



A MUNICIPAL SOLID WASTE GENERATION AND DIVERSION
FORECAST FOR THE HOUSTON-GALVESTON AREA COUNCIL
PLANNING REGION

Houston-Galveston Area Council
Houston, Texas



PREPARED BY:





3420 Executive Center Drive
Suite 165
Austin, Texas 78731
Phone: (512) 479-7900

November 7, 2017

Ms. Erin Livingston
Senior Planner
Houston-Galveston Area Council
3555 Timmons Lane, Suite 120
Houston, Texas 77027

Subject: A Municipal Solid Waste Generation and Diversion Forecast for the Houston-Galveston Area Council Planning Region | FINAL REPORT

Dear Ms. Livingston:

NewGen Strategies and Solutions, LLC (NewGen) is pleased to present our analysis, findings, and recommendations regarding A Municipal Solid Waste Generation and Diversion Forecast for the Houston-Galveston Area Council Planning Region (2017 Study).

NewGen was retained by the Houston-Galveston Area Council (H-GAC) in January 2017 to conduct the 2017 Study as an update to the Regional Solid Waste Characterization Study (2005 Study) with the goal of providing H-GAC a tool to aid in its effort to forecast the amount of municipal solid waste generated for a 20-year forecast period (2017 - 2036) within the H-GAC planning region.

NewGen would like to express its appreciation to the many people throughout the H-GAC region who contributed to the development of the 2017 Study. We appreciate the time and effort taken by these individuals to provide valuable information. NewGen would also like to thank staff at H-GAC who provided significant input, data, and coordination efforts.

Please contact me at 512.649.1254 or dyanke@newgenstrategies.net with any questions or comments regarding the 2017 Study.

Sincerely,

NewGen Strategies and Solutions, LLC

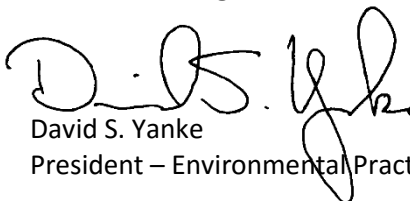

David S. Yanke
President – Environmental Practice

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Abbreviations and Definitions

Item	Description
2005 Study	<i>Regional Solid Waste Characterization Study</i>
2017 Study	<i>A Municipal Solid Waste Generation and Diversion Forecast for the Houston-Galveston Area Council Planning Region</i>
ACS	American Community Survey (provided by the U.S. Census Bureau)
Brush/Yard Waste	Tree limbs, brush, grass trimmings, leaves, and other clean woody debris
Bulky	Couches, chairs, white goods, mattresses, etc.
C&D	Construction and demolition debris is typically generated during the construction, renovation, and demolition of buildings or structures (includes material such as concrete, bricks, roofing, drywall, and other wastes)
CAGR	Compound annual growth rate
Commercial MSW	MSW produced by commercial businesses
Diversion Rate	<p>The amount of material recycled and diverted as a percentage of the total MSW generated</p> $\text{Diversion Rate} = \frac{\text{Total MSW Recycled} + \text{MSW Diverted}}{\text{Total MSW Generated}^*}$ <p>*Total MSW generated = MSW disposed + MSW recycled + MSW diverted</p>
H-GAC	Houston-Galveston Area Council
Landfill	Refers to active landfills, inactive landfills that have never accepted waste, and inactive landfills that have previously accepted waste
MRF	Material recovery facility
MSW	Municipal solid waste, more commonly known as trash or garbage, consists of everyday items discarded by the general public (includes material such as product packaging, biodegradable waste, recyclable items, and other wastes)
NewGen	NewGen Strategies & Solutions, LLC
NHIW (Class 1, 2, & 3)	Nonhazardous industrial waste
Putrescible Waste	Waste that contains organic material and typically decomposes with time
Recycling Rate	<p>The amount of material recycled as a percentage of the total MSW generated</p> $\text{Recycling Rate} = \frac{\text{Total MSW Recycled}}{\text{Total MSW Generated}^*}$ <p>*Total MSW generated = MSW disposed + MSW recycled + MSW diverted</p>

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Item	Description
Residential MSW	MSW produced by single-family and multi-family residences
TCEQ	Texas Commission on Environmental Quality
TDC	Texas Demographic Center (formerly called the Texas State Data Center)
TSDC	Texas State Data Center
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
Type I Landfill	Landfills that take both putrescible and non-putrescible MSW
Type IV Landfill	Landfills that only take non-putrescible, or inert, waste such as C&D

Section 1

INTRODUCTION

1.1 Project Background

The Houston-Galveston Area Council (H-GAC) is the state-designated regional planning agency responsible for solid waste management planning for a 13-county area, which includes the Houston/Galveston Metropolitan Area. Understanding and planning for the future landfill disposal needs of the 13-county region is an essential responsibility that has been assigned to H-GAC. In order to analyze the long-term disposal capacity for the H-GAC region, it is important to understand the source of the municipal solid waste (MSW) stream and how the population and employment factors will change in the region over the next 20 years (2017 - 2036), and the ultimate impact on the waste stream.

In 2005, H-GAC retained R. W. Beck, Inc. to conduct a Regional Solid Waste Characterization Study (2005 Study) to analyze the drivers for waste disposal in the region and establish an understanding of the MSW long-term disposal capacity and infrastructure needs for the 13-county area.¹ The 2005 Study serves as the baseline to measure a variety of factors, such as landfill capacity, by subregion, within H-GAC's 13-county planning area.

In January 2017, H-GAC retained NewGen Strategies and Solutions, LLC (NewGen) to conduct A Municipal Solid Waste Generation and Diversion Forecast for the H-GAC Planning Region (2017 Study), serving as an update to the 2005 Study.² The 2017 Study builds upon the methodology that was developed for the 2005 Study. The goal of the 2017 Study is to update the 2005 Study in evaluating the current and projected landfill capacity, as well as to quantify, to the extent possible, the current recycling and diversion activities presently occurring within the H-GAC planning region.

1.2 Project Purpose

The purpose of the 2017 Study is to provide H-GAC with a tool to aid in its effort to provide regional solid waste disposal capacity planning for the H-GAC region. The 2017 Study forecasts landfill disposal and capacity requirements for the H-GAC region from 2017 - 2036.

As part of the 2017 Study, NewGen has completed the following analysis and forecasts:

- Conducted Waste Disposal Analysis by Source Sector³ and by Geographic Subregion.⁴
- Calculated Per Capita Single-Family and Multi-Family Residential Disposal Rates.
- Calculated Per Employee Commercial Disposal Rates.
- Projected Future MSW Disposal Requirements vs. Disposal Capacity.

¹ https://www.h-gac.com/community/solid-waste-management/documents/solid_waste_characterization_study.pdf

² Mr. Dave Yanke, President of the Environmental Practice for NewGen, was the Project Manager for the 2005 Study as well as the 2017 Study.

³ Source sectors for this study included: single-family residential, multi-family residential, and commercial

⁴ H-GAC divides the region into eight subregions.

Section 1

- Evaluated the Current Level of Recycling and Diversion in the Region.

1.3 Format of 2017 Study

This report is organized into five sections, plus two appendices. The sections of this report, as well as appendices, are listed in Table 1-1 below.

**Table 1-1
2017 Study Format**

Report Component	Description
Section 1 – Introduction	Section 1 provides information regarding the project background and purpose.
Section 2 – Data Sources	Section 2 delineates the data sources used for both the 2005 Study as well as the 2017 Study.
Section 3 – Forecasts	Section 3 describes the methodology for, and the forecasts of, population, employment, and waste disposal.
Section 4 – Analysis	Section 4 describes the detailed analyses performed by NewGen for the 2017 Study.
Section 5 – Findings and Recommendations	Section 5 includes NewGen’s findings and recommendations for the 2017 Study.
Appendix A – Schedules	Appendix A provides detailed schedules of the analyses presented in this report.
Appendix B – Surveys	Appendix B includes a copy of the City and County surveys that were distributed as part of the 2017 Study.

The forecasts and associated analyses presented in the 2017 Study were completed prior to Hurricane Harvey making landfall in Texas during late August 2017.

Section 2 DATA SOURCES

2.1 2005 Data Sources

In the 2005 Study, R. W. Beck relied on multiple data sources to complete the analysis for the study. The combination of these sources provided the necessary population, employment, and residential housing information needed to develop the MSW disposal and capacity projections for 2005 - 2025.

2.1.1 Population

The H-GAC transportation department focuses its planning efforts on the consolidated metropolitan statistical area (CMSA), as defined by the federal Office of Management and Budget. As part of its planning activities, H-GAC collects detailed population data for the eight counties that comprise the CMSA. In the 2005 Study, H-GAC provided population projections from its proprietary database for the eight counties shown in Table 2-1 below:

**Table 2-1
Population Data provided by H-GAC**

■ Brazoria	■ Harris
■ Chambers	■ Liberty
■ Fort Bend	■ Montgomery
■ Galveston	■ Waller

In the 2005 Study, population projections from the Texas State Data Center (TSDC) were utilized for the remaining five counties not included in the CMSA. The five counties with population data provided by TSDC are shown in Table 2-2.

**Table 2-2
Population Data provided by TSDC**

■ Austin	■ Walker
■ Colorado	■ Wharton
■ Matagorda	

2.1.2 Housing Units

In order to develop the single-family and multi-family residential waste projections, it was necessary to determine the single-family and multi-family housing estimates for the cities, counties and unincorporated areas in the 13-county, H-GAC region. For the 2005 Study, H-GAC provided the single-family and multi-family residential housing estimates, expressed as percentages, for the majority of cities included in the counties shown in Table 2-1. H-GAC did not provide single-family and multi-family housing estimates at the county level. To determine the single-family and multi-family housing allocation for the cities included in the five counties shown in Table 2-2 (which were not captured in H-GAC's database), data from the U.S. Census Bureau was utilized.

2.1.3 Employment

Along with single-family residential and multi-family residential MSW, commercial MSW is one of the three primary components of the MSW waste stream within the H-GAC planning region. Employment is used to allocate the commercial MSW to the cities and unincorporated areas in the H-GAC region. For the 2005 Study, H-GAC was able to provide employment data for the majority of cities included in the counties shown in Table 2-1. For cities and counties not included in H-GAC's database, employment data was provided from the Texas Workforce Commission.

2.1.4 Landfill

The Texas Commission on Environmental Quality (TCEQ) compiles an annual report, known as the "Municipal Solid Waste in Texas: A Year in Review." This report was used to compile the tonnage disposed and the remaining capacity of the landfills in the H-GAC region for the 2005 Study.⁵

2.2 2017 Data Sources

2.2.1 Population

NewGen interpolated projections for all cities with a population exceeding 5,000 (based on the 2010 U.S. Census data), and those cities that are the largest in their respective county, regardless of size by using information from the Texas Water Development Board's (TWDB) published "2016 Regional Water Plan."⁶ The population projections from the TWDB were available in ten-year increments beginning with the year 2020, and were based on 2010 U.S. Census data. All counties and cities surveyed in this Study were included in these projections, with the exception of The Woodlands.⁷ The population of cities with a population of less than 5,000, and the unincorporated areas of each county, were determined by subtracting the populations of the larger cities in each county from the total population of the county.

For instance, the population of Walker County was estimated to be 69,803 in 2015. Huntsville, the only city in Walker County with a population greater than 5,000, had a population of approximately 39,652 in 2015. Thus, the total population of all the smaller cities and unincorporated areas in Walker County was determined to be 30,151.

⁵ The 2005 Study relied on the most recent landfill tonnage information which was for the state FY 2003 (September 1, 2002 through August 31, 2003).

⁶ NewGen used linear interpolation to determine the population for each county and city in 2015, which is the most recent year landfill tonnage data was available from TCEQ.

⁷ Population projections for The Woodlands were provided by H-GAC.

2.2.2 Housing Units

To determine the single-family and multi-family housing allocation for the H-GAC region, NewGen obtained data from the U.S. Census Bureau: “2015 American Community Survey (ACS) Housing Estimates.” In the ACS Housing Estimates, total housing units are separated by housing type, for all counties and cities surveyed in this Study. Table 2-3 shows the format in which the data was provided by the U.S. Census Bureau.

Table 2-3
ACS Housing Units

■ 1-unit, detached
■ 1 unit, attached
■ 2 units
■ 3 or 4 units
■ 5 to 9 units
■ 10 to 19 units
■ 20 or more units
■ Mobile home
■ Boat, RV, van etc.

For each city, the housing units in 1-unit residences, 2-unit residences, and mobile homes were categorized as single-family. The single-family and multi-family ratios were then calculated by dividing the total single-family and multi-family units by the total occupied units of each city and county. Once each percentage was calculated, it was applied to the 2015 population estimate to determine the 2015 single-family and multi-family population.

For instance, in 2015 Sealy had 1,895 occupied housing units categorized as single-family housing (versus a total of 2,263 total occupied housing units), which means approximately 83.74% of residents in Sealy live in single-family housing.⁸ Multiplying the percentage, 83.74% times 6,376, the 2015 population estimate of Sealy, NewGen determined the population residing in single-family housing in Sealy to be approximately 5,340 in 2015.⁹ The single-family, multi-family ratios and associated populations in 2015 for all surveyed cities are shown in Table 2-4.

⁸ 1,895 occupied single-family housing units / 2,263 total occupied housing units in Sealy = 83.74%.

⁹ 6,376 total population of Sealy x 83.74% single-family = 5,340 single-family housing population.

Section 2

Table 2-4
Single and Multi-Family Population Estimates (2015)

City	County	Total	Single Family		Multi-Family	
			Population	Ratio	Population	Ratio
Alvin	Brazoria	25,500	18,301	71.77%	7,199	28.23%
Angleton	Brazoria	18,693	13,859	73.08%	5,104	26.92%
Bay City	Matagorda	18,196	13,090	71.94%	5,106	28.06%
Baytown	Harris	73,720	51,547	69.92%	22,173	30.08%
Bellaire	Harris	16,994	16,075	94.59%	920	5.41%
Bellville	Austin	4,239	3,485	82.21%	754	17.79%
Cleveland	Liberty	7,745	5,994	77.40%	1,750	22.60%
Clute	Brazoria	11,325	5,877	51.90%	5,448	48.10%
Columbus	Colorado	3,742	3,310	88.44%	433	11.56%
Conroe	Montgomery	66,181	41,157	62.19%	25,025	37.81%
Dayton	Liberty	8,603	6,333	73.61%	2,270	26.39%
Deer Park	Harris	33,113	27,877	84.19%	5,236	15.81%
Dickinson	Galveston	18,890	15,914	84.25%	2,976	15.75%
El Campo	Wharton	11,854	10,800	91.11%	1,053	8.89%
Freeport	Brazoria	12,449	9,825	78.92%	2,625	21.08%
Friendswood	Galveston, Harris	37,678	32,166	85.37%	5,512	14.63%
Galena Park	Harris	10,887	10,338	94.95%	549	5.05%
Galveston	Galveston	49,471	31,139	62.94%	18,332	37.06%
Hempstead	Waller	6,230	4,354	69.89%	1,876	30.11%
Hitchcock	Galveston	7,739	6,351	82.06%	1,388	17.94%
Houston	Fort Bend, Harris, Montgomery	2,173,076	1,151,539	52.99%	1,021,537	47.01%
Humble	Harris	16,154	9,519	58.93%	6,634	41.07%
Huntsville	Walker	39,652	21,822	55.03%	17,831	44.97%
Jacinto City	Harris	10,578	8,645	81.73%	1,933	18.27%
Jersey Village	Harris	7,671	4,578	59.67%	3,094	40.33%
Katy	Fort Bend, Harris, Waller	17,498	14,865	84.95%	2,633	15.05%
La Marque	Galveston	17,082	15,863	92.87%	1,219	7.13%
La Porte	Harris	34,071	29,515	86.63%	4,556	13.37%
Lake Jackson	Brazoria	27,078	19,786	73.07%	7,291	26.93%
League City	Galveston	95,735	78,423	81.92%	17,312	18.08%
Liberty	Liberty	8,743	7,915	90.53%	828	9.47%
Manvel	Brazoria	7,757	7,757	100.00%	-	0.00%
Missouri City	Fort Bend	74,092	70,586	95.27%	3,506	4.73%
Mont Belvieu	Chambers	4,385	3,678	83.88%	707	16.12%
Palacios	Matagorda	4,874	4,452	91.34%	422	8.66%
Pasadena	Harris	151,718	99,480	65.57%	52,238	34.43%
Pearland	Brazoria, Fort Bend, Harris	102,513	86,870	84.74%	15,643	15.26%
Prairie View	Waller	6,071	4,313	71.04%	1,758	28.96%
Richmond	Fort Bend	12,034	8,684	72.16%	3,351	27.84%
Rosenberg	Fort Bend	35,164	25,620	72.86%	9,543	27.14%
Santa Fe	Galveston	12,372	11,692	94.51%	680	5.49%

City	County	Total	Single Family		Multi-Family	
			Population	Ratio	Population	Ratio
Seabrook	Harris	12,367	7,655	61.89%	4,713	38.11%
Sealy	Austin	6,376	5,340	83.74%	1,036	16.26%
South Houston	Harris	16,983	12,718	74.88%	4,265	25.12%
Stafford	Fort Bend	17,881	10,556	59.04%	7,325	40.96%
Sugar Land	Fort Bend	91,192	83,230	91.27%	7,962	8.73%
Texas City	Galveston	48,132	35,805	74.39%	12,327	25.61%
The Woodlands	Harris, Montgomery	108,070	88,605	81.99%	19,465	18.01%
Tomball	Harris	11,705	7,176	61.31%	4,529	38.69%
Webster	Harris	12,689	1,469	11.58%	11,220	88.42%
West University Place	Harris	14,879	14,790	99.40%	89	0.60%
Wharton	Wharton	9,098	6,494	71.38%	2,604	28.62%
Willis	Montgomery	6,082	5,581	91.77%	501	8.23%
Small Cities & Unincorporated ¹	Austin	20,014	19,839	99.12%	176	0.88%
Small Cities & Unincorporated ¹	Brazoria	130,152	119,616	91.90%	10,536	8.10%
Small Cities & Unincorporated ¹	Chambers	34,082	33,157	97.29%	925	2.71%
Small Cities & Unincorporated ¹	Colorado	17,631	17,351	98.42%	279	1.58%
Small Cities & Unincorporated ¹	Fort Bend	488,164	451,375	92.46%	36,790	7.54%
Small Cities & Unincorporated ¹	Galveston	66,941	63,171	94.37%	3,770	5.63%
Small Cities & Unincorporated ¹	Harris	1,737,608	1,448,883	83.38%	288,725	16.62%
Small Cities & Unincorporated ¹	Liberty	55,706	55,131	98.97%	575	1.03%
Small Cities & Unincorporated ¹	Matagorda	14,844	14,561	98.09%	283	1.91%
Small Cities & Unincorporated ¹	Montgomery	354,616	320,731	90.44%	33,884	9.56%
Small Cities & Unincorporated ¹	Walker	30,151	30,031	99.60%	120	0.40%
Small Cities & Unincorporated ¹	Waller	35,343	33,002	93.38%	2,341	6.62%
Small Cities & Unincorporated ¹	Wharton	21,572	21,072	97.68%	500	2.32%
H-GAC TOTAL		6,664,118	4,920,732	73.84%	1,743,386	26.16%

¹ "Small Cities & Unincorporated" is the remaining population in each county, determined by subtracting the combined population of the cities above from their respective total county population in any given year.

