education for contractors not removing litter.
 - *Performance Indicator:* Number of sites audited.
2. Develop and annually maintain a list of mowing contractors used by the city.
3. Develop training materials and schedule for mowing contractors used by the city.
 - *Performance Indicator:* Number of mowing contractors that have completed the litter training.
4. Increase the number of litter crews under the PNS contract.
 - *Performance Indicator:* Number of people contracted through the PNS contract.
 - *Performance Indicator:* Square miles of the city cleaned by the cleaning crews each year.
 - *Performance Indicator:* Amount of litter removed.

Volunteer Litter Abatement

1. Increase volunteer participation in the Adopt-a-program.
 - *Performance Indicator:* Number and location of adopted sites.
 - *Performance Indicator:* Hours of volunteer service achieved for each Adopt-a event.
 - *Performance Indicator:* Amount of litter removed at each adopted location.
2. Increase participation in citywide litter cleanups.
 - *Performance Indicator:* Number of participants in citywide litter cleanup events.
 - *Performance Indicator:* Number of locations cleaned.
 - *Performance Indicator:* Hours of volunteer service achieved at citywide litter cleanup events.
 - *Performance Indicator:* Amount of material collected at citywide litter cleanup events.
3. Increase the number of volunteer-led cleanups.
 - *Performance Indicator:* Number of volunteer-led cleanups.

- *Performance Indicator:* Number of participants.
 - *Performance Indicator:* Hours of volunteer service achieved at each volunteer-led cleanup event.
 - *Performance Indicator:* Amount of litter cleaned at each volunteer-led cleanup event location.
4. Send out periodic surveys to evaluate the quality of customer service provided by the city and determine if there are any unmet volunteer needs.

6.5.3 Strategies for PA 3: Compliance & Enforcement

The programs detailed below have been established to deter littering and help make Fort Worth the cleanest city in Texas. They are managed by staff working across department lines to investigate compliance issues and enforce littering ordinances.

6.5.3.1 Commercial Litter

The Consumer Health Division within Code has a commercial compliance team that enforces nuisances, including litter, by inspecting dumpster cleanliness, dumpster screening and loose debris and litter on commercial properties. Violations are documented, and follow-up procedures are in place to ensure that violations are abated in a timely manner. When violations are not abated in a timely manner, citations with fines up to \$2,000 are issued to gain compliance. If the violation persists after citations have been issued, the commercial compliance team works with the litter abatement team to clean the property.

Commercial compliance staff will also provide businesses with information on the Litter-Free Lots Program to encourage businesses to maintain their lots free of litter and remain in compliance without enforcement measures. This program can also be used as an alternative to citations. Commercial property owners and operators with improperly maintained dumpsters or littered properties will be given the opportunity to join the program, which commits them to abating the violation. City staff will provide them with a description of the program requirements, and they will be held responsible for their commitments if they choose to participate. Businesses that meet the requirements will earn a window decal demonstrating their support for the program, as well as recognition on social media or the city website. This solution benefits the business owner or operator, as well as the



Figure 6-26. An overflowing dumpster that has not been screened from public view, photo by City of Fort Worth.

community, by educating them on the importance of preventing litter and encouraging them to maintain their property in a clean condition.

6.5.3.2 Residential Litter

Trash and recycling bins are prominent sources of litter when they are not used properly. When bins and carts are overfilled, unlidded or the lids are not secure, trash and debris get scattered by animals or the wind. Multifamily properties with overflowing dumpsters or bulk items set out near the dumpsters also contribute to windblown and scattered litter, as well as potential rodent and other disease-vector issues. Code officers review residential properties during patrol or when there are complaints of egregious litter. Violations are documented and follow-up procedures are in place to ensure they are abated in a timely manner. When violations are not abated in a timely manner, citations are issued to gain compliance. Information about the HHW services are also provided, when appropriate. City staff should review current procedures to streamline inspection and enforcement efforts, and encourage community members to prevent residential litter.

6.5.3.3 Litter from Other Sources

Fort Worth has experienced tremendous growth over the past two decades, both in population and land area. Development and construction activities are common throughout the city. Construction and demolition sites without tarps and receptacles to contain debris and waste properly are major contributors to litter and stormwater pollution. Debris and construction materials, employee negligence, items falling from delivery and waste-hauling vehicles, cement truck

waste and excavation waste all have negative impacts on the properties surrounding worksites. Loading docks are also sources of blowing litter, including shrink wrap, corrugated boxes and shipping documents. Code officers observe these sites during routine patrol or when they receive a complaint. They document any violations and follow up to ensure that violations are abated in a timely manner. If they are not abated in a timely manner, citations are issued to gain compliance. Unsecured truck loads are not only a source of litter, they are a danger to other vehicles, bicyclists and pedestrians on the road. They are also in violation of city ordinance, and police officers can write citations for not having a covered load. City staff will look for ways to assess and expand litter containment technologies for these types of sites, and work with the departments involved in issuing citations to offer support and education to the public.

