DRAFT
Comprehensive Solid Waste Management Plan

City of New Braunfels
Solid Waste and Recycling Division
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SCS ENGINEERS

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1.0 EXECUTIVE SUMMARY

1.1 OVERVIEW

The City of New Braunfels Solid Waste and Recycling Division's (SWRD's) vision for the Comprehensive Solid Waste Management Plan (Plan) is to:

- Evaluate and report on the effectiveness of the SWRD's current programs and operations.
- Address the City's constantly growing population and the resulting potential capacity issues at facilities to which it currently takes its municipal solid waste.
- Provide economically and technologically feasible management methods for solid waste, based on the hierarchy of: 1) waste reduction and minimization; 2) reuse and recycling; 3) waste treatment or reprocessing for energy or resource recovery and 4) land disposal.
- Recommend new strategies and goals that allow the City to make further progress in maximizing waste reduction, diversion, and resource recovery, and extending landfill life.
- Serve as a guide for the City to make fiscally responsible and environmentally focused budgeting, services, and planning decisions.

Using the Plan, the City intends to have a positive and lasting impact on all aspects of solid waste services provided to the residential, commercial, industrial, and institutional sectors. The SWRD contracted with SCS Engineers (SCS) to:

- Help identify Plan goals and objectives
- Establish a baseline
- Forecast waste streams
- Evaluate options to increase landfill diversion and manage future waste streams
- Assess financial requirements
- Prepare an implementation plan

1.2 PLAN GOALS AND OBJECTIVES

The Plan will establish the foundation for cost-effective, long-term management of solid waste by the city of New Braunfels for the 20-year planning horizon, 2020-2040. The fiscal year 2016-2017 is the Baseline Year for this Plan. The Plan's goals and objectives are described below:

Goal #1: Achieve further progress in waste reduction, minimization, and reuse

Objectives:

- Evaluate policies and programs that focus on preventing waste generation.
- Identify repair, re-manufacturing, and refurbishing businesses and opportunities in the region that support the reuse industry.

- Emphasize the value of materials and highlight the saving of natural resources.
- Consider incentives to residents and businesses to reduce waste, such as rate structures, rewards, or penalties.

Goal #2: Maximize resource recovery and diversion

Objectives:

- Evaluate options for commercial recycling.
- Evaluate potential incentives to encourage recycling by commercial businesses.
- Enhance recycling opportunities at the City Recycling Center (CRC).
- Evaluate new technologies and processes to improve current programs and services and enhance efficiency of solid waste operations.
- Ensure convenient access to collection or drop-off services for residences, businesses, and industry.
- Evaluate options for recovering and diverting Construction and Demolition (C&D) materials.

Goal #3: Ensure available capacity at solid waste facilities utilized by the City

Objectives:

- Assess alternatives for cost effective and convenient diversion of green waste.
- Identify facilities to optimize service levels and transportation efficiencies.
- Evaluate current disposal capacity and if necessary, develop alternatives for long-term disposal capacity.

Goal #4: Maintain sufficient funding mechanisms to support SWRD programs

Objectives:

- Evaluate existing revenue sufficiency and develop a long-term financial management plan, including recommendations for future funding strategies.
- Manage waste in a manner that promotes cost-effective collection, recycling, diversion, and ultimate disposal.
- Develop 20-year capital improvement plan, to include implementation goals.

Goal #5: Encourage and expand coordination and communications regarding solid waste issues among all agencies and private firms in the city of New Braunfels and the region

Objectives:

- Increase public awareness of solid waste issues by continuing and expanding educational opportunities within the city to promote waste reduction and recycling options.
- Encourage public involvement in the Plan's implementation process.
- Provide an on-going mechanism for evaluation and feedback of the City's solid waste management system.

1.3 PROCESS AND RESEARCH METHODS

The SWRD provides an integrated waste management system for city residents and businesses that is considered well received and respected by the community. The SWRD recognizes that increasing population, new single- and multi-family home developments, and growth in commercial establishments will require additional services, resources, and infrastructure to continue the same excellent level of service. To address the future waste management requirement, as well as optimize the performance and efficiency of existing waste management services and facilities, an assessment was performed of the City's waste management needs on a short, medium, and long-term basis.

The analysis consisted of inventorying the existing solid waste system and conducting research on local and regional solid waste services and facilities. Furthermore, projections were developed on the types and quantities of materials that will be generated over the planning period and relating that to the existing and future solid waste infrastructure. Finally, various options were identified to meet the City's future solid waste goals, the diversion potential and financial resources necessary to attain them.

1.4 PUBLIC INVOLVEMENT

The City convened a series of workshops to gather public input on the Plan development. The workshops were held at City Hall, and at the SWRD office. The workshops were held during the day and in the evening, to provide convenient access to businesses and residents. The initial workshops, held in September 2018, provided information on the Plan vision, goals, and objectives, as well as background information on the existing solid waste management system in the City. Data on waste generation projections was presented, and the results of the needs assessment were identified. The second series of workshops were held in December 2018. At these workshops, options were presented to address the solid waste management needs of the city in the short, medium, and long terms. The options were organized according to topics, including education and outreach, waste reduction, recycling, organics, and special wastes.

1.5 IMPLEMENTATION PLAN

The City's solid waste management system is operating effectively, but there are opportunities for improvement. Some components, such as capacity at the public works municipal service center, need to be addressed, to continue providing fundamental, public services.

As part of this planning process, numerous options to address various needs in the current waste management system were identified, and then evaluated based on the following criteria:

- Feasibility of implementing within New Braunfels or the AACOG region
- Infrastructure and staffing requirements
- Landfill diversion potential
- Cost
- Role in sustaining reliable public services
- Ability to monitor impact

Table 1 identifies the action items that will be implemented in the short term (1-5 years); medium term (6-10 years) and long term (10-20) years. Many of the short-term action items will focus on increasing the quantity that is diverted from the landfill. During the Baseline Year, the diversion rate in New Braunfels was 16 percent. These action items are projected to increase the landfill diversion rate to 29 percent by 2025 and 38 percent by 2030.

Table 1. Implementation Plan

Action Item	***Implementation Schedule (Short, Medium, Long-Term)***
EDUCATION AND OUTREACH	
Conduct Continuous Improvement Workshop	Short
Facilitate Focus Groups	Short
Collect Additional Data	Short
WASTE REDUCTION, REUSUE AND REPURPOSING	
Support Waste Reduction in Outdoor Recreational Areas	Short
Promote Backyard Composting	Short
Promote Reuse and Exchange Opportunities at Thrift Stores and Habitat for Humanity ReStore	Short
Promote RENEW to Businesses and all City Agencies	Medium
RESIDENTIAL RECYCLING	
Establish Recycling and Participation Goals	Short
Consider a Variable Rate Structure to Incentivize Recycling	Medium
Identify Areas of the City with Low Participation and/or High Contamination Rates for Targeted Outreach and Education	Short
Consider a Multi-Family Recycling Ordinance	Medium
COMMERCIAL RECYCLING	
Consider Contracting for Recycling Services for SWRD Commercial Customers	Medium
Modify Permit Process to Require Private Haulers to Report Waste and Recycling Data	Medium
Modify Permit Process to Require Private Haulers to Provide Recycling Service	Medium
Recognize Businesses that Recycle with Green Business Certification Program	Long
Promote Purchase of Recyclable and Products Made with Recycled Content	Medium

Action Item	Implementation Schedule (Short, Medium, Long-Term)
CONSTRUCTION AND DEMOLITION DEBRIS	
Increase the Delivery of Source-Separated Wood to the Beck Landfill	Medium
Establish C&D Diversion Specifications for City Construction Projects	Medium
Secure Long-Term C&D Disposal and Recovery Capacity	Long
ORGANICS	
Educate on Acceptable Materials for Mulching	Short
Explore Development of Compost Facility with Local Partners for Food Scraps and Biosolids	Short
Assess Capacity for Processing Pre-Consumer Produce and Biosolids at Existing Facilities	Medium
Assess Opportunities to Compost Green Waste On-Site at Large Generators	Medium
Evaluate Organics Collection from Large Commercial Generators	Medium
Increase Awareness about Wasted Food and Food Recovery	Short
Provide Outreach to Restaurants and Grocery stores on Food Waste Reduction	Short
Explore a Partnership with the New Braunfels Food Bank to enhance Infrastructure for Consumable Food Recovery	Short
Educate Residents on Alternatives to Household Products	Medium
SPECIAL WASTES	
Develop Permanent, Multi-Material Recovery Center	Short
Promote Reduction Strategies Through Community-Based Social Marketing	Long
Monitor Developments in Alternative Processing Technologies	Long
FLEET MAINTENANCE	
Develop New, Fleet Service Center	Short

2.0 NATURAL AND HUMAN ENVIRONMENT (CURRENT AND PROJECTED)

The natural and human environment can influence a solid waste system and the strategies a community considers to manage waste in an environmentally sustainable and socially acceptable manner. For example, changes in population and commercial development may affect the amount and type of waste a community generates and therefore, influence the type of waste facilities that are necessary. Local geographic conditions, such as aquifers and topography, can limit where solid waste facilities can be located. This section of the Plan describes the New Braunfels' current natural, land uses, demographic and economic characteristics, and future characteristics from the City of New Braunfels' Envision New Braunfels 2018 report (Envision Report).

2.1 NATURAL RESOURCES AND INFRASTRUCTURE

2.1.1 Current

New Braunfels is located in South Central Texas and is approximately 30 miles northeast of San Antonio and 50 miles southwest of Austin. The acreage of New Braunfels spans two counties, with 82.4 percent in Comal and 17.6 percent) and Guadalupe. It is the county seat of Comal County. New Braunfels is a principal city of the San Antonio-New Braunfels metropolitan statistical area. Interstate Highway 35 runs from the southwest corner to the Northeast corner of the city boundaries and within close proximity to the city's downtown. A major throughway, Loop 337 connects the upper and lower regions of the City.

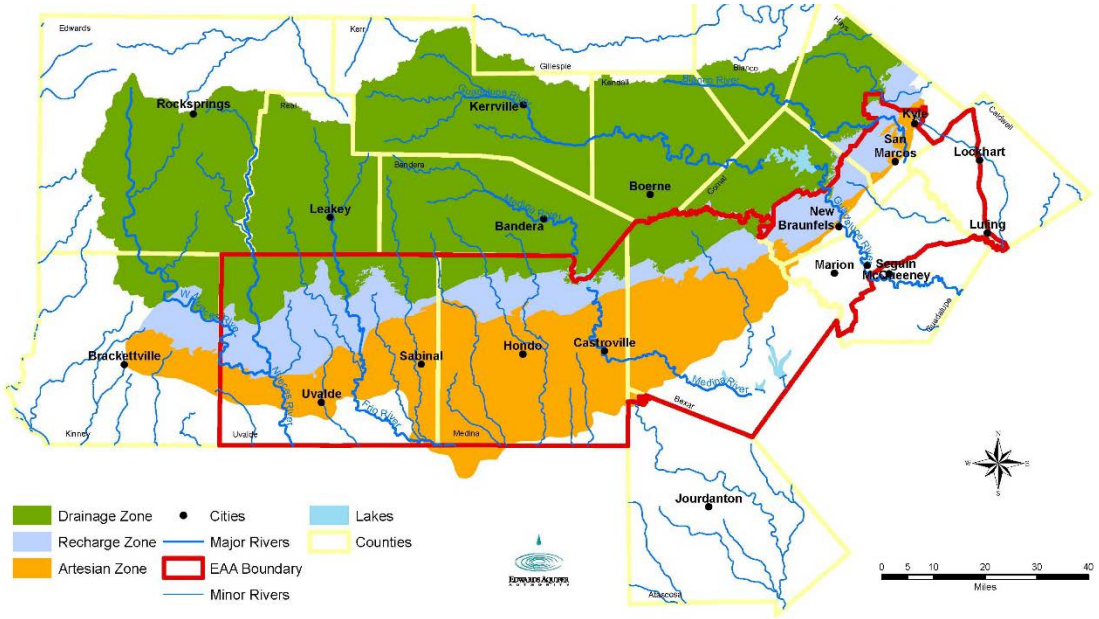
2.1.1.1 Hydrology

The city has a total land area of 43.87 square miles and 0.4 square miles of water. The city is situated along the Balcones Fault and intersected by the Comal River, which feeds into the Guadalupe River. The rivers are a vital component of the City's economy and heritage, but also present challenges.

Over 18 percent of the city limits (5,409 acres), including parts of downtown, occupy the 100-year flood zone. An additional 12 percent is within the 500-year flood zone, which includes the bulk of downtown. There are a series of dams for flood control within the watershed, including the Guadalupe Canyon Dam managed by the US Army Corps of Engineers.

Additionally, the city's western portion sits on the eastern edge of the Edwards Aquifer (**Figure 1**). This is one of the world's highest capacity artesian aquifers, and nearly two million people in south Central Texas depend on the aquifer for agricultural, industrial, recreational, and domestic purposes.

Figure 1. Edwards Aquifer



2.1.1.2 Habitat and Climate

The city's environment is a habitat for a wide array of birds, amphibians, and mammals. This includes the several endangered species: the Fountain Darter, Comal Springs Riffle Beetle, Comal Springs Dryopid Beetle, Peck's Cave Amphipod, Golden-Cheeked Warbler and Comal Springs Salamander.

In 2012, the Edwards Aquifer Recovery Implementation Program developed a Habitat Conservation Plan (HCP) for the protection of the endangered species in the watershed. This HCP recommended a range of habitat protection and flow protection projects, including the removal of non-native vegetation, restoration of native habitat, and limited channel modification in both the Comal and San Marcos Rivers.

New Braunfels experiences a humid, subtropical climate with hot summers and generally mild winters. Temperatures range from an average of 83 °F in the summer to 49 °F during winter. On average, the city receives approximately 36 inches of precipitation, with May and June being the wettest months.

2.1.2 Future

The Headwaters at the Comal is a habitat restoration project that will restore 16 acres of the New Braunfels Utilities' (NBU) Klingemann warehouse property at the headwaters of the Comal Springs to its natural environment. The ecological restoration will include:

- Removing 85 percent of the impervious cover currently on the property.
- Uncapping and restoring the spring.
- Restoring the natural riparian habitats for numerous endangered and threatened species.

- Restoring native plant communities.

Public amenities will consist of a central courtyard, event lawn, display gardens, walking trails, outdoor classrooms, natural spring overlooks, wastewater treatment wetlands, and composting facilities.

The Envision Report includes the following goals for natural resources and infrastructure:

- Protect natural riparian areas and tree canopies that provide resiliency against flooding or other risks.
- Implement storm water best management practices to improve water quality and reduce the demands on engineered storm water systems.
- Reduce solid waste through material recycling and reuse.
- Emphasize energy efficiency and innovation in homes, businesses, and equipment.
- Collaborate with surrounding water providers to preserve, conserve, and continue to diversify our water supply.
- Reduce and control air pollution.

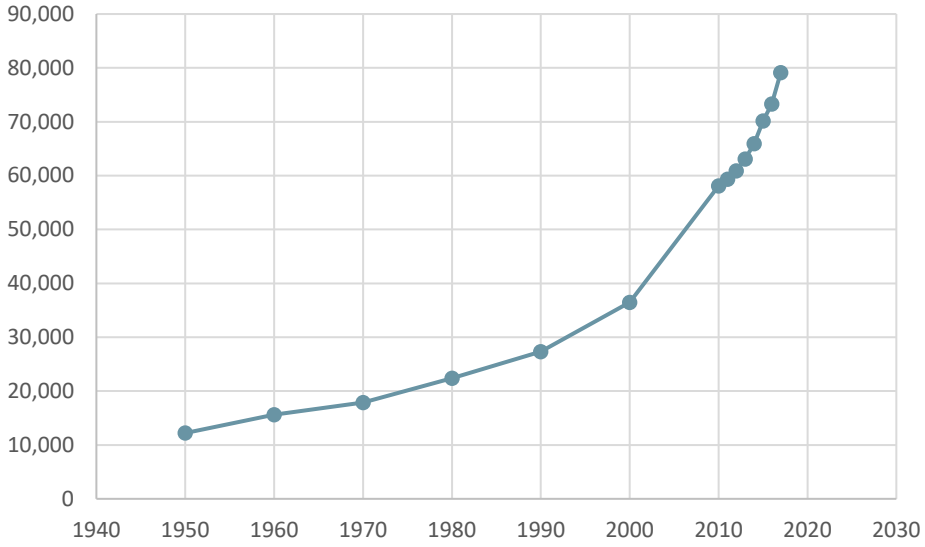
2.2 DEMOGRAPHIC CHARACTERISTICS

2.2.1 Current

2.2.1.1 Population

At the time of the 2010 U.S. Census, the official population in New Braunfels was 57,740. According to the U.S. Census Bureau, this number increased to 79,152 and New Braunfels ranked as the second-fastest growing city in the nation (population of 50,000 or more) during 2016-2017. The city has experienced substantial growth since the mid-20th century (**Figure 2**).

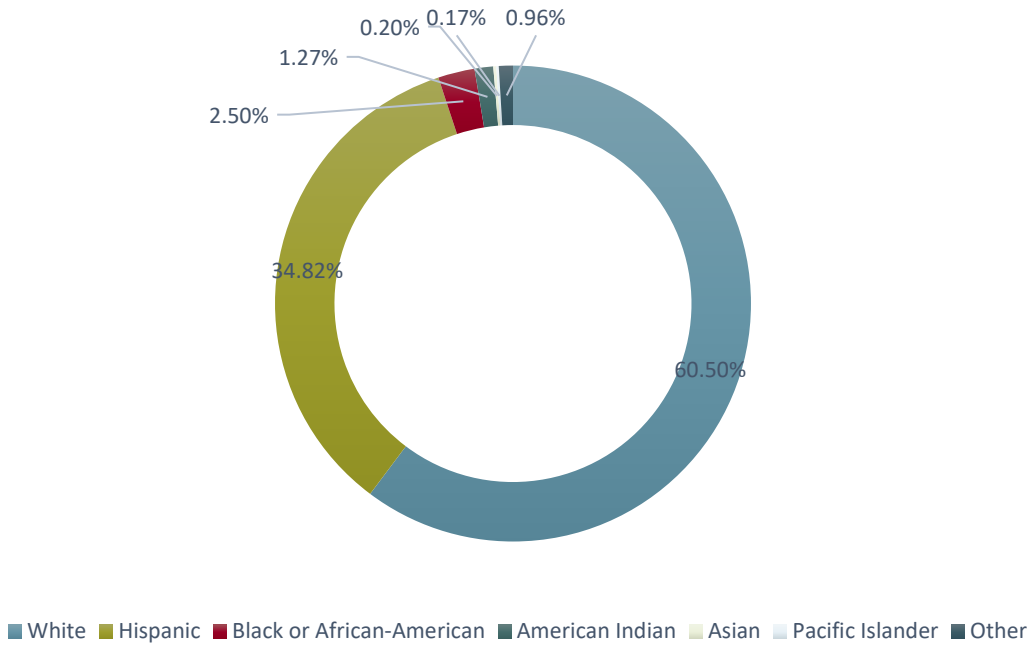
Figure 2. Historic Population Growth



The largest age segment of the city's population is the 35-54 age group. Currently, this age segment represents 26.3 percent of the population, which is slightly larger than the second most populous age segment (55+). The smallest is the 18-34 age group, which constitutes 22.1 percent of the population.

New Braunfels' population includes many households of German, Hispanic and Anglo descendants. **Figure 3** shows the 2016 population by race-ethnicity.

Figure 3. Population by Race-Ethnicity



2.2.1.2 Land Use

Land use in the city is predominantly low density residential, commercial, industrial, and open space. Commercial use occurs along key roadways, such as Interstate Highway 35, with pockets of commercial and industrial along the parkways of Loop 337, State Highway 46 and FM 306. Waterways together with open space blend together with residential and commercial spaces. Several mixed-use areas, such as Gruene and Creekside, represent a moderate amount of New Braunfels current overall land use. Schools, institutional and government establishments are located throughout the city.

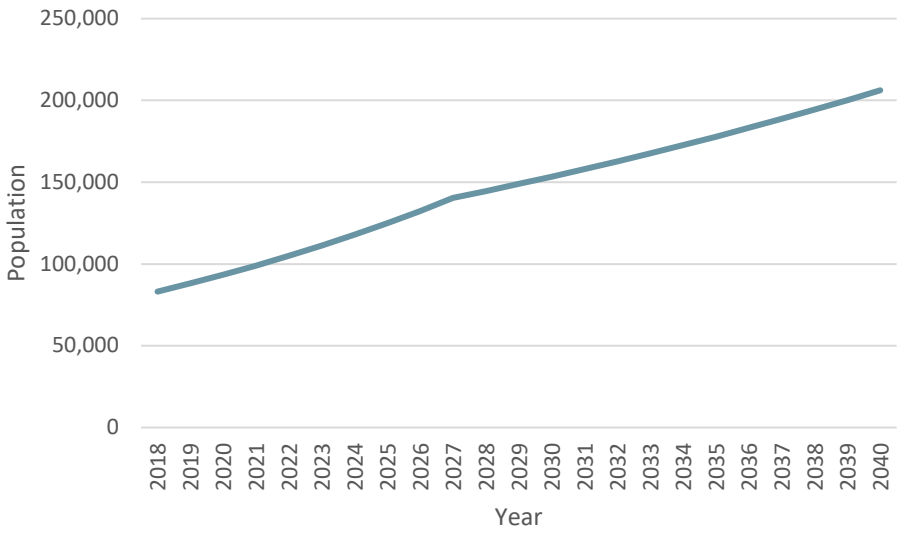
Neighborhoods vary in New Braunfels, ranging from subdivisions of detached single-family homes to multi-family complexes. Many homes are situated near the Comal and Guadalupe rivers. Rural residential communities, featuring larger homes, are typically found along the outskirts of the city.

Commercial land uses such as retail, office and industrial/warehouse are clustered in downtown, Gruene, New Braunfels Town Center and Creekside, and along the major regional highways including Interstate Highway 35, SH 46, Loop 337, FM 725 and FM 306. Commercial land uses range from general commercial to neighborhood commercial.

2.2.2 Future

The Envision Report projects a 6 percent annual growth rate in population for the next ten years, followed by a three percent annual growth rate for years 2027-2040. Based on these assumptions, it is projected the city's population will increase to 93,372 in 2020, 153,415 in 2030, and 206,177 in 2040 (**Figure 4**).

Figure 4. Population Projections



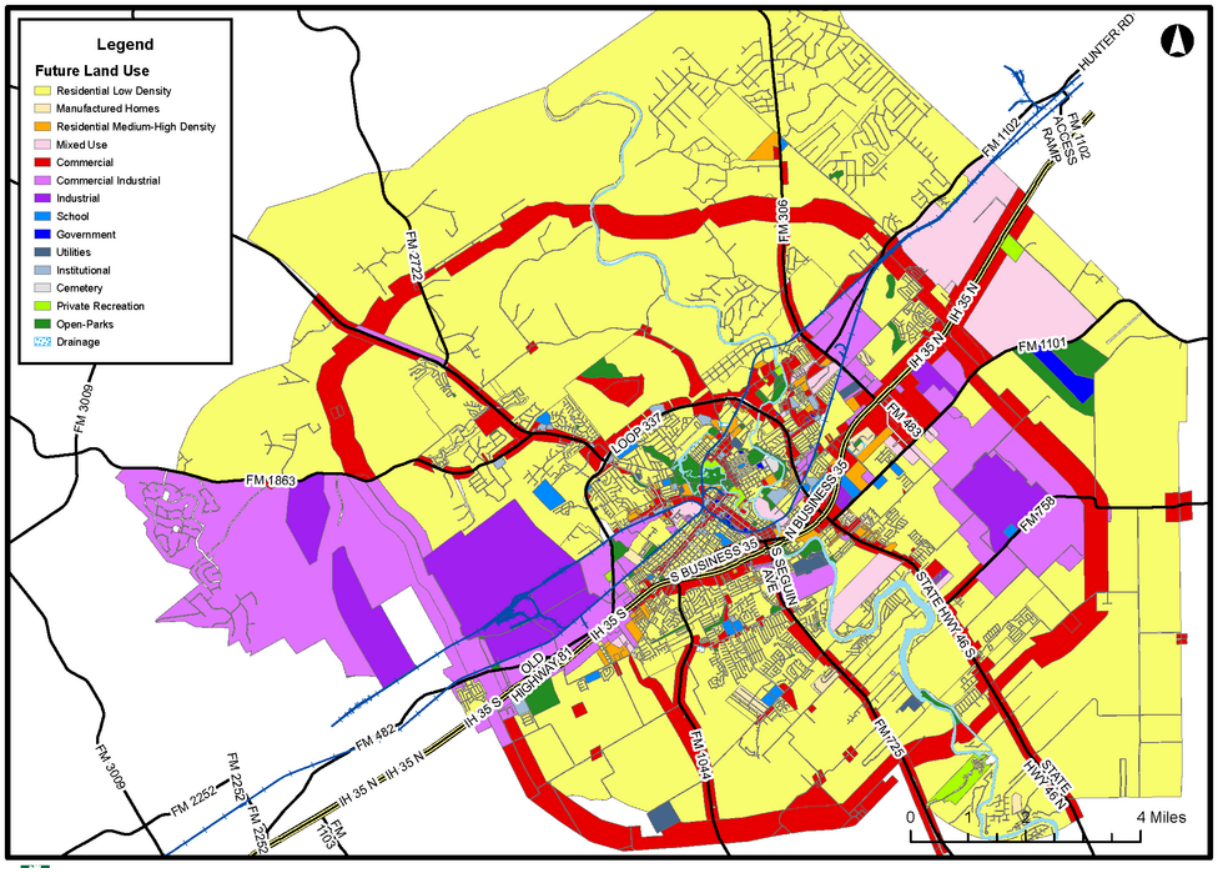
The 55+ age population is expected to see the most growth over the next 15 years; increasing to 28.2 percent by 2031. According the New Braunfels Chamber of Commerce, the city will become more diverse and multicultural in the future, as growing percentages of individuals moving to the area will be of Hispanic, Asian, Black, or African-American or mixed-race descent.

New Braunfels is not only expecting an increase in growth but also expects to be a more densified city becoming less rural and more urban. Veramendi Community will be adding 3,150 new dwellings, 480 acres of parkland, 380 acres of commercial space, a new elementary school, and is expecting to occupy 12,000 to 15,000 new residents. Howard Payne University is building a new campus at the Veramendi development.

The 2006 Future Land Use Plan proposed expanded commercial and industrial uses along Interstate Highway 35 and Loop 337 (**Figure 5**).