2.2.3 Employment

NewGen obtained 2015 employment estimates for each county and city from the U.S. Census Bureau: ACS, and then using that information estimated the employment for the smaller cities and unincorporated areas in the region. For each county, the employment of the larger cities was subtracted from the total county employment to arrive at the employment associated with the smaller cities and unincorporated areas of each county. Employment estimates are shown in Table 2-5.

Table 2-5
2015 Employment Estimates

City	County	2015 Employment
Alvin	Brazoria	12,117
Angleton	Brazoria	8,508
Bay City	Matagorda	7,729
Baytown	Harris	30,689
Bellaire	Harris	8,570
Bellville	Austin	1,965
Cleveland	Liberty	2,436
Clute	Brazoria	5,417
Columbus	Colorado	1,532
Conroe	Montgomery	29,426
Dayton	Liberty	3,379
Deer Park	Harris	16,157
Dickinson	Galveston	9,546
El Campo	Wharton	5,276
Freeport	Brazoria	4,839
Friendswood	Galveston, Harris	18,005
Galena Park	Harris	4,836
Galveston	Galveston	21,715
Hempstead	Waller	2,480
Hitchcock	Galveston	2,873
Houston	Fort Bend, Harris, Montgomery	1,074,332
Humble	Harris	6,929
Huntsville	Walker	12,117
Jacinto City	Harris	3,831
Jersey Village	Harris	4,268
Katy	Fort Bend, Harris, Waller	7,724
La Marque	Galveston	6,238
La Porte	Harris	17,345
Lake Jackson	Brazoria	13,639
League City	Galveston	48,078
Liberty	Liberty	3,411
Manvel	Brazoria	3,410
Missouri City	Fort Bend	36,113
Mont Belvieu	Chambers	1,702
Palacios	Matagorda	2,229
Pasadena	Harris	65,923
Pearland	Brazoria, Fort Bend, Harris	53,014
Prairie View	Waller	2,381
Richmond	Fort Bend	4,645
Rosenberg	Fort Bend	15,150
Santa Fe	Galveston	5,334
Seabrook	Harris	6,771
Sealy	Austin	2,971

City	County	2015 Employment
South Houston	Harris	7,101
Stafford	Fort Bend	9,823
Sugar Land	Fort Bend	41,407
Texas City	Galveston	18,652
The Woodlands	Harris, Montgomery	48,400
Tomball	Harris	4,642
Webster	Harris	6,196
West University Place	Harris	7,101
Wharton	Wharton	3,509
Willis	Montgomery	2,321
Small Cities & Unincorporated ¹	Austin	8,547
Small Cities & Unincorporated ¹	Brazoria	53,346
Small Cities & Unincorporated ¹	Chambers	13,464
Small Cities & Unincorporated ¹	Colorado	7,637
Small Cities & Unincorporated ¹	Fort Bend	207,396
Small Cities & Unincorporated ¹	Galveston	31,245
Small Cities & Unincorporated ¹	Harris	791,469
Small Cities & Unincorporated ¹	Liberty	18,541
Small Cities & Unincorporated ¹	Matagorda	5,916
Small Cities & Unincorporated ¹	Montgomery	150,111
Small Cities & Unincorporated ¹	Walker	10,495
Small Cities & Unincorporated ¹	Waller	15,266
Small Cities & Unincorporated ¹	Wharton	9,799
H-GAC TOTAL		3,067,434

¹ "Small Cities & Unincorporated" is the remaining employment in each county, determined by subtracting the combined employment of the cities listed above from their respective total county employment in any given year.

2.2.4 Landfill

The TCEQ requires all permitted MSW facilities to complete an annual survey and compiles this information in an annual report, known as the "Municipal Solid Waste in Texas: A Year in Review". The latest annual report available during the conduct of the 2017 Study was for the state FY 2015 (September 1, 2014 – August 31, 2015). Using this TCEQ report, NewGen obtained two important pieces of information:

- Tonnage disposed in H-GAC landfills in FY 2015.
- Remaining capacity of H-GAC landfills at the end of FY 2015.

2.3 Surveys

2.3.1 City Surveys

NewGen developed an online survey for city governments to collect MSW and recycling tonnage, along with other importation information (City Survey).¹⁰ NewGen used the tonnage data reported in these surveys, in combination with the 2015 population estimates, to determine the amounts of MSW generated as well as recycled and diverted, on a per capita basis.¹¹ Figure 2-1 below shows the introduction screen to the online H-GAC City Survey.



Figure 2-1. H-GAC City Survey Introduction Screen

NewGen distributed the online survey, via email, to the cities listed in Table 2-6, which represents all cities with a population exceeding 5,000 (based on the 2010 census), and those cities that are the largest in their respective county, regardless of size.

¹⁰ NewGen developed the survey through www.surveygizmo.com and distributed the survey as a website hyperlink to respondents via Microsoft Outlook.

¹¹ For purposes of this study, recycled volumes refer to “traditional” residential recyclables (e.g., cardboard, aluminum cans, paper, plastic bottles, etc.) while diverted volumes refer to recyclables plus brush, leaves, tree limbs, food waste, etc.

**Table 2-6
City Survey Distribution**

City	County	City	County
Alvin	Brazoria	Jacinto City	Harris
Angleton	Brazoria	Jersey Village	Harris
Bay City	Matagorda	Katy	Fort Bend, Harris, Waller
Baytown	Harris	La Marque	Galveston
Bellaire	Harris	La Porte	Harris
Bellville ⁽¹⁾	Austin	Lake Jackson	Brazoria
Cleveland	Liberty	League City	Galveston
Clute	Brazoria	Liberty	Liberty
Columbus	Colorado	Manvel	Brazoria
Conroe	Montgomery	Missouri City	Fort Bend
Dayton	Liberty	Palacios ⁽¹⁾	Matagorda
Deer Park	Harris	Pasadena	Harris
Dickinson	Galveston	Pearland	Brazoria, Fort Bend, Harris
El Campo	Wharton	Richmond	Fort Bend
Freeport	Brazoria	Rosenberg	Fort Bend
Friendswood	Galveston, Harris	Seabrook	Harris
Galena Park	Harris	Sugar Land	Fort Bend
Galveston	Galveston	Texas City	Galveston
Hempstead	Waller	The Woodlands	Harris, Montgomery
Hitchcock	Galveston	Webster	Harris
Houston	Fort Bend, Harris, Montgomery	West University Place	Harris
Humble	Harris	Wharton	Wharton
Huntsville	Walker	Willis	Montgomery

1. The populations in Palacios and Bellville according to the 2010 census were slightly under 5,000. However the Project Team included these cities, per the request of H-GAC.

A copy of the City Survey is included in Appendix B. The most important information obtained via the survey was the single-family tonnage information (specifically for: garbage, brush/yard waste, bulky waste, and recyclables). NewGen utilized the responses of the 14 cities, listed in Table 2-7, to conduct a per capita analysis (tons/per person/per year). The population of these cities represent approximately 43.4% of the total population of the H-GAC region.¹² Additional analysis utilizing the data obtained from the City Survey is located in Section 4 Analysis.

**Table 2-7
City Survey Responses**

City	County
Alvin	Brazoria
Bellaire	Harris
Bellville	Austin
Dickinson	Galveston
Houston	Harris

¹² As a point of reference, the 2005 Study utilized responses from 10 cities that represented approximately 46% of the total population of the H-GAC region.

City	County
Huntsville	Walker
La Porte	Harris
League City	Galveston
Missouri City	Fort Bend
Pasadena	Harris
Seabrook	Harris
Sugar Land	Fort Bend
Texas City	Galveston
The Woodlands	Montgomery

2.3.2 County Surveys

In addition to the City Survey, NewGen, based on contacts within NewGen, as well as H-GAC, distributed a survey to the counties in the H-GAC planning region that are listed below (County Survey).¹³ A copy of the County Survey is included in Appendix B. The information requested through the County Survey paralleled the City Survey but asked the questions on a county-wide level as opposed to for specific municipalities. NewGen distributed the County Survey to representatives of the following counties and/or precincts:

- Chambers County
- Fort Bend County
- Harris County, Precinct 1
- Matagorda County
- Matagorda County Precinct 1
- Montgomery County Precinct 2
- Montgomery County Precinct 3
- Montgomery County Precinct 4
- Walker County

NewGen had greater difficulty obtaining survey data from the counties.¹⁴ NewGen typically found that either the data was incomplete or was not available. This finding is not too surprising given that counties in Texas are typically not very active in the provision of solid waste and recycling services, other than through the potential operation of citizens' collection stations (CCCs). Two counties responded to the survey (Chambers and Fort Bend counties), however neither county provided sufficient information that could be utilized in NewGen's analysis.

¹³ NewGen developed the survey through www.surveygizmo.com and distributed the survey as a website hyperlink to respondents via Microsoft Outlook.

¹⁴ NewGen distributed the initial survey via email, sent at a minimum two follow-up emails, as well as several telephone attempts.

Section 3 FORECASTS

The purpose of the 2017 Study is to provide H-GAC with a tool to aid in its effort to provide regional solid waste disposal capacity planning for the H-GAC region. A component of this planning tool is an analysis of the H-GAC region’s landfill capacity, either existing or planned, and whether it is sufficient relative to the MSW generation in the region projected for 2017 to 2036. The first step in completing this analysis was to determine the disposal rate for each source sector (single-family residences, multi-family residences, and commercial businesses) for the region.

3.1 Population Forecast

In order to develop MSW disposal forecasts for 2017 to 2036, NewGen needed to determine the population forecast for the same time period. As mentioned earlier, the basis for the population forecast was based on data provided by the Texas Water Development Board (TWDB). TWDB provided a detailed population forecast for all 13 counties and surveyed cities (listed in Table 2-6), except The Woodlands.¹⁵

3.1.1 Total Population Forecast

The population forecast was based on 2010 TWDB data and forecasted in ten-year increments beginning with the year 2020. NewGen calculated a compound annual growth rate (CAGR) for each city and county, during each ten-year increment, and assumed population growth was normally distributed. For instance, the population of Austin County was 28,417 in 2010 and is projected to be 33,014 in 2020, which equates to a CAGR of 1.51%.¹⁶ Austin County population is projected to be 38,257 in 2030, which equates to a 1.48% CAGR¹⁷. The 1.51% population growth rate was applied annually to Austin County for the period of 2010 to 2020, and the 1.48% population growth rate was applied annually for the period of 2020 to 2030. NewGen performed this analysis for all cities and counties to determine the total population estimates for each year through 2036. As with the 2015 population estimates (see Section 2.2.1), the population forecasts from 2017 to 2036 for the smaller cities and unincorporated areas were determined by subtracting the populations of the larger cities in each county from the total population of the county for each year through 2036. Table 3-1 shows the population forecast and Appendix A contains a detailed population forecast for the H-GAC region, including all 13 counties.

**Table 3-1
Total Residential Population Forecast**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	25,761	27,024	28,014	29,056	30,205
Angleton	Brazoria	18,983	19,078	19,150	19,221	19,288
Bay City	Matagorda	18,315	18,894	19,384	19,849	20,164

¹⁵ Population projections for The Woodlands were provided by H-GAC.

¹⁶ $((33,014 \text{ population } 2020 / 28,417 \text{ population } 2010)^{(1 / 10 \text{ years}))} - 1 = 1.51\% \text{ CAGR for } 2010 - 2020$ (See Schedule 2, page 1)

¹⁷ $((38,257 \text{ population } 2030 / 33,014 \text{ population } 2020)^{(1 / 10 \text{ years}))} - 1 = 1.48\% \text{ CAGR for } 2020 - 2030$ (See Schedule 2, page 1)

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City	County	2016	2021	2026	2031	2036
Baytown	Harris	74,110	75,884	76,869	77,878	78,948
Bellaire	Harris	17,022	17,278	18,012	18,779	19,582
Bellville	Austin	4,268	4,418	4,581	4,750	4,925
Cleveland	Liberty	7,759	7,828	7,892	7,956	8,021
Clute	Brazoria	11,348	11,478	11,672	11,872	12,083
Columbus	Colorado	3,760	3,848	3,931	4,011	4,073
Conroe	Montgomery	68,379	79,360	86,937	94,825	101,647
Dayton	Liberty	8,905	10,490	11,954	13,536	14,943
Deer Park	Harris	33,339	34,423	35,276	36,122	36,871
Dickinson	Galveston	18,933	19,195	19,665	20,153	20,685
El Campo	Wharton	11,905	12,166	12,447	12,721	12,946
Freeport	Brazoria	12,531	12,939	13,327	13,714	14,067
Friendswood	Galveston, Harris	38,064	40,068	42,233	44,422	46,338
Galena Park	Harris	10,887	10,907	11,010	11,113	11,218
Galveston	Galveston	49,824	51,589	53,264	54,955	56,543
Hempstead	Waller	6,326	6,830	7,376	7,959	8,564
Hitchcock	Galveston	7,905	8,753	9,538	10,316	10,824
Houston	Fort Bend, Harris, Montgomery	2,187,939	2,265,821	2,354,901	2,445,862	2,533,614
Humble	Harris	16,366	17,580	19,368	21,181	22,494
Huntsville	Walker	39,877	40,980	41,952	42,885	43,587
Jacinto City	Harris	10,583	10,633	10,785	10,939	11,097
Jersey Village	Harris	7,682	7,730	7,763	7,804	7,877
Katy	Fort Bend, Harris, Waller	18,270	22,565	27,357	32,013	32,519
La Marque	Galveston	17,649	20,290	21,207	22,015	22,244
La Porte	Harris	34,126	34,388	34,602	34,825	35,084
Lake Jackson	Brazoria	27,123	27,386	27,778	28,179	28,595
League City	Galveston	98,375	110,999	117,820	124,608	129,894
Liberty	Liberty	8,814	9,174	9,532	9,896	10,237
Manvel	Brazoria	8,410	12,202	15,584	19,533	22,706
Missouri City	Fort Bend	75,517	83,166	92,024	101,456	110,235
Mont Belvieu	Chambers	4,504	5,138	5,810	6,542	7,242
Palacios	Matagorda	4,906	5,061	5,192	5,317	5,401
Pasadena	Harris	152,259	154,875	157,066	159,264	161,395
Pearland	Brazoria, Fort Bend, Harris	104,927	116,133	121,103	126,449	132,717
Prairie View	Waller	6,175	6,721	7,309	7,940	8,593
Richmond	Fort Bend	12,106	12,448	12,692	12,951	13,258
Rosenberg	Fort Bend	36,151	40,596	41,676	42,791	43,965
Santa Fe	Galveston	12,402	12,561	12,745	12,940	13,170
Seabrook	Harris	12,452	12,818	12,921	13,028	13,144
Sealy	Austin	6,450	6,833	7,245	7,678	8,120
South Houston	Harris	16,983	17,040	17,328	17,621	17,919
Stafford	Fort Bend	17,919	18,121	18,371	18,634	18,939
Sugar Land	Fort Bend	93,891	106,414	111,052	115,615	119,213
Texas City	Galveston	48,763	51,858	54,374	49,161	24,573
The Woodlands	Harris, Montgomery	111,164	124,750	126,263	127,484	127,471
Tomball	Harris	11,906	12,812	13,166	13,521	13,845

City	County	2016	2021	2026	2031	2036
Webster	Harris	13,133	15,179	15,731	16,274	16,716
West University Place	Harris	14,898	15,083	15,652	16,244	16,864
Wharton	Wharton	9,152	9,431	9,729	10,021	10,259
Willis	Montgomery	6,170	6,556	6,673	6,819	7,080
Small Cities & Unincorporated ¹	Austin	20,374	22,253	24,241	26,358	28,496
Small Cities & Unincorporated ¹	Brazoria	131,360	138,536	153,350	168,333	182,464
Small Cities & Unincorporated ¹	Chambers	34,676	37,796	41,198	44,808	48,336
Small Cities & Unincorporated ¹	Colorado	17,714	18,129	18,519	18,895	19,185
Small Cities & Unincorporated ¹	Fort Bend	513,007	640,521	728,473	819,082	885,258
Small Cities & Unincorporated ¹	Galveston	67,776	71,565	74,858	85,790	115,093
Small Cities & Unincorporated ¹	Harris	1,781,298	1,976,691	2,044,969	2,112,182	2,171,060
Small Cities & Unincorporated ¹	Liberty	56,392	59,846	63,322	66,831	70,132
Small Cities & Unincorporated ¹	Matagorda	14,941	15,413	15,813	16,191	16,449
Small Cities & Unincorporated ¹	Montgomery	366,658	433,544	512,369	600,856	694,134
Small Cities & Unincorporated ¹	Walker	30,321	31,157	31,895	32,602	33,135
Small Cities & Unincorporated ¹	Waller	36,084	39,987	44,149	48,660	53,287
Small Cities & Unincorporated ¹	Wharton	21,719	22,480	23,293	24,091	24,743
H-GAC TOTAL		6,787,681	7,393,712	7,821,751	8,265,379	8,663,781

¹ “Small Cities & Unincorporated” is the remaining population in each county, determined by subtracting the combined population of the cities above from their respective total county population in any given year.

3.1.2 Single-Family and Multi Family Population Forecasts

To forecast the single-family and multi-family populations from 2017 to 2036, the percentages shown in Table 2-4 were multiplied by the total population forecast discussed in Section 3.1.1. For instance, the 2021 population forecast for Humble was 17,580. Approximately 60% of the population lives in single-family residences, based on the methodology discussed in Section 2.2.2. Based on this methodology, NewGen determined the single-family population for Humble in 2021 to be 10,360.¹⁸ Similarly, the project team applied the percentages for the small cities and unincorporated area for each county to the population forecast for these areas. NewGen summed the single-family and multi-family population projections of the cities and unincorporated areas to determine the single-family and multi-family population forecasts for each county from 2017 to 2036. Tables 3-2 and 3-3 summarize the single-family and multi-family residential population, respectively, for the H-GAC region. Appendix A contains the detailed forecasts.