6.5.3.4 Litter Enforcement

When people can litter without consequence, it may lead them to believe their behavior is acceptable, and continue to litter. Others see this behavior and adopt it for themselves, creating a culture of litter within a community. Litter and illegal dumping attract other forms of blight, as well as crime. Enforcing litter laws and ordinances is key to prevention. The primary goal is to remediate the situation and educate the violator to prevent future infractions. For enforcement to be effective, the penalty must be adequate to ensure the impacted site is remediated, as appropriate, and deter future violations (Reference 6-14).



Figure 6-27. All loads in truck beds must be secured to keep debris from falling onto the road, photo by City of Fort Worth.

6.5.3.4.1 ILLEGAL DUMP INVESTIGATIONS & PROSECUTION

The Solid Waste Field Operations team enforces litter regulations through abatement warrants and investigations. The senior code officer on the litter abatement crew obtains and executes warrants to allow nuisance abatement activities, and files liens with Tarrant County to recover costs for these efforts. The EIU investigates illegal dumping and submits reports to the Fort Worth Police Department when there is a witness willing to testify or credible evidence or video surveillance footage of the dumping activities. The unit is also responsible for the deployment and monitoring of surveillance equipment, and obtaining accurate information from both witnesses and violators for the Tarrant County District Attorney's Office.

6.5.3.4.2 JUDICIAL HANDBOOK

Environmental staff are looking for ways to strengthen anti-littering ordinances and policies to ensure litter offenders are held accountable for their actions. Environmental staff will work with municipal courts to develop a handbook, which will help legal staff and personnel better understand how litter can impact the environment and why it is a serious problem that should be enforced through the legal system. This information is needed to ensure the courts understand that while litter may not seem like a serious offense, it is costing the city millions of dollars each year and creating other problems in our community. This handbook will also include the full range of interpretations and applications of case law to aid the efforts of legal staff and municipal courts to enforce legal codes for repeat litter offenders and those who dump their trash illegally.

6.5.3.5 Development Actions for PA 3: Litter Compliance & Enforcement

Commercial Litter

1. Evaluate litter prevention, education and enforcement strategies to engage businesses in litter control.
2. Develop and annually maintain a prioritized list of recommended actions for Fort Worth.
3. Increase participation in the Litter-Free Lots programs and recognize businesses that participate successfully.

- *Performance Indicator:* Number of businesses that join the program and the appearance index for their business over time.
- *Performance Indicator:* Number of recognitions or awards distributed to local businesses.

4. Work with partners in the city to assist in the enforcement of commercial litter ordinances.

- *Performance Indicator:* Number of violations and citations issued.
- *Performance Indicator:* Number of businesses that join the Litter-Free Lots Program as a citation alternative.

Residential Litter

1. Work with partners in the city to enforce residential litter ordinances.

- *Performance Indicator:* Number of violations and citations issued to pedestrians.
- *Performance Indicator:* Amount of collected waste that had been improperly disposed.

Litter from Other Sources

1. Support city staff who inspect properties and/or issue citations for littering.
 - *Performance Indicator:* Inventory of litter citations and outcomes.

Litter Enforcement

1. Continue to cooperate with witnesses, law enforcement and the Tarrant County District Attorney's Office to prosecute illegal dumping cases.
 - *Performance Indicator:* Inventory of illegal dumping locations identified through enforcement.
 - *Performance Indicator:* Number of litter enforcement cases associated with litter enforcement violations in Fort Worth.
2. Develop a judicial handbook to assist legal staff and municipal courts personnel when they work on cases involving illegal dumping and process violations for littering.
 - *Performance Indicator:* Number of litter and illegal dumping citations processed.
 - *Performance Indicator:* Number of cases that are enforced and dismissed.

6.5.4 Strategies for PA 4: Communication & Collaboration

The city and its partners must understand the motivational and structural barriers that exist within our community, and devise outreach and intervention strategies tailored to meet their needs. Personal messages and activities that promote an individual's obligation not to litter are important for changing littering behavior (Reference 6-6). Raising public awareness is closely related to anti-litter education. For instance, by informing the public about enforcement of litter laws, awareness is not only increased, but behaviors may change. Effective anti-litter education generally focuses on the development of BMP guidelines and training. These efforts involve national information-sharing networks as well as grassroots initiatives. The desired result is to achieve a cleaner environment by preventing litter through long-term, positive behavioral change (Reference 6-15).