However, during the 2012 Regional Transportation Plan update, the community expressed support for focusing commercial uses at key exits/gateways along Loop 337 instead of continuously along the entire loop. Residents desired more preserved greenspace and views to nature and neighborhoods along the Loop 337 Parkway, while the trends of commercial development remained along Interstate Highway 35.

Figure 5. 2006 Land Use Plan



The Envision Report includes the following goals for land uses in the city:

- Protect the character, integrity and stability of neighborhoods where families can live.
- Encourage mixed-use centers that allow people to work and play near where they live.
- Create a clear approach to annexation that allows for strategic and efficient growth.

2.3 ECONOMIC CHARACTERISTICS

2.3.1 Current

New Braunfels is part of the San Antonio- New Braunfels (SANB) metropolitan area, as defined by the U.S. Census Bureau. The SANB metro spans across the following counties: Atascosa County, Bandera County, Bexar County, Comal County, Guadalupe County, Kendall County, Medina County and Wilson County. According to the U.S. Census, in 2015 the SANB metro ranked 25th in the nation by population (2,384,075), and 1st in the nation in terms of economic growth according to the U.S. Department of Commerce.

According to the 2014 US Census, 68 percent of the city's residents work outside the city limits, while approximately 20,000 of 30,000 (or 70 percent) of jobs within New Braunfels are filled by

people living outside of the city limits[1]. The economy of New Braunfels employs 32,157 people. The largest industries in the city are retail trade, (4,454), healthcare and social assistance (3,683), and accommodation and foodservices (3,089).

Tourism/hospitality is also one of New Braunfels' largest industries and provides both direct employment opportunities and indirect employment potential from auxiliary industries such as lodging.[2] In 2017, the New Braunfels' tourism/hospitality industry contributed over $700 million to the region's economy. New Braunfels tourist attractions promote its natural resources, such as the Guadalupe and Comal Rivers, as well as festivals such as Wurstfest, Wassailfest and the Gruene Wine and Music Festival.

2.3.2 Future

The New Braunfels' Chamber of Commerce is targeting growth in aviation, manufacturing, healthcare and medical technologies, IT and data centers, warehouse and distribution, telecom information, specialty food, automotive suppliers, and the music industry. The City plans to invest in the development of housing within the business district that will spur the construction of new restaurants, bars, grocery stores to support these residents. New commercial developments in Westpointe Village and Creekside Town Center and Village will yield 3.5 million square feet additional retail space. In addition, the Solms Landing/New Braunfels Co-Op Public Improvement District (Solms Landing) will be located on 98 acres east of I-35 in the Creekside area near Resolute Health Hospital and Bucees. Solms Landing will offer 675 multifamily and single-family units, 200 hotel rooms, 500,000 square feet of mixed-use space and 150,000 square feet of office space

The Envision Report identifies the following goals for economic competitiveness:

- Create an environment that incentivizes jobs and live/work/play destinations that leverage talent and expands industries.
- Facilitate the creation of new destinations for lodging, recreation, neighborhood goods and services in underutilized neighborhoods and along corridors.
- Create policies and programs that attract families and talented residents.
- Continue to diversify the economy to ensure adaptability and resiliency
- Cultivate a free enterprise approach to growing an economy where the public and private sectors collaborate.
- Continue to be a year-round destination in Central Texas, leveraging target markets via attractions and multi-day festivals.
- Improve existing and create new facilities that encourage tourism and generate revenue through performing arts, conventions, sports events, festivals, and other destination events.
- Enhance existing resources for tourism.
- Create connections and ease of access to tourism destinations via multi-modal transportation.
- Ensure adequate parking for all tourist destinations via public/private partnerships.
- Increase arts/cultural/heritage tourism.

[1] Economic Development Strategic Plan, New Braunfels, TX, Final Report, February 2017, Pegasus Planning and Development.
[2] As of November 2016, New Braunfels has 147 hotels, lodgings or short-term rental facilities.

3.0 WASTE GENERATION AND COMPOSITION

New Braunfels' solid waste management planning requires the collection and analysis of information on the quantities, composition, and projected changes to the city's waste stream. This information helps identify waste diversion and recycling potential, measure existing program and policy effectiveness, highlight market needs, and estimate capacity for current and future processing and disposal infrastructure.

3.1 EXISTING WASTE GENERATION

Waste generation is defined as the sum of the quantity of materials disposed and diverted (reused, recycled, and composted). Based on the available data, estimated waste generation was calculated for 2010 through 2017, as shown in **Table 2**. Total waste generation increased an average of 4 percent per year from 2010 to 2017, for a total increase of 28 percent over the seven-year period.

Table 2. Waste Generation (tons)

Year	Disposal	Diversion	Generated
2010	44,878	2,695	47,573
2011	38,967	6,613	45,580
2012	42,975	6,989	49,965
2013	46,433	7,786	54,218
2014	47,646	8,032	55,678
2015	52,092	8,638	60,730
2016	54,692	9,606	64,298
2017	57,333	10,549	67,882

3.1.1 Per Capita Waste Generation

Per capita waste generation measures the population's effect on waste generation, creating a normalized comparison. The equation below shows how per capita waste generation is calculated.

$$\frac{\textit{waste generated (tons)}}{\textit{population}} \times \frac{365}{\textit{days}} = \textit{per capita waste generation (lbs./pp/day)}$$

Based on the available data, it is estimated the per capita waste generation for New Braunfels in 2017 was 4.7 pounds per person per day. The per capita waste generation for the US averages approximately 4.4 pounds per person per day (2014)[3]. Texas does not calculate a per capita waste generation rate.

[3] Advancing Sustainable Materials Management: 2014 Fact Sheet, USEPA; November 2016.

3.1.2 Disposal

The City tracks disposal by residential, commercial, and special programs. A breakdown of disposal from these three programs for the period 2010 to 2017 is shown in **Table 2**. Using disposal and population data, the per capita waste disposal rate for New Braunfels was 4.0 pounds per person per day in 2017. In 2016, the per capita disposal rate was 4.1 pounds per person per day. In contrast, the State per capita disposal rate for 2016 was 6.8 pounds per person per day. It should be noted this figure only includes waste collected by municipal crews. Whereas the state per capita disposal rate includes commercial waste collected by private waste haulers, construction and demolition (C&D) debris and wastewater sludge.

Table 3. Disposal Data, 2010 to 2017 (tons per year)

Year	Residential	Commercial	Special Programs	Total
2010	21,049	23,645	183	44,878
2011	15,290	23,500	177	38,967
2012	17,259	25,435	280	42,975
2013	17,737	27,266	1,430	46,433
2014	18,382	27,898	1,365	47,646
2015	19,604	31,163	1,325	52,092
2016	21,131	31,858	1,703	54,692
2017	22,133	33,620	1,580	57,333

In addition to City-collected waste, New Braunfels Utilities' (NBU) waste water treatment plants disposed 616 tons of sludge at Mesquite Creek landfill during the Baseline Year.

3.1.3 Diversion

Diversion in New Braunfels consists of recycling, green waste, and brush pickup programs, including residential curbside recycling and green waste collection, weekly brush pick-up, cardboard, scrap metal, Styrofoam, and material collected at the City's recycling center. A breakdown of the diversion data for the period from 2010 to 2017 is shown in **Table 4**. The city's overall diversion tonnage has increased an average of 28 percent per year between 2011 and 2017. Recycling has increased an average of 14 percent per year, and green waste an average of 13 percent per year during the same period.

Table 4. Diversion Data, 2010 through 2017 (tons)

Year	Recyclables	Green Waste, Brush	Total
2010	2,695	0	2,695
2011	4,376	2,237	6,613
2012	5,015	1,975	6,989
2013	5,192	2,593	7,786
2014	5,423	2,609	8,032
2015	5,920	2,718	8,638
2016	6,260	3,346	9,606
2017	6,223	4,326	10,549

A diversion rate indicates the quantity of generated waste that is being reused, recycled, composted, or otherwise diverted from the landfill. For this study, data was not available on reuse and therefore was not included in the calculations of the diversion rate. Based on available data, it is estimated the New Braunfels' diversion rates for 2015, 2016 and 2017 were 14 percent, 15 percent, and 16 percent, respectively. According to the Texas Recycling Data Initiative (TRDI), in 2015, the Texas recycling rate (recycling tons/ disposal tons + recycling tons) was 18.9 percent. According to the 2017 "Study on the Economic Impacts of Recycling" prepared for the Texas Commission on Environmental Quality (TCEQ), the 2015 recycling rate for Texas was 22.7 percent.[4]

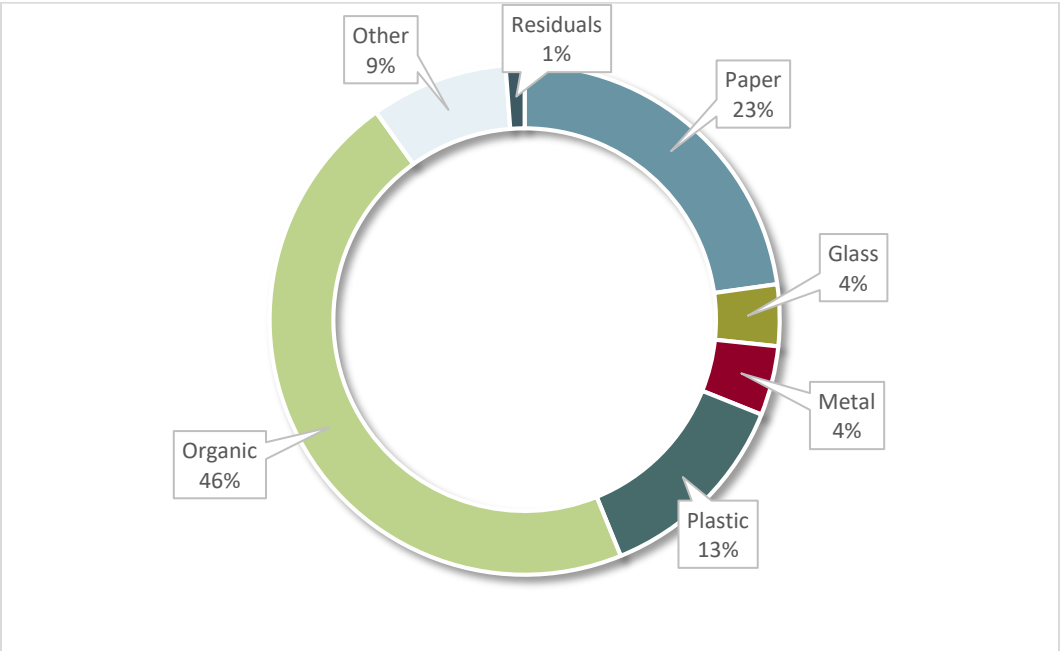
3.2 WASTE COMPOSITION

Waste composition information provides useful data for the City to evaluate existing diversion programs and policies, develop new waste diversion and recycling programs, and evaluate the potential to reduce costs and increase revenues.

To provide perspective on the waste composition in New Braunfels, SCS reviewed recent waste composition studies prepared in Texas. The composition of the New Braunfels' waste stream is estimated based on data from waste characterization studies conducted in Austin, Dallas, and Ft. Worth.[5] The overall waste composition is shown in **Figure 6.**

Using the average waste composition data, combined with the disposal data from New Braunfels, the estimated types and quantities of waste disposed in New Braunfels are presented in **Table 5**.

Figure 6. Overall Waste Composition



[4] The Study On The Economic Impacts Of Recycling, TCEQ, Final Report July 2017.
[5] Data was obtained from 2017 TCEQ Study on the Economic Impacts of Recycling; City of Ft. Worth 2017 Solid Waste Management Plan; City of Dallas 2013 Solid Waste Management Plan.

Table 5. Waste Composition and Disposal Estimates, 2017

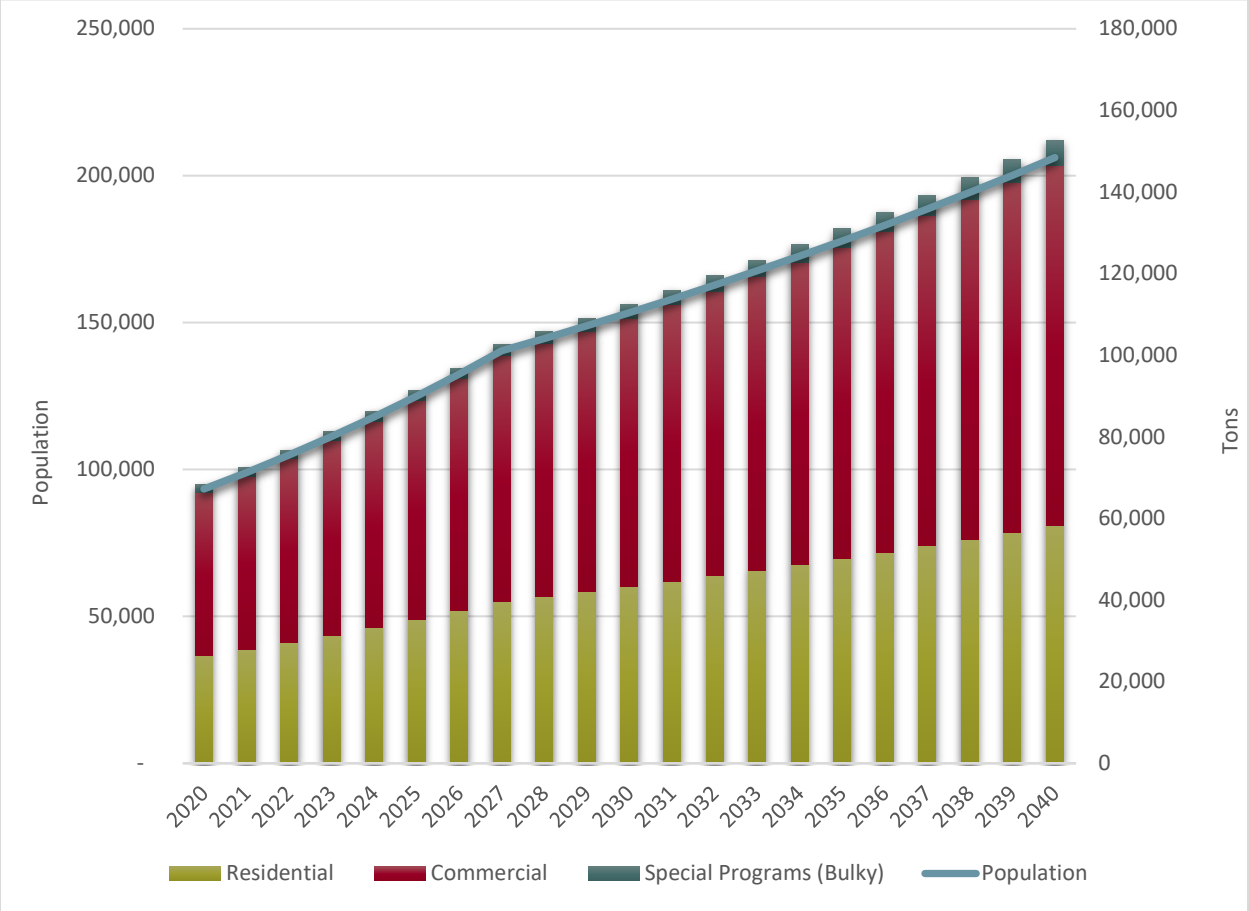
Material Type	Waste Composition	Tons
Paper	27%	15,595
Plastics	11%	6,383
Metals	4%	2,293
Glass	4%	2,121
Organics	36%	20,449
C&D	5%	2,580
Other	14%	7,931
TOTAL	100%	57,352

3.3 WASTE STREAM PROJECTIONS

This section presents waste generation projections until 20 years. Waste stream projections were based on growth assumptions included in the Envision Report. The growth assumptions project a 6 percent annual growth rate in population for the next ten years, followed by a three percent annual growth rate for years 2027-2040. Based on these assumptions, it is projected the City's population will increase to 93,372 in 2020, 153,415 in 2030, and 206,177 in 2040.

As indicated in **Table 2**, the total amount generated during the Baseline Year was approximately 68,000 tons. Using the projected population growth, an increase of 6 percent annually for 10 years followed by 3 percent for the subsequent 10 years, the total tons generated in the city are estimated for the 20-year planning period, 2020 to 2040 (**Figure 7**). As indicated, the city's total waste generation is projected to increase from approximately 80,000 tons in 2020, to nearly 153,000 tons by 2040.

Figure 7. Waste Generation Projections, 2020-2040



4.0 EXISTING POLICIES, PROGRAMS, AND FACILITIES

4.1 GOVERNANCE, POLICIES, AND REGULATIONS

4.1.1 Governance

The City of New Braunfels was founded in 1845 under German charter, and is a home-rule city under Texas State Law. This means it has the right to perform an act without having received that right from the Texas constitution or the state legislature.

A seven-member council governs New Braunfels and has over 500 employees under a city manager. The City has several local advisory committees, boards and commissions who make recommendations to the City Council regarding policies and the operation of several City departments. Fifteen departments operate within the City, including Public Works that reports directly to the assistant city manager.

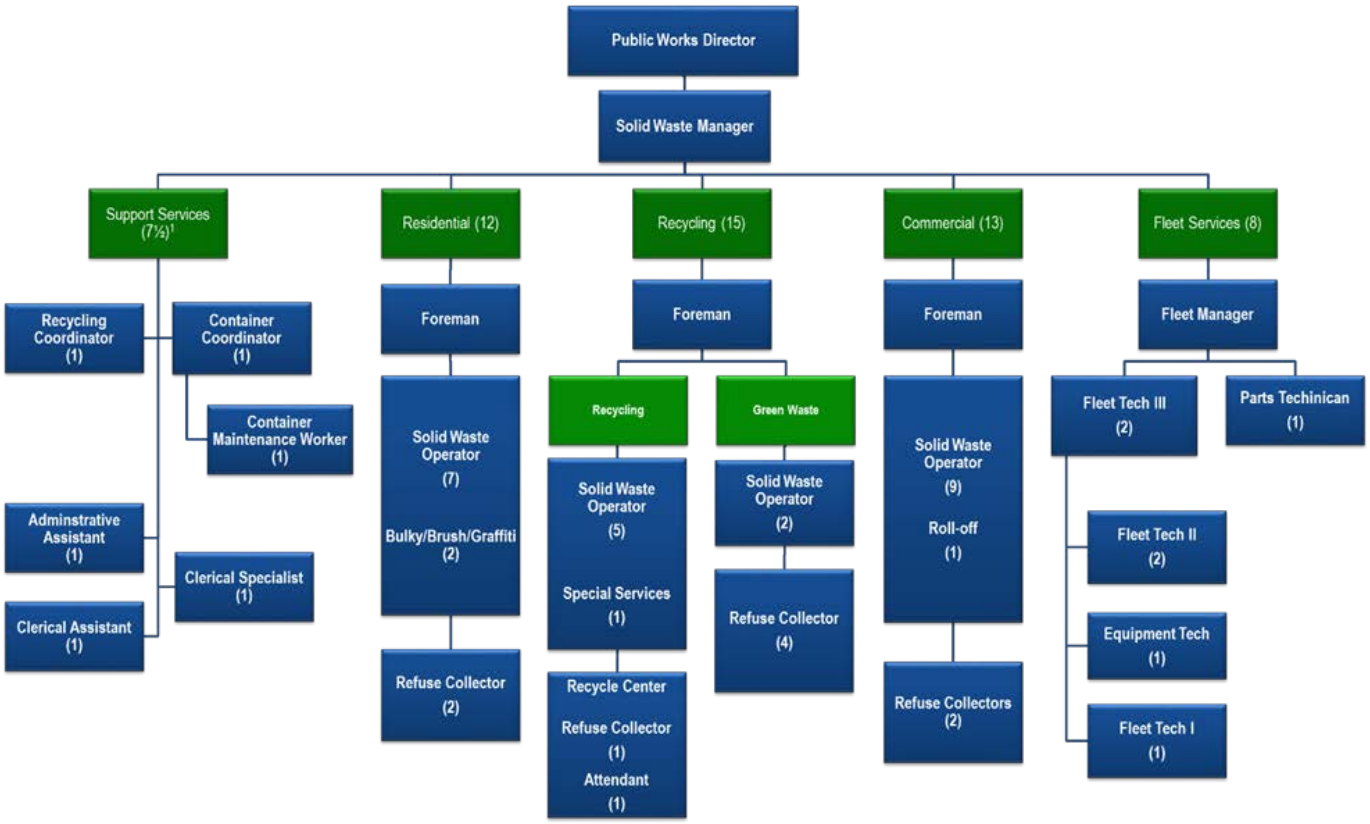
The SWRD is part of the Public Works Department. Public Works is also responsible for the following City services:

- City streets
- Drainage
- Pavement markings
- Signs
- Storm water management
- Traffic signals

The SWRD manages the City's municipal solid waste (MSW) system. As shown in **Figure 8**, the SWRD as five core services and employed 55.5 full-time employees during the Baseline Year.

- Support services
- Residential
- Recycling and green waste
- Commercial
- Fleet services

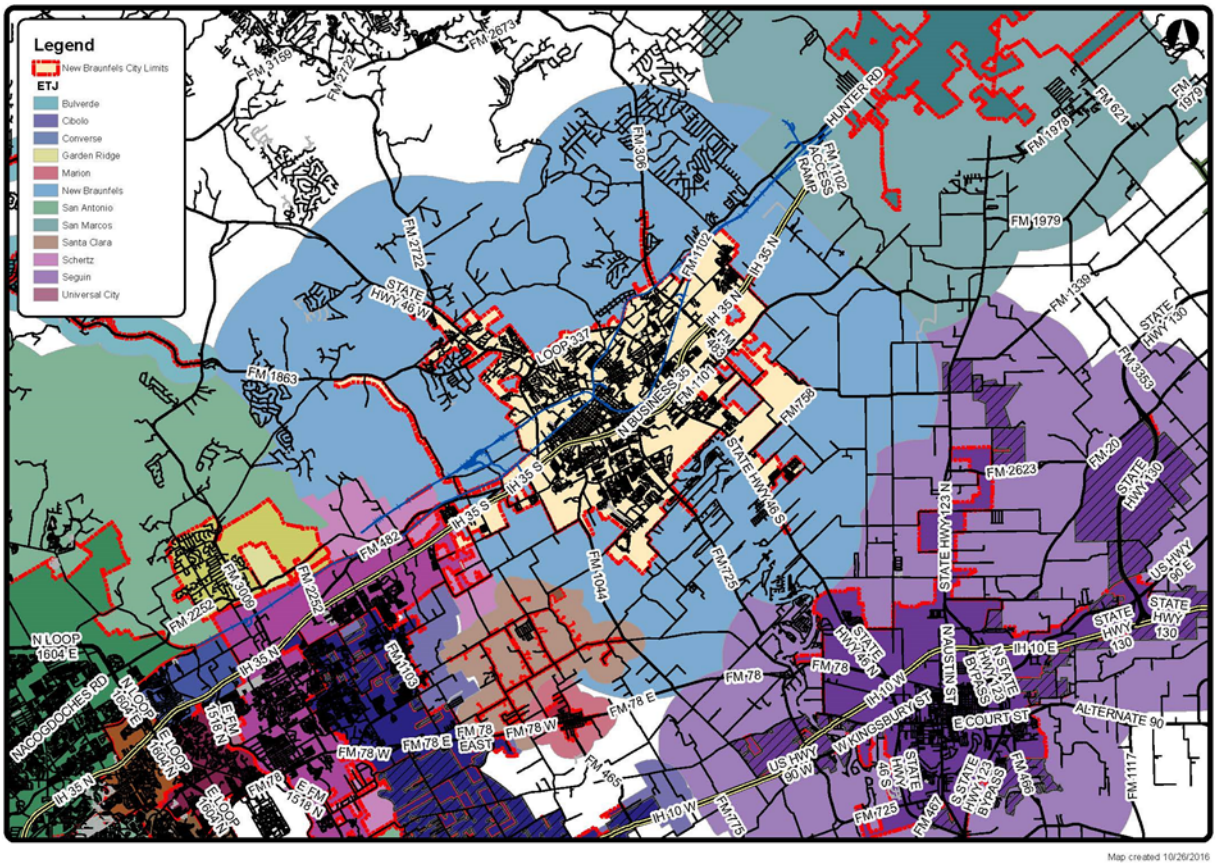
Figure 8. SWRD Organizational Structure



New Braunfels has a 3.5-mile Extraterritorial Jurisdiction (ETJ), which means the City has the legal capability to exercise authority beyond the boundaries of its incorporated area. The State of Texas

has granted such review authority to cities to facilitate alignment of services and policies between incorporated city limits and areas that could one day be part of the incorporated city limits. The City has adopted ordinances establishing regulations for subdivision review and off-premise signage in the ETJ. **Figure 9** shows the 2016 ETJ boundaries.

Figure 9. 2016 ETJ Boundaries



The City is a member of the Alamo Area Council of Governments (AACOG), which was established in 1967 under Chapter 391 of the Local Government Code. AACOG is a voluntary association of local governments and organizations that serves its members through planning, information, and coordination activities. AACOG serves the Alamo Area/State Planning Region 18, which covers 13 counties and 12,582 square miles. The AACOG region is comprised of Atascosa, Bandera, Bexar, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina, McMullen, and Wilson counties and the governmental units within these counties.

4.1.2 Regulations and Policies

The City's rules, regulations, policies, and rate provisions affecting solid waste within the city limits are contained in Chapter 110 of the City of New Braunfels Code of Ordinances (the Solid Waste Code). The Solid Waste Code establishes regulations governing the accumulation, storage, and disposal of waste for residential and commercial, industrial and institutional users, and establishes

the solid waste rate model that is used to monitor and make recommendations on changing or amending solid waste rates. The existing Solid Waste Code was adopted on March 12, 2018, when the City amended the Solid Waste Code in its entirety. Formerly, the Solid Waste Code addressed similar subject matter, and was derived from Ordinance Number 2010-41, § 2 that was adopted June 28, 2010, and Ordinance Number 2017-07, § 1 that was adopted January 23, 2017.

4.2 EDUCATION AND OUTREACH

The SWRD employs a variety of ongoing, annual and periodic outreach and education methods to educate and encourage compliance with program participants.

4.2.1 Ongoing

Ongoing education and outreach activities and services offered by the SWRD include:

- The City's website is updated on a regular basis with the most current program information and the main site for SWRD is at www.nbtexas.org/swrd. The website also has digital versions of most printed materials, event information, and informational videos about services. Since 2013, almost all SWRD's printed materials for outreach and education have been in both English and Spanish. The website also has a calendar, where all events are posted. Through the website, http://www.nbtexas.org/1769/Stay-Informed, residents can sign up to be directly notified of events, media releases, and changes via the website's "Notify Me" feature.