**Table 3-2
Single Family Population Forecast**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	18,488	19,394	20,105	20,853	21,678
Angleton	Brazoria	13,873	13,943	13,996	14,048	14,096
Bay City	Matagorda	13,175	13,592	13,945	14,279	14,505
Baytown	Harris	51,820	53,061	53,749	54,455	55,203
Bellaire	Harris	16,101	16,343	17,038	17,763	18,523
Bellville	Austin	3,509	3,632	3,766	3,905	4,049

¹⁸ (17,580 Humble Total Population 2021) x (58.93% single-family) = 10,360 single-family population 2021

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City	County	2016	2021	2026	2031	2036
Cleveland	Liberty	6,005	6,059	6,108	6,158	6,209
Clute	Brazoria	5,889	5,957	6,058	6,161	6,271
Columbus	Colorado	3,326	3,404	3,477	3,548	3,602
Conroe	Montgomery	42,524	49,352	54,064	58,969	63,212
Dayton	Liberty	6,555	7,722	8,800	9,964	11,000
Deer Park	Harris	28,067	28,980	29,698	30,410	31,041
Dickinson	Galveston	15,950	16,172	16,567	16,978	17,427
El Campo	Wharton	10,847	11,085	11,341	11,591	11,796
Freeport	Brazoria	9,889	10,211	10,517	10,823	11,102
Friendswood	Galveston, Harris	32,496	34,207	36,055	37,924	39,559
Galena Park	Harris	10,338	10,357	10,454	10,552	10,652
Galveston	Galveston	31,361	32,472	33,527	34,591	35,591
Hempstead	Waller	4,421	4,773	5,155	5,562	5,985
Hitchcock	Galveston	6,487	7,183	7,827	8,465	8,882
Houston	Fort Bend, Harris, Montgomery	1,159,415	1,200,686	1,247,890	1,296,091	1,342,592
Humble	Harris	9,644	10,360	11,413	12,482	13,256
Huntsville	Walker	21,945	22,552	23,087	23,601	23,987
Jacinto City	Harris	8,649	8,690	8,814	8,940	9,069
Jersey Village	Harris	4,584	4,612	4,632	4,657	4,701
Katy	Fort Bend, Harris, Waller	15,521	19,170	23,241	27,196	27,626
La Marque	Galveston	16,390	18,842	19,694	20,445	20,657
La Porte	Harris	29,563	29,789	29,975	30,169	30,392
Lake Jackson	Brazoria	19,820	20,011	20,298	20,591	20,895
League City	Galveston	80,585	90,927	96,514	102,075	106,405
Liberty	Liberty	7,979	8,305	8,629	8,959	9,268
Manvel	Brazoria	8,410	12,202	15,584	19,533	22,706
Missouri City	Fort Bend	71,944	79,230	87,670	96,655	105,019
Mont Belvieu	Chambers	3,777	4,309	4,873	5,487	6,074
Palacios	Matagorda	4,481	4,623	4,743	4,857	4,934
Pasadena	Harris	99,834	101,550	102,986	104,427	105,825
Pearland	Brazoria, Fort Bend, Harris	88,916	98,412	102,623	107,154	112,466
Prairie View	Waller	4,386	4,774	5,192	5,641	6,105
Richmond	Fort Bend	8,736	8,982	9,158	9,345	9,567
Rosenberg	Fort Bend	26,339	29,579	30,365	31,178	32,033
Santa Fe	Galveston	11,721	11,870	12,045	12,229	12,446
Seabrook	Harris	7,707	7,933	7,998	8,064	8,136
Sealy	Austin	5,401	5,723	6,067	6,430	6,800
South Houston	Harris	12,718	12,760	12,976	13,195	13,419
Stafford	Fort Bend	10,579	10,698	10,846	11,001	11,181
Sugar Land	Fort Bend	85,693	97,123	101,356	105,520	108,804
Texas City	Galveston	36,274	38,577	40,448	42,316	43,875
The Woodlands	Harris, Montgomery	91,141	102,280	103,521	104,522	104,511
Tomball	Harris	7,299	7,855	8,072	8,290	8,488
Webster	Harris	1,520	1,757	1,821	1,884	1,935
West University Place	Harris	14,809	14,993	15,559	16,147	16,763
Wharton	Wharton	6,533	6,731	6,944	7,153	7,323

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City	County	2016	2021	2026	2031	2036
Willis	Montgomery	5,662	6,016	6,124	6,258	6,497
Small Cities & Unincorporated ¹	Austin	20,196	22,058	24,028	26,127	28,246
Small Cities & Unincorporated ¹	Brazoria	120,726	127,321	140,935	154,706	167,693
Small Cities & Unincorporated ¹	Chambers	33,734	36,770	40,079	43,592	47,024
Small Cities & Unincorporated ¹	Colorado	17,434	17,842	18,226	18,595	18,881
Small Cities & Unincorporated ¹	Fort Bend	474,345	592,249	673,573	757,353	818,542
Small Cities & Unincorporated ¹	Galveston	63,959	67,534	70,642	73,669	76,141
Small Cities & Unincorporated ¹	Harris	1,485,313	1,648,239	1,705,172	1,761,217	1,810,312
Small Cities & Unincorporated ¹	Liberty	55,810	59,228	62,669	66,141	69,409
Small Cities & Unincorporated ¹	Matagorda	14,656	15,119	15,511	15,882	16,135
Small Cities & Unincorporated ¹	Montgomery	331,623	392,118	463,410	543,442	627,808
Small Cities & Unincorporated ¹	Walker	30,200	31,034	31,768	32,473	33,003
Small Cities & Unincorporated ¹	Waller	33,694	37,339	41,224	45,437	49,757
Small Cities & Unincorporated ¹	Wharton	21,216	21,959	22,753	23,533	24,170
H-GAC TOTAL		5,022,001	5,518,631	5,863,395	6,221,656	6,541,256

¹ "Small Cities & Unincorporated" is the remaining population in each county, determined by subtracting the combined population of the cities above from their respective total county population in any given year.

**Table 3-3
Multi-Family Population Forecast**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	7,273	7,630	7,909	8,203	8,528
Angleton	Brazoria	5,110	5,135	5,155	5,174	5,192
Bay City	Matagorda	5,140	5,302	5,440	5,570	5,659
Baytown	Harris	22,290	22,824	23,120	23,423	23,745
Bellaire	Harris	921	935	975	1,016	1,060
Bellville	Austin	759	786	815	845	876
Cleveland	Liberty	1,753	1,769	1,783	1,798	1,813
Clute	Brazoria	5,459	5,522	5,615	5,711	5,812
Columbus	Colorado	435	445	454	464	471
Conroe	Montgomery	25,856	30,008	32,873	35,855	38,435
Dayton	Liberty	2,350	2,768	3,154	3,572	3,943
Deer Park	Harris	5,272	5,443	5,578	5,712	5,830
Dickinson	Galveston	2,983	3,024	3,098	3,175	3,259
El Campo	Wharton	1,058	1,081	1,106	1,130	1,150
Freeport	Brazoria	2,642	2,728	2,810	2,891	2,966
Friendswood	Galveston, Harris	5,568	5,861	6,178	6,498	6,778
Galena Park	Harris	549	550	556	561	566
Galveston	Galveston	18,463	19,116	19,737	20,364	20,952
Hempstead	Waller	1,905	2,057	2,221	2,397	2,579
Hitchcock	Galveston	1,418	1,570	1,711	1,850	1,942
Houston	Fort Bend, Harris, Montgomery	1,028,524	1,065,136	1,107,011	1,149,771	1,191,022
Humble	Harris	6,722	7,220	7,955	8,699	9,239
Huntsville	Walker	17,932	18,427	18,865	19,284	19,600
Jacinto City	Harris	1,934	1,943	1,971	1,999	2,028

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City	County	2016	2021	2026	2031	2036
Jersey Village	Harris	3,098	3,117	3,131	3,147	3,177
Katy	Fort Bend, Harris, Waller	2,749	3,395	4,116	4,817	4,893
La Marque	Galveston	1,259	1,448	1,513	1,571	1,587
La Porte	Harris	4,563	4,598	4,627	4,657	4,691
Lake Jackson	Brazoria	7,304	7,374	7,480	7,588	7,700
League City	Galveston	17,789	20,072	21,306	22,533	23,489
Liberty	Liberty	835	869	903	937	970
Manvel	Brazoria	-	-	-	-	-
Missouri City	Fort Bend	3,573	3,935	4,355	4,801	5,216
Mont Belvieu	Chambers	726	828	937	1,055	1,168
Palacios	Matagorda	425	438	449	460	468
Pasadena	Harris	52,425	53,325	54,080	54,836	55,570
Pearland	Brazoria, Fort Bend, Harris	16,011	17,721	18,479	19,295	20,252
Prairie View	Waller	1,788	1,946	2,117	2,300	2,489
Richmond	Fort Bend	3,371	3,466	3,534	3,606	3,691
Rosenberg	Fort Bend	9,811	11,018	11,311	11,614	11,932
Santa Fe	Galveston	681	690	700	711	724
Seabrook	Harris	4,745	4,884	4,924	4,965	5,009
Sealy	Austin	1,048	1,111	1,178	1,248	1,320
South Houston	Harris	4,265	4,280	4,352	4,426	4,500
Stafford	Fort Bend	7,340	7,423	7,526	7,633	7,758
Sugar Land	Fort Bend	8,198	9,292	9,697	10,095	10,409
Texas City	Galveston	12,489	13,281	13,926	14,569	15,106
The Woodlands	Harris, Montgomery	20,022	22,470	22,742	22,962	22,960
Tomball	Harris	4,606	4,957	5,094	5,231	5,357
Webster	Harris	11,613	13,422	13,910	14,390	14,781
West University Place	Harris	89	90	94	97	101
Wharton	Wharton	2,620	2,699	2,785	2,868	2,937
Willis	Montgomery	508	540	549	561	583
Small Cities & Unincorporated ¹	Austin	179	195	213	231	250
Small Cities & Unincorporated ¹	Brazoria	10,634	11,215	12,414	13,627	14,771
Small Cities & Unincorporated ¹	Chambers	941	1,026	1,118	1,216	1,312
Small Cities & Unincorporated ¹	Colorado	280	287	293	299	304
Small Cities & Unincorporated ¹	Fort Bend	38,662	48,272	54,900	61,729	66,716
Small Cities & Unincorporated ¹	Galveston	3,817	4,031	4,216	4,397	4,544
Small Cities & Unincorporated ¹	Harris	295,985	328,452	339,797	350,965	360,749
Small Cities & Unincorporated ¹	Liberty	582	618	654	690	724
Small Cities & Unincorporated ¹	Matagorda	285	294	302	309	314
Small Cities & Unincorporated ¹	Montgomery	35,035	41,426	48,958	57,413	66,326
Small Cities & Unincorporated ¹	Walker	120	124	127	130	132
Small Cities & Unincorporated ¹	Waller	2,390	2,648	2,924	3,223	3,529
Small Cities & Unincorporated ¹	Wharton	503	521	540	558	573
H-GAC TOTAL		1,765,681	1,875,081	1,958,356	2,043,724	2,122,525

¹ "Small Cities & Unincorporated" is the remaining population in each county, determined by subtracting the combined population of the cities above from their respective total county population in any given year.

3.2 Employment Forecast

Employment data is used to allocate the commercial MSW to the cities and unincorporated areas in the region. NewGen used the 2015 employment estimates shown in Table 2-5 to determine ratios of employment relevant to total population for each city and small unincorporated area in 2015. For instance, the employment for the City of Sugar Land was estimated at 41,407 in 2015, representing 45.41% of the city's total population of 91,192. NewGen maintained these ratios of employment for each city and unincorporated area for the employment forecast. For instance, in 2026, the employment for the City of Sugar Land was estimated at 50,425 and total population at 111,052, maintaining employment at 45.41% of the total population for Sugar Land. Table 3-4 includes the employment ratios and forecast for all cities and unincorporated areas in the region. Appendix A contains the detailed forecast.

**Table 3-4
Employment Forecast for the H-GAC Region**

City	County	Ratio	2016	2021	2026	2031	2036
Alvin	Brazoria	47.52%	12,241	12,841	13,312	13,807	14,353
Angleton	Brazoria	44.87%	8,517	8,560	8,592	8,624	8,654
Bay City	Matagorda	42.48%	7,779	8,025	8,234	8,431	8,565
Baytown	Harris	41.63%	30,851	31,590	32,000	32,420	32,865
Bellaire	Harris	50.43%	8,584	8,713	9,083	9,470	9,875
Bellville	Austin	46.35%	1,978	2,048	2,124	2,202	2,283
Cleveland	Liberty	31.45%	2,440	2,462	2,482	2,502	2,523
Clute	Brazoria	47.83%	5,428	5,490	5,583	5,679	5,780
Columbus	Colorado	40.94%	1,539	1,575	1,609	1,642	1,667
Conroe	Montgomery	44.46%	30,403	35,286	38,654	42,161	45,195
Dayton	Liberty	39.28%	3,497	4,120	4,695	5,317	5,869
Deer Park	Harris	48.79%	16,267	16,796	17,212	17,625	17,991
Dickinson	Galveston	50.53%	9,567	9,700	9,937	10,184	10,453
El Campo	Wharton	44.51%	5,299	5,415	5,540	5,662	5,762
Freeport	Brazoria	38.87%	4,871	5,029	5,180	5,331	5,468
Friendswood	Galveston, Harris	47.79%	18,190	19,147	20,182	21,228	22,143
Galena Park	Harris	44.42%	4,836	4,845	4,890	4,936	4,983
Galveston	Galveston	43.89%	21,870	22,644	23,380	24,122	24,819
Hempstead	Waller	39.81%	2,518	2,719	2,936	3,168	3,409
Hitchcock	Galveston	37.12%	2,935	3,249	3,541	3,830	4,018
Houston	Fort Bend, Harris, Montgomery	49.44%	1,081,680	1,120,184	1,164,223	1,209,193	1,252,576
Humble	Harris	42.89%	7,020	7,541	8,308	9,086	9,649
Huntsville	Walker	30.56%	12,186	12,523	12,820	13,105	13,319
Jacinto City	Harris	36.22%	3,833	3,851	3,906	3,962	4,019
Jersey Village	Harris	55.64%	4,274	4,300	4,319	4,342	4,383
Katy	Fort Bend, Harris, Waller	44.14%	8,065	9,961	12,076	14,131	14,354
La Marque	Galveston	36.52%	6,445	7,409	7,744	8,040	8,123
La Porte	Harris	50.91%	17,373	17,506	17,615	17,729	17,860
Lake Jackson	Brazoria	50.37%	13,662	13,794	13,992	14,194	14,403
League City	Galveston	50.22%	49,404	55,744	59,169	62,578	65,233
Liberty	Liberty	39.01%	3,439	3,579	3,719	3,861	3,994
Manvel	Brazoria	43.96%	3,697	5,364	6,851	8,587	9,981

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City	County	Ratio	2016	2021	2026	2031	2036
Missouri City	Fort Bend	48.74%	36,808	40,536	44,853	49,451	53,729
Mont Belvieu	Chambers	38.82%	1,748	1,994	2,255	2,539	2,811
Palacios	Matagorda	45.73%	2,244	2,315	2,375	2,432	2,470
Pasadena	Harris	43.45%	66,158	67,295	68,247	69,202	70,128
Pearland	Brazoria, Fort Bend, Harris	51.71%	54,262	60,058	62,627	65,392	68,634
Prairie View	Waller	39.22%	2,422	2,636	2,867	3,114	3,370
Richmond	Fort Bend	38.60%	4,673	4,805	4,899	4,999	5,118
Rosenberg	Fort Bend	43.08%	15,575	17,491	17,956	18,436	18,942
Santa Fe	Galveston	43.11%	5,347	5,415	5,495	5,579	5,678
Seabrook	Harris	54.75%	6,817	7,018	7,074	7,133	7,196
Sealy	Austin	46.60%	3,005	3,184	3,376	3,578	3,784
South Houston	Harris	41.81%	7,101	7,125	7,245	7,368	7,492
Stafford	Fort Bend	54.94%	9,844	9,955	10,092	10,237	10,404
Sugar Land	Fort Bend	45.41%	42,633	48,319	50,425	52,496	54,130
Texas City	Galveston	38.75%	18,896	20,096	21,071	22,044	22,856
The Woodlands	Harris, Montgomery	44.79%	49,785	55,870	56,548	57,095	57,089
Tomball	Harris	39.66%	4,721	5,081	5,221	5,362	5,491
Webster	Harris	48.83%	6,413	7,412	7,681	7,946	8,162
West University Place	Harris	47.72%	7,110	7,198	7,470	7,752	8,048
Wharton	Wharton	38.57%	3,530	3,637	3,752	3,865	3,957
Willis	Montgomery	38.16%	2,354	2,502	2,547	2,602	2,702
Unincorporated ¹	Austin	42.70%	8,701	9,503	10,352	11,256	12,169
Unincorporated ¹	Brazoria	40.99%	53,841	56,782	62,854	68,995	74,787
Unincorporated ¹	Chambers	39.50%	13,698	14,931	16,275	17,701	19,095
Unincorporated ¹	Colorado	43.32%	7,673	7,853	8,022	8,185	8,310
Unincorporated ¹	Fort Bend	42.48%	217,950	272,124	309,491	347,986	376,101
Unincorporated ¹	Galveston	46.68%	31,635	33,403	34,940	36,438	37,660
Unincorporated ¹	Harris	45.55%	811,369	900,369	931,470	962,085	988,903
Unincorporated ¹	Liberty	33.28%	18,769	19,919	21,076	22,244	23,343
Unincorporated ¹	Matagorda	39.85%	5,955	6,143	6,302	6,453	6,556
Unincorporated ¹	Montgomery	42.33%	155,209	183,522	216,889	254,346	293,831
Unincorporated ¹	Walker	34.81%	10,554	10,845	11,102	11,348	11,534
Unincorporated ¹	Waller	43.19%	15,586	17,272	19,069	21,018	23,016
Unincorporated ¹	Wharton	45.43%	9,866	10,212	10,581	10,944	11,240
H-GAC TOTAL		46.03%	3,122,941	3,394,831	3,586,407	3,784,766	3,963,309

¹ "Small Cities & Unincorporated" is the remaining employment in each county, determined by subtracting the combined employment of the cities above from their respective total county employment in any given year.