6.5.4.1 City Staff Training & Collaboration

Environmental staff developed an initiative to train city staff and the KFWB board to give presentations on litter and illegal dumping in the community. Members of the Litter Speakers' Bureau will serve as anti-litter ambassadors to the community and speak at public meetings to discuss litter problems and solutions in Fort Worth. These presentations will be available to a range of audiences including businesses, neighborhood associations, faith groups and NPOs. The bureau will also engage schools, encouraging college or high school groups to volunteer in KFWB programs or host their own events to clean up litter in the city. Print



Figure 6-28. Staff attend a regional KTB training to learn BMPs from other affiliates, photo by City of Fort Worth.

material that incorporates the presentation messaging will be distributed at all speaking engagements. All city inspectors who regularly visit sites will be trained on litter enforcement procedures, and incorporate litter assessment and violations in inspection reports. The training will be offered citywide to inspectors in Code, Planning & Development, Water and Transportation & Public Works. Environmental staff will work with these departments to inform them of city litter ordinances, update inspection reports, understand the compliance and enforcement process and collect data on inspections and outcomes.

KAB and KTB require annual training for affiliate coordinators. Training records, including the types of trainings attended and the number of hours, must be kept for reporting requirements. It is beneficial to provide KAB and KTB training to board members, as well, to provide them with the latest program information and available resources. City staff will occasionally need to provide trainings to the board on initiatives, such as the Litter Speakers' Bureau, or software and systems the city uses to track information or communicate externally. Environmental staff are also collaborate with KTB and other North Texas affiliates to offer regional training where organizations can share BMPs and program information. Affiliates are working toward establishing a regional approach to litter to better serve all communities in the area, especially because our residents and workers are mobile and tend to work, live and play in different cities.

6.5.4.2 Public Technical Guidance

City staff offer trainings to community groups and schools to provide the information and tools they need to engage in activities like composting, recycling and volunteering. Current programs should be expanded to offer additional training opportunities throughout the year, including master composter classes and Waste-In Place. New training programs should be developed, such as volunteer leadership and youth volunteer classes, utilizing KAB curriculum and BMPs for training. City staff will assess the target audiences for training and ways to encourage them to participate, such as the scholarships offered to teachers for compost training. Staff should also explore training tailored to specific businesses, such as fast food restaurants, convenience stores and bars and restaurants on strategies to reduce litter associated with their industry. Staff should also



Figure 6-29. Participants at a City of Fort Worth master composter class learn how to build a successful compost pile, photo by City of Fort Worth.

hold workshops for the Chamber of Commerce and PIDs to encourage them to support litter control efforts.

To engage community leaders and businesses in the fight against litter, environmental staff held a litter summit in 2016. This event included city staff, regional partners and community stakeholders with a vested interest in litter reduction. The litter summit provided an overview of the city's current Litter Control programs, as well as pilot and planned programs. Attendees gave feedback on these strategies and were asked to implement or improve at least one litter prevention and reduction practice at their home campus after the meeting. The second litter summit is scheduled for fall of 2018, and will cover program updates since the last meeting. City staff will work with stakeholders to evaluate these programs for continual improvement. Additional litter summits will be held every two to three years to increase awareness of city Litter Control programs in the community and how residents and businesses can help prevent litter. City staff will develop a communications strategy to periodically update participants between summits, and assess the timing of the next summit based on responses from stakeholders.

6.5.4.3 Public Education & Outreach

To maximize the effectiveness of public awareness initiatives, the city must provide clear, consistent and informative messages through in-person interactions

and across various media. These include digital platforms, such as the city website, social media accounts, online newsletters and email lists, as well as traditional media outlets like newspaper articles, print material and television. The city must provide a unified message across all of these channels through organized campaigns.

6.5.4.3.1 LITTER PRESENTATIONS

The Community Engagement Office offers several presentations with environmental quality and litter prevention messages to community groups and schools. Its staff will receive Litter Speakers' Bureau training and they will be add this presentation to their list. Environmental staff promote litter awareness and programs at school career day events, and speaking engagements at local businesses and community meetings. They serve as subject matter experts for the city on litter issues. Presentations can be requested by any group in Fort Worth and tailored to that audience. City staff will continue to advertise the availability of presentations and speaking engagements to spread litter awareness in the community. The city should consider developing a form on the website to streamline the speaker request process and promote the program.