- For every event and change to service (i.e. collection holidays), the SWRD runs advertisements in the local newspaper, the Herald-Zeitung, and sends a media release to local media outlets. The SWRD also runs ads about program compliance – what is and is not recyclable, "Don't trash your Green Waste," etc.

- On the collections side, drivers in all divisions carry door hangers, called "tags," which are left for a customer when an issue needs to be addressed. Once three tags are left within a 60-day time frame, the address is sent a letter asking they correct the issue to continue to receive service.

- SWRD service information runs 24/7 on cable PEG channel for Government Access.

- The SWRD has a mascot, named Scout the Green Raccoon that goes to presentations to talk about recycling and waste reduction. Scout has a local origin story, which on his website: http://www.nbtexas.org/1808/Scout-the-Green-Raccoon. Scout has an activity book that is custom-created for New Braunfels residents, encouraging young children to pick up litter, reuse, and recycle. He usually makes about 10 public appearances a year.

- Each year, the SWRD has direct interaction with more than 2,200 people via events and presentations.

- The SWRD distributes promotional items made from recycled materials: tire jar openers; shirts, bags, rulers, and pens with recycled plastic; pencils with recycled newspaper.

- The SWRD posts videos to encourage recycling and program compliance in New Braunfels: http://www.nbtexas.org/CivicMedia?VID=382 *and more recently:*

http://www.nbtexas.org/CivicMedia?VID=401. Both of these videos have played in the local movie theater and on the PEG channel.

4.2.2 Annual

Each year, the SWRD conducts the following education and outreach activities:

- Direct mails every household that it services information about curbside services;
- Shows a 30-second video applauding recycling efforts in New Braunfels in a local movie theater. In 2017, there were approximately 82,000 views of this video;
- Makes about 20 presentations to various school classes on recycling, waste reduction, and environmental impacts, including the award-winning two-day 6th grade curriculum on the 3Rs: Reduce, Reuse, and Recycle given to every NBISD 6th grader. Students often play a game that requires them to choose between recyclable and non-recyclable items;
- Participates in story time at the Public library around Earth Day, reading stories and conducting activities about recycling;
- Staffs a table at the City's Community Arbor Day and gives away promotional materials to approximately 75 people;
- Participates in Earth Day events where there are from 75 to 400 attendees;
- Conducts six to eight presentations for City employees on recycling at work and at home, including at the New Hire Orientation and the Employee Health & Wellness Expo;
- Makes presentation at City University to about 25 residents; and,
- Distributes four, environmentally-oriented newsletters. These newsletters include articles from City departments (Environmental Health, Watershed Management, Parks and Recreation) and New Braunfels Utilities (NBU), as well as SWRD information and current issues in the solid waste industry. These are handed out at events and quarterly, 10,000 are inserted into a Sunday edition of the Herald-Zeitung.

4.2.3 Other Presentations/ General Outreach

The SWRD also:

- Made at least one presentation at the local children's museum (McKenna), for garden clubs and church groups, camps, career day, student groups (Lego league, Girl Scouts, Boy Scouts), private schools, and other local organizations (Council of Realtors, Farmer's Market, Kops N Kids); and,
- Hosts tours at the CRC to students, organizations, and residents.

4.3 SWRD SERVICES, PROGRAMS, AND FACILITIES

The following provides an overview of each SWRD service center, which includes the quantity of MSW that each service center managed during the Baseline Year and the governing provisions of the Solid Waste Code.

4.3.1 Support Services

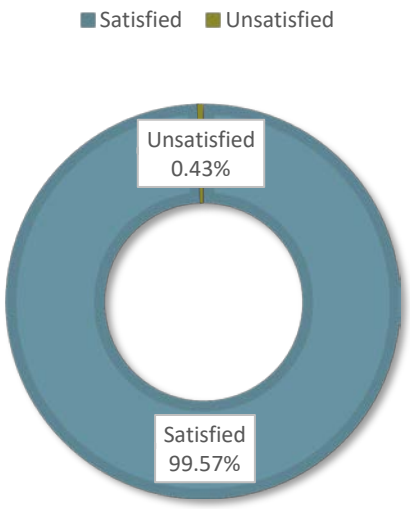
The Support Services section of SWRD includes 7.5 positions, because the solid waste fund partially funds the position of Public Works Director. Most of these positions handle the administrative responsibilities associated with the management of solid waste and recycling services.

In Support Services, staff members take calls from residential and commercial customers regarding services, as well assist residents in-person. Many calls result in a service request, or a work order, being created to ensure that the service is completed. Service requests are tracked by a software program that the City utilizes, called Accela Automation. During the Baseline year, Support Services received and average of 4,795 calls per month that initiated on average 631 work orders each month. The average amount of time spent on the phone in Support Services is 101 hours per month.

The container maintenance part of Support Services is responsible for the delivery, maintenance, and repair of carts and dumpsters that are used for collection. During the Baseline Year, 1,076 residential garbage and 340 recycling cart maintenance work orders were completed. 1,214 new service delivery work orders, meaning initiating service for a new construction home, were requested for residential. With respect to commercial, Support services received approximately 394 work orders for maintenance of commercial containers (carts and dumpsters combined) during the Baseline Year. For commercial new service, approximately 84 work orders were requested.

In 2013, the City began surveying customers who contact Support Services to gage their level of satisfaction. On average, approximately 1,300 customers participate in the survey each year and as shown in **Figure 10**, over 99 percent of the participants were satisfied with the service they received.

Figure 10. Average Customer Satisfaction Since 2013



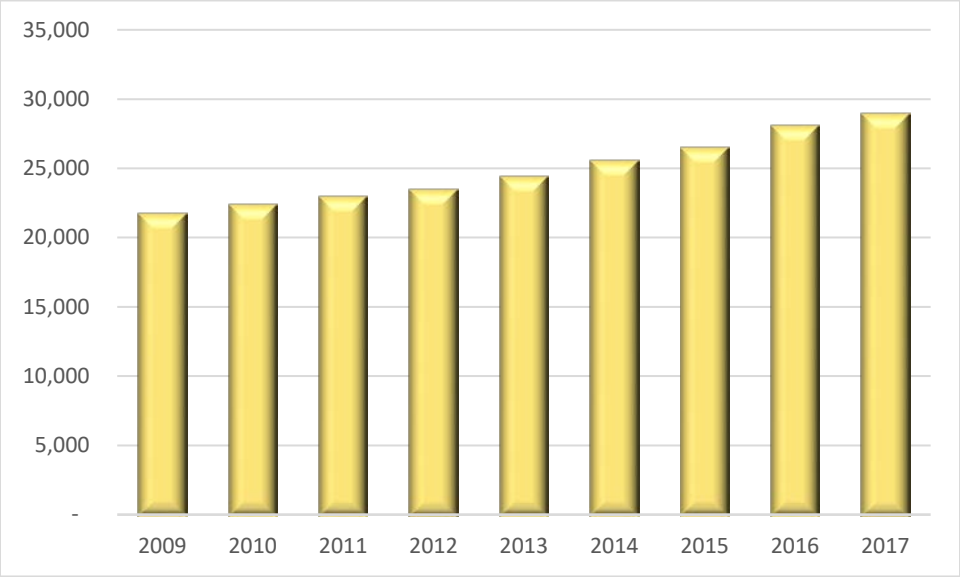
4.3.2 Residential Waste

4.3.2.1 Curbside Waste Collection

The SWRD is the exclusive waste hauler for residential customers in the city. During the Baseline Year, the SWRD collected 34,216 tons of waste from 28,899 residential customers. According to the Solid Waste Code, "any person making application for water and/or electric service inside the City limits shall be deemed to have applied for garbage and recycling services and shall be considered a customer of the Solid Waste and Recycling Division of the City until such time as water and/or electric service to such person has been discontinued."

The number of residential waste customers has been steadily increasing at an average of 3 percent per year over the past eight years. This is indicative of the growth the city has experienced over this period, and the SWRD has added new collection routes to meet the demand. **Figure 11** provides a historic overview of residential waste customers.

Figure 11. Historic Residential Waste Customers



Residential customers receive weekly waste collection and the SWRD provides them with a 96-gallon cart. Residential customers pay a monthly fee of $13.40 for this service. A 48-gallon cart is also available, but the monthly fee is the same. During the Baseline Year, less than 3 percent of customers requested a 48-gallon cart. If the residential customer requests a return service, meaning the SWRD needs to return and service a cart outside of the normal route or business day, the SWRD will charge them a fee of $15.00.

Residential customers can request additional carts for a fee of $6.50 per month. The residential customer must keep the cart for a minimum of four consecutive months before they can return or exchange the cart. Residential customers may also purchase tags from the SWRD in increments of five for $10 when waste exceeds cart capacity. Tags are available at the following locations:

- City Municipal Building 424 S Castell Avenue
- New Braunfels Utilities 263 Main Plaza

Based on 2017 expenditures, the SWRD sold 45 packs of tags. The SWRD prohibits residential customers from putting the following materials in waste carts or tagging them for waste collection:

- Bricks and rocks
- Bulky appliances
- Construction debris
- Dirt
- Flammable or combustible liquids or gases
- Green waste
- Hot ashes or coal
- Tires
- Televisions and electronics

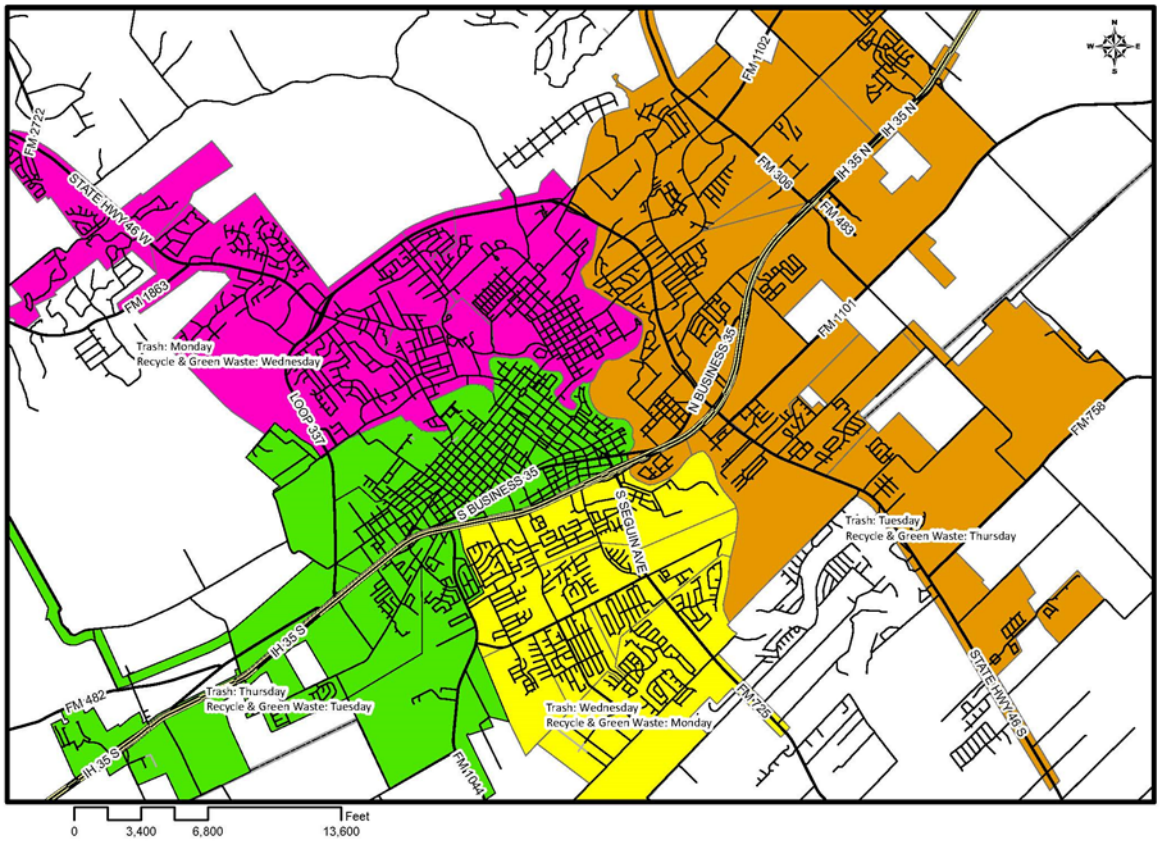
The SWRD permits residential customers to put household medical and infectious waste into carts, including lancets, syringes, and hypodermic needles. However, residential customers must put lancets, syringes, and hypodermic needles in a rigid, leak-proof and puncture resistant container with a secured and taped lid that has a label identifying the contents.

The SWRD began collecting waste with an automated collection system in 2005. In an automated collection system, the driver positions the collection vehicle beside the cart. Using controls inside the cab of the vehicle, the driver maneuvers a hydraulic arm to pick up the cart and tip its contents into the vehicle. The driver then uses the arm to return the cart to its original location. To optimize the performance of an automated collection system, the Solid Waste Code includes the following provisions:

- All carts must be placed on the addressed side of the structure or designated point of collection approximately five feet laterally from any obstacle.
- Carts must be placed at the street's edge with the wheels against the curb. If curbs do not exist, wheels must face away from main street section.
- No carts can be placed in an alleyway, under any overhead lines of any type or low overhanging branches and must be placed five feet from any obstacle or structure. Exceptions to this shall only be given by the Solid Waste Manager or designee.
- It is unlawful to park, place, allow, permit or cause to be parked, place any motor vehicle, trailers, boats, or similar obstruction within five feet of, or obstruct in any manner the collection of waste.

The SWRD divides residential waste collection into four zones (**Figure 12**), and services customers four days per week using 10-hour shifts.

Figure 12. Residential Waste Collection Zones



4.3.2.2 Bulky Goods

The SWRD does not collect bulky goods, such as furniture and appliances, curbside unless a residential customer has scheduled a pick-up for these items for a fee. The SWRD charges a minimum fee of $25.00 for the first one-half hour and $25.00 for each additional one-half hour. During the Baseline Year, the SWRD responded to 212 requests for bulky good service requests and collected 1,064 tons of bulky goods.

The SWRD offers Bulky Goods Drop-Off events (BGD) to residents at no additional charge. Residents must bring a current New Braunfels Utilities (NBU) or Guadalupe Valley Electric Cooperative (GVEC), bill and a photo identification. The SWRD conducts the BGD several times a year at multiple locations, including the Mesquite Creek Landfill, operated by Waste Management.

Residents can bring the following materials to the BGD:

- Non-metal oversized trash items
- Furniture
- Mattresses
- Up to four, whole passenger tires per resident. Rims must be removed.

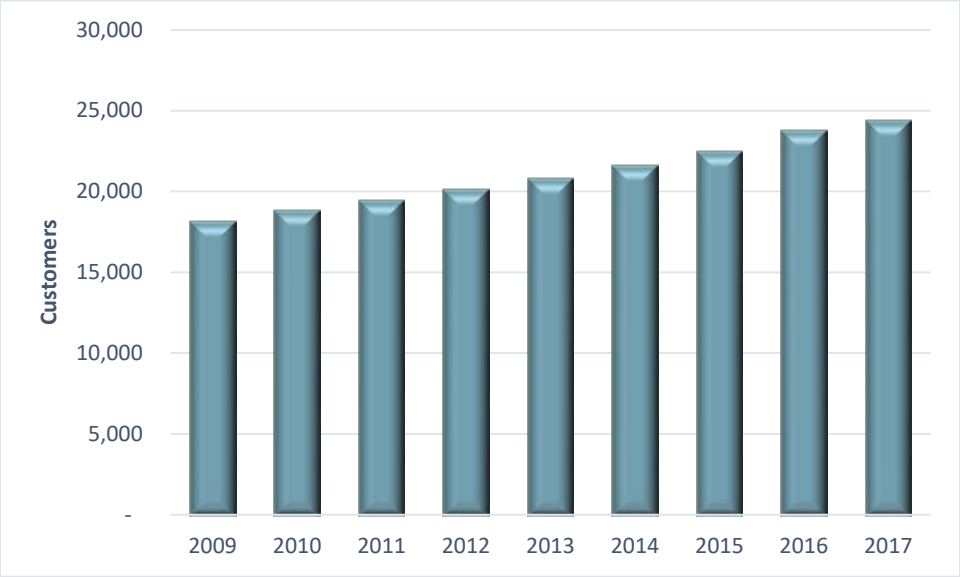
During the Baseline Year, 2,114 residents participated in the BGD and the SWRD received 175 tons of material at BGD and 39 tons of scrap metal[6]. The SWRD disposed the waste at the Mesquite Creek Landfill and sold the scrap metal to Comal Iron & Metal, a local scrap metal recycler.

4.3.3 Recycling and Green Waste

4.3.3.1 Curbside Recycling

The SWRD began operation of a residential curbside recycling service in 1995. In October 2010, the program was upgraded to provide increased container capacity of 96-gallons per customer, and once-a-week collection of single-stream recyclables via automated collection. Presently, the SWRD provides curbside recycling services to all single-family and some, smaller multi-family homes. The SWRD curbside recycling customers pay a monthly fee for this service, whether or not they participate. Data on the number of residential recycling customers from 2009 to 2017 is shown in **Figure 13**.

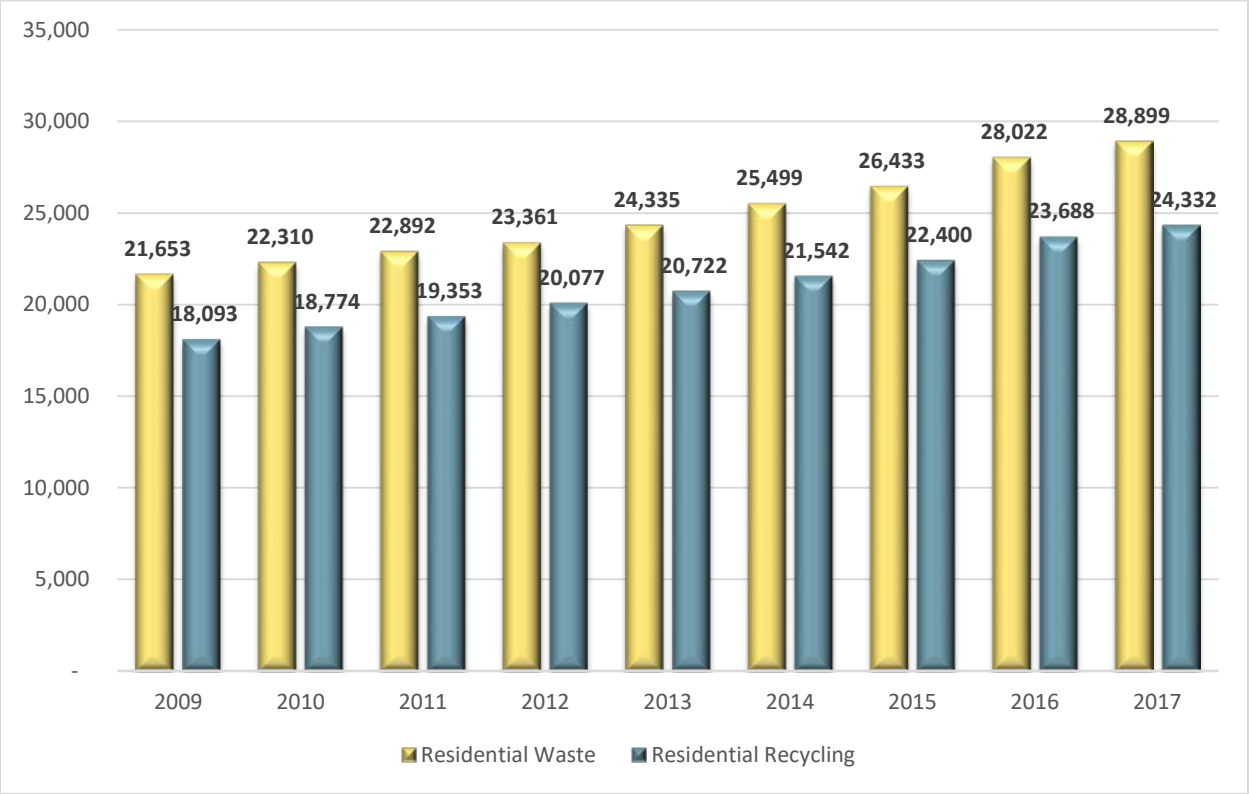
Figure 13. Historic Curbside Recycling Customers



As shown in **Figure 14**, the City has fewer curbside recycling customers than waste even though the Solid Waste Code requires all residential customers to subscribe for both services. This is because some multi-family complexes are charged the residential waste rate but are not currently serviced under the City's curbside residential recycling program. Therefore, they are not billed for curbside recycling services.

[6] Due to high participation at events, scrap metal stopped being accepted at BGD sites beginning in September 2018. Operationally, it was more efficient to direct residents to the CRC year-round, rather than at quarterly BGD

Figure 14. Historic Residential Waste and Recycling Customers



The monthly fee for curbside recycling service is $4.26. Residential customers can obtain an additional recycling cart at no charge. During the Baseline Year, 5,740 tons of recyclables were collected curbside, which included:

- Plastic containers #1-7, less than 5 gallons in volume with lids on.
- Clean, dry mixed paper including:
  Newspaper, magazines, junk mail, catalogues, cereal boxes, phone books, envelopes, and printer paper

  Shredded paper in a shut and stapled, paper bag

  Cardboard: no larger than 18 inches by 18 inches and must be flattened
- Steel and tin: food cans and beverage containers
- Food-grade glass bottles and jars
- Aluminum cans and bottles
- Food and beverage cartons

Pursuant to the Solid Waste Code, "Only residential recycling is to be placed in carts. Garbage, refuse, yard waste, brush and limbs, construction debris, tires, dead animals, lancets, syringes, hypodermic needles, hazardous substances, diapers, hot ashes/coals and stable matter such as

dirt, brick and rock will not be accepted." The SWRD will not service the cart if it contains any prohibited items. The residential customer must remove all unauthorized items before the SWRD will service it. If the residential customer requests a return service for recyclables, as well as waste, the SWRD will charge them a fee of $15.00.

The SWRD provides residential recycling customers with 96-gallon carts, and 48-gallon carts are available upon request. However, the monthly fee is the same. The SWRD collects recyclables weekly on the same day as green waste, but not on the same day as waste collection. Similar to waste collection, the SWRD uses automated vehicles to collect recyclables and the same Solid Waste Code requirements apply to recycling cart placement. During the Baseline Year, 56 percent of residential customers set out recyclables on a regular basis.

4.3.3.2 Multi-Material Drop-Off Recycling

The SWRD provides an opportunity for all residents, businesses, and visitors to recycle at the CRC, which is located at 488 S. Castell Avenue in New Braunfels. During the Baseline Year, the CRC serviced 36,889 visitors with an average of 146 visitors per day. The CRC is open Tuesday through Saturday, from 8:00 am to noon and 12:30 pm to 4:00 pm. The CRC accepts the following materials:

- Plastic containers #1-7
- Paper
- Newspaper, junk mail, magazines, catalogs, paperboard
- Cardboard
- Food and beverage cartons
- Glass bottles and jars
- Aluminum cans
- Steel cans
- Tin cans
- Hangers
- Chains
- Scrap metal
- Appliances, without Freon
- Lawn mowers, without fluids
- BBQ grills, without coals or propane
- Bicycles

During the Baseline Year, the CRC recovered 214 tons of commingled recyclables, 74 tons of cardboard and 111 tons of scrap metal.

In addition, the CRC accepts expanded polystyrene (EPS), commonly identified with the #6 code and referred to as Styrofoam. The SWRD requires that all EPS is free of food residue, tape, labels, and any other items that might be attached to the EPS. In addition, the EPS must be contained in a bag or container that the SWRD can empty easily and quickly.

When the CRC receives EPS, an onsite machine cuts the material into small pieces, heats it, and densifies it. Once densified, manufacturers can use the recycled foam to create new products, such as picture frames and crown molding. The SWRD delivered one load of densified foam to a manufacturer during the Baseline Year.

4.3.3.3 Household Hazardous Waste (HHW)

The SWRD conducts collection events to encourage proper disposal of HHW and recycling non-hazardous household chemical-based products several times each year. Residents of the City and Comal County can deliver the following materials to these events at no charge:

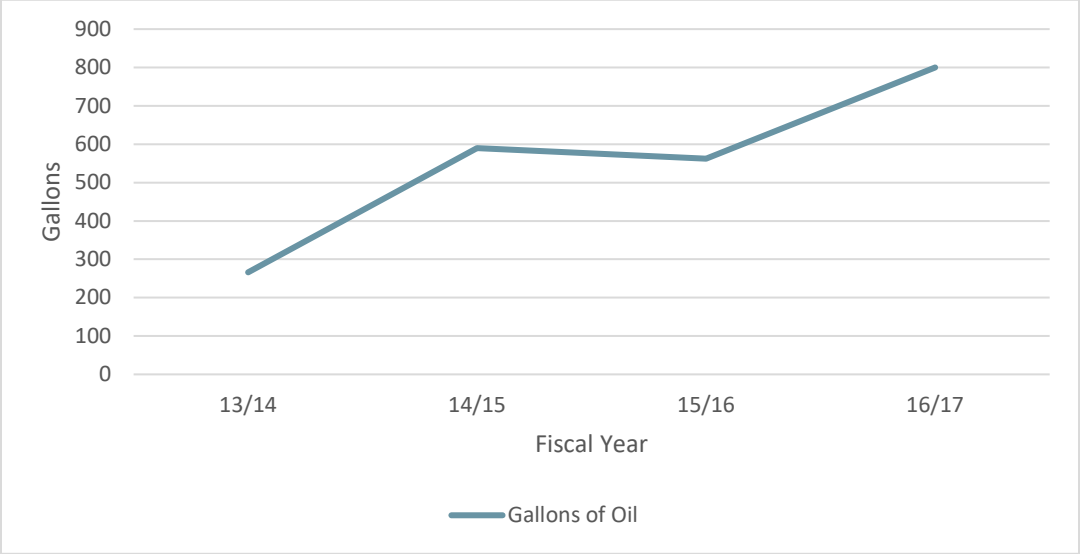
- Auto batteries
- Antifreeze
- Brake fluid
- Herbicides, pesticides, poisons
- Gasoline
- Cleaning products
- Motor oil
- Oil and fuel filters
- Paint, paint thinner, stains
- Pool chemicals

To assure that the HHW events run safely and efficiently, the SWRD requires the following:

- Participants cannot mix products.
- Participants must transport products in their car's trunk or truck bed.
- Products must be in the original containers and labeled if possible. Containers of liquid waste must be five gallons or less.
- The City will not accept trailer loads.
- Participants must bring a picture ID for proof of residency.