3.3 Residential Generation and Disposal Forecast

To project the MSW generation for the region from 2017 to 2036, it is important to understand disposal rates for single-family residences, multi-family residences, and commercial businesses. NewGen surveyed city governments to collect MSW tonnage data, along with other essential information. NewGen used the tonnage data reported in these surveys to develop single-family and multi-family residential per capita disposal rates. The project team applied these rates to the population projections for 2017 to 2036 to determine the single-family and multi-family MSW projections for 2017 to 2036. The commercial MSW

tonnage was calculated as the difference between total tonnage disposed in H-GAC region’s landfills and total single-family and multi-family MSW generated in any given year.

3.3.1 Single-Family Generation and Disposal Per Capita

The cities in Table 2-7 provided information regarding the generation of four categories of single-family MSW, whether collected by the City or by a private collection company:

- Garbage
- Brush/Yard Waste
- Bulky Items
- Recycling

Per capita calculations for the cities who returned surveys were based on the actual tonnage data received in the survey response and 2016 single-family population estimates. Table 3-5 shows the per capita calculations for the 14 cities who returned complete surveys.

**Table 3-5
Surveyed Cities Single-Family Per Capita Calculations**

City	SF Garbage (tons/year)	SF Brush (tons/year)	SF Bulky (tons/year)	SF Recycling (tons/year)	SF Total (tons/year)	2016 SF Population	Generation Per Capita ⁴	Disposal Per Capita ⁵
Bellville	2,736	58	64	202	3,060	3,509	0.8722	0.7981
Alvin ¹	6,213	-	631	1,501	8,345	18,488	0.4514	0.3702
Missouri City	14,945	2,079	839	2,101	19,964	71,944	0.2775	0.2194
Sugar Land	40,420 ²	8,388	-	15,655	64,462	85,693	0.7522	0.4717
Dickinson	10,600	250	-	1,200	12,050	15,950	0.7555	0.6646
League City	42,044	-	-	3,833	45,877	80,585	0.5693	0.5217
Texas City	15,851	4,061	7,500	978	28,390	36,274	0.7827	0.6437
Bellaire	6,318	1,579	157	1,958	10,012	16,101	0.6218	0.4021
Houston	385,660	54,479	287,064	58,036	785,239	1,038,448 ³	0.7562	0.6478
La Porte	11,999	7,827	15,213	6,225	41,264	29,563	1.3958	0.9205
Pasadena ¹	46,815	-	22,177	1,635	70,627	99,834	0.7074	0.6911
Seabrook	5,464	-	-	572	6,036	7,707	0.7832	0.7090
The Woodlands	33,391	2,073	-	14,087	49,551	91,141	0.5437	0.3664
Huntsville	5,845	327	510	1,449	8,130	21,945	0.3705	0.2896

1 Tonnage data for Brush and Bulky items were combined for these cities, NewGen assumed all tonnage was disposed in landfills due to the comingling of these categories.
 2 Sugar Land SF Garbage tonnage includes Bulky tonnage.
 3 Single-family population of Houston served by City, excluding private sector customers. City serves 386,628 single-family households out of the 431,666 total single-family households = approx. 89.57%. Total Houston single-family population in 2016 = 1,159,415 X 89.57% = 1,038,448 Single-family population served by City.
 4 Total SF tonnage / 2016 SF Population = Generation Per Capita, shown in (tons/capita/year).
 5 SF Garbage tonnage + SF Bulky tonnage / 2016 SF Population = Disposal Per Capita, shown in (tons/capita/year). NewGen assumed all Brush was diverted from landfills.

Any arithmetic differences are due to rounding.

An important observation by NewGen between the time of the 2005 Study and the 2017 Study is the significant increase in composting and mulching facilities located within the H-GAC region, that were not in existence in 2005. This has had a significant impact upon the decrease in the disposal rate on a per capita basis, and will be discussed in greater detail in Section 4 of this report.

NewGen calculated a weighted average, single-family per capita disposal rate using the data provided by the 14 cities. Table 3-6 lists the tonnage and per capita rate NewGen determined for single-family MSW disposal in the H-GAC region.

**Table 3-6
Single-Family Disposal Per Capita in the H-GAC Region**

	Tonnage	Population	Disposal Per Capita ⁵ (tons/capita/year)
Single-Family Garbage	628,300	1,617,182 ³	0.3885
Single-Family Brush¹	-	-	-
Single-Family Bulky²	334,155	1,336,105 ⁴	0.2501
Single-Family Total			0.6386

- 1 NewGen assumed all brush tonnage collected on dedicated brush routes is diverted from the landfill.
- 2 Bulky tonnage includes some Brush tonnage due to the comingling of these materials in areas without dedicated routes for Brush pick-up.
- 3 Total single-family population of all 14 cities who returned tonnage data for single-family garbage.
- 4 Total single-family population of the 9 cities who returned tonnage data for single-family bulky.
- 5 Per Capita = Tonnage / Population.

For the cities that did not return a survey, and for the smaller cities and unincorporated areas, NewGen multiplied the per capita rate shown in Table 3-6 by the single-family population for each city or unincorporated area to get the projected single-family tonnage in any given year.

Single-Family Per Capita Disposal Rate: 0.6386 tons

The project team determined the single-family tonnage at the county level by adding the data for the cities and unincorporated areas. For instance, Mont Belvieu was the largest city in Chambers County, since no city had a population over 5,000 according to the 2010 Census. The single-family population for Mont Belvieu was 3,880 in 2017 and thus the single-family MSW tonnage for 2017 was 2,478.¹⁹ The combined single-family population of the smaller and unincorporated areas was 34,321. The combined tonnage of single-family MSW for the smaller and unincorporated areas was 21,918.²⁰ Thus, NewGen determined the single-family solid waste disposal for 2017 in Chambers County to be 24,396 tons.

3.3.2 Single-Family Disposal Forecast

Once NewGen established the single family-family per capita disposal rate, the project team was able to apply this rate to the single-family population forecast to determine the single-family waste disposal forecast for 2017 to 2036. The project team assumed the per capita disposal rate would remain constant

¹⁹ Single-family tonnage = 3,880 single-family residents X 0.6386 tons per resident = 2,478 tons

²⁰ Single-family tonnage = 34,321 single-family residents X 0.6386 tons per resident = 21,918 tons

from 2017 to 2036.²¹ Table 3-7 summarizes the forecast for single-family residential waste disposal in the region and Appendix A contains the forecast on an annual basis.

**Table 3-7
Single-Family Disposal Forecast (Tons)**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	6,844	7,180	7,443	7,720	8,025
Angleton	Brazoria	8,860	8,904	8,938	8,971	9,002
Bay City	Matagorda	8,414	8,680	8,905	9,118	9,263
Baytown	Harris	33,093	33,885	34,325	34,775	35,253
Bellaire	Harris	6,475	6,572	6,851	7,143	7,449
Bellville	Austin	2,800	2,898	3,005	3,116	3,231
Cleveland	Liberty	3,835	3,869	3,901	3,933	3,965
Clute	Brazoria	3,761	3,804	3,868	3,935	4,005
Columbus	Colorado	2,124	2,174	2,220	2,266	2,300
Conroe	Montgomery	27,156	31,517	34,526	37,659	40,368
Dayton	Liberty	4,186	4,932	5,620	6,363	7,025
Deer Park	Harris	17,924	18,507	18,966	19,420	19,823
Dickinson	Galveston	10,600	10,747	11,010	11,283	11,581
El Campo	Wharton	6,927	7,079	7,243	7,402	7,533
Freeport	Brazoria	6,315	6,521	6,716	6,912	7,090
Friendswood	Galveston, Harris	20,752	21,845	23,025	24,219	25,263
Galena Park	Harris	6,602	6,614	6,676	6,739	6,803
Galveston	Galveston	20,028	20,737	21,410	22,090	22,729
Hempstead	Waller	2,823	3,048	3,292	3,552	3,822
Hitchcock	Galveston	4,143	4,587	4,999	5,406	5,672
Houston	Fort Bend, Harris, Montgomery	751,089	777,824	808,404	839,630	869,754
Humble	Harris	6,159	6,616	7,289	7,971	8,465
Huntsville	Walker	6,354	6,530	6,685	6,834	6,946
Jacinto City	Harris	5,523	5,550	5,629	5,709	5,792
Jersey Village	Harris	2,927	2,946	2,958	2,974	3,002
Katy	Fort Bend, Harris, Waller	9,912	12,242	14,842	17,368	17,642
La Marque	Galveston	10,467	12,033	12,577	13,056	13,192
La Porte	Harris	27,212	27,421	27,591	27,770	27,976
Lake Jackson	Brazoria	12,657	12,779	12,963	13,149	13,344
League City	Galveston	42,044	47,440	50,355	53,256	55,515
Liberty	Liberty	5,096	5,304	5,511	5,721	5,918
Manvel	Brazoria	5,371	7,792	9,952	12,474	14,501
Missouri City	Fort Bend	15,784	17,383	19,234	21,205	23,040
Mont Belvieu	Chambers	2,412	2,752	3,112	3,504	3,879
Palacios	Matagorda	2,862	2,952	3,029	3,101	3,151
Pasadena	Harris	68,992	70,178	71,170	72,166	73,132
Pearland	Brazoria, Fort Bend, Harris	56,783	62,847	65,536	68,430	71,822

²¹ While it is conceivable the disposal rate may decline over the period of 2017 to 2036, as it has since the 2005 Study, to be conservative in our landfill capacity forecast, NewGen did not assume a decrease in the per capita disposal rate.

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City	County	2016	2021	2026	2031	2036
Prairie View	Waller	2,801	3,049	3,316	3,602	3,899
Richmond	Fort Bend	5,579	5,736	5,848	5,968	6,110
Rosenberg	Fort Bend	16,821	18,889	19,391	19,910	20,457
Santa Fe	Galveston	7,485	7,581	7,692	7,810	7,948
Seabrook	Harris	5,464	5,624	5,670	5,717	5,768
Sealy	Austin	3,449	3,655	3,875	4,106	4,343
South Houston	Harris	8,122	8,149	8,287	8,427	8,569
Stafford	Fort Bend	6,756	6,832	6,926	7,025	7,140
Sugar Land	Fort Bend	40,420	45,811	47,808	49,772	51,321
Texas City	Galveston	23,351	24,833	26,038	27,240	28,244
The Woodlands	Harris, Montgomery	33,391	37,472	37,926	38,293	38,289
Tomball	Harris	4,661	5,016	5,155	5,294	5,421
Webster	Harris	971	1,122	1,163	1,203	1,236
West University Place	Harris	9,457	9,575	9,936	10,312	10,705
Wharton	Wharton	4,172	4,299	4,435	4,568	4,676
Willis	Montgomery	3,616	3,842	3,911	3,996	4,149
Small Cities & Unincorporated ¹	Austin	12,897	14,086	15,344	16,685	18,038
Small Cities & Unincorporated ¹	Brazoria	77,097	81,309	90,003	98,797	107,091
Small Cities & Unincorporated ¹	Chambers	21,543	23,482	25,595	27,838	30,030
Small Cities & Unincorporated ¹	Colorado	11,133	11,394	11,639	11,875	12,058
Small Cities & Unincorporated ¹	Fort Bend	302,922	378,217	430,152	483,655	522,731
Small Cities & Unincorporated ¹	Galveston	40,845	43,128	45,113	47,046	48,624
Small Cities & Unincorporated ¹	Harris	948,538	1,052,585	1,088,943	1,124,734	1,156,086
Small Cities & Unincorporated ¹	Liberty	35,641	37,824	40,021	42,239	44,325
Small Cities & Unincorporated ¹	Matagorda	9,359	9,655	9,905	10,142	10,304
Small Cities & Unincorporated ¹	Montgomery	211,778	250,411	295,939	347,049	400,925
Small Cities & Unincorporated ¹	Walker	19,286	19,818	20,287	20,738	21,076
Small Cities & Unincorporated ¹	Waller	21,517	23,845	26,326	29,017	31,776
Small Cities & Unincorporated ¹	Wharton	13,549	14,024	14,530	15,029	15,435
H-GAC TOTAL		3,137,926	3,445,950	3,660,951	3,884,426	4,084,045

¹ "Small Cities & Unincorporated" is the remaining tonnage in each county, determined by subtracting the combined tonnage of the cities above from their respective total county tonnage in any given year.

3.3.3 Multi-Family Disposal Per Capita

With limited multi-family data available, NewGen made an assumption, consistent with the methodology used in the 2005 Study, regarding multi-family waste disposal. The project team assumed the per capita disposal rate for multi-family residents to be equal to the "Single-Family Garbage" disposal rate plus the "Single-Family Bulky" disposal rate.²²

²² Multi-Family Per Capita Disposal Rate = Single-Family Per Capita Disposal Rate, due to the fact that of the 14 cities surveyed that separated out brush tonnage, they were either diverting it, or assumed to be diverting the material. NewGen would still emphasize that brush/yard waste is still landfilled in the H-GAC region (although it appears at a significantly lower level than at the time of the 2005 Study). Brush/yard waste material diversion cannot be quantified when the material is mixed with the waste stream.

NewGen assumed that brush and yard waste at the vast majority of multi-family complexes would be disposed/diverted by professional landscapers.

Multi-Family Per Capita Disposal Rate: 0.6386 tons

3.3.4 Multi-Family Disposal Forecast

Similar to single-family residential, NewGen was able to apply the established multi-family per capita disposal rate to the multi-family population forecasts to determine the multi-family disposal forecast for 2017 to 2036. Table 3-8 summarizes the forecast for multi-family waste disposal in the region and Appendix A provides the forecast on an annual basis.

**Table 3-8
Multi-Family Disposal Forecast (Tons)**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	2,692	2,824	2,928	3,037	3,157
Angleton	Brazoria	3,263	3,279	3,292	3,304	3,316
Bay City	Matagorda	3,282	3,386	3,474	3,557	3,614
Baytown	Harris	14,235	14,576	14,765	14,959	15,164
Bellaire	Harris	370	376	392	409	426
Bellville	Austin	606	627	651	675	699
Cleveland	Liberty	1,120	1,130	1,139	1,148	1,158
Clute	Brazoria	3,486	3,526	3,586	3,647	3,712
Columbus	Colorado	278	284	290	296	301
Conroe	Montgomery	16,512	19,163	20,993	22,898	24,545
Dayton	Liberty	1,501	1,768	2,014	2,281	2,518
Deer Park	Harris	3,367	3,476	3,562	3,648	3,723
Dickinson	Galveston	1,982	2,010	2,059	2,110	2,166
El Campo	Wharton	676	690	706	722	735
Freeport	Brazoria	1,687	1,742	1,794	1,846	1,894
Friendswood	Galveston, Harris	3,556	3,743	3,945	4,150	4,329
Galena Park	Harris	351	352	355	358	362
Galveston	Galveston	11,790	12,208	12,604	13,005	13,380
Hempstead	Waller	1,216	1,313	1,418	1,531	1,647
Hitchcock	Galveston	906	1,003	1,093	1,182	1,240
Houston	Fort Bend, Harris, Montgomery	666,295	690,013	717,140	744,841	771,564
Humble	Harris	4,293	4,611	5,080	5,556	5,900
Huntsville	Walker	5,192	5,336	5,462	5,584	5,675
Jacinto City	Harris	1,235	1,241	1,259	1,277	1,295
Jersey Village	Harris	1,978	1,991	1,999	2,010	2,029
Katy	Fort Bend, Harris, Waller	1,756	2,168	2,629	3,076	3,125
La Marque	Galveston	804	924	966	1,003	1,013
La Porte	Harris	4,201	4,233	4,259	4,287	4,318
Lake Jackson	Brazoria	4,664	4,709	4,777	4,846	4,917
League City	Galveston	9,281	10,472	11,116	11,756	12,255
Liberty	Liberty	533	555	577	599	619

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City	County	2016	2021	2026	2031	2036
Manvel	Brazoria	-	-	-	-	-
Missouri City	Fort Bend	784	863	955	1,053	1,144
Mont Belvieu	Chambers	464	529	598	674	746
Palacios	Matagorda	271	280	287	294	299
Pasadena	Harris	36,229	36,851	37,373	37,896	38,403
Pearland	Brazoria, Fort Bend, Harris	10,225	11,317	11,801	12,322	12,933
Prairie View	Waller	1,142	1,243	1,352	1,469	1,589
Richmond	Fort Bend	2,153	2,213	2,257	2,303	2,357
Rosenberg	Fort Bend	6,266	7,036	7,223	7,417	7,620
Santa Fe	Galveston	435	441	447	454	462
Seabrook	Harris	3,364	3,463	3,491	3,520	3,551
Sealy	Austin	670	709	752	797	843
South Houston	Harris	2,724	2,733	2,779	2,826	2,874
Stafford	Fort Bend	4,688	4,740	4,806	4,875	4,955
Sugar Land	Fort Bend	3,867	4,383	4,574	4,762	4,910
Texas City	Galveston	8,039	8,550	8,965	9,378	9,724
The Woodlands	Harris, Montgomery	7,336	8,232	8,332	8,413	8,412
Tomball	Harris	2,942	3,166	3,253	3,341	3,421
Webster	Harris	7,416	8,571	8,883	9,190	9,439
West University Place	Harris	57	58	60	62	64
Wharton	Wharton	1,673	1,724	1,778	1,832	1,875
Willis	Montgomery	324	345	351	359	372
Small Cities & Unincorporated ¹	Austin	114	125	136	148	160
Small Cities & Unincorporated ¹	Brazoria	6,791	7,162	7,928	8,702	9,433
Small Cities & Unincorporated ¹	Chambers	601	655	714	777	838
Small Cities & Unincorporated ¹	Colorado	179	183	187	191	194
Small Cities & Unincorporated ¹	Fort Bend	24,690	30,827	35,060	39,421	42,606
Small Cities & Unincorporated ¹	Galveston	2,438	2,574	2,693	2,808	2,902
Small Cities & Unincorporated ¹	Harris	189,019	209,753	216,998	224,130	230,378
Small Cities & Unincorporated ¹	Liberty	372	394	417	440	462
Small Cities & Unincorporated ¹	Matagorda	182	188	193	197	201
Small Cities & Unincorporated ¹	Montgomery	22,374	26,455	31,265	36,665	42,357
Small Cities & Unincorporated ¹	Walker	77	79	81	83	84
Small Cities & Unincorporated ¹	Waller	1,526	1,691	1,867	2,058	2,254
Small Cities & Unincorporated ¹	Wharton	321	333	345	356	366
H-GAC TOTAL		1,122,859	1,191,597	1,244,525	1,298,804	1,349,023

¹ "Small Cities & Unincorporated" is the remaining tonnage in each county, determined by subtracting the combined tonnage of the cities above from their respective total county tonnage in any given year.