6.5.4.3.2 MEDIA CAMPAIGNS

The Code Communication Team is responsible for communicating Litter Control Program messaging to the public and building the city's litter awareness brands, including KFWB and Litter-Free Fort Worth. Environmental staff worked with the Code Communication Team to develop communications and marketing strategies around division programs. The team rolls out campaigns to support the Litter Control Program brands, typically in three-year cycles. They develop graphics, social media ads, print material and signage to promote these campaigns. As of 2018, the city was conducting an anti-litter campaign called "Still Littering, Seriously?" and promoting it with vehicle wraps, magnets, banners at the city's four drop-off stations and print material distributed at Litter Speakers' Bureau presentations. Staff will explore promotional items to support the campaign, such as pocket ashtrays and car litter bags. These items can be distributed when city staff give presentations or at booth events to emphasize the anti-litter message.



Figure 6-30. A City of Fort Worth vehicle wrapped with the “Still Littering, Seriously?” campaign graphics, photo by City of Fort Worth.

6.5.4.3.3 DIGITAL MEDIA

The Code Communications Team uses multiple digital media channels to reach both internal and external audiences. Internally, the team uses monthly reports and regular city news bulletins to communicate Litter Control Program news to city staff and encourage them to support litter awareness initiatives and citywide event activities. They work with city web developers and IT to maintain the Litter Control Program and KFWB web pages and update them as needed with current program information and anti-litter campaigns. These updates should include an awards or recognition page to showcase the efforts of volunteers, businesses that participate in the Litter-Free Lots Program and other organizations within the community working to end littering. The city maintains an email list for KFWB supporters and volunteers, and it is utilized to share information on major programs and citywide cleanup events. The Code Communications Team shares information for major events on the City of Fort Worth home page and social media accounts, including Nextdoor. The team also partners with staff in the Environmental Quality and Solid Waste divisions to maintain social media accounts for KFWB, including Facebook and Twitter. Environmental staff will work with the Code Communications Team to develop a social media strategic plan to increase engagements on current platforms and evaluate the need to utilize other platforms to reach a wider audience.

6.5.4.4 Community Partnerships & Volunteerism

The city has cultivated meaningful partnerships that have greatly increased the reach of Litter Control programs and established regional collaborations in the fight against litter. These efforts are supported

by volunteers who have a profound impact on their community. City staff work closely with neighborhood groups, schools, NPOs, NGOs, as well as volunteers, to support and recognize them for their contributions to their community.

6.5.4.4.1 REVERSE LITTER

The city has partnered with TRWD and other cities in North Central Texas on the regional Reverse Litter campaign, developed by the OCG, since 2012. Reverse Litter is a litter prevention and awareness campaign focusing on reducing litter in North Central Texas waterways and protecting the Trinity River watershed. “Ten on Tuesday” is an initiative within the Reverse Litter campaign that asks people to make a pledge to pick up ten pieces of litter every Tuesday, or once a week. It is a small call to action with a large awareness impact, as more than 25,000 people have taken the pledge. In 2017, OCG increased campaign coverage through traditional and new media, negotiated more than \$100,000 in public service announcements and developed outreach programs that increased Ten on Tuesday pledges by 50%. Post-campaign research shows that, due to these efforts, Reverse Litter awareness doubled among North Texas residents (Reference 6-16). The campaign has been tailored to each city involved in the campaign to better resonate with residents, and the OCG continues to evolve communications strategies, as needed, to serve Tarrant, Dallas and Denton counties.



Figure 6-31. A Reverse Litter campaign billboard designed specifically for Fort Worth, graphic by TRWD.

6.5.4.4.2 LITTER-FREE FORT WORTH

Litter-Free Fort Worth grew from the Reverse Litter campaign, and has since become a regional initiative with other cities using the Litter-Free brand. Environmental staff are developing several programs

around Litter-Free Fort Worth to target different audiences. To engage the business community and commercial districts, the Litter-Free Lots Program was developed and piloted (discussed in Section 6.5.3.1). Nearly one third (33 percent) of Fort Worth’s population is under the age of 18, so involving youth in anti-litter



Figure 6-32. Litter-Free Fort Worth logo developed in partnership with the TRWD Reverse Litter program.

activities is crucial to program success and creating a clean city in the future. The city already engages schools through KFWB programs and citywide cleanup events, so incorporating the “Litter-Free School Zones” challenge into these strategies was a natural fit. This challenge is a partnership with the Fort Worth Strengthen After-School Programs through Advocacy, Resources and Collaboration, Fort Worth Independent School District (FWISD) and TRWD to engage children in litter awareness and prevention activities. It is open to all schools in Fort Worth and FWISD, and challenges a group of students to complete activities to win a prize and recognition for their school. This program has moved out of the pilot phase and is rolling out citywide. The KFWB board, Community Engagement Office and other partners are assisting in raising awareness for the program and encouraging schools to participate. The program will continue to be evaluated and updated as the city receives feedback from teachers and administrators.