During the Baseline Year, the SWRD conducted three HHW collection events, where 1,006 City and County residents brought HHW and the events recovered 800 gallons of used oil. As shown in **Figure 15**, the quantity of used oil delivered to HHW collection events continues to increase.

Figure 15. Used Oil Delivered to HHW Events



In 2014, the SWRD began crushing fuel and oil filters were crushed, so that the metal could be recycled with scrap metal and the oil and fuel could be blended for recycling by a vendor. Table 6 shows the quantity of filters crushed and gallons of oil and fuel recovered from crushed filters since 2014.

Table 6. Filter and Oil Recovery

Year	Filters	Gallons
2014	80	3.75
2015	225	2.5
2016	683	6.5
2017	180	2.5

The SWRD contracts with Clean Harbors Environmental to operate the HHW collection events, as well as to prepare and transport the materials to final management facilities. Final management facilities can include recycling, incineration, blending into fuel and landfilling. Clean Harbors charges the SWRD different rates for each type of HHW received. The City and Comal County share the cost of the HHW events. During the Baseline Year, Clean Harbors processed 188 tons of HHW from the collection events.

The SWRD also educates residents on how to manage HHW throughout the year, including how to dispose of materials properly, such as latex paint. The SWRD also provides the location of stores that will take HHW materials, such as antifreeze and car batteries, on the City's website.

4.3.3.4 Electronics Recycling

To recover used electronics, the SWRD annually conducts an Electronics Recycling Event where the following materials are accepted:

- Cables/ cable boxes
- Cellular phones
- Computers monitors
- Fax machines
- Hubs
- Ink jet cartridges
- Laptops
- Mice
- Keyboards
- Power cords
- Printers
- Servers
- Switches
- Routers
- Telephones
- Toner cartridges
- Televisions
- UPS

During the Baseline Year, 228 participants delivered approximately 14 tons of electronics. As shown in Table 7, televisions comprised the vast majority of electronics delivered to the event.

Table 7. Electronic Waste Composition

Item	Percentage
Televisions	76.00%
Printers	8.22%
Computer Scrap	7.49%
Cable Mix	0.72%
Power Supplies	0.04%
Modems	0.17%
Speakers	1.87%
Household Electronics	2.85%
Keyboards	0.88%
Mice	0.07%
Hard Drives	0.13%
Remotes	0.09%
A/C Adaptors	0.64%
Cell Phones with Battery	0.09%
Phones- House/Office	0.20%
Cameras	0.10%
CD Roms- Floppies	0.10%
Circuit Boards	0.11%
UPS	0.22%

4.3.3.5 Green Waste

The SWRD provides weekly collection of green waste on the same day as recyclables. The Solid Waste Code defines green waste as, "leaves, grass clippings, yard and garden trimmings, brush, including clean woody vegetative material measuring six inches or less in diameter that results from homeowner landscaping maintenance and not commercial land clearing operations. This term does not include stumps, roots, yucca, cactus, palm debris, soil or rocks." Residential customers can also bundle branches with rope or twine, but they must be cut into 4-foot lengths.

The SWRD offers City-purchased, green waste paper bags to residential customers at no charge. The bags are available at the following locations:

- City Recycle Center 488 S Castell Avenue
- City Library 700 E. Common Street
- Landa Recreation Center 164 Landa Park Drive
- City Hall 550 Landa Street

Residential customers do not pay an additional fee for green waste collection or green waste paper bags. The collection of green waste and green waste paper bags are funded through the $4.26 per month recycling fee.

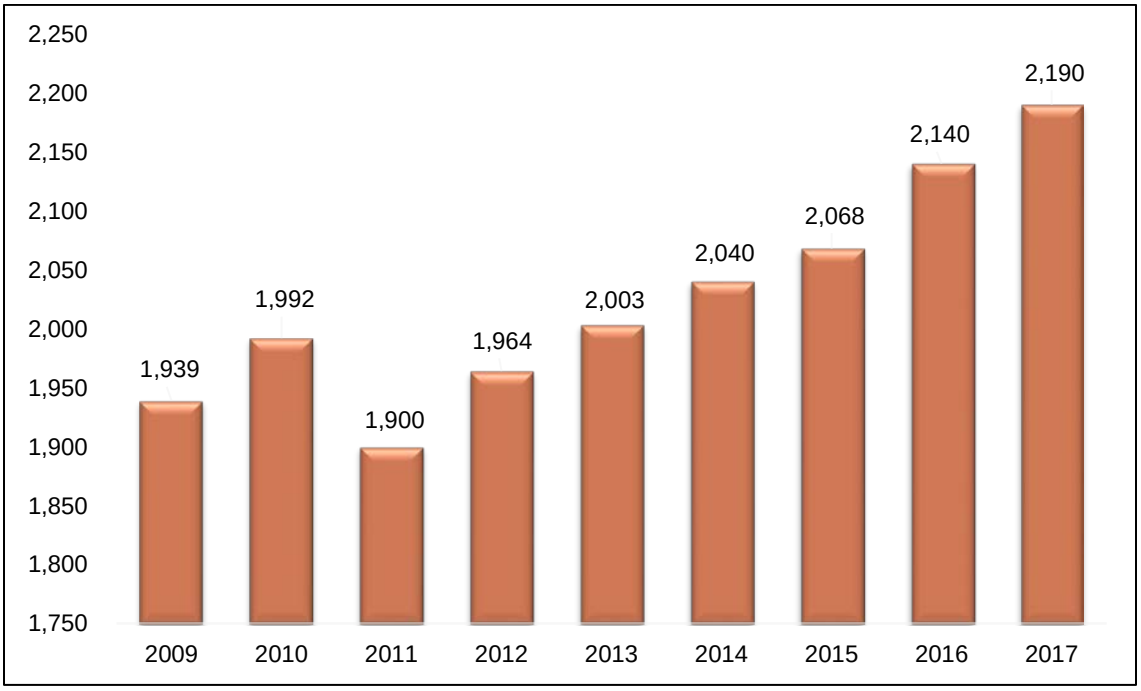
However, the SWRD does charge an additional fee for large-quantity, curbside brush collection: $25 minimum for the first one-half hour and $25 for each additional one-half hour. During 2017, the SWRD collected 4,085 tons of green waste during regular weekly collection, and an additional 241 tons of brush through separate brush collection.

4.3.4 Commercial Waste

The SWRD provides waste collection to the majority of commercial establishments in New Braunfels. The Solid Waste Code defines commercial customers as "any enterprise or establishment whose main purpose is to carry on a commercial activity whether for profit or not. Typically includes, but not limited to, such enterprises as; hotels, motels, restaurants, fast food establishments, retail stores, schools, offices, shopping centers/malls/plazas, factories/manufacturing facilities, warehouses, and high density occupied dwellings such as apartment/condominium complexes and mobile home parks."

The SWRD has four categories of commercial customers, which are based on the type of waste receptacle they use. These categories include: 96-gallon carts; dumpsters; compactors; and roll-off containers. During the Baseline Year, the SWRD collected 37,691 tons of waste from 2,190 commercial customers. **Figure 16** presents the growth in commercial customers since 2009, which shows a decrease in commercial customers from 2010 to 2011. This is due to an internal billing audit, removing customers that were no longer active accounts and consolidating commercial customer.

Figure 16. Historic Commercial Customers



During the Baseline Year, the SWRD collected 35,459 tons of waste from dumpster customers. Compactor customers accounted for 14 tons and roll-off customers generated 1,131 tons of waste. The SWRD also collected approximately 15 tons of animal waste.

4.3.5 Fleet Services

Fleet Services provides maintenance and repair services for City vehicles. The past four years, employees have earned the Blue Seal of Excellence from the National Institute for Automotive Service Excellence (ASE) by having employees pass ASE-certification tests in both the Automotive & Light Truck and Medium-Heavy Truck categories. All employees have taken and passed at least two certification tests. Three are even considered an ASE-Certified Master in their category. There are 62 heavy vehicles and 305 light vehicles in the City's fleet. During the Baseline Year, Fleet Services completed 4,117 work orders, which is an average of 343 per month. Of the maintenance work orders, 655 were solely for oil changes. That averages out to about 54 oil changes per month.

Fleet Services crushes fuel and oil filters so that the metal can be recycled with scrap metal and the oil and fuel can be blended for recycling by a vendor. **Table 8** shows the quantity of filters crushed and gallons of oil recovered from crushed filters since 2014.

Table 8. Filter and Oil Recovery by Fleet Services

Year	Filters	Gallons
2014	781	29.5
2015	644	14.65
2016	579	5.75

4.4 ADDITIONAL SOLID WASTE SERVICES, PROGRAMS, AND FACILITIES

4.4.1 Other Government Agencies

4.4.1.1 Comal County

The SWRD transports green waste to the Comal County Rural Recycling and Chipping Facility, which is located at 281 Resource Drive in New Braunfels. Comal County permits vehicles operated by municipalities, public utilities, school districts, and political subdivisions to drop off brush and green waste at the Comal County Rural Recycling and Chipping Facility at no charge. This brush and green waste must come from properties located within Comal County.

Comal County Rural Recycling and Chipping Facility offers free wood chips to the public, but their vehicle must have a tarp. This facility is open during the following hours:

- Sunday and Monday- Closed
- Tuesday thru Friday- 7am-3pm
- Saturday- 8am-noon

In addition to collecting green waste, the SWRD promotes backyard composting, and encourages residents to use mulching mowers. The City's website provides information on reducing and recovering green waste.

4.4.1.2 NBU and GVEC

The SWRD does not issue bills for solid waste and recycling services, but instead relies on the two utility providers in the area, NBU, the main utility provider in the New Braunfels area; and GVEC, an electric provider in Guadalupe County and other nearby counties. Customers in the city and the ETJ areas of New Braunfels are billed by NBU, and customers in the Guadalupe County area of New Braunfels are billed by GVEC. Because of this arrangement, the City has limited access to data regarding existing customer service levels and charges.

4.4.1.3 New Braunfels River Activity Fund

For the past several years, the SWRD has funded the expenses associated with litter pickup along and in the Comal River. During the Baseline Year, the SWRD allocated $145,000 to garbage collection and disposal of litter around the Comal River. In addition, funding litter removal expenses, the City passed a series of ordinances many years ago prohibiting the use certain drink coolers and containers while floating down the river.

4.4.1.4 New Braunfels General Fund

The SWRD annually pays $300,000 to the City's General Fund to help offset the cost of street maintenance and repair from mainly refuse collection vehicles. The SWRD also contributes funding to the General Fund for administrative support including accounting and budgeting, information technology services, purchasing, human resources, attorney support and facilities maintenance. During the Baseline Year this contribution totaled $421,636.

4.4.2 Private Sector

4.4.2.1 Commercial Collection

According to the Solid Waste Code, "Business establishments shall be serviced by the City's Solid Waste and Recycling Division. If service is not available or furnished by the City or it is not in the best interest of the City to provide said service as determined by the Solid Waste Manager or designee, (i.e. businesses require containers larger than the City can provide, or containers in which materials would be placed that the City will not accept, such as building materials), service may be provided by a commercial hauler permitted to operate in the New Braunfels. Every business establishment must contract with either the City or an approved commercial hauler, if the City is unable to provide the required level of service, for weekly waste disposal service for their business."

It is unlawful to operate a solid waste vehicle in the New Braunfels without a permit. To obtain a waste hauling permit, a company or individual must submit an application to the SWRD that includes the following information:

- Company name, location, contact and ownership structure.
- Any record of criminal felony convictions against applicant or employees resulting from the unlawful operation of a vehicle used to haul waste.

- The source and the types of waste the applicant intends to collect and transport.
- The estimated annual tonnages of waste to be collected.
- Location(s) where applicant intends to dispose of the waste collected including name, address, and telephone number of the operator of each location.
- A certified list of vehicles that the applicant will use to collect and transport commercial solid waste.
- A certificate of insurance evidencing that applicant has obtained and filed with the City the required commercial general (public) liability and vehicle insurance policy in an amount of not less than $500,000.

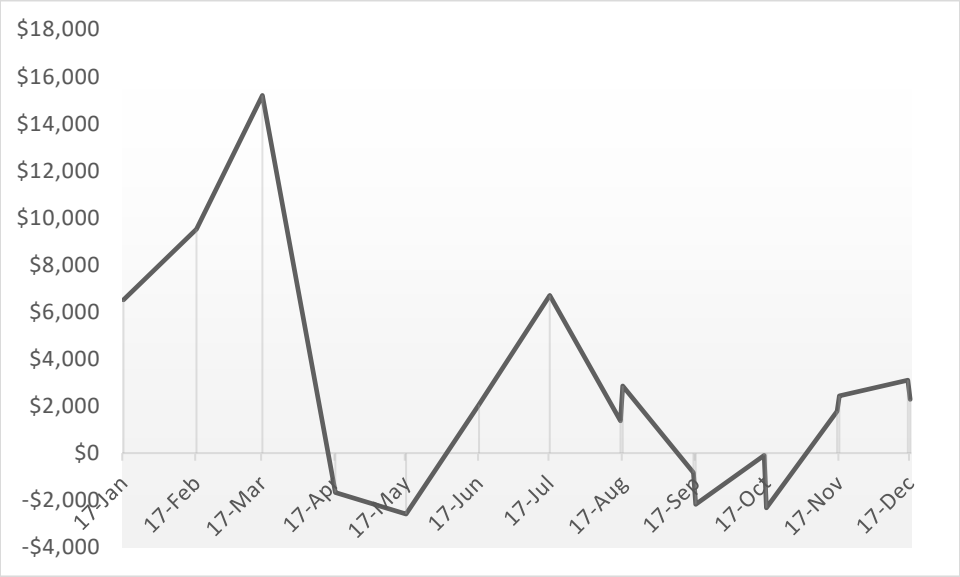
There are six permitted waste haulers in the City. However, only two of these haulers are permitted to collect solid waste. The other four can only collect C&D debris.

4.4.2.2 Recycling Processing

The SWRD transports recyclables to a Material Recovery Facility (MRF) located at 1947 Hormel Drive in San Antonio, Texas, which is owned and operated by Republic Services. In 2016, the SWRD awarded a three-year contract to ReCommunity to process City-collected recyclables that included two, one-year renewals. Republic Services acquired ReCommunity in 2017 and the contract was transferred to Republic Services.

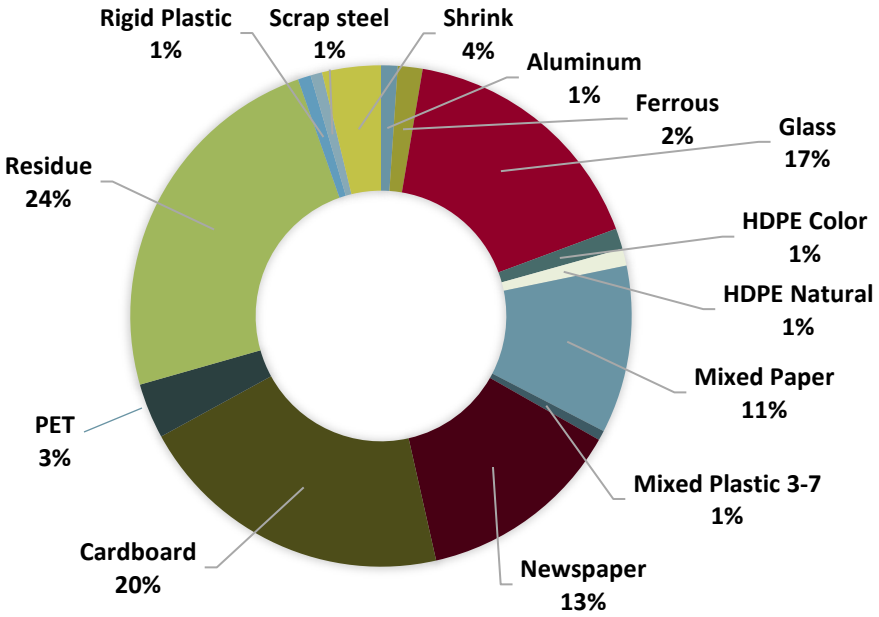
During the Baseline Year, the MRF charged the SWRD a $57.00 per ton processing fee. The SWRD is eligible to receive 85 percent of the average, commodity sale revenue based on the actual composition of New Braunfels' recyclables. The administration, collection and processing of the residential recycling program is approximately $1.9 million during the Baseline Year while the 2017 revenue was $44,142. **Figure 17** shows the net revenue the City received from commodity sales from the ReCommunity contract (commodity revenue minus processing fee costs) fluctuated significantly during 2017.

Figure 17. 2017 Monthly Recycling Revenue



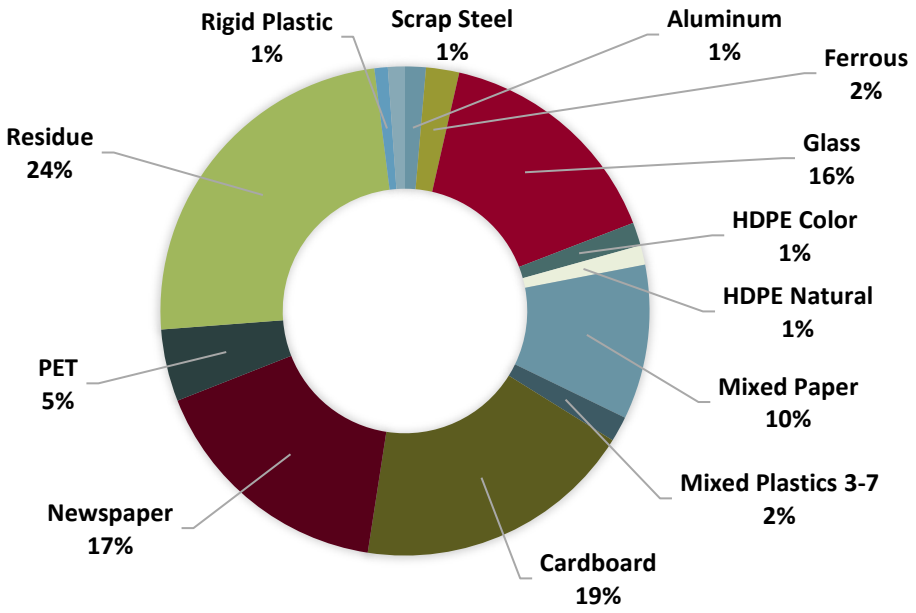
During the Baseline Year, the SWRD transported 5,740 tons of commingled recyclables from the residential curbside program to the MRF, and the MRF operator conducted two audits of the City's recyclables to determine the composition. ReCommunity conducted the first audit on April 5, 2017 and it consisted of a 108-ton sample. **Figure 18** shows the composition of City recyclables based on this audit.

Figure 18. April 2017 Composition of New Braunfels' Recyclables



Republic Services conducted the second audit on October 25, which included a 109-ton sample. **Figure 19** presents the results of this audit.

Figure 19. October 2017 Composition of New Braunfels' Recyclables



As shown in **Table 9**, both audits identified residue as the most prevalent component of the City's recyclables, with cardboard being the next most dominant material. Newspaper and glass were the next highest materials delivered to the MRF, but their ranking differed. **Table 9** shows the percent of each component from highest to lowest.

Table 9. Recycling Composition Comparison

April 2017 Audit			October 2017 Audit	
Material	Percent		Material	Percent
Residue	24.05%		Residue	24.20%
Cardboard	20.55%		Cardboard	18.57%
Glass	16.68%		Newspaper	16.59%
Newspaper	13.24%		Glass	15.57%
Mixed Paper	10.82%		Mixed Paper	10.23%
Shrink*	3.78%		PET	4.77%
PET	3.56%		Ferrous	2.19%
Ferrous	1.60%		Mixed Plastics 3-7	1.68%
HDPE Color	1.33%		HDPE Color	1.54%

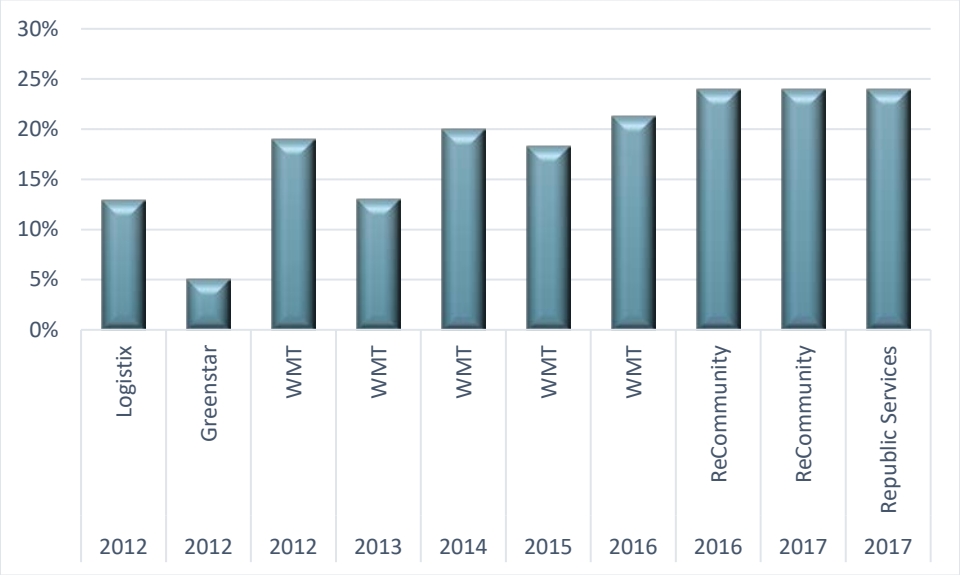
April 2017 Audit			October 2017 Audit	
Material	Percent		Material	Percent
HDPE Natural	1.10%		Aluminum	1.38%
Aluminum	1.07%		HDPE Natural	1.29%
Rigid Plastic	0.84%		Scrap Steel	1.12%
Scrap steel	0.75%		Rigid Plastic	0.88%
Mixed Plastic 3-7	0.63%			

* Was not included in October 2017 Audit; Shrink is wet material that adds weight but not value.

Because international markets have become extremely stringent about the amount of residue in recyclables, SCS assessed the residue rate in the City's recyclables for each audit conducted since 2012 (**Figure 20**). During that timeframe, the following companies processed City recyclables:

- Logistix
- Greenstar
- Waste Management Texas (WMT)
- ReCommunity
- Republic Services

Figure 20. Historical Recycling Residue Rates



As shown in **Figure 20**, the residue rate has fluctuated between 2012 and 2016, but has been constant at approximately 24 percent for the last three years.

4.4.2.3 Landfill Disposal

The SWRD contracts WMT to receive and dispose New Braunfels' waste at the Mesquite Creek Landfill, which WMT owns and operates. The Mesquite Creek Landfill is located at 1700 Kohlenberg Road, in New Braunfels. During the Baseline Year, the SWRD delivered 57,333 tons of waste to the Mesquite Landfill.

- The City executed the contract with WMT in 2009, which both parties amended in 2012, 2013, and 2018.
- The term of the 2018 amendment is for an additional five-year term beginning on October l, 2018 and ending on September 30, 2023. The 2018 amendment may be renewed for up to two, additional three- year terms by mutual written agreement of the parties, which renewal may require the inclusion of new or additional 2018 amendment terms.
- In 2018, the SWRD negotiated the following base rates that WMT will charge the City for receiving and disposing of City waste:
  - Year 1 through 9/30/19: $27.60 per ton
  - Year 2 (10/1/19to 9/30/20): $28.60 per ton
  - Year 3 (10/1/20 to 9/30/21): $29.60 per ton
  - Year 4 (10/1/21 to 9/30/22): $30.60 per ton
  - Year 5 (10/1/22 to 9/30/23): $31.60 per ton
- The City agrees to deliver at least 40,000 tons of waste to the landfill during each year of the Agreement in exchange for receiving the preferred base rate pricing contained in the Agreement.

According to the October 2017 Texas Commission on Environmental Quality Report, *Municipal Solid Waste in Texas: A Year in Review FY 2016 Data Summary and Analysis*, the Mesquite Creek Landfill received a total of 457,219 tons of waste in 2016 and at that time, had 20 years of remaining capacity. In 2017, this landfill received approximately 1,800 tons per day.

This landfill is open six days per week (Monday through Saturday), and is a Type I landfill. This means the facility is permitted to accept MSW, C&D, special waste, auto fluff, and biosolids. The Mesquite Creek Landfill has an active landfill gas-to-energy plant, which generates three MW of power that the landfill sells to NBU.

The Mesquite Creek Landfill is one of seven MSW landfills in the Alamo Area Council of Governments (AACOG) region. During 2016, these seven landfills received a total of 2,875,505 tons of waste and in aggregate, had 167,819,522 tons of permitted capacity. Based on the 2016 tonnage and remaining capacity, the AACOG has over 58 years of permitted capacity.

In addition, a new landfill (the Post Oak Clean Green Landfill) is being developed in Guadalupe County, and will be sited approximately 12 miles east of Seguin. The Post Oak Clean Green Landfill will have the capacity to accept an estimated 52 million tons of MSW.

4.5 NEEDS ASSESSMENT

The SWRD provides an integrated waste management system for City residents and businesses, where 89 percent of City residents feel that waste collection services are good or excellent[7]. However, the SWRD recognizes that increasing population, new single- and multi-family home developments, and growth in commercial establishments will require additional services, resources, and infrastructure to continue the same excellent level of service. To address the future waste management requirement, as well as optimize the performance and efficiency of existing waste management services and facilities, SCS assessed the City's waste management needs on a short, medium, and long-term basis.

4.5.1 Short Term (1-5 years)

- Increase diversion – Currently, the City of New Braunfels does not have a specific goal for diversion, and the State of Texas does not mandate diversion goals for cities or counties to achieve. The City's diversion rate is 16 percent including residuals and 14 percent excluding residuals. In 2013, the State of Texas diversion rate averaged 23 percent excluding residuals.[8] The City needs to establish short-term, medium-term, and long-term diversion goals that are appropriate, achievable, and sustainable.

- Increase recycling set out – During the Baseline Year, 56 percent of residential customers set out recyclables at the curb. The City should strive to increase this rate as there are costs to drive by houses that have not set out recyclables, when program economics are evaluated on cost per ton recovery basis. In addition, higher participation will yield increased waste diversion.

- Increase capture rate – Even though SWRD provides opportunities to recycle plastics and cardboard, only 42 percent of plastics were captured during the Baseline Year and less than 30 percent of cardboard was recovered during that time frame. An increasing number of municipalities are instituting mandates to increase recovery of certain recyclable commodities, such as requiring businesses over a certain size to recycle cardboard. The SWRD needs to evaluate options for increasing the capture rate of materials.