3.4 Commercial Disposal

The total commercial MSW disposed of in the H-GAC planning region was determined to be the total MSW disposed in the region, less the single-family and multi-family MSW disposed in any given year. For instance in 2015, TCEQ reported a total of 8,820,636 tons disposed in H-GAC landfills. By subtracting 4,184,034 tons (the total of single and multi-family residential tonnage), NewGen determined the

commercial MSW disposed in 2015 to be 4,636,602 tons.²³ Total tonnage disposed at landfills in the H-GAC region is forecasted to increase with population throughout the period from 2017 to 2036.

3.4.1 Commercial Waste Allocation

Commercial MSW is allocated to each city and smaller unincorporated areas based on employment. This methodology was used since there is typically a strong correlation between the number of employees in a region and the amount of commercial MSW generated in that region. Table 3-9 provides an example of this methodology for the City of Katy. This methodology was applied to all surveyed cities and the small cities and unincorporated areas for each year of the forecasted period.²⁴

**Table 3-9
City of Katy Commercial Waste Allocation**

Katy Employment 2017	8,420
Total Employment H-GAC Region	3,179,732
Percentage of Total	0.26%
Total Commercial MSW Tonnage to be Allocated in 2017	4,812,250
Commercial MSW Tonnage Allocated to Katy	12,743

Any arithmetic differences are due to rounding.

3.4.2 Commercial Disposal Forecast

NewGen assumed that the commercial MSW disposal would grow in direct proportion to the employment for each city and unincorporated area. NewGen determined the commercial waste forecast for the counties in the region by summing the MSW forecast of the cities and unincorporated areas. Table 3-10 summarizes the forecast for commercial waste disposal in the region and Appendix A contains the forecast on an annual basis.

**Table 3-10
Commercial Disposal Forecast (Tons)**

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	18,514	19,475	20,219	21,001	21,853
Angleton	Brazoria	12,882	12,982	13,051	13,118	13,176
Bay City	Matagorda	11,766	12,172	12,506	12,824	13,041
Baytown	Harris	46,662	47,911	48,605	49,313	50,039
Bellaire	Harris	12,983	13,215	13,797	14,404	15,035
Bellville	Austin	2,992	3,106	3,225	3,349	3,476
Cleveland	Liberty	3,691	3,734	3,770	3,806	3,841
Clute	Brazoria	8,210	8,327	8,480	8,637	8,800
Columbus	Colorado	2,328	2,389	2,444	2,498	2,539
Conroe	Montgomery	45,984	53,516	58,712	64,130	68,811
Dayton	Liberty	5,290	6,249	7,132	8,087	8,936

²³ NewGen used the 2015 landfills disposal data because it was the most recent data available from the TCEQ.

²⁴ This methodology is consistent with the 2005 Study.

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City	County	2016	2021	2026	2031	2036
Deer Park	Harris	24,603	25,474	26,144	26,809	27,392
Dickinson	Galveston	14,471	14,712	15,094	15,490	15,915
El Campo	Wharton	8,014	8,213	8,415	8,613	8,773
Freeport	Brazoria	7,367	7,628	7,868	8,108	8,325
Friendswood	Galveston, Harris	27,511	29,040	30,654	32,289	33,714
Galena Park	Harris	7,314	7,348	7,428	7,508	7,587
Galveston	Galveston	33,078	34,344	35,511	36,691	37,788
Hempstead	Waller	3,809	4,124	4,460	4,819	5,191
Hitchcock	Galveston	4,438	4,928	5,378	5,825	6,118
Houston	Fort Bend, Harris, Montgomery	1,636,024	1,698,929	1,768,342	1,839,249	1,907,106
Humble	Harris	10,618	11,437	12,619	13,820	14,691
Huntsville	Walker	18,431	18,993	19,472	19,933	20,279
Jacinto City	Harris	5,797	5,841	5,933	6,026	6,119
Jersey Village	Harris	6,464	6,522	6,560	6,605	6,673
Katy	Fort Bend, Harris, Waller	12,198	15,107	18,342	21,494	21,855
La Marque	Galveston	9,748	11,237	11,763	12,229	12,368
La Porte	Harris	26,276	26,551	26,755	26,967	27,193
Lake Jackson	Brazoria	20,664	20,921	21,252	21,589	21,930
League City	Galveston	74,723	84,544	89,872	95,185	99,320
Liberty	Liberty	5,201	5,428	5,648	5,872	6,081
Manvel	Brazoria	5,592	8,135	10,406	13,061	15,197
Missouri City	Fort Bend	55,671	61,478	68,128	75,217	81,806
Mont Belvieu	Chambers	2,644	3,025	3,425	3,862	4,280
Palacios	Matagorda	3,393	3,510	3,607	3,698	3,761
Pasadena	Harris	100,063	102,063	103,660	105,260	106,773
Pearland	Brazoria, Fort Bend, Harris	82,071	91,086	95,125	99,465	104,498
Prairie View	Waller	3,663	3,998	4,354	4,737	5,132
Richmond	Fort Bend	7,068	7,287	7,441	7,603	7,792
Rosenberg	Fort Bend	23,557	26,527	27,273	28,043	28,840
Santa Fe	Galveston	8,087	8,213	8,346	8,486	8,645
Seabrook	Harris	10,311	10,643	10,745	10,849	10,957
Sealy	Austin	4,546	4,829	5,128	5,442	5,761
South Houston	Harris	10,740	10,806	11,005	11,207	11,407
Stafford	Fort Bend	14,889	15,098	15,329	15,571	15,841
Sugar Land	Fort Bend	64,481	73,283	76,590	79,850	82,416
Texas City	Galveston	28,580	30,478	32,004	33,530	34,800
The Woodlands	Harris, Montgomery	75,300	84,735	85,891	86,844	86,920
Tomball	Harris	7,141	7,706	7,931	8,156	8,360
Webster	Harris	9,699	11,241	11,667	12,087	12,428
West University Place	Harris	10,754	10,917	11,346	11,792	12,254
Wharton	Wharton	5,339	5,516	5,699	5,879	6,025
Willis	Montgomery	3,561	3,795	3,868	3,958	4,114
Small Cities & Unincorporated ¹	Austin	13,160	14,413	15,723	17,121	18,528
Small Cities & Unincorporated ¹	Brazoria	81,434	86,119	95,469	104,946	113,867
Small Cities & Unincorporated ¹	Chambers	20,718	22,645	24,720	26,924	29,073
Small Cities & Unincorporated ¹	Colorado	11,606	11,910	12,184	12,449	12,653

City	County	2016	2021	2026	2031	2036
Small Cities & Unincorporated ¹	Fort Bend	329,647	412,718	470,087	529,306	572,631
Small Cities & Unincorporated ¹	Galveston	47,847	50,661	53,071	55,424	57,339
Small Cities & Unincorporated ¹	Harris	1,227,183	1,365,548	1,414,812	1,463,384	1,505,652
Small Cities & Unincorporated ¹	Liberty	28,388	30,210	32,012	33,834	35,540
Small Cities & Unincorporated ¹	Matagorda	9,006	9,316	9,572	9,815	9,981
Small Cities & Unincorporated ¹	Montgomery	234,750	278,339	329,433	386,874	447,372
Small Cities & Unincorporated ¹	Walker	15,963	16,449	16,863	17,262	17,561
Small Cities & Unincorporated ¹	Waller	23,573	26,196	28,964	31,970	35,043
Small Cities & Unincorporated ¹	Wharton	14,922	15,488	16,071	16,646	17,113
H-GAC TOTAL		4,723,400	5,148,780	5,447,405	5,756,838	6,034,325

¹ "Small Cities & Unincorporated" is the remaining tonnage in each county, determined by subtracting the combined tonnage of the cities above from their respective total county tonnage in any given year.

3.5 Total Disposal Forecast

The total MSW waste disposal forecast, summarized in Table 3-11, is the summation of single-family, multi-family, and commercial waste for the H-GAC region. See Appendix A for comprehensive results. Figure 3-1 provides a graphic illustration of the total MSW waste projections.

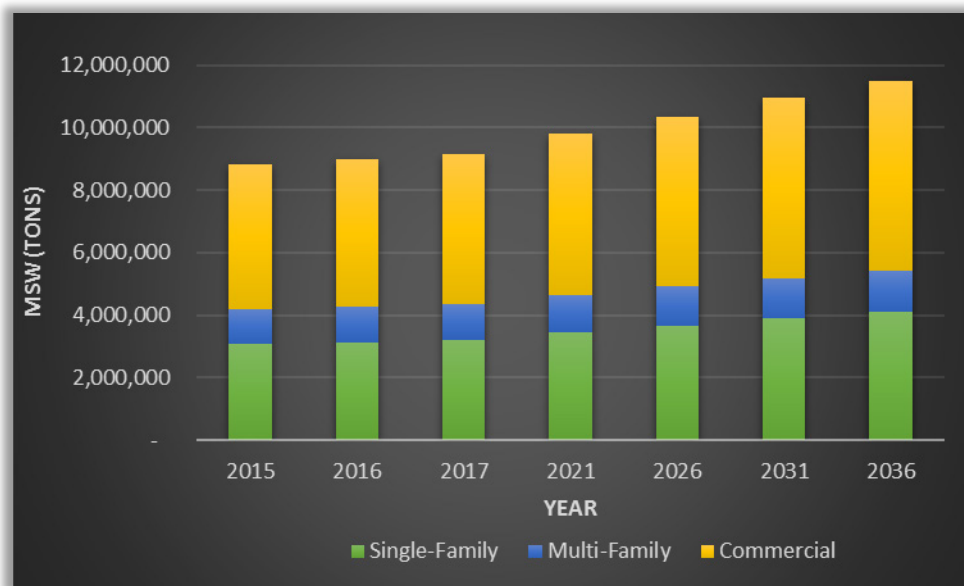


Figure 3-1: Total MSW Forecast

Table 3-11
Total Disposal Forecast

City	County	2016	2021	2026	2031	2036
Alvin	Brazoria	28,051	29,480	30,590	31,758	33,035
Angleton	Brazoria	25,005	25,166	25,280	25,393	25,494
Bay City	Matagorda	23,462	24,237	24,885	25,499	25,918
Baytown	Harris	93,989	96,372	97,694	99,047	100,456

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City	County	2016	2021	2026	2031	2036
Bellaire	Harris	19,829	20,163	21,040	21,956	22,910
Bellville	Austin	6,398	6,632	6,881	7,140	7,407
Cleveland	Liberty	8,646	8,733	8,810	8,887	8,964
Clute	Brazoria	15,457	15,657	15,935	16,219	16,516
Columbus	Colorado	4,729	4,847	4,955	5,059	5,140
Conroe	Montgomery	89,652	104,196	114,231	124,686	133,725
Dayton	Liberty	10,976	12,948	14,766	16,731	18,479
Deer Park	Harris	45,894	47,457	48,672	49,876	50,938
Dickinson	Galveston	27,053	27,469	28,162	28,883	29,662
El Campo	Wharton	15,617	15,983	16,364	16,737	17,041
Freeport	Brazoria	15,369	15,891	16,378	16,867	17,309
Friendswood	Galveston, Harris	51,820	54,628	57,625	60,658	63,306
Galena Park	Harris	14,267	14,314	14,459	14,605	14,751
Galveston	Galveston	64,896	67,289	69,526	71,786	73,897
Hempstead	Waller	7,849	8,486	9,170	9,902	10,660
Hitchcock	Galveston	9,487	10,518	11,470	12,413	13,030
Houston	Fort Bend, Harris, Montgomery	3,053,408	3,166,767	3,293,887	3,423,720	3,548,424
Humble	Harris	21,069	22,664	24,987	27,346	29,056
Huntsville	Walker	29,977	30,858	31,619	32,351	32,900
Jacinto City	Harris	12,555	12,631	12,820	13,012	13,205
Jersey Village	Harris	11,370	11,459	11,518	11,589	11,703
Katy	Fort Bend, Harris, Waller	23,865	29,517	35,812	41,938	42,622
La Marque	Galveston	21,019	24,195	25,306	26,288	26,573
La Porte	Harris	57,689	58,204	58,606	59,023	59,488
Lake Jackson	Brazoria	37,985	38,410	38,992	39,584	40,191
League City	Galveston	126,048	142,456	151,343	160,197	167,090
Liberty	Liberty	10,830	11,287	11,736	12,192	12,619
Manvel	Brazoria	10,962	15,927	20,358	25,535	29,698
Missouri City	Fort Bend	72,239	79,724	88,317	97,476	105,990
Mont Belvieu	Chambers	5,520	6,306	7,136	8,040	8,904
Palacios	Matagorda	6,526	6,742	6,923	7,094	7,210
Pasadena	Harris	205,284	209,092	212,203	215,322	218,308
Pearland	Brazoria, Fort Bend, Harris	149,078	165,250	172,463	180,217	189,253
Prairie View	Waller	7,606	8,290	9,022	9,808	10,619
Richmond	Fort Bend	14,799	15,237	15,546	15,874	16,259
Rosenberg	Fort Bend	46,644	52,453	53,888	55,369	56,917
Santa Fe	Galveston	16,008	16,234	16,486	16,750	17,055
Seabrook	Harris	19,139	19,730	19,906	20,086	20,276
Sealy	Austin	8,665	9,193	9,755	10,345	10,946
South Houston	Harris	21,586	21,688	22,071	22,460	22,851
Stafford	Fort Bend	26,332	26,670	27,061	27,471	27,936
Sugar Land	Fort Bend	108,768	123,476	128,972	134,383	138,646
Texas City	Galveston	59,971	63,862	67,007	70,148	72,768
The Woodlands	Harris, Montgomery	116,026	130,439	132,149	133,550	133,621
Tomball	Harris	14,744	15,888	16,339	16,791	17,201
Webster	Harris	18,087	20,934	21,713	22,480	23,103

FORECASTS

City	County	2016	2021	2026	2031	2036
West University Place	Harris	20,267	20,550	21,342	22,166	23,023
Wharton	Wharton	11,184	11,539	11,912	12,278	12,576
Willis	Montgomery	7,501	7,981	8,129	8,313	8,635
Small Cities & Unincorporated ¹	Austin	26,171	28,623	31,204	33,953	36,726
Small Cities & Unincorporated ¹	Brazoria	165,322	174,590	193,400	212,445	230,391
Small Cities & Unincorporated ¹	Chambers	42,863	46,782	51,029	55,539	59,941
Small Cities & Unincorporated ¹	Colorado	22,918	23,488	24,011	24,515	24,905
Small Cities & Unincorporated ¹	Fort Bend	657,259	821,762	935,298	1,052,381	1,137,968
Small Cities & Unincorporated ¹	Galveston	91,129	96,363	100,876	105,277	108,866
Small Cities & Unincorporated ¹	Harris	2,364,741	2,627,886	2,720,754	2,812,248	2,892,117
Small Cities & Unincorporated ¹	Liberty	64,401	68,428	72,451	76,513	80,327
Small Cities & Unincorporated ¹	Matagorda	18,548	19,159	19,670	20,155	20,486
Small Cities & Unincorporated ¹	Montgomery	468,902	555,206	656,638	770,588	890,654
Small Cities & Unincorporated ¹	Walker	35,326	36,346	37,231	38,082	38,721
Small Cities & Unincorporated ¹	Waller	46,617	51,732	57,158	63,045	69,073
Small Cities & Unincorporated ¹	Wharton	28,793	29,844	30,946	32,031	32,915
H-GAC TOTAL		8,984,184	9,786,327	10,352,881	10,940,068	11,467,393

1 "Small Cities & Unincorporated" is the remaining tonnage in each county, determined by subtracting the combined tonnage of the cities above from their respective total county tonnage in any given year.

Section 4 ANALYSIS

Section 4 of the report is divided into four subsections which focus on particular analyses performed by NewGen for the H-GAC region. They are as follows:

- **Subsection 4.1** begins with historical landfill analysis and identifies trends that have occurred since the 2005 Study.
- **Subsection 4.2** examines in detail the 2015 waste stream – its composition, and where it is landfilled within the H-GAC region.
- **Subsection 4.3** evaluates the forecasted remaining landfill disposal capacity for the H-GAC region.
- **Subsection 4.4** contains other analyses related to per capita rates, transfer stations, and the state of recycling and diversion within the H-GAC region.

In addition, the following full-page maps for the H-GAC region are located at the end of this section.

- Type I and Type IV Landfills;
- Transfer Stations;
- Citizens' Collection Stations;
- Composters, and
- Material Recovery Facilities.

4.1 Historical Landfill Analysis (2005-2015)

4.1.1 Forecasted 2005 Study Tonnage Disposed vs. Actual Tonnage Disposed

In order to gain a full understanding of the disposal characteristics of the region, NewGen examined past disposal trends in the H-GAC region. As mentioned in prior sections, the 2017 Study relied upon analysis, and a methodology that was originally developed as part of the 2005 Study. Figure 4-1 compares the forecasted total tons that the 2005 Study estimated would be disposed in the H-GAC region from 2005 to 2015 versus the actual tonnage recorded by the TCEQ for the same period.