Environmental staff plan to develop two other initiatives under the “Litter-Free” brand: Litter-Free Lanes and Litter-Free Landmarks. The Litter-Free Lanes initiative will ask residents to keep their neighborhood streets clean and free of litter. Neighborhoods can share photos, compete to see who can keep their street the cleanest and demonstrate community pride. The Litter-Free Landmarks initiative will ask residents and visitors to take a pledge to keep iconic destinations free of litter and submit photos of themselves picking up litter and properly disposing of trash. Landmarks are tourist destinations and impact how visitors perceive Fort Worth. If the city can generate positive media and the perception that Fort Worth is a litter-free community, this will encourage people not to litter, whether they live here or are just visiting.

6.5.4.4.3 SCHOOL GREEN TEAMS

Historically, School Green Teams was a KFWB program created to provide classroom recycling bins to local schools, and was funded, in part, through grants from the North Central Texas Council of Governments (NCTCOG). It has evolved into an umbrella for all school environmental programs, including Recycling at School, Litter-Free School Zones and other activities. Environmental staff work with the Solid Waste Division to offer the school recycling program, as well as compost training. Staff work with schools in Fort Worth to enhance their overall recycling programs and provide support, such as waste audits and recycling training for teachers and custodial staff. Many students are required to complete volunteer hours for their school programs and college applications. The School Green Teams program has been integrated into the city’s volunteer tracking software to allow students to log their volunteer activities and hours. City staff will continue to identify opportunities for program expansion, such as incorporating KAB youth curriculum into new or existing environmental programs. Staff should also engage home schooling coalitions to ensure that all Fort Worth students have access to city programs.

6.5.4.4.4 COMMUNITY AWARDS & RECOGNITION

The city currently hosts the annual Mayor’s Community Engagement Workshop and Neighborhood Awards Luncheon that recognizes individuals and organizations who have given exceptional service to their community. Environmental staff and the KFWB board are establishing awards and recognition for volunteers, and



Figure 6-33. Lowery Road Elementary School Green Team.

considering collaborating as a partner with the current awards luncheon or holding a separate awards function specifically for KFWB volunteers. In either case, the number of awards and application criteria must be developed. This could include individuals and groups giving exceptional service through litter abatement and beautification activities. KFWB currently recognizes groups for their cleanup efforts during the Cowtown Great American Cleanup and Neighborhood Litter Stomp, such as picking up the most litter or engaging the most youth, through acknowledgment on social media and rewards. Every year, KFWB hosts Earth Party after the Cowtown Great American Cleanup to recognize and reward volunteer efforts with a free lunch, musical performances and exhibitors. City staff and the KFWB board will research BMPs for volunteer appreciation in other cities and affiliate organizations to develop and improve recognition programs.



Figure 6-34. Volunteers enjoy the festivities at Earth Party, photo by City of Fort Worth.

6.5.4.5 Development Actions for PA 4: Litter Communication & Collaboration

City Staff Training & Collaboration

1. Distribute Litter Speakers' Bureau presentation and materials to city staff to present to residents, organizations and businesses. Offer trainings on presentation, if applicable.
2. Cross-train city staff to incorporate litter assessments and violations into inspection reports and other site visits.

- *Performance Indicator:* Number of city staff who receive litter inspection training.
 - *Performance Indicator:* Number of litter assessments performed by trained city staff.
 - *Performance Indicator:* Number of reported violations made by trained city staff.
3. City staff and KFWB board members will continue to support and attend trainings to maintain a good standing status with KAB and KTB.
 - *Performance Indicator:* Number of trainings attended by city staff and KFWB board members.

Public Technical Guidance & Training

1. Increase public participation in available training classes, such as the master composter class.
2. Evaluate the potential to offer additional training programs that incorporate KAB curriculum, such as volunteer leadership.
 - *Performance Indicator:* Number of participants and organizations that attend the public training courses.
 - *Performance Indicator:* List of public training classes that incorporate KAB curriculum.
3. Survey litter summit participants and develop list of lessons learned to inform future summits.
 - *Performance Indicator:* Number of litter summit list participants.
 - *Performance Indicator:* List of companies and organizations represented at litter events.

Public Education & Outreach

1. Raise awareness for Litter Speakers' Bureau through various communications channels (e.g., social media, city website, etc.) and outreach events.
 - *Performance Indicator:* Number of presentations given.
 - *Performance Indicator:* List of civic groups and NGOs that receive the presentation.
 - *Performance Indicator:* Number of people in attendance.
2. Annually review and update as applicable the media campaigns for litter control programs and evaluate successes and areas for improvement.