- Reduce residue rate in recyclables - The residue rate in the City's curbside recyclables has fluctuated between a low of 5 percent in 2012 to a high of 24 percent for the last three years. In 2013, the State of Texas average was 13 percent.[9] During 2018, numerous recycling processors have increased tipping fees, reduced the type of recyclables accepted, or stopped accepting commingled recyclables, due to China's new policies on contamination in imported recyclables. Therefore, it will be highly valuable if not essential for the City to significantly reduce their residue rate when evaluating proposals for new recyclable processing.

- Improve quality of green waste - Many compost facilities express concerns about the quality of incoming materials. Some residents believe that green waste includes any waste that comes from the yard, which can even include old lawn mowers, barbecue

[7] 2017 New Braunfels Community Livability Report
[8] 2017 Study on Economic Impacts of Recycling
[9] I.B.I.D.

grills, and children's playground sets. Mulch and compost facilities cannot process plastic, metal, glass, trash, rock, gravel, dirt, sod, wire, rope, or lumber without damaging the equipment.

- **Analyze impact of education and outreach initiatives –** The SWRD has innovative and comprehensive education and outreach initiatives. However, only 56 percent of residents set out recyclables on a regular basis, and the City's landfill diversion rate is less than 16 percent. Thus, the SWRD needs to analyze if the message is reaching their intended target audiences and if the message is catalyzing proper participation in recycling. In addition, the SWRD should monitor the number and demographics of visitors accessing the City's digital platforms.

- **Secure processing contract for recyclables** – The City's contract with Republic Services for processing of recyclables concludes in 2019. The City issued a request for proposals (RFP) for MRF processing and selected Republic Services. Under the new contract, Republic Services will process the City's recyclables for three years, beginning August 1, 2019 through July 31, 2022, with two, one-year options to renew.

- **Enhance reduction and recycling opportunities in recreational areas** – Certain recyclables, such as single serve containers, paper serving products, and polystyrene (Styrofoam) carryout boxes, create litter in New Braunfels and especially in recreational areas. For the past several years, the SWRD has funded the expenses associated with litter pickup along and in the Comal River, and passed ordinances prohibiting the use certain drink coolers and containers while they float down the river. Despite this ordinance, SWRD funded $145,000 in garbage collection and disposal of litter from the Comal River in FY 2016-2017. To reduce the environmental impact of litter in this vital recreation area and decrease costs, SWRD needs to enhance waste reduction and recycling opportunities for single-serve containers, target restaurants in these areas for recycling, and work with establishments in recreational areas to reduce the use of straws, plastic bags, and polystyrene carryout boxes.

- **Establish commercial recycling opportunities** - The SWRD did not collect any recyclables from commercial accounts during the Baseline Year, and not all private waste haulers offer this service to their commercial customers. Approximately 71 percent of SWRD's commercial customers would recycle paper or cardboard if the cost of recycling was offset by the size of their trash container or frequency of collection[10]. Due to the interest of their commercial customers in recycling, the SWRD evaluated providing recycling service to their customers. However, it may not be financially feasible at this time. The City needs to continue to re-evaluate the opportunities for commercial recycling programs, either through in-kind services, contracting with private collectors, establishing public-private partnerships, or utilizing rate structure mechanisms.

- **Reduce the need for HHW external processing** – During the Baseline Year, 188 tons of HHW were collected through the drop-off events, and the majority was processed by an external contractor, Clean Harbors. The total cost of these events was $109,110, or $580 per ton. Programs across the country are developing or have developed reuse programs to save money and to return perfectly usable materials back to residents. In Stearns County, Minnesota, an HHW Reuse Store was created to encourage residents to

[10] Commercial Recycling Feasibility Study; February 2015

reuse materials that come into the HHW facility to save money and to use the materials for their intended purpose. In 2016, this program diverted 31 percent of the HHW materials delivered to their permanent facility and saved more than $53,000. The SWRD should consider a permanent HHW facility and reuse center to reduce costs and save resources.

- **Improve data gathering and information exchange** - NBU and GVEC currently administer billing to SWRD customers, and accurate information on the number of customers and level of service is not available real-time to the SWRD. This lack of access to data makes it challenging for SWRD to respond to customer requests and assess needs in a timely manner. A system needs to be established where the NBU and GVEC provide SWRD access to accurate customer data on demand.

  In addition, the Division does not currently have information on the quantity of waste and recyclables collected by private haulers. Understanding the total quantity of waste that is generated within the city will be important for evaluating the cost, design and operating parameters of future solid waste facilities.

- **Develop a new fleet maintenance service center** – As discussed, the City's population is projected to increase from 79,152 in the Baseline Year to 93,372 in 2020 and to 153,415 by 2030. During the Baseline Year, the SWRD serviced 4,117 City vehicles. These vehicles included police and fire, as well as public works vehicles. Based on a population of 79,152 and 4,117 service requests, the per capita vehicle service request rate is 0.05. If the per capita vehicle service request rate remains constant, the SWRD will service 4,857 vehicles in 2020 and 7,980 vehicles in 2030. The current public works municipal service center is close to capacity, with respect to the number of vehicles that can be stored and serviced at the same time, and the current location is not conducive to expansion. Therefore, the SWRD needs to begin identifying a location for a new service center, and secure funds for constructing this new facility within the next five years.

4.5.2 Medium Term (6-10 years)

- **Monitor disposal capacity within the AACOG region based on population growth and landfill closures** – At the present time, the AACOG region has 167,819,522 tons of permitted airspace, which could provide enough permitted capacity for 58 years. In addition, the new Post Oak Clean Green Landfill could yield another 52 million tons of airspace. Although the current landfill infrastructure provides enough disposal capacity through the 20-year planning period, this should be revaluated every five years as population growth, economic development, decreases in landfill diversion and landfill closures could significantly impact disposal capacity.

- **Reduce wasted food** – Food waste accounts for almost 18 percent of the disposed waste stream, which means approximately 10,000 tons were disposed during the Baseline Year. At the same time, almost 15 percent of residents in Comal County live in food insecure homes.[11] The U.S. Department of Agriculture defines food insecurity as a lack of consistent access to enough food for an active, healthy life. The City needs to increase awareness about food waste, educate grocery stores and restaurants with food inventory

[11] FeedingTexas.org

practices, and partner with the New Braunfels Food Bank to develop strategies to enhance the infrastructure for food waste recovery.

- **Expand organic waste infrastructure** – Currently, the Comal County Rural Recycling and Chipping facility accepts and mulches yard waste. Due to its limited acreage and proximity to the Edwards Aquifer, the site manager of this facility does not consider the site suitable for processing food scraps or liquid sludge and does not believe the facility could receive notification status from TCEQ to accept these organics. Compost operations that receive notification status from TCEQ are permitted to accept source-separated meat, fish, dead animal carcasses, oils, grease or dairy materials, and source-separated yard trimmings, clean wood material, vegetative material or manure. To process sludge, a facility must be registered with TCEQ. One facility in the AACOG region accepts food waste, the New Earth Compost Facility in San Antonio.

- **Facilitate the development of additional C&D infrastructure** – The City is projecting significant economic development and new construction during the next ten years. However, there is only one C&D landfill in the AACOG region; the Beck Landfill in Guadalupe County, and no C&D recycling centers in the region[12]. The SWRD should collaborate with other counties and municipalities in the AACOG region to facilitate the development of additional C&D infrastructure.

4.5.3 Long Term (11-20 years)

- **Develop access to regional disposal capacity** – The Mesquite Landfill has less than 20 years of permitted, disposal capacity, but the AACOG region currently has over 58 years of disposal capacity. This regional capacity will increase when the Post Oak Landfill begins operating. However, accessing these landfills could be expensive to the SWRD if they direct-haul waste. Therefore, the SWRD may want to conduct a cost/benefit analysis on developing a transfer station to decrease the cost of accessing these landfills approximately five to seven years before the Mesquite Landfill reaches capacity.

  Although cost-effectiveness will vary, transfer stations generally become economically viable when the hauling distance to the disposal facility is greater than 15 to 20 miles[13]. As shown below, all of the landfills in the AACOG region exceed this parameter.

Post Oak Landfill[14]	54 miles roundtrip
BFI Tessman Road	58 miles roundtrip
Texas Disposal Systems Landfill	78 miles roundtrip
Waste Management Covel Gardens	95 miles roundtrip
City of Fredericksburg	142 miles roundtrip
Kerrville Landfill	170 miles roundtrip

[12] TCEQ Municipal Solid Waste in Review; FY 2016 Year in Review
[13] USEPA Waste Transfer Stations: A Manual for Decision Making
[14] The Post Oak Landfill permit was approved by TCEQ on August 8, 2018. It could be operational by 2025.

- **Reduce greenhouse gas emissions** – Conversion technologies, such as anaerobic digestion, can reduce greenhouse gas emissions through creation of a fuel that is not carbon based and reducing the release of methane from decomposing organics. Although conversion technologies are not common in the Southwest, it is possible that they could serve as a final waste management option for New Braunfels or the AACOG region at some point in the future. Currently, the largest barriers to conversion technology facilities in the Southwest are the relatively low tipping fees charged by landfills, and the low price of energy available to consumers. However, the paradigm of inexpensive landfills and energy may one day shift, increasing the viability of conversion technologies as a final waste management option. Thus, the SWRD should periodically re-evaluate the financial feasibility of conversion technologies as market conditions change.

5.0 IDENTIFICATION AND EVALUATION OF ACTION ITEMS

As discussed in Section 4.5 Needs Assessment, the City's solid waste management system is operating effectively, but there are opportunities for improvement. Some components, such as capacity at the public works municipal service center, need to be addressed to continue providing fundamental public services.

As part of this planning process, numerous options to address various needs in the current waste management system were identified, and then evaluated based on the following criteria:

- Feasibility of implementing within New Braunfels or the AACOG region
- Infrastructure and staffing requirements
- Landfill diversion potential
- Cost
- Role in sustaining reliable public services
- Ability to monitor impact

Based on these evaluation criteria, as well as communication with internal and external stakeholders, the SWRD shortlisted the action items and organized them according to the following waste management service categories (Service Categories):

- Education and outreach
- Waste reduction, reuse, and repurposing
- Residential recycling
- Commercial recycling
- Organics recovery
- Special waste management

For the selected action items, the following implementation consideration information is provided, as available and relevant:

- Opportunities and obstacles for implementation; management needs of the City
- Landfill diversion potential
- Waste sector or source affected
- Estimated costs and benefits of implementation, as available
- Potential conflicts with adopted land use plans, if applicable
- Schedule for implementation

Table 10 identifies all the selected action items and summarizes the diversion potential, affected waste sector or source, financial requirements, land use plan conflicts, and implementation schedule considerations. Details on these considerations are provided in the narrative. With respect to financial requirements, Table 10 shows operations and maintenance (O&M) expenditures, as well as capital expenditures (CAPEX).

Many of these action items will require an additional communication specialist. Therefore, the SWRD plans to hire one new communication specialist, and estimates the cost (salary and benefits) to be approximately $45,000 in YR 1. Table 10 allocates the cost of this new position over the 14 options that include a communication component.

For some action items, the SWRD could not estimate diversion potential because either data was not available, or the option would increase the performance of a program but not necessarily yield an increase in the tons of waste diverted from the landfill. The lack of data was of particular significance when designing commercial action items, because private waste haulers do not provide the SWRD with disposal or recycling data from their commercial customers. For these action items, **Table 10** indicates that the SWRD was **Not Able to Estimate (NATE)** the recovery potential.

Table 10. Action Item Implementation Considerations

Action Item	YR 1 of Implementation Diversion Potential in Tons Per Year (TPY)	Affected Waste Sector or Source	Incremental Financial Requirements ($ in YR 1 of Implementation)	Conflicts with Land Use Plans (Yes/No)	Implementation Schedule (Short, Medium, Long-Term)
EDUCATION AND OUTREACH					
Conduct Continuous Improvement Workshop	NATE	Residential and Commercial	$3,000	No	Short
Facilitate Focus Groups	NATE	Residential and Commercial	$3,000	No	Short
Collect Additional Data	NATE	Residential and Commercial	$0	No	Short
WASTE REDUCTION, REUSE AND REPURPOSING					
Support Waste Reduction in Outdoor Recreational Areas	1.7	Residential and Tourism	$150,000	No	Short
Promote Backyard Composting	2,840 - 4,300	Residential	$3,000	No	Short
Promote Reuse and Exchange Opportunities at Thrift Stores and Habitat for Humanity ReStore	NATE	Residential and Commercial	$3,000	No	Short
Promote RENEW to Businesses and all City Agencies	NATE	Commercial	$3,000	No	Medium

Action Item	YR 1 of Implementation Diversion Potential in Tons Per Year (TPY)	Affected Waste Sector or Source	Incremental Financial Requirements ($ in YR 1 of Implementation)	Conflicts with Land Use Plans (Yes/No)	Implementation Schedule (Short, Medium, Long-Term)
RESIDENTIAL RECYCLING					
Establish Recycling and Participation Goals	3,000	Residential	$65,000 - $75,000	No	Short
Consider a Variable Rate Structure to Incentivize Recycling	2,240	Residential	$290,000 (CAPEX)	No	Medium
Identify Areas of the City with Low Participation and/or High Contamination Rates for Targeted Outreach and Education	1,000	Residential	$48,000 $1.6 million (CAPEX)	No	Short
Consider a Multi-Family Recycling Ordinance	264	Residential and Commercial	$0	No	Medium
COMMERCIAL RECYCLING					
Consider Contracting for Recycling Services for SWRD Commercial Customers	4,770	Commercial	$0	No	Medium
Modify Permit Process to Require Private Haulers to Report Waste and Recycling Data	NATE	Commercial	$0	No	Medium
Modify Permit Process to Require Private Haulers to	NATE	Commercial	$0	No	Medium

Action Item	YR 1 of Implementation Diversion Potential in Tons Per Year (TPY)	Affected Waste Sector or Source	Incremental Financial Requirements ($ in YR 1 of Implementation)	Conflicts with Land Use Plans (Yes/No)	Implementation Schedule (Short, Medium, Long-Term)
Provide Recycling Service					
Recognize Businesses that Recycle with Green Business Certification Program	NATE	Commercial	$3,000	No	Long
Promote Purchase of Recyclable Products and Products Made with Recycled Content	106	Commercial and Residential	$3,000	No	Medium
CONSTRUCTION AND DEMOLITION DEBRIS					
Increase the Delivery of Source-Separated Wood to the Beck Landfill	934	Commercial and Residential	$3,000	No	Medium
Establish C&D Diversion Specifications for City Construction Projects	NATE	Commercial	$0	No	Medium
Secure Long-Term C&D Disposal and Recovery Capacity	NATE	Residential and Commercial	$0	No	Long
ORGANICS					
Educate on Acceptable Materials for Mulching	205	Residential	$3,000	No	Short
Explore Establishing a Partnership to Develop	5,300	Residential and Commercial	$80,000 to $100,000	Possibly	Short

Action Item	YR 1 of Implementation Diversion Potential in Tons Per Year (TPY)	Affected Waste Sector or Source	Incremental Financial Requirements ($ in YR 1 of Implementation)	Conflicts with Land Use Plans (Yes/No)	Implementation Schedule (Short, Medium, Long-Term)
Compost Facility with for Food Scraps and Biosolids			$1.5 million to $15 million (CAPEX)		
Assess Capacity for Processing Pre-Consumer Produce and Biosolids at Existing Facilities	6,60[15]	Residential and Commercial	$0	No	Medium
Assess Opportunities to Compost Green Waste On-Site at Large Generators	2,300	Commercial	$0	No	Medium
Evaluate Organics Collection from Large Commercial Generators	NATE	Commercial	$0	No	Medium
Increase Awareness about Wasted Food and Food Recovery	470	Residential and Commercial	$3,000	No	Short
Provide Outreach to Restaurants and Grocery stores on Food Waste Reduction	204	Commercial	$3,000	No	Short
Explore a Partnership with the New	95	Residential and Commercial		No	Short

[15] This only includes biosolids. Data is not available on pre-consumer produce

Action Item	YR 1 of Implementation Diversion Potential in Tons Per Year (TPY)	Affected Waste Sector or Source	Incremental Financial Requirements ($ in YR 1 of Implementation)	Conflicts with Land Use Plans (Yes/No)	Implementation Schedule (Short, Medium, Long-Term)
Braunfels Food Bank to Enhance Infrastructure for Consumable Food Recovery					
SPECIAL WASTES					
Educate Residents on Alternatives to Household Products	9	Residential	$4,000	No	Medium
Develop Permanent, Multi-Material Recovery Center	824	Residential and Commercial	$600,000 $2.5 million (CAPEX)	Yes	Short
Promote Reduction Strategies Through Community-Based Social Marketing	NATE	Residential and Commercial	$3,000	No	Long
ALTERNATIVE TECHNOLOGIES					
Monitor Developments in Alternative Processing Technologies	Anaerobic Digestion (AD) – 21,109	Residential and Commercial	$950,000	Yes	Long
	Thermal- 38,968	Residential and Commercial	$4.2 million	Yes	Long
FLEET MANAGEMENT					
Develop new Public Works Municipal Service Center	NATE	City Fleet	$550,000	Yes	Short

5.1 EDUCATION AND OUTREACH

The SWRD has an established and effective education and outreach program to encourage waste reduction and recovery and promote participation in SWRD programs. However, like many communities, New Braunfels is at a juncture where existing education and outreach initiatives may require modification to optimize their impact on increasing waste reduction, reuse, recycling and composting, as well as improving the quality of the recyclables and yard waste recovered. One of the values of a strategic planning process is that it provides opportunities to reflect on existing initiatives and reposition for the future.

Options to improve the effectiveness of education and outreach initiatives may include:

- Continuous Improvement work session – The SWRD may conduct an internal "Continuous Improvement" work session to identify the goals for each education and outreach initiative, target audiences, resource requirements and implementation mechanisms. At the end of each year, the SWRD would evaluate whether goals, target audiences and resource requirement estimates were achieved, or if modifications are required.

- Facilitate focus groups – The SWRD may facilitate focus groups for specific target audiences that are designed to understand what motivates or discourages these audiences to participate in SWRD programs. The SWRD would conduct informal focus groups and more formally organized focus groups through New Braunfels' civic organizations or public institutions, such as schools and the New Braunfels Chamber of Commerce.

- Collect additional data – The SWRD may work with the Information Technology Department to query customers about where they learn about SWRD services and what materials they should recycle. In addition, the SWRD will survey participants at events where they have a booth and/or are making a presentation to gather data to help target outreach messages. This data could include demographics and media choices.

5.2 WASTE REDUCTION, REUSE, REPURPOSING

Reducing, reusing and repurposing waste can be environmentally preferable over recycling, because collecting, processing and transporting recyclables requires resources and can generate CO_2 emissions. In addition, reducing, reusing and repurposing waste is not typically affected by international commodity markets. To promote the concept of reducing, reusing and repurposing waste in New Braunfels, the SWRD may implement the following options:

- Support waste reduction in outdoor recreational areas – As previously discussed, the Comal and Guadalupe Rivers are unique and treasured outdoor recreation areas in New Braunfels. To protect the environmental integrity of these natural resources, the City passed ordinances prohibiting the use of certain ice chests and container types while floating down the river. Specifically, the ordinance prohibits disposable snack containers, cans, bags, cups and bottles. In addition, there is a limit of one cooler per person and it must be 16 quarts or less.

  To promote the ordinance and keeping the rivers clean, the New Braunfels Parks and Recreation Department distributed over 30,000 hotel room key cards to educate guests

on what is and is not allowed on the rivers, placed 275 posters throughout the City, provided artwork to river outfitters and consumer touchpoints, placed pop-up banners at libraries, the visitor center and city hall, and set-up a-frame informational boards near the rivers.

In addition to education, the police department, rangers, outfitters, and convention and visitors' bureau assisted with enforcing the ordinance. These enforcement efforts yielded 430 citations for disposable containers offenses and 45 were for oversized coolers in fiscal year 2017/2018.

Through these education and enforcement efforts, the amount of waste pulled out of the river, as well as from the banks and parks along the river, decreased from approximately 18 tons during the Baseline Year to approximately 8 tons during fiscal year 2017/2018. In addition, the amount of waste retrieved from the bottom of the river decreased from approximately 1.5 tons in 2017 to approximately 0.5 tons during fiscal year 2017/2018.

The SWRD plans to continue supporting the Parks and Recreation Department with efforts to decrease the illegal disposal of waste in the rivers and fund the remediation of waste in the rivers. Typically, the SWRD allocates $150,000 to fund waste remediation from the rivers. In fiscal year 2017/2018, waste remediation only cost $139,701. The SWRD will collaborate with Parks and Recreation to determine the role they can play in reducing the amount of waste that is illegally disposed in the rivers and the amount of funds required to remediate river waste.

Due to high levels of contamination, the waste retrieved from the rivers may not be able to be recycled. However, based on the positive effect of education and enforcement efforts, the SWRD estimates an additional reduction of 20 percent or approximately 1.7 tons in waste that is illegally dumped in the rivers and along their banks.

- Promote backyard composting – Backyard composting is an attractive, simple method of managing organic waste at home. It adapts to fit individual lifestyles, incomes, yard sizes, and ambitions. Therefore, the SWRD may offer a *Master Composter* program. The *Master Composter* training would include classroom sessions or field trips, as well as practical education through volunteering in the community. In the classes, trained *Master Composters* or experts will provide in-depth instruction about various aspects of composting and the importance of composting in waste management. Additionally, trainees receive instruction on how to be effective educators for a variety of age groups and in a range of settings.

  If funds are available, the SWRD may sell backyard compost bins at a subsidized rate. The bins would be sold several times a year and residents would register for them in advance to assure that the SWRD only orders the number of bins that could be sold. The SWRD would promote the backyard compost bins at local garden stores.

  To estimate potential quantities of organics that could be reduced through backyard composting, the 2010 study on the Langley Township in British Columbia, Canada was used as a resource. The Township of Langley undertook a study to develop and test strategies to enhance the township's backyard composting program for green waste and food scraps.

Langley Township employed two different strategies that were piloted over a seven-week period. One strategy used a high intensity approach, including a personal level of coaching, and the other strategy used a medium level of intensity without personal coaching. For both strategies, all participants were exposed to a comprehensive outreach campaign that included backyard composting in schools and other public areas, commitment by public officials and neighborhood backyard composting champions. The findings for each strategy are summarized in **Table 11**.

Table 11. Langley Township Pilot Program Results

Measure	Medium Intensity Strategy	High Intensity Strategy
Participation Rate	45%	51%
Waste Reduction	12-18%	31%
Organics Composted	8.4 lbs./household/week	11.24 lbs./household/week

Based on the Langley Township results, between 12 and 31 percent of the SWRD's 28,899 residential customers would participate in a backyard composting program or between 13,005 and 14,733 customers, and between 2,840 and 4,306 tons of organics could be reduced.

- **Promote reuse and exchange opportunities at thrift stores and Habitat for Humanity ReStore**– Multiple thrift stores and a Habitat for Humanity ReStore are located in New Braunfels. To help increase awareness about these venues that reuse domestic and building products, the SWRD may coordinate an annual event that showcases these reusable products to the community. These events could be fashion shows or product displays at events hosted or attended by SWRD staff.

- **Promote RENEW to businesses and all City agencies** - The Resource Exchange Network for Eliminating Waste (RENEW) is a free materials-exchange network established by the Texas Legislature in 1987 to promote the reuse or recycling of business waste. The network is a marketing channel for industries, businesses, and governmental units who wish to sell surplus materials, by-products, and wastes to those who will reclaim or reuse them. Since 1989, more than 500 exchanges have resulted in over 1 billion pounds of material for reuse or recycling. These efforts also saved facilities more than $27 million dollars in disposal costs and earned over $15 million dollars from the sale of recyclable materials.

  If the option is pursued, the SWRD would encourage commercial businesses and manufacturing industries to post on RENEW and connect with businesses in the region that are currently disposing products that they want. For example, a company in Texas is currently looking for solvent with contamination of ink, paint, or oil. North American Industry Classification System (NAICS) code 323111 represents commercial printing and there are several printing companies in New Braunfels. Thus, the SWRD could reach out to these printing companies and help them access the RENEW database. The SWRD could work with RENEW participants to estimate potential savings and share these success stories with similar types of businesses.

Because data on what commercial businesses and City departments dispose of is not available, it is not possible to estimate the potential quantity of waste that could be reduced through promoting RENEW.

5.3 RECYCLING

5.3.1 Residential

In New Braunfels, all single-family and some smaller, multi-family dwellings have access to curbside recycling, however the average set out rate was 56 percent during the Baseline Year. Approximately 24 percent of what residents set out in their recycling carts during the Baseline Year was contamination. As previously discussed, domestic recycling processors have implemented new requirements regarding the quality of recyclables they receive, due to China's new policies on contamination in imported recyclables. Some processors have even stopped accepting commingled recyclables or significantly increased processing fees.

The City's 24 percent contamination rate is higher than the state average, even though the City's Solid Waste Code specifies that only residential recyclables can be placed in carts and that the SWRD will not service the cart if it contains anything else. The Solid Waste Code further states that "the residential customer must remove all unauthorized items before the SWRD will service it. If the residential customer requests a return service for recyclables, as well as waste, the SWRD will charge them a fee of $15.00."

The following are potential options to increase the quantity and quality of residential recyclables. None of these options will create a conflict with adopted land use plans:

- **Establish recycling and participation goals** - A national survey of 264 communities found that those who set a recycling goal were more successful[16]. Why? Goals give residents a target to strive for. Therefore, the SWRD may establish recycling and participation goals, which will be promoted in SWRD materials and at public events, as well as civic, business, and educational organizations. Continual promotion of the goals would serve as a reminder to participate in recycling and motivate the community to achieve the goal.

  As detailed in Section 8, the New Braunfels' landfill diversion rate could increase from 16 percent to 38 percent during the first 10 years of the Plan's implementation. However, before the City can commit to recycling goals, the SWRD needs to characterize the composition of waste disposed at Waste Management's Mesquite Creek Landfill (Composition Study). The Composition Study would identify the recyclables and organics in both residential and commercial waste streams that could be reduced, reused, recycled or composted, based on local market conditions, facilities and programs. The Composition Study would also be designed to align with this Plan's options. For example, estimating the amount of pre-consumer food scraps generated by commercial establishments to support the food waste recovery option in this Plan. If the SWRD conducts the Composition Study, the data would be used to establish short, medium, and long-term goals for residential and commercial generators.