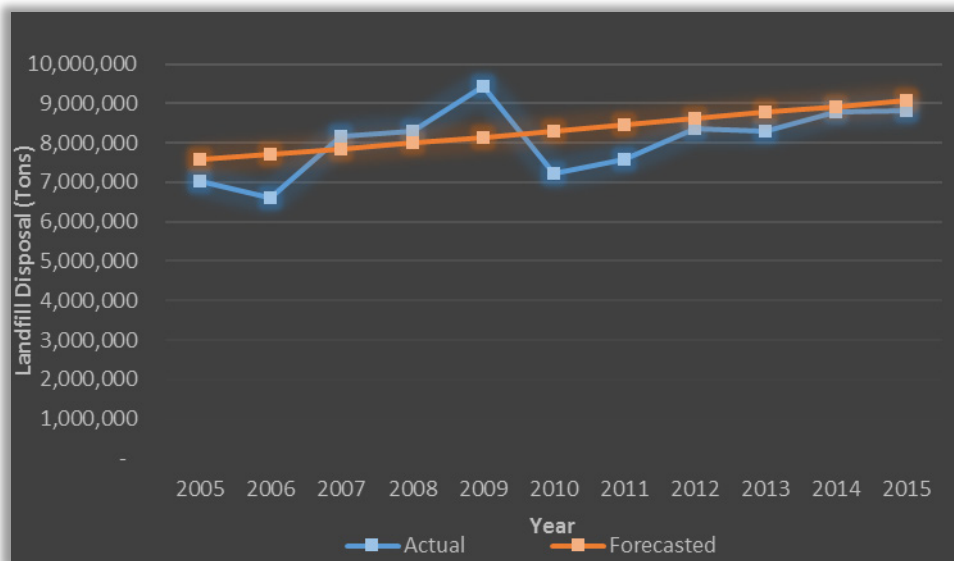


Figure 4-1: Forecasted 2005 Study Tonnage Disposed vs. Actual Annual Tonnage Disposed

Figure 4-1 shows a substantial increase in tonnage in 2009 due to Hurricane Ike, which impacted the H-GAC region in September 2008,²⁵ as well as a major drop in tonnage disposed from 2009 to 2010, which was directly related to the effects of the Great Recession which took place from 2007 to 2009.²⁶ ***The difference in actual tonnage versus forecasted tonnage fluctuates annually, but the cumulative forecasted tonnage was only 3.10% higher than the actual tonnage for the period of 2005 to 2015.*** Actual tonnage for the period above was 88,620,425 tons and the 2005 Study forecasted tonnage for the same period was 91,368,367 tons.

4.1.2 Tonnage Disposed in Type I vs. Type IV Landfills (2008-2015)

Figure 4-2 shows the annual tonnage disposed in Type I and Type IV landfills from 2008 to 2015.²⁷ Total tonnage disposed drops significantly from 2009 to 2010, similar to what was seen in Figure 4-1. Type IV landfill tonnage, had a significant decrease, dropping 46% from 2009 to 2010. While it has recovered somewhat since that precipitous drop, no doubt related to the Great Recession, total Type IV landfill tonnage has yet to return to values seen prior to the Great Recession.

²⁵ Hurricane Ike impacted the Houston area during September 2008:

<http://www.nhc.noaa.gov/outreach/history/#ike>

²⁶ National Bureau of Economic Research states the Great Recession occurred December 2007 - June 2009.

²⁷ Tonnage data provided annually in the TCEQ “Municipal Solid Waste in Texas: A Year in Review” for 2008 through 2015.

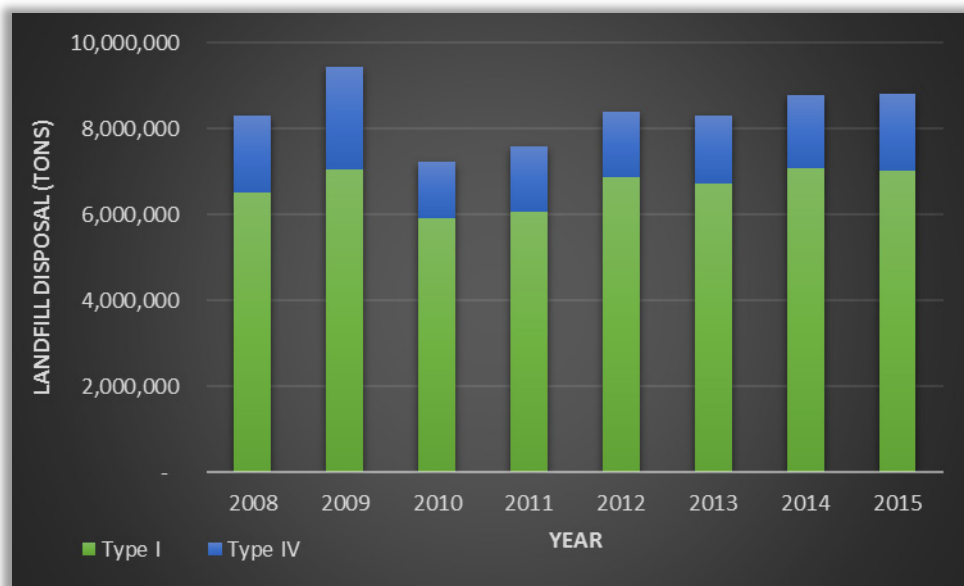


Figure 4-2: Tonnage Disposed in Type I vs. Type IV Landfills (2008-2015)

Table 4-1 shows the percentage of the total tonnage in the H-GAC region that is disposed in the two different types of landfills (Type I and IV). C&D waste is a significant component of the total waste stream in the region and it can be seen in the high percentage of total waste disposed in Type IV landfills. C&D waste is examined in greater detail later in this section of the report. Type IV disposal as a percentage of total disposal in the region, peaked at just over 25% in 2009 (due in part to Hurricane Ike) before dropping significantly in 2010 (again, due to the Great Recession). On average, Type IV tonnage makes up approximately 20% of the total tonnage disposed within the H-GAC region since 2008.

Table 4-1
Breakdown of Total Waste Landfilled in the H-GAC Region

	2008	2009	2010	2011	2012	2013	2014	2015
Type I	78.57%	74.76%	82.18%	80.03%	82.01%	81.09%	80.74%	79.50%
Type IV	21.43%	25.24%	17.82%	19.97%	17.99%	18.91%	19.26%	20.50%

4.1.3 Subregion Analysis

H-GAC divides its 13-county region into eight subregions. These subregions are listed below in Table 4-2.

Table 4-2
H-GAC Subregions

Subregion	Counties
Subregion 1	Montgomery, Walker
Subregion 2	Chambers, Liberty
Subregion 3	Galveston
Subregion 4	Brazoria

**Table 4-2
H-GAC Subregions**

Subregion 5	Colorado, Matagorda, Wharton
Subregion 6	Austin, Waller
Subregion 7	Fort Bend
Subregion 8	Harris

NewGen examined the historical distribution of waste disposal by Subregion in Figure 4-3 for 2008 to 2015. As expected, the majority of the disposal occurred in Subregion 8 (Harris County), where more than half of the active landfills in the H-GAC Region are located. Tonnage distribution among the eight subregions remained relatively constant from 2008 to 2015, with a decrease seen in Subregions 3 and 4. The decrease in tonnage in Subregion 3 can be associated with the North County Landfill in Galveston County. The North County Landfill reported 334,131 tons disposed in 2009 but has averaged only 32 tons per year since 2012.²⁸

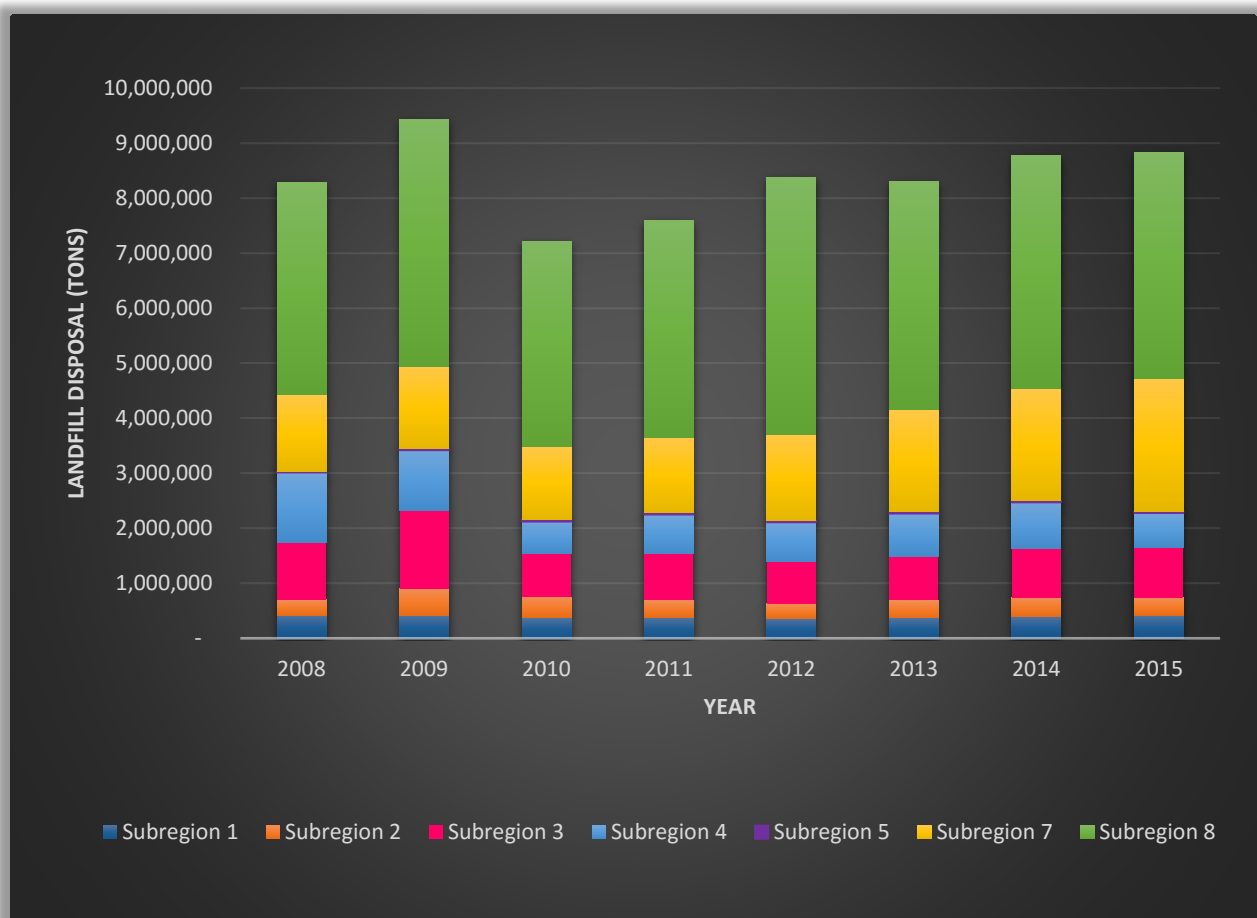


Figure 4-3: Total Tonnage Landfilled by Subregion*

**Subregion 6 has no current landfills and has been omitted from the Subregional charts.*

²⁸ The North County Landfill was utilized during 2009 for debris related to Hurricane Ike.

Figure 4-4 and Figure 4-5 show a subregion analysis for Type I and Type IV landfills, respectively.

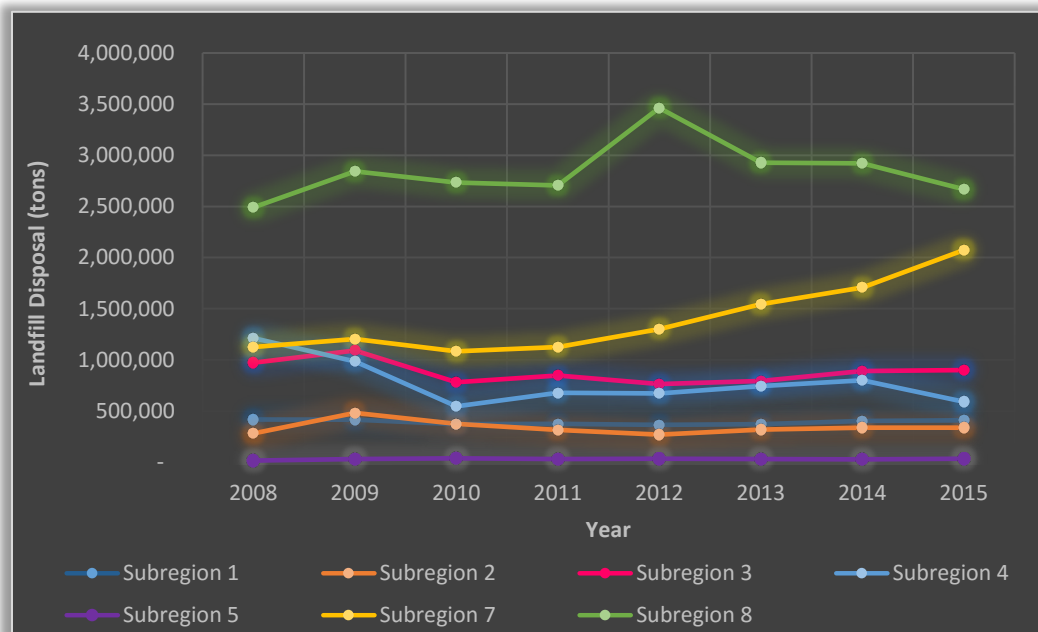


Figure 4-4: Type I Tonnage Landfilled by Subregion*

*Subregion 6 has no current landfills and has been omitted from the Subregional charts.

Figure 4-4 shows the annual tonnage disposed by subregion and highlights the drop in disposal at all Type I landfills from 2009 to 2010. Since 2010, Subregion 7 has seen the most growth in tonnage disposed in Type I landfills.

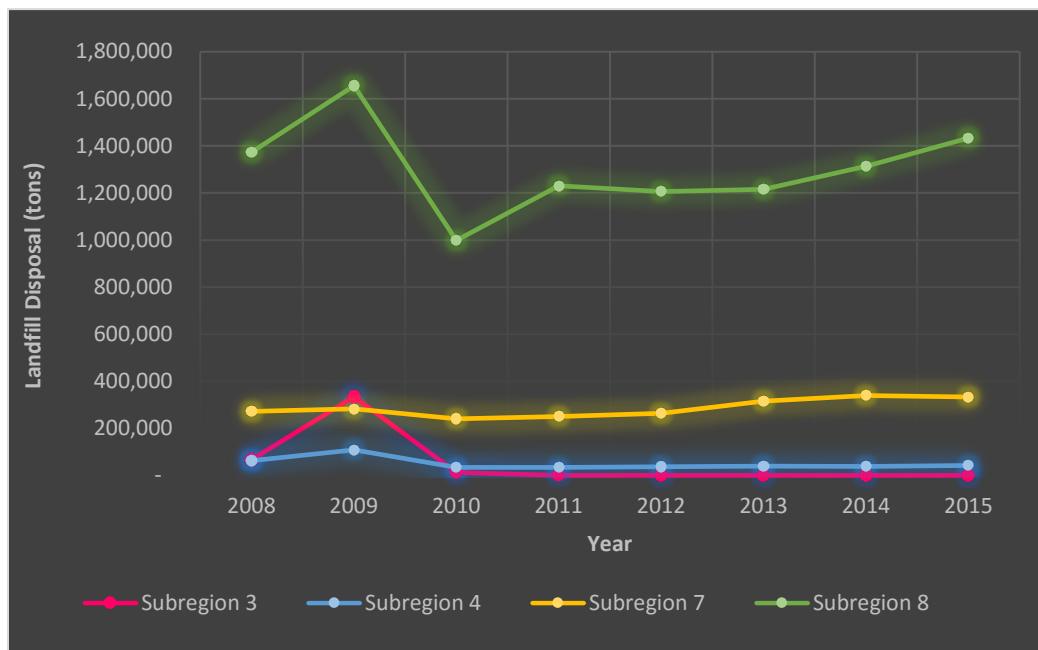


Figure 4-5: Type IV Tonnage Landfilled by Subregion*

*Chart only shows Type IV landfills that accepted material from 2008-2015.

Figure 4-5 shows that the majority of Type IV tonnage disposal occurs in Subregion 8 (Harris County), not surprising given that eleven of the total fourteen Type IV landfills are located in Subregion 8. Since 2008, 77% of total Type IV tonnage has been disposed in Subregion 8. As mentioned above, the North County Landfill, the only Type IV facility in Subregion 3, has seen a significant decrease in annual disposal since 2009.²⁹

4.2 2015 Detailed Waste Stream Analysis

Figure 4-6 shows the breakdown of total tons disposed in Type I and Type IV landfills in H-GAC in 2015 by subregion.³⁰ As expected, Subregion 8 accounts for the most disposal of any of the subregions in 2015.

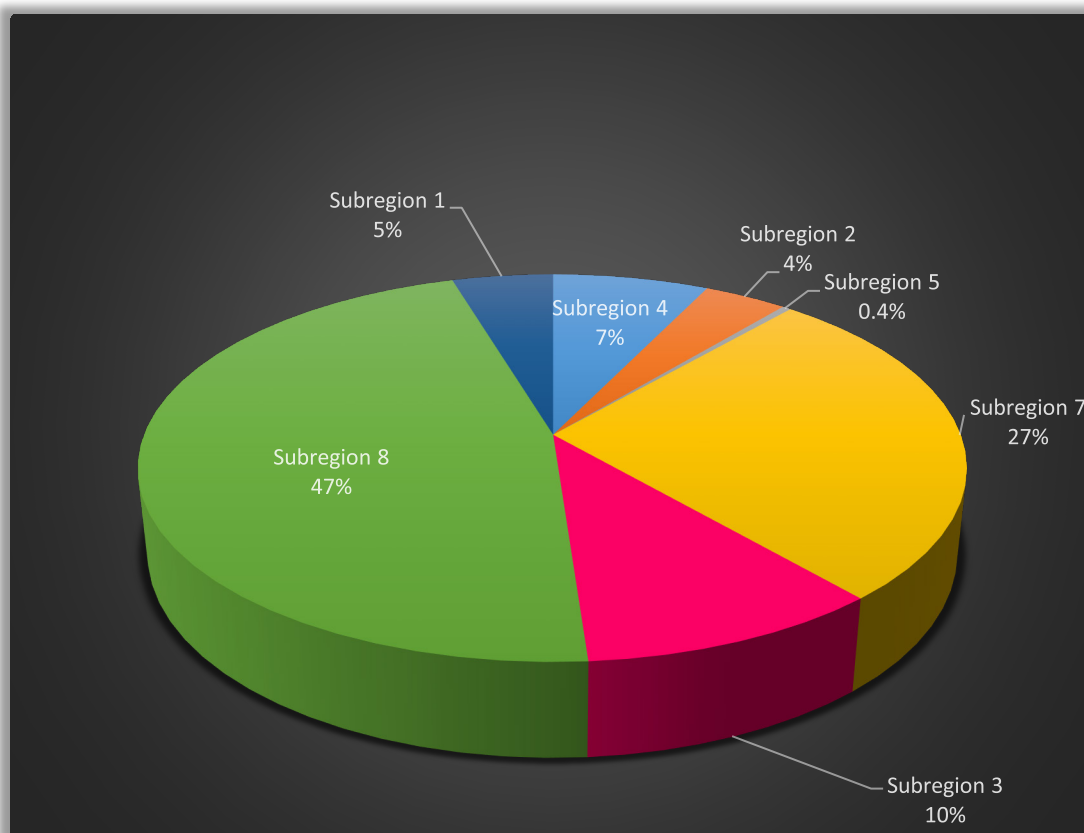


Figure 4-6: Where Waste is Disposed in the H-GAC Region

Figure 4-7 shows the composition of the waste stream disposed in Type I and Type IV landfills in the H-GAC region for FY 2105.³¹ MSW composed the majority of the waste at 59% but construction and

²⁹ The North County Landfill was utilized during 2009 for debris related to Hurricane Ike.