- *Performance Indicator:* Inventory of media campaigns, including graphics and collateral pieces, as well as public response to the campaign to help design future campaigns.
 - *Performance Indicator:* List of implemented BMPs and anti-litter campaigns with a record of their performance.
3. Follow strategies outlined in the Code Compliance Communications Plan to increase awareness of litter control programs, especially the Litter-Free Fort Worth and KFWB brands.
 4. Annually review and update as applicable the litter control information on the city website and social media.
 - *Performance Indicator:* Number of visits to website.
 - *Performance Indicator:* Number of people registered for city-sponsored litter control events advertised on website and social media.

Community Partnerships & Volunteerism

1. Continue to support the Reverse Litter partnership with TRWD and guide the marketing strategy to fit Fort Worth's needs and distribute information through Fort Worth's communications channels and outreach.
 - *Performance Indicator:* Annual summary of TRWD's media efforts and strategies, including the actions taken to share the Reverse Litter brand to TRWD.
2. Increase participation in the Litter-Free School Zones Challenge.
 - *Performance Indicator:* Number of schools that sign up for the Litter-Free School Zones challenge.
 - *Performance Indicator:* Number of schools that complete the Litter-Free Zone Challenge.
3. Develop the Litter-Free Lanes and Litter-Free Landmarks programs and encourage participation through various media channels and outreach.
 - *Performance Indicator:* Inventory of neighborhoods that participate in Litter-Free Lanes.
 - *Performance Indicator:* Frequency of how often neighborhoods engage in cleanup activities.

- *Performance Indicator:* Frequency of posts on social media about Litter-Free Lanes and Litter-Free Landmark events.
 - *Performance Indicator:* Amount of litter collected during Litter-Free Lanes and Litter-Free Landmark events.
4. Market Litter-Free Lanes to groups that have adopted roadways.
 5. Increase participation in School Green Team activities and share promotional and educational materials with schools.
 - *Performance Indicator:* Number of schools participating in School Green Team activities.
 - *Performance Indicator:* Number of student volunteer hours logged for supporting litter control and Green Team activities.
 6. Explore options for offering community recognition for litter and beautification efforts, including hosting an awards ceremony, partnering with existing city awards programs and nominating individuals or organizations for external awards.
 - *Performance Indicator:* Number of awards distributed to individuals and organizations supporting the city's litter control events and beautification efforts.

6.6 Conclusion

While litter control may seem like a daunting and never-ending challenge, it can be addressed through strategic planning and actions. The city will work with residents, businesses and other organizations to develop a comprehensive approach to litter control that includes prevention, abatement, enforcement and communications strategies with the goal of transforming awareness into action. By addressing the behaviors and social dynamics that contribute to littering, the city can make meaningful progress toward reducing litter in the community and making Fort Worth the most livable city.

6.6.1 Summary of Litter Control Development Actions

Litter Analysis

1. Research successful components of beautification programs, as well as KAB and KTB beautification programs.
2. Research BMPs for bin placement and design that encourages use.
3. Develop and annually maintain a prioritized list of frequently littered items to inform anti-litter campaigns.
4. Develop and annually maintain a prioritized list of areas in the city for litter cleanup projects and activities based on the CAI and the litter and illegal dumping hot spots map.
5. Develop and maintain a database of KFWB documents.

Litter Reduction Planning

1. Work with the KFWB board to develop a strategic plan for KFWB management and governance, which includes goals that support the mission, and update it annually.
2. Create a volunteer management plan that includes the resources necessary for daily coordination, and work with KFWB board and city staff to implement it.

Litter Rules & Regulations

1. Review litter ordinances, penalties and enforcement strategies and revise existing ordinances or draft new ordinances to better address the litter problem in Fort Worth.

Litter Control Projects & Technologies

1. Evaluate litter control technologies and tools for potential pilot projects and field deployment.
2. Launch long-term, neighborhood-specific litter control projects. Incorporate increased anti-litter messaging and outreach into projects.
3. Evaluate litter control projects upon completion and develop lessons learned to inform future projects.
4. Continue to automate the litter cleanup supply request and event registration processes.

5. Explore options to collect litter cleanup and other KFWB program data online.
 - Create a web-based mapping application for public use that tracks litter clean-up projects.
Performance Indicator: Number of visitors to the website.
6. Maintain the trash bin inventory database and include information on bin maintenance, replacement timelines and amount of trash collected.
7. Evaluate the need for additional illegal dump cameras and staff to monitor them.
 - *Performance Indicator:* Number of incidents captured by illegal dumping cameras.
8. Continue the collaboration with TPW/Stormwater Management Division and TRWD to identify opportunities to install litter control devices along along local streams and the Trinity River.
 - *Performance Indicator:* Number of litter control devices installed.
9. Collect data on the amount of litter removed from waterways.
 - *Performance Indicator:* Quantity of floatable debris removed from waterways by collection devices.