  The most significant obstacle about introducing recycling goals is making them relevant to the community and continually motivating people to recycle. Therefore, the SWRD

[16] David H. Folz; *Public Administration Review* (1991)

would use the website, newsletters, and community outreach activities to raise awareness about the goals and why they are relevant to New Braunfels, as well as report the City's progress in achieving the goals. The SWRD would also highly promote each time the City increases recycling by each percentage point when progressing from 16 to 20 percent, and every five percent thereafter.

Similar to the education and outreach initiatives, the SWRD would annually evaluate whether residential recycling and participation goals are being achieved. If goals are not being achieved, the SWRD would assess if existing strategies to achieve them need to be modified, or if the goals need to be reconsidered.

The SWRD estimates that increasing the City's overall diversion rate from 16 to 20 percent could recover approximately 3,000 additional tons of waste from the landfill each year. The SWRD estimates the Composition Study for residential and commercial waste would cost between $65,000 and $75,000. The SWRD does not foresee any conflicts with approved land use plans from this option.

- **Consider a variable rate structure to incentivize recycling** - The SWRD offers residential customers both 48 and 96-gallon waste carts, but the monthly fee is the same for both. Therefore, one of the options the SWRD is considering to help increase recycling volume is establishing a variable rate system, where residents pay a higher monthly fee for the larger cart. Cities throughout the United States have increased recycling rates when waste collection fees align with the quantity of waste customers set out.

  This relationship between fees and recycling rates is reinforced by a 2018 study conducted by WasteZero.[17] This study analyzed the impact of unit-based pricing, also known as variable rate or pay-as-you-throw (PAYT) programs, on residential trash[18]. WasteZero conducted head-to-head comparisons of municipalities in southern Maine with and without unit-based pricing. The study revealed that, on average, municipalities with unit-based pricing annually generate 44.8 percent less trash per capita and have 62.3 percent higher recycling rates than municipalities that do not.

  The SWRD identified three municipalities in the region that have a variable rate structure: Denton, Killeen, and San Antonio. **Table 12** shows the rate structure for each one of these cities.

[17] WasteZero is a Raleigh, North Carolina-based company that designs and operates PAYT programs
[18] In general, the term variable rate is used when the collection system uses carts and the term PAYT is used with bags, tags and/or stickers.

Table 12. Variable Rate Monthly Rate Structures

Municipality	Small Cart	Medium Cart	Large Cart
Denton	Not available	60 Gallon - $24.51	90 Gallon- $29.96
Killeen	31 Gallon - $16.25	64 Gallon - $17.63	96 Gallon- $19.78
San Antonio	48 Gallon - $19.00	64 Gallon - $21.00	96 Gallon - $29.00

If the City of New Braunfels pursues a variable rate system, there would be policy, financial, and operational considerations. Also, most communities throughout the United States with variable rate structures offer medium-sized carts of approximately 60 to 65-gallons, and as shown in Table 12, communities in the region offer a medium-sized cart. If New Braunfels opts to provide a medium-sized cart, this would be a capital cost to the SWRD. On average, 20 percent of households select the mid-sized cart if the larger cart is the default size. Based on a cost of $50 per cart and 20 percent of the SWRD's 28,899 customers selecting this cart size, offering a medium-sized cart would require a capital investment of almost $290,000. Due to the cost of purchasing carts, the variable rate program may be implemented in phases or the cost of purchasing/distributing new carts may be shared with customers.

Finally, a variable rate program would most likely increase the number of residential customers that participate in curbside recycling and the volume of recyclables recovered. Since the City crews currently transport recyclables to San Antonio for processing, higher set out rates could decrease the number of households that collection crews can service in a day and therefore, recycling routes may need to be reconfigured to facilitate efficient operations.

With respect to diversion potential, a variable rate program combined with additional education and outreach could significantly increase the amount of waste that is diverted. During the Baseline Year, 21,509 tons of residential waste was disposed, and 10,549 tons of waste was recycled or mulched, which yields a residential waste generation quantity of 32,058 tons. It should be noted that these recycling/mulching quantities include material delivered to the CRC, and a portion of this could be generated by businesses or tourists. However, data is not available to itemize residential, business and tourist recyclables delivered to the CRC.

Based on residential generation quantity of 32,058 tons and the SWRD collecting 5,740 tons of residential recyclables through the curbside recycling program, approximately 18 percent of waste generated by residential customers was recovered through the residential curbside recycling program during the Baseline Year. If a variable rate program increased this recovery rate to 25 percent, an additional 2,244 tons of residential recyclables would be diverted from the landfill.

- **Identify areas of the City with low participation and/or high contamination rates for targeted outreach** – In most cities, recycling participation and contamination rates vary substantially from neighborhood to neighborhood, and even by street. Therefore, SWRD may work with drivers to determine if there are certain routes where less than 50 percent of households set out recyclables on a regular basis or contamination is a persistent

problem. As part of an effort to stave off contamination and reduce the contamination in the curbside carts, a program compliance technician would assist with ensuring carts that are serviced are prepared correctly.

The SWRD may also evaluate installing radio frequency identification (RFID) tags on recycle carts to track recycling habits. Each ID tag would be linked to an address, which would allow the SWRD to keep track of residents who recycle and those who do not. This would allow SWRD to target their outreach specifically to those who do not participate, rather than wasting effort on those who already do, which could save money and improve recycling rates. To monitor contamination, the RFID chips could be combined with an on-board, camera tracking system.

The SWRD could use this data to focus on those customers and neighborhoods for additional outreach to increase participation and reduce contamination. The SWRD could also meet with leaders in these communities to further understand potential barriers to recycling and obtain their endorsement of recycling.

While tracking chip/camera systems can be an effective tool to increase recycling and decrease contamination, they would require the SWRD to replace their existing recycling carts with chipped carts and install scanning devices in trucks and more. In 2017, Richland County, Texas implemented a fully integrated system of garbage haulers, county waste inspectors' trucks and route management software that electronically interacts with the 160,000 chipped carts. Excluding the price of the chipped carts (the County had previously purchased these), the entire system cost the county $1 million, or $6.25 per cart.

To implement a tracking chip/camera system, the SWRD would need to purchase new, chipped carts and these typically cost approximately $50 each. Thus, the entire new cart system could require a capital investment of approximately $56.25 per cart or $1.6 million for all 28,899 customers.

As discussed, 56 percent or 16,309 households set out recyclables during the Baseline Year, and 5,740 tons of recyclables were collected curbside. This yields a contribution of 0.35 tons per year (TPY) per household. If this option increases the number of households that set out recyclables by 10 percent, the weight of recyclables recovered will increase by almost 1,000 TPY.

- **Consider ordinance to provide on-site access to recycling for multi-family complexes** - Currently, the SWRD does not collect recyclables from multi-family complexes, and private waste haulers are not required to provide this service. Thus, the only opportunity for these residents to recycle is at the CRC. To increase recycling and waste diversion in the City, and make recycling more convenient for multi-family residents, the SWRD may consider introducing an ordinance that requires all apartment complexes in New Braunfels to provide recycling to their occupants.

  San Antonio's city council passed an ordinance in 2010 to implement a multi-family recycling program. The multi-family recycling program/ordinance was a strategy from San Antonio's 2010 solid waste management plan. The San Antonio ordinance requires owners/managers of multi-family properties to prepare a recycling plan and arrange for on-site collection of recyclables. Owners/managers of properties with less than eight

units can contract with the San Antonio waste management department, all others must use a private hauler. Although owners/managers of multi-family properties must provide on-site recycling, private waste haulers are not required to collect recyclables at multi-family properties. The ordinance allows owners/managers to self-haul recyclables, but they must submit an annual report that includes the quantity of recyclables transported and where they were delivered. The recycling facility must certify the quantity of recyclables received.

The San Antonio multi-family recycling program was fully implemented by 2012 and has consistently exceeded the 97 percent compliance goal. The San Antonio waste management department has two full-time inspectors dedicated to the multi-family recycling program. If an owner/manager is not in compliance, they could be fined up to $2,000 per each day they are not in compliance. However, the compliance officers provide extensive support to establish a recycling program before issuing a fine.

If the City of New Braunfels pursues the development of a multi-family recycling ordinance, the SWRD would need to create an inventory of the multi-family properties in the City, as well as create a data base of the owners/mangers and number of units. After this database is created, the SWRD would need to survey multi-family occupants to assess their desire to have on-site recycling, especially if it increases the rent or home-owner fees. The SWRD would also conduct workshops with owners/managers.

Currently, there are 5,361 multi-family units in New Braunfels, and a 2001 USEPA study estimates that approximately 14 percent of multi-family residents actively participate in on-site recycling programs. For New Braunfels, that would be equivalent to 751 units. On average, households that actively participate in the curbside recycling program annually contribute 0.35 tons of recyclables. If this participation rate is applied to the 751 multi-family units that may participate in an on-site recycling program, approximately 264 tons of recyclables would be recovered annually.

- **Promote purchase of products made with recycled content and that can be recycled** – According to the TCEQ "*Buying products with recycled content makes the recycling process sustainable. When you purchase recycled-content products, you increase the demand for recycled materials. As a result, manufacturers continue to use recycled materials in their products, and recyclers continue to have a market for their materials.*" To encourage people to buy more recycled-content products, the SWRD may conduct an annual, month-long *Get in the Loop* campaign that reminds shoppers to buy recycled through in-store promotional materials and identifies specific recycled-product choices right on the store shelf. This would be supported by a print and radio advertising campaign conducted cooperatively with product manufacturers and local retailers. The campaign would be designed to do one of three things: show consumers the importance of buying recycled; tell them where they could buy recycled content products; and show them actual product choices. During that month, the SWRD would make the theme *Close the Loop* for all presentations.

  If the SWRD pursues this option, they would work with retailers to establish a baseline for the number of recycled products sold before and after the campaign. The quantity of recycled products sold would also be measured six months after the campaign to assess its impact on consumer purchasing practices.

The campaign materials would include shelf talkers, and self-stick door decals announcing that the store is committed to sustainable recycling. If funds are available, the in-store materials would be supplemented with paid advertising. It is not possible to estimate the cost of a *Close the Loop* campaign until the number of stores participating is confirmed. However, the cost per store would be approximately $100 for materials.

A *Close the Loop* campaign may not directly increase recycling in New Braunfels but could significantly contribute to the sustainability of recycling. In addition, a *Close the Loop* campaign could increase awareness about recycling, and it may yield an increase in the number of residents who set out recyclables for collection and/or deliver recyclables to the CRC.

5.3.2 Commercial

The SWRD does not collect recyclables from their commercial customers, but all businesses in New Braunfels do have access to the CRC at no cost. The SWRD previously evaluated collecting recyclables from their commercial customers, but determined it was cost prohibitive. Several of the private waste haulers do offer recycling services to their commercial trash customers, however, they do not provide the SWRD with any data on the number of customers they serve, or quantities of recyclables they collect.

There are also private recycling companies in the region that have the capacity to collect and process commercial recyclables. Because private haulers do not share data on the sources and tonnages of commercial waste currently collected and disposed, the SWRD cannot estimate the quantity of commercial recyclables that could be recovered from their customers.

The SWRD may consider the following options to provide commercial customers with the opportunity to recycle, obtain data from private waste haulers, and foster recycling within the New Braunfels business community.

- Consider a franchise agreement for recycling services for SWRD commercial customers - To provide SWRD commercial customers with the opportunity to recycle at their establishment, the SWRD may award a franchise agreement to a private company to offer this service. The franchisee would be responsible for establishing individual contracts with each business, as well as billing customers. The SWRD franchise agreement would be the legal instrument to allow one company to provide recycling services for SWRD commercial customers. The SWRD has several thousand customers, and most are within a small geographic area. Thus, an exclusive franchise agreement for the entire city would probably yield the most affordable rates for SWRD commercial customers.

  To increase interest from service providers to bid on collection services and potentially decrease costs, the SWRD may work with businesses to assess the economics and benefits associated with implementing a recycling program at their establishment. In addition, the SWRD may help interested businesses determine the number of trash and recycling containers they will require if they implement a recycling program. Participating in the SWRD assessment would not be a commitment by the business to participate in the recycling program. However, more recycling companies may consider commercial recycling a viable opportunity if the request for proposals (RFP) demonstrates that the SWRD and businesses have assessed if the service is financially feasible.

Data is available to estimate the potential quantity of recyclables that could be recovered from SWRD customers. In 2015, the SWRD conducted a *Commercial Recycling Feasibility Study*, which estimated that 20.7 percent of commercial waste was recyclable, and of that, 31.1 percent was cardboard and paper. During the Baseline Year, the SWRD collected 32,459 tons of waste from their commercial customers. Using the percentages from the *Commercial Recycling Feasibility Study*, 6,719 tons of waste from SWRD commercial customers is recyclable, and 2,089 tons of those recyclables are cardboard and paper.

The *Commercial Recycling Feasibility Study* also estimated that 71 percent of SWRD commercial customers would pay to recycle cardboard and paper if those costs were offset by a reduction in their trash collection bill. The *Commercial Recycling Feasibility Study* did not ask survey respondents if they would participate in a program for all recyclables if recycling costs were offset by trash collection savings. For planning purposes, the SWRD projects that 71 percent of SWRD commercial customers would participate in a program to recover all targeted commercial recyclables if it is cost neutral. Therefore, the SWRD estimates that approximately 4,770 tons of recyclables could be recovered from SWRD commercial customers, of which 1,485 tons are cardboard and paper.

Under the franchise agreement, the service provider would directly bill the commercial establishment for service. Thus, this option would not represent an incremental cost for the SWRD.

- **Modify permit process to require private haulers to report waste and recycling data** – The Solid Waste Code prohibits the operation of a solid waste vehicle in the City without a permit. The applicant does have to estimate the annual tonnages of waste to be collected and provide the sources and types of waste they intend to collect. However, they do not need to validate waste tonnage estimates at the end of the year. In addition, they do not have to estimate annual tonnages of recyclables, indicate the types of recyclables they collect, or report which businesses participate in recycling. Both the waste and recyclable tonnages are important for determining disposal and processing capacity requirements, as well as whether the City is achieving waste diversion goals. Therefore, the SWRD might amend the Solid Waste Code to require this information to receive a permit.

  This option may not necessarily increase the amount of commercial waste that is recovered but will increase the City's overall recycling rate if commercial quantities are included. Also, this information could provide the SWRD with insight on the types of businesses and materials currently being recycled, which could be useful when approaching new businesses about recycling.

- **Modify permit process to require private haulers to provide recycling** - After private waste haulers begin providing data on the quantity of waste that their commercial customers disposed, the SWRD may modify the permit process to require them to provide the opportunity for their customers to recycle. This requirement may be limited to a certain size or type of business. The SWRD will work with the private haulers and their commercial customers to determine the financial impact of implementing an on-site recycling program.

- **Consider ordinance to encourage commercial recycling** – After an infrastructure is established that assures all businesses in New Braunfels have access to onsite recycling, the SWRD may consider modifying the Solid Waste Code to require businesses to implement recycling programs. This ordinance could be structured to target certain types of business that generate materials that have the greatest potential to be recycled. Prior to designing a commercial recycling ordinance, the SWRD would work extensively with the business community to design its structure and implementation.

- **Recognize businesses that recycle with green business certification program** – The SWRD will consider implementing a program like San Antonio's ReWorksSA, where businesses are recognized for their commitment to waste reduction and recycling through recycling certification. For a business to be eligible for recycling certification, they would need to have a recycling program in place. The SWRD would identify a series of waste reduction and recycling best practices that the business can choose from. For each best practice the business implements, they receive points. The more points a business earns, the higher level of certification they could receive.

  San Antonio has 27 elective best practices and the highest certification is a gold level. Certifications are valid for two years. **Table 13** shows the awards associated with each tier in San Antonio.

Table 13. San Antonio Certification Level Awards

	Bronze	Silver	Gold
Official Certificate	⚙	⚙	⚙
Certification Window Decal	⚙	⚙	⚙
Digital Logo Package	⚙	⚙	⚙
Recognition on ReWorksSA.org	⚙	⚙	⚙
Framed Official Certificate		⚙	⚙
Thank You Letter From City Leadership		⚙	⚙
Certification Plaque			⚙
Dedicated Spotlight page on ReWorksSA.org			⚙

- **Promote environmentally preferable products** - The SWRD may promote the US Environmental Protection Agency's (USEPA) Comprehensive Procurement Guideline program for environmentally preferable products (EPP) with other City agencies and encourage the purchase of materials recovered from solid waste to contribute to the demand of recycled-content products. Categories include the following products or City services: construction; landscaping; office supplies; parks and recreation; and transportation and maintenance. The SWRD may also work with City agencies to develop a list of specifications for procuring "green products." The SWRD may also research

other cities that have developed capital improvement projects that use recycled-content materials; minimize or contain environmental impacts; avoid disturbance to natural resources; and make maximum use of sound environmental management practices.

Promoting environmentally preferable products will not directly increase the quantity of waste that is reduced or recovered for recycling or composting. However, it will increase awareness of waste reduction amongst City employees. Therefore, the SWRD conservatively projects a 1 percent increase in the quantity of material annually recovered, or approximately 106 tons.

5.4 CONSTRUCTION AND DEMOLITION (C&D) DEBRIS

Comal County and New Braunfels are "ranked as the ninth fastest-growing county and second fastest-growing city in the nation and are experiencing an unprecedented growth rate—growing at an average of four to five percent per year, or a 77 percent increase in the last decade[19]." This population growth will yield an increase in C&D debris.

There is only one C&D landfill in the AACOG region: the Beck Landfill in Guadalupe County. The Beck Landfill accepts non-putrescible, C&D debris. This includes wood waste, asphalt, concrete, brush, roofing material, scrap metal, clean soil, and inert debris and rubbish. Hazardous, putrescible, regular household and liquid wastes, paint, chemicals, batteries, tires and Class I industrial wastes are not accepted.

The Beck Landfill also accepts separated loads of uncontaminated wood waste (fencing, lumber, brush, etc.) for processing and recycling. Wood waste is sorted for re-use or processing by grinding to various sizes. The processed wood waste is recycled into bio-fuel (used in cement kilns), landscaping mulch, erosion control, and wet weather road traction. The Beck Landfill also recovers scrap metal and appliances from the landfill face, which they take to an off-site metal recycling facility.

To increase the recovery of C&D debris, the SWRD will consider the following options:

- Increase the delivery of source-separated wood to the Beck Landfill -The Beck Landfill estimates that 50 percent of the material received is wood waste, but only 10 percent of the lumber is source-separated. The Beck Landfill evaluated installing a processing line to extract wood waste from the incoming loads of C&D debris, however, they could not make the economics work. To help the Beck Landfill increase the amount of source-separated wood waste delivered, the SWRD may work with other solid waste and recycling divisions in the AACOG region to develop promotional materials to encourage builders, remodelers, and construction companies to source-separate wood waste. The SWRD may also work with C&D haulers to evaluate the costs associated with hauling dedicated loads of source-separated wood waste to the Beck Landfill. Finally, the SWRD may work with the Beck Landfill to determine if charging a lower tipping fee for source-separated wood waste is economically viable.

  During the Baseline Year, 395,000 tons of C&D debris waste was disposed at the Beck Landfill, of which 50 percent or 197,500 tons was wood waste. If the amount of source-separated wood waste increases from 10 to 25 percent, almost 30,000 tons of wood waste could be recovered from the AACOG region. The AACOG region had a population of

[19] New Braunfels 2017 Demographic Profile

2,542,648[20] during the Baseline Year, which means the potential per capital diversion rate for source-separated wood waste is 0.012 TPY. When this diversion rate is applied to the New Braunfels Baseline Year population of 79,152, approximately 934 tons of source-separated wood waste could be recovered from implementing this option.

- **Establish C&D diversion specifications for City construction projects** – To increase C&D debris recovery, the SWRD may facilitate the development of C&D diversion specifications for City construction projects. Initially, the specifications would be limited to source-separated wood waste, as that is what the current infrastructure in the region has the resources to process. The SWRD will consider increasing the materials they target for recycling in City construction project specifications as capacity to recycle C&D materials comes on-line.

  The most significant barrier to establishing C&D debris diversion specifications for City construction projects is that they may increase the cost of the project and reduce the number of companies that are willing to bid on them. Therefore, the Capital Programs Department will help the affected City divisions conduct a cost benefit analysis and identify construction firms that are willing to source separate wood waste.

  Because the C&D material diversion specifications will initially be limited to source-separated wood waste, the SWRD is not projecting additional quantities from the 934 tons of wood waste that could be recovered through partnering with other recycling divisions in the AACOG region.

- **Secure long-term C&D debris disposal capacity** - The Beck Landfill has a remaining capacity of approximately 2.8 million tons, or 14 years[21]. Increasing the quantity of wood waste recovered will increase the life of this facility. However, the SWRD may need to begin actively monitoring C&D material disposal capacity in the region in approximately five to eight years and evaluate the need for a new facility or a dedicated C&D debris transfer station. If a new C&D facility is developed, the SWRD will evaluate the feasibility of co-locating a C&D material recycling facility.

5.5 ORGANICS

The SWRD has an integrated system to collect and mulch yard waste, but no programs exist to recover organics such as food scraps and biosolids. In addition, the green waste collected at the curb contains contaminants. Thus, to increase the types of organics recovered, and to improve the quality of yard waste collected, the SWRD will consider the following options.

- **Provide education on acceptable materials for mulching** –SWRD would develop a multi-faceted campaign to educate residents on what materials are acceptable for green waste collection, and emphasize that not all products found in the yard (i.e. plastic mulch bags) comply with the City's definition of Green Waste. The campaign might include placing posters where yard products and bagged mulch is sold. If funds are available, the SWRD may advertise on cable channels that feature home improvement and gardening shows. The campaign would be designed to increase the quality of green waste

[20] AACOG Economic Development District Comprehensive Economic Development Strategy
[21] Municipal Solid Waste in Texas: A Year in Review 2017 Data Summary and Analysis

recovered rather than the quantity. By increasing awareness about green waste recovery, more residents may participate. Thus, the SWRD is projecting a five percent increase in the amount of green waste diverted from the landfill because of this campaign. This five percent increase is equivalent to approximately 205 tons. If the campaign is limited to posters, the SWRD is estimating the cost to be approximately $500 per year.

- **Begin discussions with or explore the development of a compost facility with local partners for food scraps and biosolids** – The Comal County Rural Recycling and Chipping Facility does not have sufficient acreage to process biosolids or food scraps, and according to the site manager, it probably would not receive notification status from TCEQ to accept these organics. The New Earth Composting Facility in San Antonio does accept these organics, but the cost to transport organics to this site may reduce the viability of this option. In addition, the New Earth Composting Facility will only consider accepting municipal biosolids if there was extensive data demonstrating that it will comply with TCEQ requirements.

  The SWRD may work with local partners, such as NBU and Comal County, to evaluate the feasibility of developing a facility within Comal County to compost biosolids and food scraps. A significant obstacle will be siting the facility, due to the amount of land required, odor concerns, and regulatory/zoning requirements. Therefore, the potential compost system should consider aerated static piles (ASP) or in-vessel compost technology, rather than open windrow composting, as these technologies require less land, and odors are minimized.

  ASP is a composting method that uses a specialized fabric to cover compost windrows. The entire system includes fabric covers, in-floor aeration, blowers, oxygen and temperature sensors, controllers, computers, software, cover handling systems, installation, training and engineering support. The specialized laminate fabric is waterproof and windproof, shielding the windrows from weather, but it allows water vapor and CO_2, by-products of composting, to evaporate through it.

  In-vessel composting involves placing all the raw materials into an enclosed vessel, adding moisture and oxygen to the vessel as needed, and turning or rotating the vessel to mix the material as the decomposition proceeds. In-vessel systems control odors by retaining them.

  The composting process can be greatly accelerated by ASP and vessels, as the material can be manipulated as much as desired to add mixing, air and moisture. Compared to open windrows, these technologies require less land, can minimize odors, and produce compost more quickly, but the capital costs are significantly higher. These higher capital costs could translate into processing fees that are substantially greater than landfill tipping fees, which will decrease the economic viability of diverting organics from the landfill.

  Although economics may be a barrier, there is significant diversion potential from targeting biosolids and food scraps for recovery. During the Baseline Year, over 10,000 tons of food and 600 tons of biosolids were disposed. If 50 percent of these organics were captured through a composting system, the City's overall diversion rate would increase from 16 to 22 percent. As previously discussed, this type of system will require

a significant capital investment. Equipment for a windrow composting system with aerated static piles will cost approximately $1.5 million and require approximately 10 acres of land. An in-vessel system would require less than an acre but could cost up to $15 million to develop. For both types of technologies, the facility would need to be sited in a location that complies with TCEQ environmental regulations and local zoning requirements.

If the SWRD, in partnership with Comal County and NBU, pursue the development of a compost facility for biosolids and food scraps, they will first assess the technical and financial feasibility of an organics recovery system. This type of feasibility study typically costs between $80,000 and $100,000 and includes the following components:

- Evaluate compost technologies:
  - Operating description
  - Processing capacity
  - Infrastructure requirements
  - Compost production
  - Capital costs
  - Operating and maintenance expenditures
- Review regulatory requirements
- Assess ability to secure feedstock
- Evaluate potential to market compost
- Develop financial pro forma

- **Assess the capacity for processing food and biosolids at existing facilities** – As discussed, the New Earth Composting Facility in San Antonio accepts pre-consumer produce waste, as well as biosolids from San Antonio. However, this does not necessarily mean that New Earth has the capacity to process pre-consumer produce waste from New Braunfels or if the NBU biosolids will meet their feedstock specifications. If this option is progressed, the SWRD would meet with New Earth to assess if diverting these organics to their facility is a viable option. The SWRD would also meet with the private waste haulers that are permitted to collect MSW in the City to assess their desire to collect pre-consumer vegetable waste from their commercial accounts, requirements for providing this service, and potential collection fees.

  The SWRD does not foresee any obstacles for implementing this option or potential conflicts with adopted land use plans. With respect to diversion potential, it is only possible to estimate the amount of biosolids that could be annually recovered (approximately 660 tons). Data is not available on the amount of pre-consumer produce waste that is annually generated in the city; only the total amount of pre- and post-consumer food waste disposed.

- **Assess opportunities to compost Green Waste on-site at large generators** – Large generators of green waste sometimes have enough land to compost green waste on their property. Large green waste generators often include parks, golf courses, and landscapers. If the SWRD pursues this option, they will survey these institutions and businesses to identify how they currently manage their green waste, and if they would be interested in learning how to compost it on site. For those institutions and businesses

that express an interest in on-site composting, the SWRD will provide technical assistance, employee training, and guidance on regulatory and zoning considerations.