³⁰ Tonnage data provided in the TCEQ “Municipal Solid Waste in Texas: A Year in Review” 2015.

³¹ Tonnage data provided in the TCEQ “Municipal Solid Waste in Texas: A Year in Review” 2015.

demolition (C&D) waste was the second largest waste type disposed in the H-GAC region at 24%.³² C&D waste in the H-GAC region accounts for 33% of the total C&D waste disposed in landfills in Texas in 2015.³³

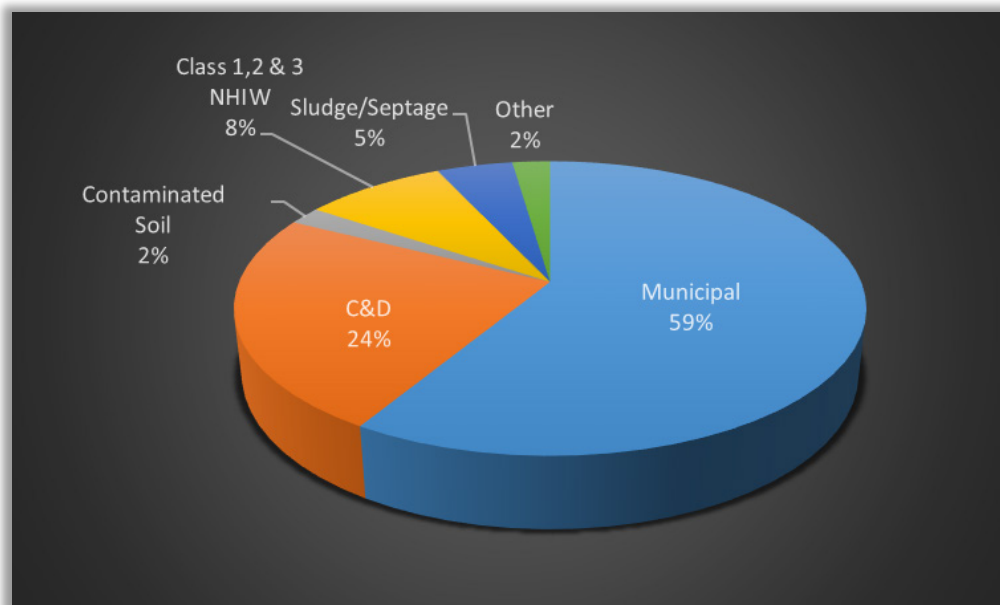


Figure 4-7: FY 2015 Waste Stream Composition

4.2.1 Type I Landfill Tonnage

Figures 4-8 and 4-9 show where waste is landfilled by subregion as well as the composition of the waste stream, exclusively for Type I landfills.

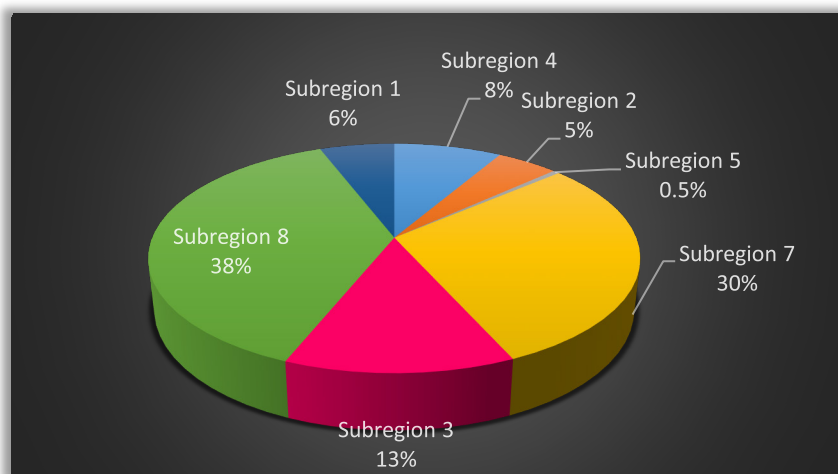


Figure 4-8: Type I Waste Disposed by Subregion for 2015

³² 2,102,010 tons of C&D waste disposed in Type I & Type IV landfills / 8,820,636 total tons disposed in H-GAC landfills in FY 2015 = 23.83%.

³³ 2,102,010 tons of C&D waste disposed in H-GAC in 2015 / 6,410,338 tons of C&D waste disposed in Texas in 2015 = 32.79%

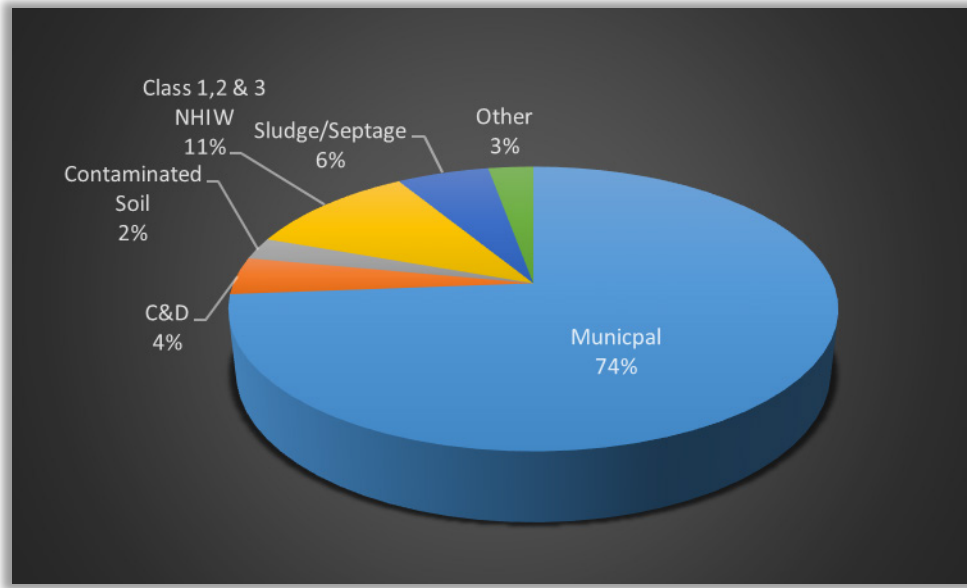


Figure 4-9: Type I Waste Composition for 2015

4.2.2 Type IV Landfill Tonnage

Figure 4-10 and Figure 4-11 show where waste is landfilled by subregion as well as the composition of the waste stream, exclusively for Type IV landfills.

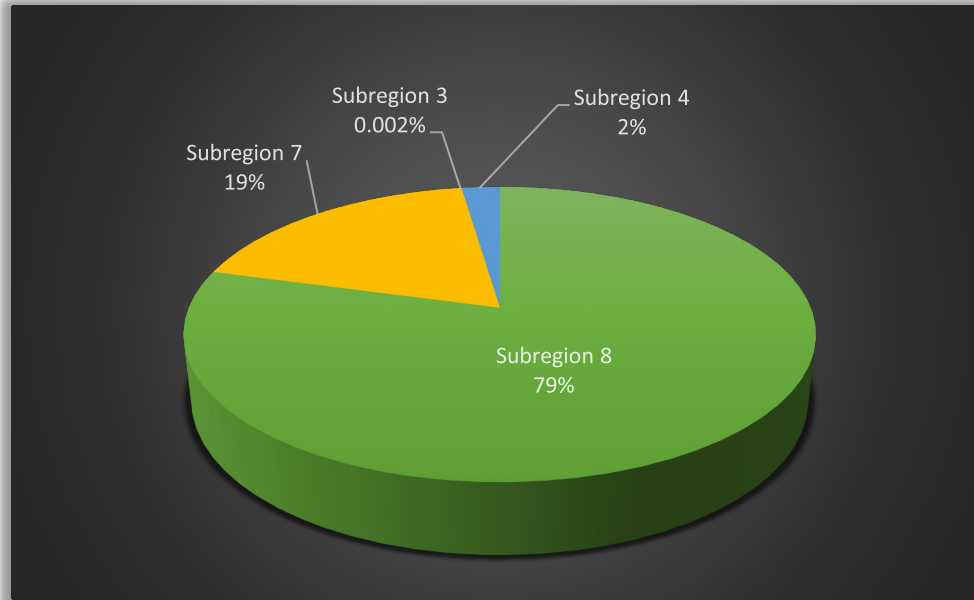


Figure 4-10: Type IV Disposal by Subregion

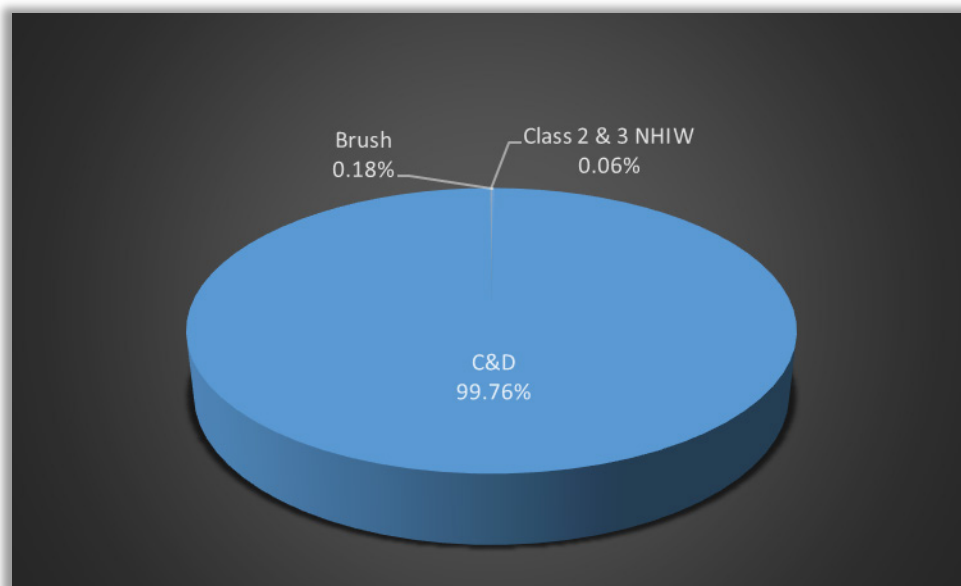


Figure 4-11: Type IV Waste Composition

4.3 Forecasted Landfill Disposal Capacity (2017-2036)

NewGen analyzed the available landfill capacity of the region for the next 20 years. By comparing the landfill disposal capacity over the next 20 years with the projected MSW disposal needs, NewGen can provide valuable information to H-GAC for solid waste management planning. As mentioned earlier in this report, TCEQ requires landfills in Texas to complete an annual questionnaire that TCEQ compiles into an annual report. Table 4-3 lists the landfills in the region, the remaining capacity at the end of FY 2015 and any permitted or pending landfill expansions that have occurred since August 31, 2015.³⁴ The forecast of remaining landfill capacity included in this report for the H-GAC region, **does not** incorporate any assumptions for the use of airspace consumed by daily cover materials.

NewGen would note that the forecasts and associated analyses were completed prior to Hurricane Harvey making landfall in Texas during late August 2017.

Table 4-3
Remaining Landfill Capacity

Permit	Type	County	Permittee/ Registrant	2015 Remaining Capacity		Expansions (tons)	2015 Remaining Capacity with Expansions (tons) ¹
				Cubic Yards	Tons		
1539A	1	Brazoria	Seabreeze LF	24,107,207	21,588,004	-	21,588,004
1502A	1	Chambers	Chambers County LF	17,625,309	10,575,185	-	10,575,185
1535B	1	Chambers	Baytown LF	9,524,792	6,286,363	-	6,286,363
203A	1	Colorado	Altair LF	682,901	409,741	-	409,741
1505A	1	Fort Bend	Blue Ridge LF		92,295,945	-	92,295,945
2270	1	Fort Bend	Fort Bend LF	146,734,412	33,640,895	-	33,640,895
				38,446,737			

³⁴ State fiscal year 2015 was from September 1, 2014 to August 31, 2015.

Section 4

Permit	Type	County	Permittee/ Registrant	2015 Remaining Capacity		Expansions (tons)	2015 Remaining Capacity with Expansions (tons) ¹
				Cubic Yards	Tons		
1149B	1	Galveston	Galveston County LF ²	15,868,808	10,655,905	18,580,258	29,236,163
1721A	1	Galveston	Coastal Plains RDF	12,994,698	10,395,758	-	10,395,758
261B	1	Harris	McCarty Road LF	23,714,739	26,252,216	-	26,252,216
1193	1	Harris	Whispering Pines LF	10,902,343	10,902,343	-	10,902,343
1307D	1	Harris	Atascocita RDF	41,325,341	31,820,513	-	31,820,513
1752B	1	Montgomery	Security Landfill RDF	13,591,254	9,649,790	-	9,649,790
TYPE I SUBTOTAL				355,518,541	264,472,658	18,580,258	283,052,916
1708	4	Brazoria	Dixie Farm Road LF	2,079,645	915,044	-	915,044
1797A	4	Fort Bend	Sprint Fort Bend LF	14,908,965	7,245,757	-	7,245,757
1849B	4	Galveston	North County LF	3,689,442	3,929,256	-	3,929,256
1301	4	Harris	Addicks Fairbanks LF	470,444	319,902	-	319,902
1403	4	Harris	Casco LF	1,621,642	729,739	-	729,739
1540A	4	Harris	Greenshadows LF	2,807,774	2,498,919	-	2,498,919
1565B	4	Harris	Fairbanks LF ³	50,080	41,316	14,755,950	14,797,266
1586A	4	Harris	WCT Greenbelt LF	3,341,565	2,506,174	-	2,506,174
1599B	4	Harris	Greenhouse Road LF ⁴	5,924,756	2,962,378	3,536,500	6,498,878
1921A	4	Harris	Cougar LF	69,396	57,252	-	57,252
2185	4	Harris	Hawthorn Park LF	201,024	136,696	-	136,696
2240B	4	Harris	Ralston Road LF ⁵	768,062	576,047	758,334	1,334,381
2304	4	Harris	Tall Pines LF ⁶	2,707,956	2,030,967	11,332,824	13,363,791
2344	4	Harris	Lone Star RDF	12,273,118	7,977,527	-	7,977,527
2324	4	Montgomery	Sprint Montgomery County LF ⁷	40,260,000	28,182,000	-	28,182,000
TYPE IV SUBTOTAL				91,173,869	60,108,974	30,383,608	90,492,582
TOTAL				446,692,410	324,581,632	48,963,866	373,545,498

1 This column shows capacity (permitted and pending) as of 2015, assuming all expansions occur.

2 Galveston County Landfill expansion permitted December 2015, remaining capacity at FYE 2016 = 28,878,670 tons, with 357,493 tons disposed during FY 2016. FY 2015 Remaining Capacity with Expansion = 28,878,670 + 357,493 = 29,236,163 tons. Expansion Tons = 29,236,163 - 10,655,905 = 18,580,258 tons.

3 Fairbanks Landfill expansion permitted February 2016, expansion included an additional 17,886,000 cubic yards of disposal capacity. Fairbanks Expansion Tons = (17,886,000 / 2,000) x 1,650 estimated compaction rate = 14,755,950 tons.

4 Greenhouse Road Landfill expansion is pending, expansion would include an additional 7,073,000 cubic yards of disposal capacity. Greenhouse Road Expansion Tons = (7,073,000 / 2,000) X 1,000 estimated compaction rate = 3,536,500 tons.

5 Ralston Road Landfill expansion permitted March 2017, expansion included an additional 1,011,112 cubic yards of disposal capacity. Ralston Road Expansion Tons = (1,011,112 / 2,000) x 1,500 estimated compaction rate = 758,334 tons.

6 Tall Pines Landfill expansion is pending, expansion would include an additional 15,110,432 cubic yards of disposal capacity. Tall Pines Expansion Tons = (15,110,432 / 2,000) x 1,500 estimated compaction rate = 11,332,824 tons.

7 Originally permitted in 2011, previously named Montgomery Landfill Solutions Type IV Landfill and was renamed the Sprint Montgomery County Landfill in March 2015 with a transfer of ownership. Sprint Montgomery County Landfill remaining tons = (40,260,000 / 2,000) X 1,400 estimated compaction rate = 28,182,000 tons.

The H-GAC region currently has 324,581,632 tons of remaining disposal capacity permitted.³⁵ If both Greenhouse Road Landfill and Tall Pines Landfill are able to secure permits for expansion, the H-GAC region will have 373,545,498 tons of remaining disposal capacity. Additionally, Waste Management has had preliminary discussions about possibly expanding the Hawthorn Park Landfill in the future but capacity and timeline of this expansion are unknown at this time. This expansion is not included in NewGen's analysis but would add additional disposal capacity to the H-GAC region. NewGen contacted other landfill operators about future landfill expansions in the region but no other expansions were

³⁵ 324,581,632 tons of remaining capacity based on data provided from TCEQ for state FY 2015.

reported. Based on this analysis, NewGen was able to examine disposal capacity for the region from 2017 to 2036, inclusive of permitted and pending landfill expansions. For all figures in this section the disposal tonnage is cumulative, for example, 2017 data includes the sum of 2015, 2016 and 2017 tonnage. Figure 4-12 shows the MSW disposal forecasts versus capacity in the H-GAC region through 2036.