Litter Prevention

1. Encourage the use of the drop-off stations by offering additional services and opening more drop-off stations throughout the city (per the Solid Waste Plan).
 - *Performance Indicator:* Number of people visiting drop-off stations.
 - *Performance Indicator:* Amount of the different materials collected.
2. Develop and annually maintain a prioritized list of areas that need public trash bins and work with partners to place and maintain new bins.
 - *Performance Indicator:* Number and location of new bins.
 - *Performance Indicator:* Amount of trash or recyclables collected.
3. Research the use and effectiveness of bin art and other creative strategies and develop a prioritized list of recommended actions for the city.

4. Coordinate with partners to host events focused on the collection of hard to recycle items.
 - *Performance Indicator:* Number of people who participate in the events.
 - *Performance Indicator:* Amount and type of material collected.
5. Work with partners to develop a pilot program to test the effectiveness of public cigarette butt receptacles.
 - *Performance Indicator:* Number and location of installed receptacles.
 - *Performance Indicator:* Volume or weight of cigarette butts collected at each one.

City Litter Abatement

1. Increase the number of littered sites abated or the total volume of litter collected by expanding the number of litter abatement teams and/or utilizing community service workers.
 - *Performance Indicator:* Number of sites abated.
 - *Performance Indicator:* Amount of litter collected by abatement teams.
2. Expand the city's street sweeping fleet and/or add more crews on different shifts to increase the amount of time sweepers are in operation.
 - *Performance Indicator:* Number of curb miles swept by the city along each route.

Contractual Litter Abatement

1. Perform regular audits of areas mowed by contractors to ensure they are removing litter before mowing and provide additional education for contractors not removing litter.
 - *Performance Indicator:* Number of sites audited.
2. Develop and annually maintain a list of mowing contractors used by the city.
3. Develop training materials and schedule for mowing contractors used by the city.
 - *Performance Indicator:* Number of mowing contractors that have completed the litter training.
4. Increase the number of litter crews under the PNS contract.
 - *Performance Indicator:* Number of people contracted through the PNS contract.

- *Performance Indicator:* Square miles of the city cleaned by the cleaning crews each year.
- *Performance Indicator:* Amount of litter removed.

Volunteer Litter Abatement

1. Increase volunteer participation in the Adopt-a program.
 - *Performance Indicator:* Number and location of adopted sites.
 - *Performance Indicator:* Hours of volunteer service achieved for each Adopt-a event.
 - *Performance Indicator:* Amount of litter removed at each adopted location.
2. Increase participation in citywide litter cleanups.
 - *Performance Indicator:* Number of participants in citywide litter cleanup events.
 - *Performance Indicator:* Number of locations cleaned.
 - *Performance Indicator:* Hours of volunteer service achieved at citywide litter cleanup events.
 - *Performance Indicator:* Amount of material collected at citywide litter cleanup events.
3. Increase the number of volunteer-led cleanups.
 - *Performance Indicator:* Number of volunteer-led cleanups.
 - *Performance Indicator:* Number of participants.
 - *Performance Indicator:* Hours of volunteer service achieved at each volunteer-led cleanup event.
 - *Performance Indicator:* Amount of litter cleaned at each volunteer-led cleanup event location.
4. Send out periodic surveys to evaluate the quality of customer service provided by the city and determine if there are any unmet volunteer needs.

Commercial Litter

1. Evaluate litter prevention, education and enforcement strategies to engage businesses in litter control.
2. Develop and annually maintain a prioritized list of recommended actions for Fort Worth.
3. Increase participation in the Litter-Free Lots programs and recognize businesses that participate successfully.

- *Performance Indicator:* Number of businesses that join the program and the appearance index for their business over time.
 - *Performance Indicator:* Number of recognitions or awards distributed to local businesses.
4. Work with partners in the city to assist in the enforcement of commercial litter ordinances.
 - *Performance Indicator:* Number of violations and citations issued.
 - *Performance Indicator:* Number of businesses that join the Litter-Free Lots Program as a citation alternative.

Residential Litter

1. Work with partners in the city to enforce residential litter ordinances.
 - *Performance Indicator:* Number of violations and citations issued to pedestrians.
 - *Performance Indicator:* Amount of collected waste that had been improperly disposed.

Litter from Other Sources

1. Support city staff who inspect properties and/or issue citations for littering.
 - *Performance Indicator:* Inventory of litter citations and outcomes.