One of the barriers to implementing this option is training employees. Many of these establishments use seasonal employees for yard maintenance, and there is a high turn-over rate with permanent employees. Consequently, they are reluctant to require employees to participate in training outside of their core business or service. In addition, the SWRD could invest significant time training and providing guidance without any guarantees that the establishment will implement a composting program.

Estimating the quantity of green waste that would be composted on-site by large generators is not possible to project, as the data on the amount of green waste they currently dispose is not available. However, green waste comprises almost 11,500 tons of the landfilled waste stream and, consequently, on-site composting could divert almost 2,300 tons of green waste if just 20 percent originates from these sources.

The SWRD does not envision any additional costs if existing staff are used to implement this option. In addition, there should not be any conflicts with adopted land use plans if the green waste is composted on the generator's property.

- **Evaluate organics collection from large commercial generators –** If New Earth San Antonio has the capacity to process pre-consumer produce from New Braunfels or a composting facility for organic material is developed in Comal County, the SWRD may help large commercial generators prepare business case analyses (BCA) to determine the viability of recovering pre-consumer food scraps. The BCA would consist of quantifying the pre-consumer produce and/or food scraps available for recovery, evaluating storage capacity, assessing the potential for employees to source-separate organics, working with the facility's waste hauler, and estimating costs. These businesses and institutions could include:

  - Grocery stores, such as the three H-E-Bs and the Walmart Supercenter;
  - Institutions with cafeterias, such as New Braunfels Independent School District and the New Braunfels Regional Rehabilitation Hospital; and,
  - Event venues, such as Schlitterbahn water-park, the Civic/Convention Center, and Landa Haus.

  If this option is implemented, the SWRD would also work with large green waste generators who aren't interested in on-site composting to explore the possibility of requiring their landscapers to deliver green waste to the compost facility. This option is viable for large generators of green waste because they often produce enough material to fill an entire vehicle. If a vehicle makes multiple stops before it is full, it is difficult for one customer to direct where the landscaper deposits green waste.

  The SWRD does not foresee any obstacles for implementing this option, incremental costs if existing staff is used, or potential conflicts with adopted land use plans. It is not possible to estimate the volume of organics that this option could divert, as data on the amount of food scraps or green waste currently disposed by large generators is not available.

- **Increase awareness about wasted food and food recovery -** As previously discussed, food waste accounts for almost 18 percent of the disposed waste stream, which means approximately 10,626 tons were disposed during the Baseline Year. At the same time, almost 15 percent of residents in Comal County live in food insecure homes. To increase awareness about waste food and food recovery, the SWRD is considering the following options:

    - **Promote the USEPA "Food Recovery Challenge"** - The "Food Recovery Challenge" encourages universities, businesses, and other community organizations to make their food management systems more sustainable. Participants are required to set baseline goals, and annually report the amount of food waste diverted into the EPA's data management system. The EPA then takes the amount of food that has been saved and translates that into measures such as "cars off the road" or reductions in greenhouse gas. This helps participants share what they have accomplished and encourages others to get involved. Each year the EPA awards participating organizations in the categories of source reduction, leadership, innovation, education, and outreach. Winners of the "Food Recovery Challenge" awards are recognized on the EPA's various social media platforms.

    - **Link the SWRD website to the "I Value Food" website page** - The "I Value Food" campaign aims to raise awareness about food waste in the United States. The campaign's website offers tools and tips on how to help end food waste and features useful articles such as "Creative Ways to Use Leftovers," or "Cooking for One with Zero Waste." The campaign's website also offers a quiz to help see how much food individuals and families really waste every day. "I Value Food" will soon launch an online challenge and toolkit for reducing food waste at home, adapted from the EPA's "Food Too Good to Waste" program. Through various social media platforms, "I Value Food" shares ways to reduce food waste

    - **Incorporate "Save the Food" into classroom presentations -** The Food and Agricultural Organization of the United Nations developed "Save the Food," which is designed to raise awareness among school children, teachers, staff and their related families on food loss and waste issues and introduce good practices conducive to food waste reduction. An education package named "Do Good: Save Food!" consists of different modules that can be used by SWRD or teachers to plan lessons and activities on the issue. The content is adaptable and interactively designed to enable educators to select and implement components they consider to be most pertinent to the cause, depending on the needs related to time availability, knowledge and age of the students, curriculum context, etc.

    The SWRD does not foresee any obstacles, incremental costs, or conflicts with adopted land use plans to implement these options. With respect to diversion, the Natural Resources Defense Council (NRDC) estimates the average American annually throws away 240 pounds of food. This translates into approximately 9,500 tons of food waste in New Braunfels. The NRDC also estimates 20 percent of purchased food is never eaten. The SWRD is hoping to decrease the amount of food never eaten by 5 percent, which would reduce the amount of food never eaten by over 470 tons.

- **Provide outreach to restaurants and grocery stores on food waste reduction -** To identify options to help grocery stores and restaurants reduce food waste and recover food, ReFED was used as a resource to identify potential options for this Plan. ReFED is a multi-stakeholder nonprofit, comprised of a network of the nation's leading business, nonprofit, foundation, and government leaders committed to reducing U.S. food waste. ReFED takes a data-driven approach to move the food system from acting on instinct to insights that solve the national food waste problem. ReFED has identified 27 of the best opportunities to reduce food waste through a detailed economic analysis. The solutions were analyzed using the EPA Food Recovery Hierarchy. Below are ReFED strategies to reduce food waste in restaurants and grocery stores that the SWRD could encourage local businesses to implement:

    - **Smaller plates** - Using smaller-sized plates in all-you-can-eat dining establishments can minimize consumer food waste. Cornell Professor Brian Wansink's research on food psychology found that consumers given larger bowls took (and consumed) 16 percent more cereal than those with smaller bowls. Consumers generally find a 70 percent fill rate to be visually pleasing, so smaller plates reduce the amount of food consumers serve themselves[22]. New Braunfels has several buffet restaurants, and the SWRD may meet with them about converting to smaller plates. Obstacles that the SWRD may encounter is these restaurants will incur upfront costs to purchase new plates, and they may be concerned that smaller plates will impact customer satisfaction by requiring more frequent trips for refills.

    - **Standardize date labelling** - Current date labeling practices on food packaging cause confusion with "sell-by," "best-by," "use-by," and "best before" dates, leading up to 90 percent of Americans to occasionally throw out still-fresh food. Confusion over the meaning of date labels is estimated to account for 20 percent of consumer waste of safe, edible food. This equates to approximately $29 billion of wasted consumer spending each year in the United States; 5 to 10 percent of this is expected to be impacted by standardized date labels. One of the most significant challenges to standardized date labelling is there is no comprehensive national regulation or government agency with the direct mandate to regulate food date labelling for safety and perishability. In addition, food manufacturers have little incentive to change their practices, because date label standardization would do little to lower costs and increase revenues, as incremental savings and revenues would be incurred by the retailer.

      Although there are obstacles, H-E-B has several stores in New Braunfels and is also a food manufacturer headquartered in San Antonio. Therefore, there may be an opportunity for SWRD to work with other solid waste and recycling divisions in the AACOG region to progress the concept of standardized dates on products manufactured by H-E-B, and design educational materials on what the dates mean. The SWRD and other solid waste and recycling divisions could also work with H-E-B to monitor the reduction in disposal of products manufactured by H-E-B.

    - **Embrace imperfect produce** – Over the years, supermarkets have promoted high cosmetic standards for fruits and vegetables, leading them to reject even marginally imperfect-looking food (e.g., too short, long, big, small or uneven in shape,

[22] ReFED

too red or not red enough, and so on). If this option is selected, the SWRD would work with local stores and restaurants to accept and integrate the sale of off-grade produce (short shelf life, different size/shape/color), also known as "imperfect produce", into food business menu planning and product lines. In addition, the SWRD could include activities to educate students that the way a fruit or vegetable looks does not necessarily impact its taste.

On a national basis, ReFED estimates the annual reduction in food waste for these options: smaller plates - 178,000 tons; standardized date labelling – 398,000 tons; and embrace imperfect produce – 266,000 tons. Based on a U.S. population of 3.27 million, these three options could yield reduction rates of approximately 0.003 tons per capita. When this per capita rate is applied to the New Braunfels' Baseline Year population of 79,152, an estimated 204 tons of food waste could be reduced. The SWRD does not envision incremental costs associated with these activities if existing staff is used.

- **Explore a partnership with the New Braunfels Food Bank to enhance infrastructure for consumable food recovery** - The New Braunfels Food Bank was founded in 2010 and is a branch facility of the San Antonio Food Bank. Their mission is that no child should go to bed hungry, adults should not have to choose between a hot meal and utilities, nor a senior sacrifice medical care for the sake of a meal. To help the New Braunfels' Food Bank succeed in its mission and foster food recovery, the SWRD may periodically host food drives at the CRC to recover the "twelve most wanted" food items that the New Braunfels' Food Bank needs, such as canned soups and boxed dinner meals. In addition, the SWRD will explore the possibility of co-hosting a fundraiser with the New Braunfels Food Bank, where a movie about food waste in the United States is shown, such as "Wasted! The Story of Food Waste," and local chefs make food from recovered food and imperfect produce.

  There is little data on the effectiveness of this type of activity, so it is estimated that there will be a 1 percent or 95-ton reduction in the amount of consumable food that is thrown away by raising awareness about food waste and the New Braunfels' Food Bank.

5.6 SPECIAL WASTES

For this Plan, "Special Wastes" are Electronics and HHW. Options that SWRD will consider to reduce and recycle Special Wastes include:

- **Promote reduction strategies through community-based social marketing** - A community-based social marketing program could be implemented to help promote special waste reduction and recycling, with different messages targeted to different demographics using a wide assortment of tools now available. SWRD would work with community partners to further develop a special waste reduction and recycling public education and outreach program that targets specific audiences (e.g. language-specific and/or culturally competent mailings, brochures, or community meetings). General education brochures, utility bill inserts, newspaper articles, media ads, new program kick-off events, webpage, etc. should reflect the needs of the City's various ethnic and social communities. Funding programs on an on-going basis to educate target audiences about the new rules and

changes is an important part of maintaining positive community relations and engagement.

- **Provide outreach and education on alternative products** - The SWRD may provide outreach and education to residents to reduce the amount of HHW generated. The program will provide information on less toxic, alternative products residents can use to substitute for hazardous materials that are often difficult and/or expensive to dispose, and on reducing and properly managing HHW. Training would be provided via media and/or in a workshop open for residents to attend.

  During the Baseline Year, 188 tons of HHW were delivered to the special collection events. Through promoting the use of alternatives and only purchasing quantities that will be used, the SWRD estimates a 5 percent reduction in the amount of HHW generated. This is equivalent to approximately 9 tons. The SWRD estimates that the workshop could cost approximately $1,000 to conduct.

- **Build a permanent, multi-material drop-off center** – As previously discussed, the SWRD operates the CRC that is the primary outlet for local businesses, multi-family residents, and tourists to recycle, and provides SWRD residential customers with an opportunity to recycle on a daily basis. In addition, it is the only public outlet to recycle plastic foam #6 (also called Styrofoam) in the vicinity. Currently, the CRC does not accept Special Wastes, and these materials are recovered through collection events that are only available several times a year.

  Periodic collection events for Special Wastes are typically more expensive than a permanent facility due to contractor mobilization fees. In addition, a permanent facility can increase the recovery of Special Wastes and provide opportunities to locally reuse Special Wastes, which could significantly reduce contactor fees.

  When Olathe, Kansas transitioned from collection events to a permanent facility, materials recovered increased by 315 percent and $/ton costs decreased from $1,795 to $703. Most of this $/ton decrease was because only 41 percent of the material received required final management by the contractor. The remaining 59 percent was reused within the community.

  Therefore, the SWRD plans to develop a permanent, multi-material waste facility that would accept Special Wastes throughout the year. This facility would include a reuse center for HHW. The facility would also accept single-stream recyclables, scrap metal, plastic foam #6, flattened cardboard, bulky goods, green waste and oversized brush. The facility may also accept source-separated lumber that could be recovered at the Beck Landfill.

  The new facility would accept single-stream recyclables, scrap metal, plastic foam #6, and flattened cardboard year-round during the same hours the CRC currently operates. Those hours are Tuesday – Saturday, 8am to 12pm and 12:30pm to 4pm. With respect to all other items, the facility would initially be open two days per month throughout the year. The facility would be closed Sundays, Mondays and City holidays.

As previously discussed, the multi-material, drop-off center will replace the CRC and special collection events that diverted the following tonnage of materials from the landfill during the Baseline Year:

- Commingled recyclables 214 tons
- Latex Paint/Alkaline Batteries 18 tons
- Scrap metal 111 tons
- Cardboard 74 tons
- Electronics 14 tons
- Used oil 3 tons
- Batteries 2 tons

TOTAL 436 tons

Special events also accepted bulk goods and HHW, however the vast of these materials were landfill disposed. **Table 14** shows the incremental amount of material that could be landfill diverted in Year 1 due to the development of the new facility.

Table 14. Multi-Material Drop-Off Center Year 1 Estimates

Material	Tons
Cardboard	212
Scrap Metal	38
Commingled Recyclables	111
Brush and Green Waste	437
Styrofoam	2
Latex Paint/Alkaline Batteries	18
Electronics	5
Used Oil[23]	1
TOTAL	**824**

Source: Feasibility Study: Multi-Stream Waste Collection Center

The Feasibility Study for the Multi-Stream Waste Collection Center estimated that the facility could cost approximately $2.5 million in capital expenditures (CAPEX) to develop, and YR 1 O&M expenditures may be approximately $487,000. O&M includes hiring one foreman and four attendants. In addition, the facility could incur approximately $114,000 in contractor expenditures during YR 1 to manage tires, E-waste and HHW. During YR 1, all preparation and packaging of HHW will be conducted by the contractor. During YR 2, facility staff will be trained to complete these activities and by YR 3, HHW contractor costs should be reduced.

The SWRD plans to assess gate fees on materials delivered by any commercial customers and individuals that reside outside City limits and for all large brush and bulky goods. To support the initial construction of this facility, the SWRD anticipates there may be a residential rate increase.

[23] Based on 7 pounds per gallon

As this will be a new facility, land use plans will need to be considered when identifying a location. The facility will most likely be sited in a business district.

5.7 ALTERNATIVE TECHNOLOGIES

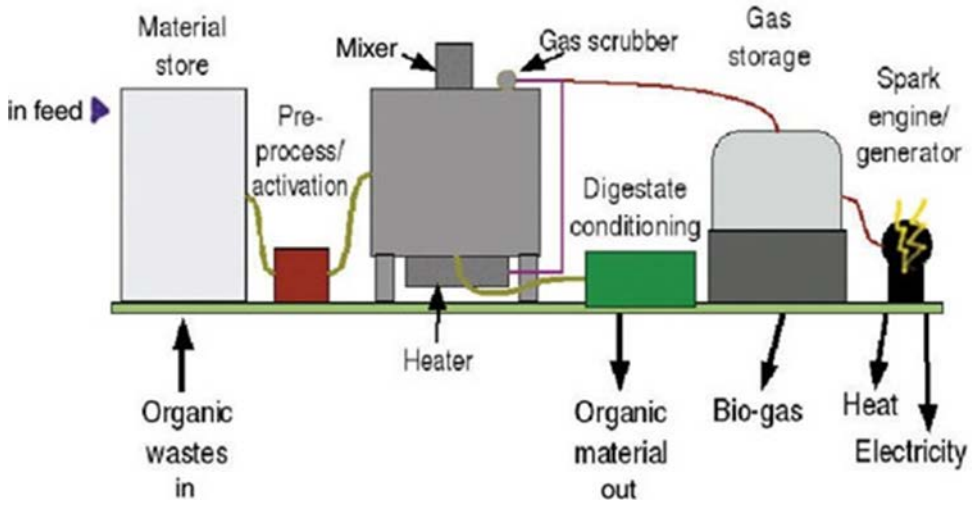
Although alternative technologies, such as waste conversion facilities, are not common in the Southwest, it is possible at some long-range future point for a facility of this type to serve as a final waste management option for the AACOG region. Currently, the largest barriers to alternative technologies are the relatively low tipping fees charged by landfills and the low price of energy available to consumers. However, the paradigm of inexpensive landfills and energy may one day shift, increasing the viability of alternative technologies in the region.

Multiple types of alternative technologies are used throughout the world and include anaerobic digestion (AD), thermal waste-to-energy (WTE), gasification/pyrolysis, plasma arc, and plastics-to-fuel. However, AD and thermal WTE are the two that are currently used to process MSW at multiple facilities in the United States and are the alternative technologies considered to be viable options for the AACOG region. Both evaluated WTE technologies can be complemented by upstream recycling.

5.7.1 Anaerobic Digestion (AD)

AD is a biochemical process, which breaks down organic waste in the absence of oxygen and produces biogas and digestate. Biogas produced is approximately 50 to 60 percent methane, and can be used to generate energy, either as a direct replacement for natural gas, in a combined heat and power system, in internal combustion engines, or converted to compressed natural gas (CNG) or liquefied natural gas (LNG). Digestate is defined as the remaining undigested solid and liquid fractions of the input feedstock material after the AD process. Digestate can be land applied or composted to produce a high-quality soil amendment. AD is typically undertaken using one of two distinct technologies: wet or dry digestion. Determining which technology is best depends on the quality, composition, and/or pre-treatment of the feedstock. Dry AD technologies typically process feedstocks with total solids content greater than or equal to 15 percent. Wet AD systems process feedstock with total solids content less than 15 percent (Figure 20).

Figure 21. AD Schematic

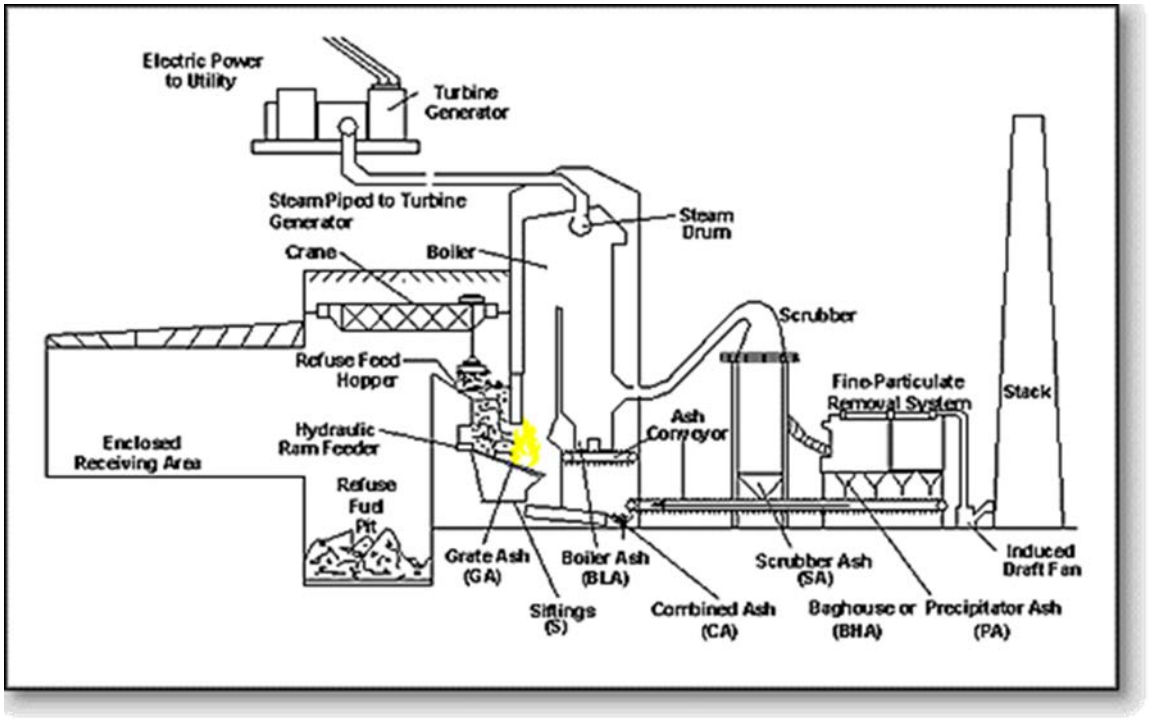


5.7.2 Thermal Combustion

Thermal combustion, also known as controlled combustion or thermal WTE, is one of the most widely adopted WTE technologies, with hundreds of active installations worldwide and dozens in North America. Thermal WTE usually involves the combustion of MSW and converts the combustible fraction of the solid waste stream into fuel for energy production, cleaning any flue gases that are produced through the process. In order for combustion to take place, a sufficient quantity of oxygen is required to fully oxidize the fuel. Typically, thermal WTE combustion (flame) temperatures are in excess of 850 degrees Celsius, and the waste is converted into carbon dioxide, water, and heat. Thermal WTE produces steam that can be used to generate thermal energy or electricity.

Bottom ash and fly ash are additional byproducts of the thermal WTE process and may require landfill disposal. Whereas fly ash from a coal-fired power plant is categorically exempt from Subtitle C and regulated under EPA's Coal Combustion Residuals (CCR) rules (40 CFR Parts 257 and 261), fly ash from a MSW WTE plant is not exempt and, as such would require testing to determine if it is hazardous. If testing demonstrates the fly ash to be non-hazardous, it could be approved at a Type I MSW landfill for disposal as a special waste with the landfill operator's approval. If testing shows that the waste is hazardous, the WTE plant operator would have to find a hazardous waste landfill to dispose of it OR develop a plan for excluding components of the waste stream that contributed to the failed TCLP test. There are two key types of thermal combustion technologies: controlled mass-burn and refuse derived fuel (RDF). In mass-burn systems, MSW is combusted with little or no pre-processing other than the removal of bulky or hazardous items. In RDF systems, the MSW is shredded into "fluff", or produced into a densified form, such as pellets (Figure 21).

Figure 22. Thermal Combustion Schematic



As discussed in Section 4.4.2.3, the AACOG region has over 58 years of permitted disposal or until 2077. However, the process to develop new final management capacity may need to begin by 2057. In addition to capacity, other variables may impact the City's decision to explore a new final management option that include:

- Additional landfill capacity is not secured within the region by 2057.
- Tipping fees at regional landfill facilities increase significantly (greater than historical increases, out of line with other utilities being provided by City).
- The energy market changes such that revenues from the sale of electricity from WTE increase significantly.
- Disposal tonnages in the AACOG region increase, causing landfill airspace to be consumed more quickly than anticipated, triggering earlier discussion of new final management options.

During the Baseline Year, the SWRD collected and disposed 54,692 tons of waste, of which 36 percent or 20,449 tons was organics, and NBU disposed 660 tons of biosolids. Theoretically, all these materials could be processed in an AD plant; however, not all AD technologies can co-digest multiple organic waste streams. For planning purposes, the SWRD estimates that all organics and biosolids, or 21,109 tons could be processed by an AD plant.

With respect to thermal WTE plants, most have the potential to process 95 percent of the waste stream. This means that 51,957 tons of waste collected by SWRD can be processed at a thermal

WTE plant. However, thermal WTE plants also generate both bottom and fly ash that often requires landfill disposal. For planning purposes, the SWRD estimates that 75 percent of material delivered to a thermal WTE plant, or 38,968 tons would be converted to electricity.

If either an AD or thermal WTE plant is developed in the AACOG region, it will most likely be accomplished by the private sector or through a public-private-partnership. Thus, it will not impact the SWRD Capital Improvement Plan (CIP). Based on data from other communities, tipping fees at AD facilities are approximately $45-$65/ton, and $80-$100/ton at thermal WTE plants. Thus, if SWRD sends 21,109 tons of organics to an AD plant, the YR 1 costs could be approximately $950,000. For a thermal WTE plant that processes 51,957 tons of City waste at $80/ton, YR 1 costs would be approximately $4.2 million. Depending on where these facilities are located, the City's Land Use Plan may need to be considered.

5.8 FLEET SERVICES

As previously discussed, the SWRD serviced 4,117 City vehicles during the Baseline Year. Service requests are projected to increase to 4,857 in 2020 and 7,980 by 2030. These vehicles include police and emergency, as well as public works. The current public works municipal service center is close to capacity with respect to the number of vehicles that can be stored and serviced at the same time, and the current location is not conducive to expansion.

Having enough staffing and floor capacity is essential to keeping the City's fleet consistently and reliably operating. Without a fully operating fleet, the City will incur overtime expenses and may not be able to provide fundamental services. Therefore, the SWRD will begin identifying a location for a new service center and secure funds for constructing this new facility within the next five years.

In addition to a new building, extra staffing will be required to service the expanding City fleet. The SWRD believes that one additional fleet manager; three heavy technicians; and one parts technician could be required over time. The YR 1 costs for these new employees are estimated to be approximately $215,000. Two new vehicles may also be necessary and could cost approximately $340,000. The vehicles will be funded through the annual operating budget rather than the CIP.

While this new service center will not directly increase the quantity of recyclables and green waste that is recovered in the City, consistent service is essential to encouraging residential customers to participate in these programs. The new service center location will need to be assessed to assure it conforms to the City's land use plans.

6.0 PUBLIC ENGAGEMENT METHODS FOR PLAN DEVELOPMENT

6.1 OUTREACH AND EDUCATION

The SWRD convened a series of workshops to gather public input on the Plan development. The workshops were held at City Hall, and at the Solid Waste and Recycling Division offices. The workshops were held during the day and in the evening, to provide convenient access to businesses and residents.

The initial workshops, held in September 2018, provided information on the Plan vision, goals, and objectives, as well as background information on the existing solid waste management system in the City. Data on waste generation projections was presented, and the results of the needs assessment were identified. The second series of workshops were held in December 2018. At these workshops, options were presented to address the solid waste management needs of the city in the short, medium, and long terms. The options were organized according to topics, including education and outreach, waste reduction, recycling, organics, and special wastes.

7.0 FUNDING STRATEGIES AND ANALYSIS

7.1 BUDGET

During the Baseline Year, the SWRD had a revenue budget of approximately $8.59 million from the following sources:

- Residential waste fees $4.65 million
- Residential recycling fees $1.21 million
- Commercial waste fees $2.39 million
- Miscellaneous $169,750[24]
- Garbage penalties $110,000
- Brush removal $30,000

The SWRD expenditure budget during the Baseline Year was approximately $8.90 million, which was allocated to the following cost centers:

- Residential waste collection $2.26 million
- Residential recycling $2.25 million
- Commercial waste collection $2.27 million
- Administration $1.61 million
- Public works service center $505,000

7.2 FEES

7.2.1 Residential

During the Baseline Year, New Braunfels residents were assessed a monthly fee of $13.40 for the collection and disposal of waste. The fee includes weekly service of one, 96- or 48-gallon waste cart and residential customers can request additional waste carts for a fee of $6.50 per month. Residential customers may also purchase tags from the SWRD in increments of five for $10 when waste exceeds cart capacity. If the residential customer requests a return service for waste, green waste or recyclables, they are charged a fee of $15.00

For bulk collection, the SWRD charges a minimum fee of $25.00 for the first one-half hour and $25.00 for each additional one-half hour. Residents also have access to free, BGD events.

Residents with access to curbside recycling are charged $4.26 per month. Revenues from these fees funded slightly more than 50 percent of the cost to collect and process recyclables during the Baseline Year. Due to this deficit, revenue from residential waste collection subsidizes this service.

Revenue from residential fees also helps fund HHW, Electronics and BGD collection events, as well as the operation of the CRC and the river clean up. In addition, revenue from residential fees partially pay for the administration of the SWRD, including the operation of fleet services.

[24] Includes return pick-ups, sale of recyclables, roll-off tonnage charges,

7.2.2 Commercial

Upon request for collection service, the SWRD determines the service level requirements for that location. The SWRD determines the type and number of solid waste containers (dumpsters, roll-off, or compactor) and frequency of collection based on the type of commercial activity at the location, and the size of the development itself. The SWRD provides businesses that generate a small amount of waste with two, 96-gallon carts that are collected once a week. **Tables 15 through 18** provide 2018 commercial rates.

Table 15. Dumpster Rates

Container Size	Collections per Week						Call-in per pick up
(Cubic Yards)	1	2	3	4	5	6	
3	$97.71	$112.18	$123.95	$184.22	$185.08	$185.92	**$123.88**
4	$123.02	$138.33	$153.04	$187.49	$232.50	$247.22	**$152.75**
6	$174.82	$191.30	$208.37	$265.61	$317.84	$320.79	**$211.25**
8	$226.03	$249.99	$263.70	$343.74	$374.94	$411.33	**$276.07**
10	$277.83	$312.51	$319.03	$421.82	$446.76	$467.36	**$345.11**
96-gal (2 carts)	$29.32						
Addt'l cart (limit 2)	$14.66	**Each**					
Admin fee	$10.00	**per request**					

Table 16. Compacting Dumpster Rates

Container Size (Cubic Yards)	Collections per Week						Call-in per pick up
	1	**2**	**3**	**4**	**5**	**6**	
3	$108.57	$133.88	$156.50	$227.62	$239.33	$251.03	**$133.06**
4	$139.29	$165.45	$196.44	$241.74	$303.03	$334.02	**$170.75**
6	$196.52	$234.70	$273.47	$352.41	$420.91	$445.57	**$240.39**
8	**$253.15**	**$304.24**	**$350.50**	**$452.24**	**$515.99**	**$579.51**	**$310.32**

Table 17. Compacting Roll-Off Rates

Container Size (Cubic Yards)	Collection per Month				Call-in per pick up
	1	2	3	4	
20	$393.86	$786.63	$1,180.48	$1,575.44	**$482.79**
30	$508.87	$1,017.73	$1,526.60	$2,035.48	**$623.77**
40	$623.88	$1,247.75	$1,871.63	$2,495.52	**$764.75**

Table 18. Open Top Roll-Off Rates (20, 30, 40 cy containers)

Minimum one-month rental	**$150.00**
Delivery/setup fee	**$150.00**
Service fee	**$150.00**
	plus disposal fee for weight of contents

During the Baseline Year, the commercial waste collection program generated approximately $2.39 million in fees and cost approximately $2.27 million. The surplus funds were used in conjunction with residential waste revenues to fund the administration of SWRD and operate the City's fleet service center.

7.3 REVENUE SUFFICIENCY ANALYSIS

Expenditures exceeded revenues by approximately $310,000 during the Baseline Year, which required the SWRD to draw down its working capital reserves fund. During the Baseline Year, the SWRD had a working capital reserve of $2.90 million, which is equivalent to 4-5 months of SWRD's O&M expenses. Many utilities have policies to maintain approximately 3-6 months of O&M expenses as a working capital reserve. Without generating additional revenue, the working capital reserves would be depleted to less than three months of O&M expenses by 2023, and the reserves could be completely depleted by 2025.

Consequently, as part of the planning process, the SWRD collaborated with SCS Engineers to conduct a revenue sufficiency analysis (RSA) to ensure that it can meet its operating cost requirements while maintaining adequate reserves. The RSA will also serve as the foundation for a ten-year financial plan to satisfy operating and capital requirements, maintain adequate reserves, and minimize rate increases to customers.

As part of the RSA process, the following SWRD data was analyzed:

- Historical and budgeted financial information
- Historical and future customer counts and tonnage data
- Multi-year capital improvement programs
- Current financial and debt policies.

The RSA indicated that the growth in residential customers will increase annual revenues but will not eliminate the need for the SWRD to transfer funds from their working capital reserves to fund annual expenditures and scheduled, capital improvement projects[25]. Based on the RSA, the SWRD needs to increase annual revenue by approximately 1.5 percent to meet financial obligations.

7.4 OPTIONAL FUNDING STRATEGIES

Refuse and recycling collection fees account for approximately 96 percent of SWRD's annual revenues. Therefore, collection fees will need to be adjusted for the SWRD to meet financial obligations. While collection fees will continue to serve as the primary funding mechanism for the SWRD, other funding sources are available to diversify the SWRD revenue portfolio.

- Environmental Fees - The collection fees currently fund several programs that contribute to decreasing the City's dependency on landfills and its carbon footprint, but do not require curbside collection. These programs include the CRC and special collection days for HHW, Electronics and bulky goods. In addition, collection fees fund river clean-ups. Some programs, such as the CRC, are available to businesses that are not SWRD customers, as well as tourists. However, these businesses and tourists do not financially contribute to SWRD expenditures. Therefore, to generate additional revenues and to recover costs from all recipients of SWRD programs, the City could establish an environmental fee that is assessed on all residents, businesses and hotel stays. As previously discussed, SWRD revenue generated by residential customers currently subsidizes the programs that could be funded by an environmental fee. Consequently, if the SWRD assesses an environmental fee, residential collection fees would be reduced.

  The San Antonio municipal code (Chapter 14, Article III, Section 14-30 (b) states that all properties in San Antonio, residential and nonresidential, pay a monthly environmental services fee of three dollars and twenty-four cents ($3.24) per each electrical meter account. Out of the $3.24 fee, solid waste receives $2.24, and parks receives $1.00. This fee is intended to defray municipal expenses necessary for cleaning up illegally dumped waste, collecting and disposing of dead animals, performing regulatory maintenance on closed landfills, providing environmental services to the city's park system, and equitably sharing costs for neighborhood clean-ups benefiting residents and businesses that do not pay a monthly solid waste processing fee. At locations where the electrical meter does not accurately reflect the number of units, an environmental fee applies to each residential and non-residential unit.

- User fees - Currently, the SWRD does not charge participants for the materials they bring to special collection days for HHW, Electronics and bulky goods, or recyclables they deliver to the CRC. When the permanent facility for Special Wastes and recyclables is constructed, the SWRD may charge a fee to use the facility. It is unlikely that fee will be high enough to generate all the revenue required to operate the facility, as the SWRD does not want to discourage participation. In addition, the SWRD may not charge New Braunfels' residents to us the facility.

[25] The CIP currently includes two projects: a permanent facility for Special Waste and recyclables; and a new, public works service center.

- **Franchise fees** - Some cities assess franchise fees or taxes on gross receipts upon solid waste collection companies for the privilege of entering into a contract with or doing business within a city. These fees sometimes fund solid waste-related activities.

- **Grants**

  - **State/Local** - In accordance with Texas Health and Safety Code, the TCEQ awards grants to regional and local governments for MSW management projects through the state's regional solid waste grants program. The TCEQ is directed by the Legislature to dedicate one-third of the revenue generated by state fees on MSW disposed of at landfills to grants for regional and local MSW projects.

    The TCEQ allocates the funds to the state's 24 councils of governments (COGs), based on a formula that considers population, area, solid waste fee generation, and public health needs. The COGs use the funds to develop and maintain an inventory of closed MSW landfills, conduct regional coordination and planning activities, maintain a regional solid waste management plan, and administer pass-through grant programs to provide funding for regional and local MSW projects.

    Typically, the AACOG region begins the pass-through grant application process in the fall and has a biennial grant cycle. This means that AACOG region will begin promoting the available grants in the fall of 2019, for grants that will be awarded in 2020 and 2021. The types of projects that may be funded with these grants vary from region to region, depending on the priorities identified in the regional plans. Prior to developing the grant priorities, each COG is required to hold public meetings to receive input on the proposed grant categories.

    All projects must be consistent with the regional solid waste management plans prepared by the COGs and approved by the TCEQ. Also, projects funded with these grants must promote cooperation between public and private entities and may not be otherwise readily available or create a competitive advantage over a private industry that provides recycling or solid waste services.

    SWRD consistently participates and is awarded grants from this program. However, in recent years, the funding available has been minimal and only funded small equipment purchases or projects.

  - **National** - *The Recycling Partnership* offers technical and financial assistance to communities when implementing a cart-based collection system. Currently, grant funding is not available to replace existing carts, to support the purchase of carts for waste or organics collection, or to support the collection of recyclables from businesses, schools, or institutions. However, the SWRD will continue to monitor *The Recycling Partnership,* as grant application criteria may change.

    While not a grant, the *Closed Loop Partners' Closed Loop Fund* provides financial backing to municipalities developing systems and facilities to decrease dependency on landfills. The *Closed Loop Fund* is backed by Walmart and several other large corporations. Launched in the spring of 2014, the group provides zero interest loans to spur recycling growth throughout the United States. If the feasibility study on a

composting facility for food scraps and biosolids shows that it is technically viable and financially feasible, the *Closed Loop Fund* could be a source of capital.

The SWRD is currently conducting a cost of service study that will allocate all direct and indirect costs to each SWRD program and service. This information will be used to estimate the billing rates required to fund those programs and how those rates would be influenced if collection fees were supplemented with these alternative funding structures.

7.5 RECOMMENDED FUNDING STRATEGIES

The SWRD is interested in the adoption on some type of environmental fee. Therefore, the SWRD will meet with the City of San Antonio to understand how the fee was adopted, supported by customers, and the rate of $3.34 was established. The SWRD will also actively monitor changes in the AACOG solid waste management plan to assure that City grant applications align with AACOG solid waste management goals. The SWRD will also annually review the grant application criteria for The Recycling Partnership to see if replacing existing recycling carts with carts containing RFID chips could be eligible.

8.0 20-YEAR IMPLEMENTATION PLAN

8.1 ACTION ITEMS

At the outset of the planning process, the SWRD identified the following goals for solid waste management in the City:

Goal #1: Achieve further progress in waste reduction, minimization, and reuse.

Goal #2: Maximize resource recovery and diversion.

Goal #3: Ensure available capacity at solid waste facilities utilized by the City.

Goal #4: Maintain sufficient funding mechanisms to support SWRD programs.

Goal #5: Encourage and expand coordination and communications regarding solid waste issues among all agencies and private firms in New Braunfels and the region.

Figure 23 presents how the actions in the solid waste management plan will help the City realize these goals.

Figure 23. Goals and Action Items

Achieve Further Progress In Waste Reduction, Minimization, And Reuse

- Conduct focus groups
- Facilitate continuous improvement workshops
- Support waste reduction in outdoor recreational areas
- Promote backyard composting
- Promote reuse and exchange opportunities at thrift stores and Habitat for Humanity ReStore
- Encourage businesses and City agencies to participate in RENEW
- Implement a variable rate structure
- Increase awareness about food waste
- Provide guidance to restaurants and grocery stores on food waste reduction
- Develop a multi-material recovery center
- Educate residents on alternatives to household hazadous products through community-based, social marketing

Maximize Resource Recovery And Diversion

- Facilitate focus groups
- Conduct continuous improvement workshops
- Establish recycling and participation goals
- Collect additional data
- Implement a variable rate structure
- Target education/outreach efforts
- Enact a multi-family recycling ordinance
- Contract for recycling services on behalf of SWRD commercial customers
- Require private haulers to provide recycling data
- Recognize businesses that reduce, reuse and recycle
- Encourage the purchase of recyclable and recycled-content products
- Increase delivery of source-separated wood to Beck Landfill
- Establish C&D diversion specifications for City projects
- Educate on acceptable materials for mulching
- Explore the development of a food scraps and biosolids compost facility
- Increase awareness of food waste and food recovery
- Explore a partnership with the New Braunfels food bank
- Develop a multi-material recovery center
- Monitor developments in alternative processing technologies

Assure Adequate Capacity At Facilities Serving The City

- Annually monitor disposal capacity
- Secure long-term C&D disposal and recovery capacity
- Assess capacity for processing pre-consumer produce at existing facilities
- Consider developing a transfer station to access regional disposal capacity
- Develop a multi-material recovery center
- Monitor developments in alternative processing technologies

Maintain Sufficient Funding Mechanisms To Support SWRD Programs

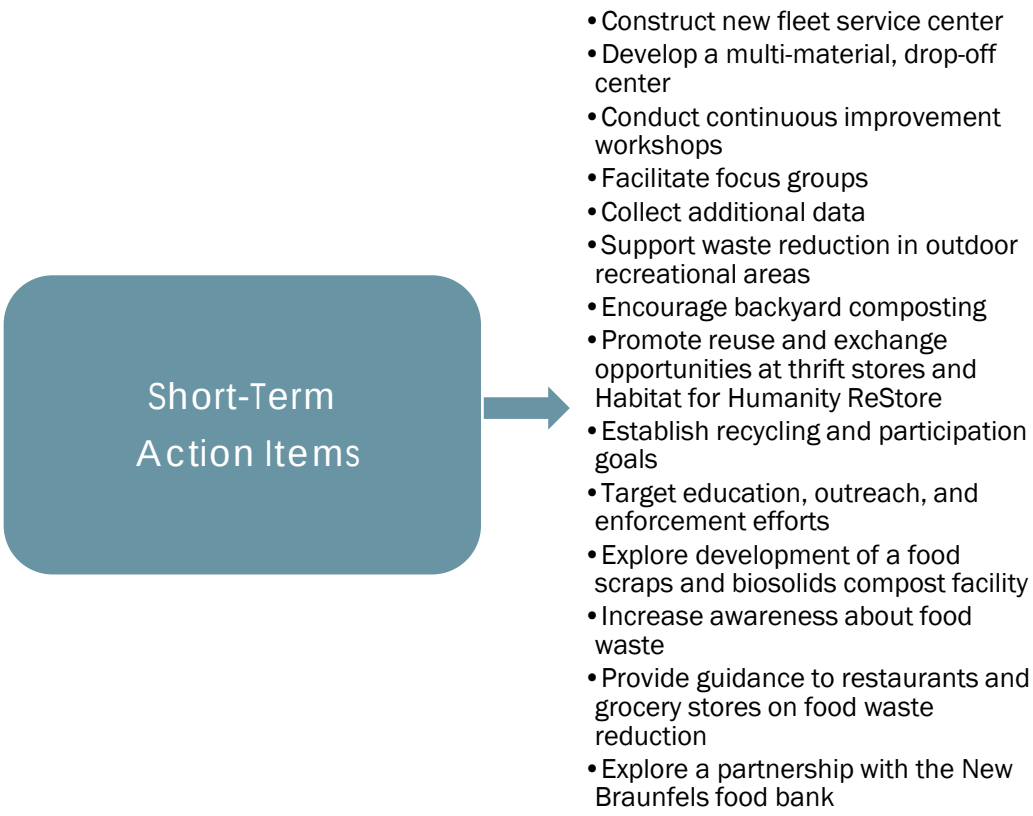
- Implement recommendations from the revenue sufficiency analysis
- Prepare a cost of service study
- Develop a rate analysis
- Evaluate alternative funding sources

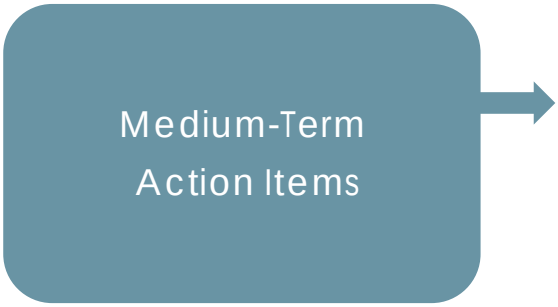
Coordinate With Other City Agencies, Government Departments And Private Organizations

- Facilitate focus groups
- Conduct continuous improvement workshops
- Promote RENEW to City agencies
- Recognize businesses that reduce, reuse and recycle
- Explore the possibility of a food scraps and biosolids compost facility with NBU and Comal County
- Establish C&D diversion specifications for City projects
- Assess opportunities to compost green waste on-site at large, private businesses
- Evalutate organics collection from large generators
- Explore a partnership with the New Braunfels food bank
- Develop new public works municipal service center

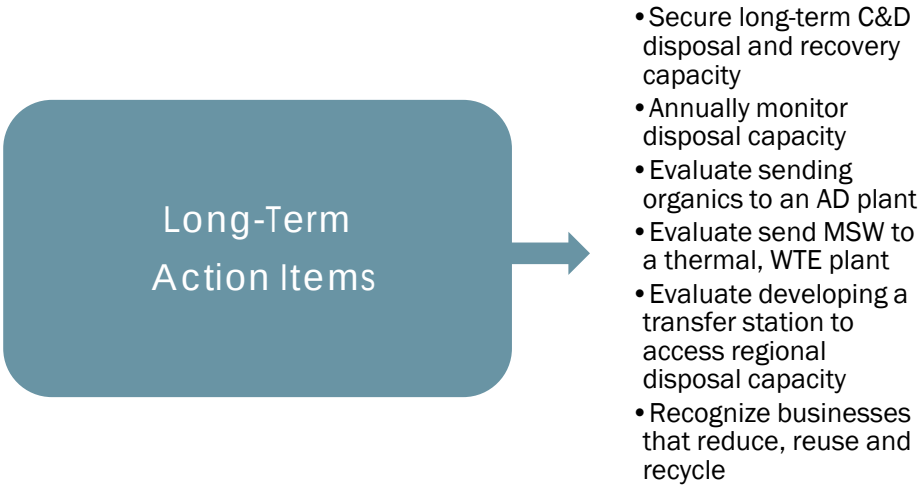
As shown in **Figure 23**, many of the actions will help the City achieve multiple solid waste management goals. **Figure 24** shows the schedule for when the SWRD will implement these action items in the short-term, medium-term and/or long-term.

Figure 24. Implementation Schedule





- Promote RENEW to businesses and City agencies
- Implement a variable rate structure
- Enact a multi-family recycling ordinance
- Require private haulers to provide recycling data
- Contract for recycling services on behalf of SWRD commercial customers
- Assess opportunities to compost green waste on-site at large generators
- Evalutate organics collection from large generators
- Assess capacity for processing pre-consumer produce at existing facilities
- Encourage the purchase of recyclable and recycled-content products
- Establish C&D diversion specifications for City projects
- Increase delivery of source-separated wood waste to Beck Landfill
- Educate residents on alternatives to household hazardous products through community-based, social marketing



8.2 DIVERSION

8.2.1 Quantities

During the Baseline Year, 67,822 tons of waste were generated and 10,549 tons were diverted from the landfill, yielding a landfill diversion rate of 16 percent. As part of the planning process, the SWRD and SCS used case studies and previous experience with reduction, reuse, repurposing, recycling, and composting programs to estimate the incremental quantity of waste that could be diverted from landfilling through the selected action items. As discussed in Section 5 of this Plan, it was not possible to estimate diversion quantities for every action item. Table 19 summarizes the landfill diversion quantities that could be estimated. In instances where a diversion quantity range was estimated, Table 19 provides an average of the range.

Table 19. Action Item Diversion Potential

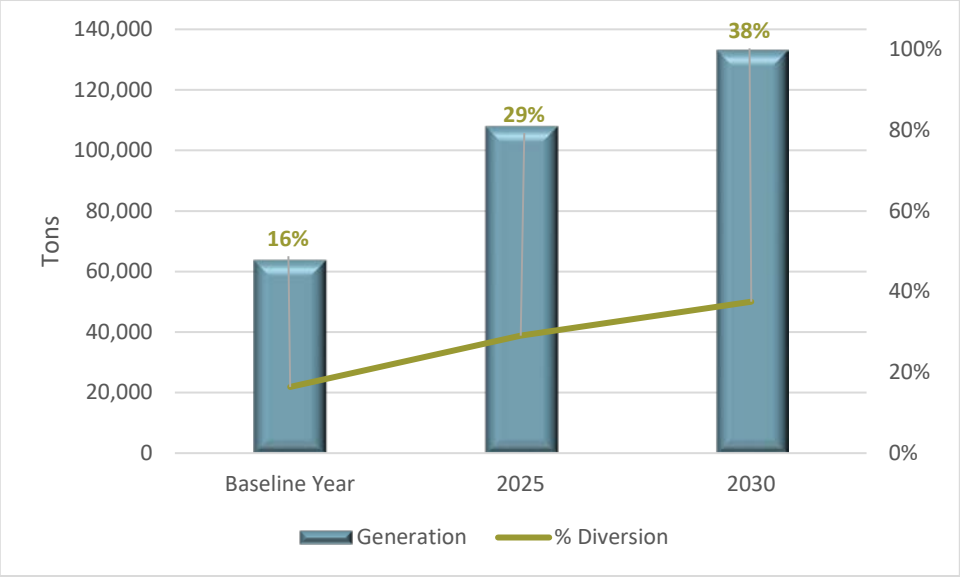
Implementation Term	Action Item	Incremental Diversion Potential (TPY)
Short-Term	Support waste reduction in outdoor recreation areas	1.7
	Promote backyard composting	3,573
	Establish recycling and participation goals	3,000
	Target education/ outreach/enforcement efforts	1,000
	Educate on acceptable materials for mulching	205
	Explore developing a biosolids and food scrap composting facility with local partners	5,300
	Increase awareness about food waste recovery	470
	Provide guidance to restaurants and grocery stores on food waste reduction	204
	Explore partnership with New Braunfels food bank	95
	Develop a multi-material, drop-off center	824
Short-Term Total		*14,672*
Medium-Term	Educate residents on alternatives to household hazardous products through community-based, social marketing	9
	Implement a variable rate structure	2,240
	Enact a multi-family recycling ordinance	264
	Contract for recycling services on behalf of SWRD commercial customers	4,770
	Encourage the purchase of recyclable and recycled-content products	106
	Increase delivery of source-separated wood waste to Beck Landfill	934

Implementation Term	Action Item	Incremental Diversion Potential (TPY)
	Assess capacity for processing pre-consumer produce at existing facilities	660
	Assess opportunities to compost green waste on site at large generators	2,300
Medium-Term Total		***11,283***
Long-Term	Evaluate sending organics to an AD plant	21,109
	Evaluate send MSW to a thermal WTE plant	38,968
Long-Term Total		***60,077***

8.2.2 Diversion Rates

During the Baseline Year, 10,549 tons of waste were diverted, which provided New Braunfels with a 16 percent diversion rate. As discussed on Sections 8.2.1, the quantity of waste that will be diverted is projected to increase substantially over the next 20 years. **Figure 25** shows that adding the short-term action items to the Baseline Year activities will divert over 31,000 TPY of waste from the landfill by 2025, and adding the medium-term action items divert a total of almost 50,000 tons by 2030. **Figure 25** also indicates that these increased tonnages will yield a landfill diversion rate of 29 percent in 2025 and 38 percent in 2030. .

Figure 25. Projected Diversion (TPY)



The long-term action items that will increase landfill diversion include the development of an AD and/or a thermal WTE plant. Combined, these two facilities could divert an estimated 60,777 tons of waste from the landfill by 2030. However, some of this material is most likely already being diverted through Baseline Year initiatives and will be diverted through short- and medium-term action items. In addition, these facilities will only be developed if they are economically viable. Therefore, the SWRD is not including them in the diversion rate analysis because the incremental amount of was these facilities would divert could not be estimated. In addition, when and if they would be developed is uncertain.

8.3 FINANCIAL

8.3.1 Operations and Maintenance (O&M)

As discussed in Section 7.3, the SWRD had a revenue budget of approximately $8.59 million during the Baseline Year. **Table 20** shows the incremental O&M associated with implementing this plan's action items. Fourteen of these action items include a communication component that will require the SWRD to create a new position for communication and outreach. The budget for this position is $45,000. **Table 20** allocates the cost of this new position over the 14 options that include a communication component.

Table 20. Action Item O&M Budget

Implementation Term	*Action Item*	*Estimated Budget*
Short-Term	Conduct Continuous Improvement workshops	$3,000
	Facilitate focus groups	$3,000
	Support waste reduction in outdoor recreational areas	$150,000
	Promote backyard composting	$3,000
	Promote reuse and exchange opportunities at thrift stores and Habitat for Humanity ReStore	$3,000
	Establish recycling and participation goals	$65,000 to $ 75,000
	Target education/outreach efforts	$48,000
	Educate on acceptable materials for mulching	$3,000
	Develop a special waste, multi-material recovery center	$601,000
	Explore development of a food scraps and biosolids compost facility with local partners	$80,000 to $100,000
	Increase awareness about food waste	$3,000
	Provide guidance to restaurants and grocery stores on food waste reduction	$3,000
	Develop new Public Works Municipal Center	$550,000
Medium-Term	Educate residents on alternatives to household hazardous products through community-based, social marketing	$4,000
	Promote RENEW to businesses and all City agencies	$4,000
Long-Term	Evaluate sending organics to an AD plant	$950,000
	Evaluate sending MSW to a thermal WTE plant	$4.2 million

8.3.2 Capital Expenditures (CAPEX)

Currently, the SWRD has two planned projects that will require CAPEX. The first is the development of a special waste, multi-material recovery center that will require $2.5 million in capital. The other is the public works municipal service center, which the SWRD has the capacity to issue debt for, but the CAPEX is yet to be determined.

Both facilities with be funded through a combination of capital reserves and debt. For planning purposes, any debt that is required is assumed to have the following terms:

- Long-Term Debt (Revenue Bond or Bank Loan)
- Term: 20 years
- Interest Rate: 4.00%
- Cost of Issuance: 2.00% of par
- Debt Service Reserve: No debt service reserve

Table 21 shows the additional action items that could require a capital investment.

Table 21. Potential Capital Requirements

Action Item	Estimated Capital Requirement	Implementation Term
Target education/outreach efforts	$1.6 million	Short
Explore developing a biosolids and food scrap composting facility with local partners	$1.5 to $15 million	Short
Implement a variable rate structure	$290,000	Medium