Litter Enforcement

1. Continue to cooperate with witnesses, law enforcement and the Tarrant County District Attorney's Office to prosecute illegal dumping cases.
 - *Performance Indicator:* Inventory of illegal dumping locations identified through enforcement.
 - *Performance Indicator:* Number of litter enforcement cases associated with litter enforcement violations in Fort Worth.
2. Develop a judicial handbook to assist legal staff and municipal courts personnel when they work on cases involving illegal dumping and process violations for littering.
 - *Performance Indicator:* Number of litter and illegal dumping citations processed.
 - *Performance Indicator:* Number of cases that are enforced and dismissed.

City Staff Training & Collaboration

1. Distribute Litter Speakers' Bureau presentation and materials to city staff to present to residents, organizations and businesses. Offer trainings on presentation, if applicable.
2. Cross-train city staff to incorporate litter assessments and violations into inspection reports and other site visits.
 - *Performance Indicator:* Number of city staff who receive litter inspection training.
 - *Performance Indicator:* Number of litter assessments performed by trained city staff.
 - *Performance Indicator:* Number of reported violations made by trained city staff.
3. City staff and KFWB board members will continue to support and attend trainings to maintain a good standing status with KAB and KTB.
 - *Performance Indicator:* Number of trainings attended by city staff and KFWB board members.

Public Technical Guidance & Training

1. Increase public participation in available training classes, such as the master composter class.
2. Evaluate the potential to offer additional training programs that incorporate KAB curriculum, such as volunteer leadership.
 - *Performance Indicator:* Number of participants and organizations that attend the public training courses.
 - *Performance Indicator:* List of public training classes that incorporate KAB curriculum.
3. Survey litter summit participants and develop list of lessons learned to inform future summits.
 - *Performance Indicator:* Number of litter summit list participants.
 - *Performance Indicator:* List of companies and organizations represented at litter events.

Public Education & Outreach

1. Raise awareness for Litter Speakers' Bureau through various communications channels (e.g., social media, city website, etc.) and outreach events.
 - *Performance Indicator:* Number of presentations given.

- *Performance Indicator:* List of civic groups and NGOs that receive the presentation.
 - *Performance Indicator:* Number of people in attendance.
2. Annually review and update as applicable the media campaigns for litter control programs and evaluate successes and areas for improvement.
 - *Performance Indicator:* Inventory of media campaigns, including graphics and collateral pieces, as well as public response to the campaign to help design future campaigns.
 - *Performance Indicator:* List of implemented BMPs and anti-litter campaigns with a record of their performance.
 3. Follow strategies outlined in the Code Compliance Communications Plan to increase awareness of litter control programs, especially the Litter-Free Fort Worth and KFWB brands.
 4. Annually review and update as applicable the litter control information on the city website and social media.
 - *Performance Indicator:* Number of visits to website.
 - *Performance Indicator:* Number of people registered for city-sponsored litter control events advertised on website and social media.
- *Performance Indicator:* Inventory of neighborhoods that participate in Litter-Free Lanes.
 - *Performance Indicator:* Frequency of how often neighborhoods engage in cleanup activities.
 - *Performance Indicator:* Frequency of posts on social media about Litter-Free Lanes and Litter-Free Landmark events.
 - *Performance Indicator:* Amount of litter collected during Litter-Free Lanes and Litter-Free Landmark events.
4. Market Litter-Free Lanes to groups that have adopted roadways.
 5. Increase participation in School Green Team activities and share promotional and educational materials with schools.
 - *Performance Indicator:* Number of schools participating in School Green Team activities.
 - *Performance Indicator:* Number of student volunteer hours logged for supporting litter control and Green Team activities.
 6. Explore options for offering community recognition for litter and beautification efforts, including hosting an awards ceremony, partnering with existing city awards programs and nominating individuals or organizations for external awards.
 - *Performance Indicator:* Number of awards distributed to individuals and organizations supporting the city's litter control events and beautification efforts.

Community Partnerships & Volunteerism

1. Continue to support the Reverse Litter partnership with TRWD and guide the marketing strategy to fit Fort Worth's needs and distribute information through Fort Worth's communications channels and outreach.
 - *Performance Indicator:* Annual summary of TRWD's media efforts and strategies, including the actions taken to share the Reverse Litter brand to TRWD.
2. Increase participation in the Litter-Free School Zones Challenge.
 - *Performance Indicator:* Number of schools that sign up for the Litter-Free School Zones challenge.
 - *Performance Indicator:* Number of schools that complete the Litter-Free Zone Challenge.
3. Develop the Litter-Free Lanes and Litter-Free Landmarks programs and encourage participation through various media channels and outreach.

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