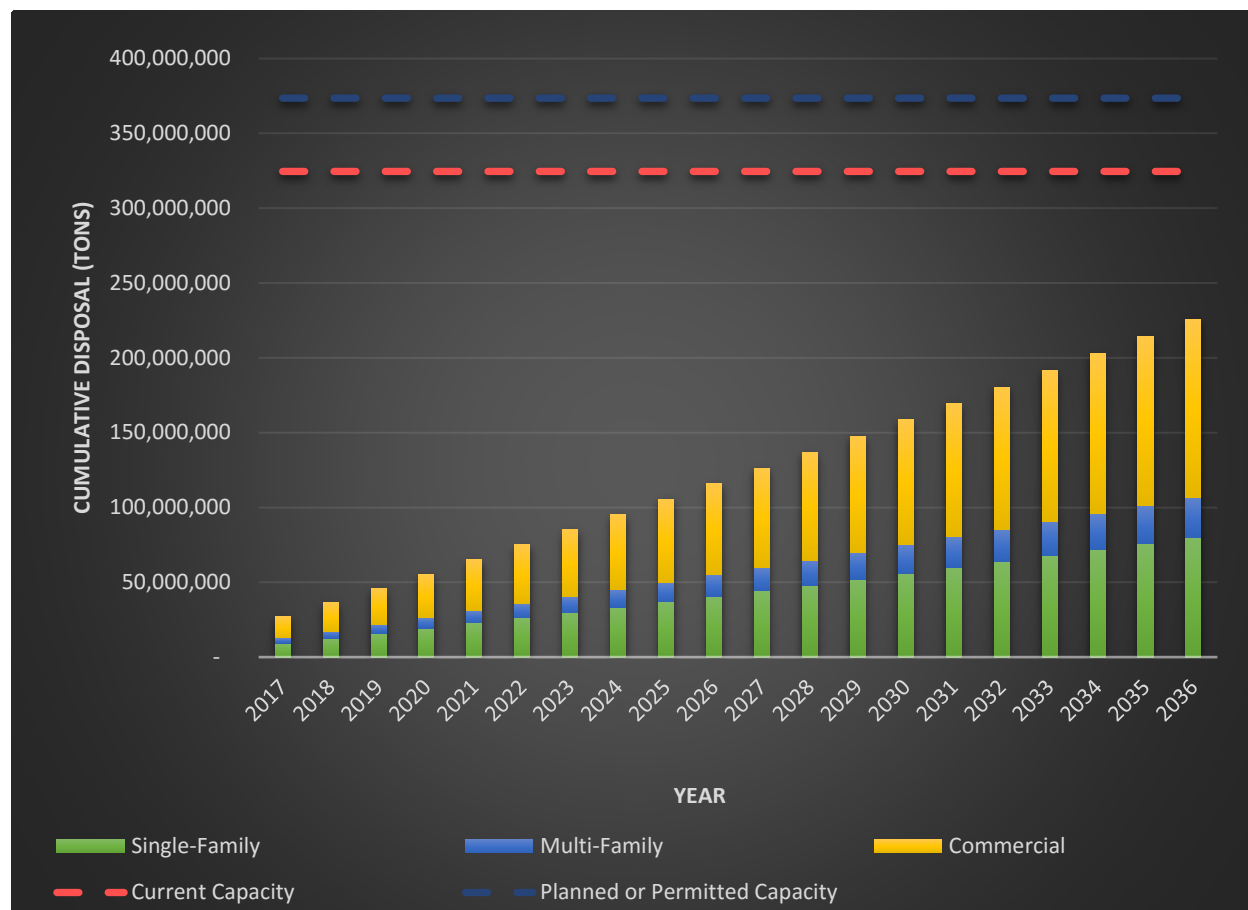


Figure 4-12: MSW Disposal Forecast vs. Disposal Capacity in the H-GAC Region

Based on Figure 4-12, the H-GAC region should have sufficient landfill capacity beyond 2036, regardless of the outcome of the pending permits for Greenhouse Road Landfill and Tall Pines Landfill.

4.3.1 Disposal Capacity by Subregion

4.3.1.1 Subregion 1

Subregion 1 is comprised of Montgomery and Walker Counties. Within those counties there is one Type I landfill, the Security Landfill RDF as well as one Type IV landfill, the Sprint Montgomery County Landfill. As shown in Figure 4-13, Subregion 1 should have sufficient capacity through the forecast period of 2036. It should also be noted that the City of Huntsville transports its waste out of Walker County to the Polk County Landfill in Legget, Texas.

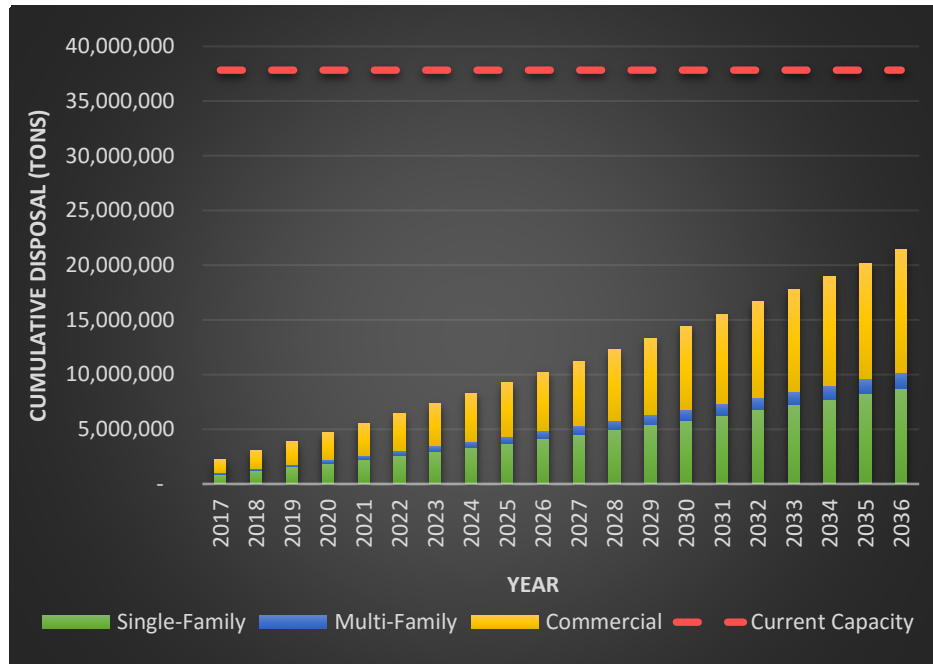


Figure 4-13: Subregion 1 Disposal Forecast vs. Disposal Capacity

4.3.1.2 Subregion 2

Subregion 2 is comprised of Chambers and Liberty Counties. Within those counties there are two Type I landfills, the Chambers County Landfill and Baytown Landfill. Based on Figure 4-14 below, Subregion 2 should have sufficient disposal capacity beyond 2036.

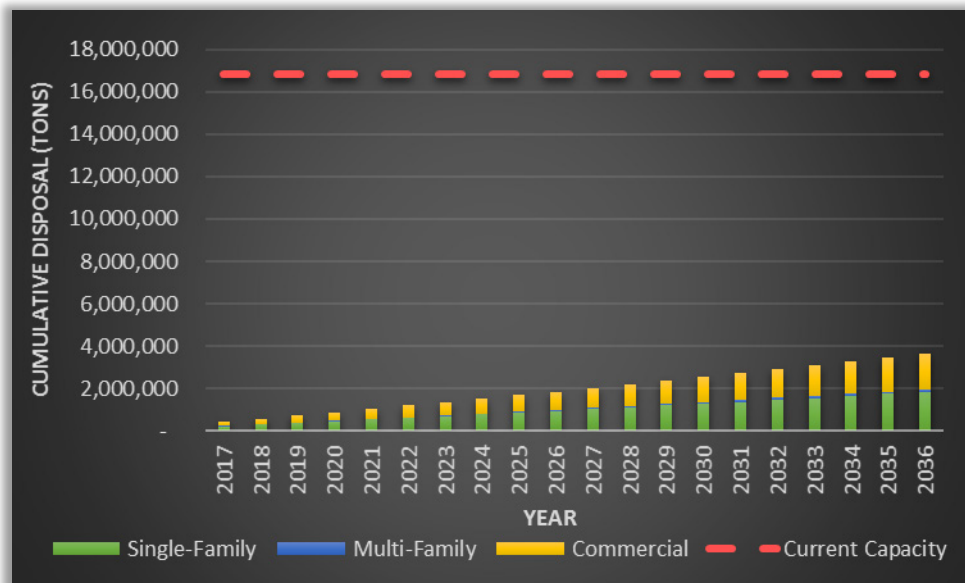


Figure 4-14: Subregion 2 Disposal Forecast vs. Disposal Capacity

4.3.1.3 Subregion 3

Subregion 3 is comprised of Galveston County. Within the county there are two Type I landfills, the Galveston County Landfill and Coastal Plains RDF, and one Type IV landfill, the North County Landfill. Based on Figure 4-15 below, Subregion 3 should have sufficient disposal capacity beyond 2036.

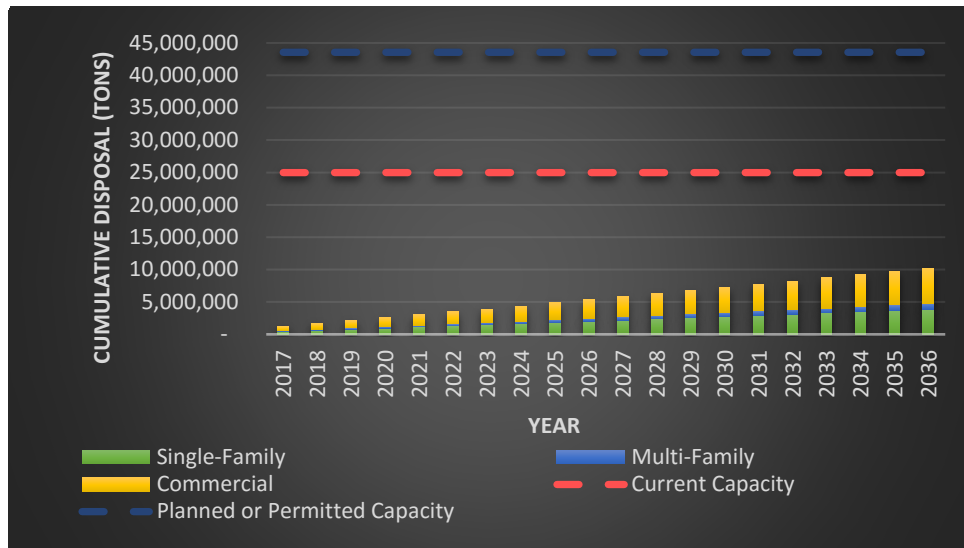


Figure 4-15: Subregion 3 Disposal Forecast vs. Disposal Capacity

4.3.1.4 Subregion 4

Subregion 4 is comprised of Brazoria County. Within the county there is one Type I landfill, the Seabreeze Environmental Landfill, and one Type IV landfill, the Dixie Farm Road Landfill. Based on Figure 4-16 below, Subregion 4 should have sufficient disposal capacity beyond 2036.

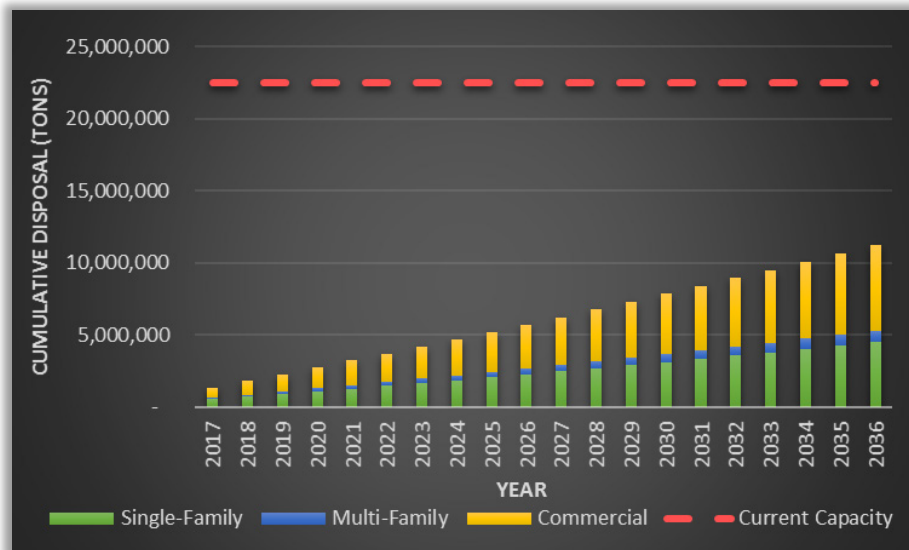


Figure 4-16: Subregion 4 Disposal Forecast vs. Disposal Capacity

4.3.1.5 Subregion 5

Subregion 5 is comprised of Colorado, Matagorda, and Wharton Counties. Within those counties there is one Type I landfill, the Altair Disposal Services Landfill. Based on Figure 4-17 below, Subregion 5 cumulative disposal will surpass current available capacity in 2018. Current capacity for Subregion 5 is 409,741 tons and cumulative disposal for Subregion 5 reaches 526,517 tons in 2018, meaning Subregion 5 will become a net exporter of MSW in 2018.

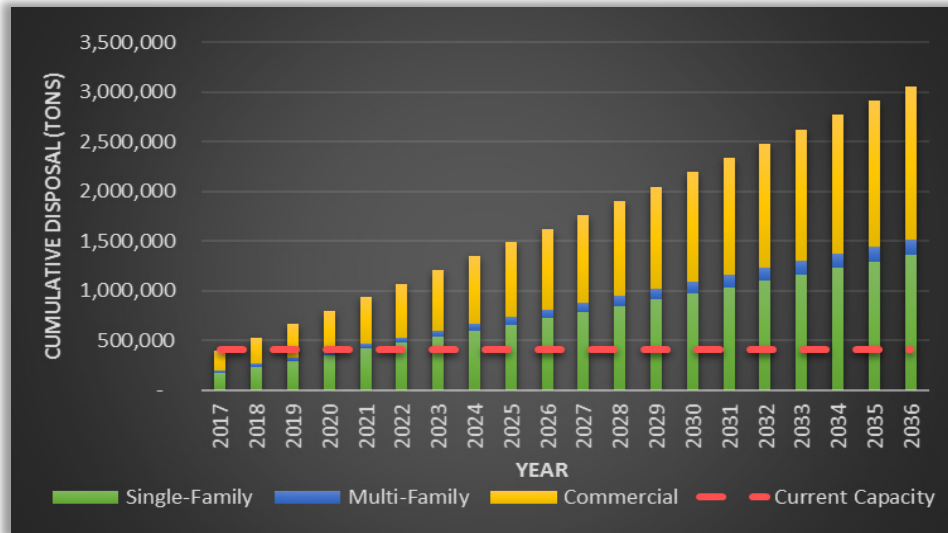


Figure 4-17: Subregion 5 Disposal Forecast vs. Disposal Capacity

4.3.1.6 Subregion 6

Subregion 6 is comprised of Austin and Waller Counties. This subregion contains no active landfills and thus no current disposal capacity. Subregion 6 is a net exporter of waste. Figure 4-18 below shows the disposal forecast for Subregion 6 from 2017 to 2036.

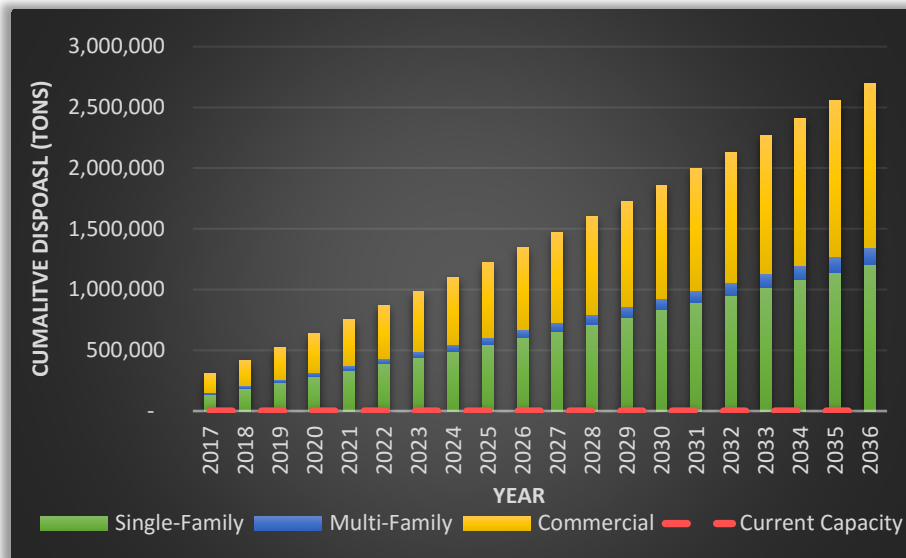


Figure 4-18: Subregion 6 Disposal Forecast vs. Disposal Capacity

4.3.1.7 Subregion 7

Subregion 7 is comprised of Fort Bend County. Within the county there are two Type I landfills, the Blue Ridge Landfill and Fort Bend Regional Landfill, and one Type IV landfill, the Sprint Fort Bend County Landfill. Based on Figure 4-19 below, Subregion 7 should have sufficient disposal capacity beyond 2036.

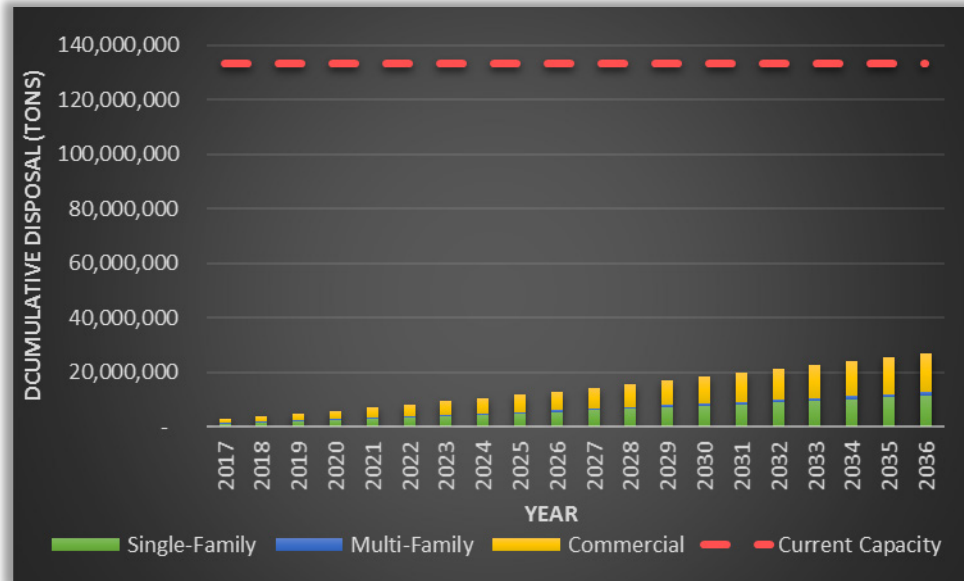


Figure 4-19: Subregion 7 Disposal Forecast vs. Disposal Capacity

4.3.1.8 Subregion 8

Subregion 8 is comprised of Harris County. Within this county there are 14 of the total 26 permitted landfills in the H-GAC Region: three Type I landfills and eleven Type IV landfills. Based on Figure 4-20 below, Subregion 8 cumulative disposal tonnage will exceed current capacity in 2028.

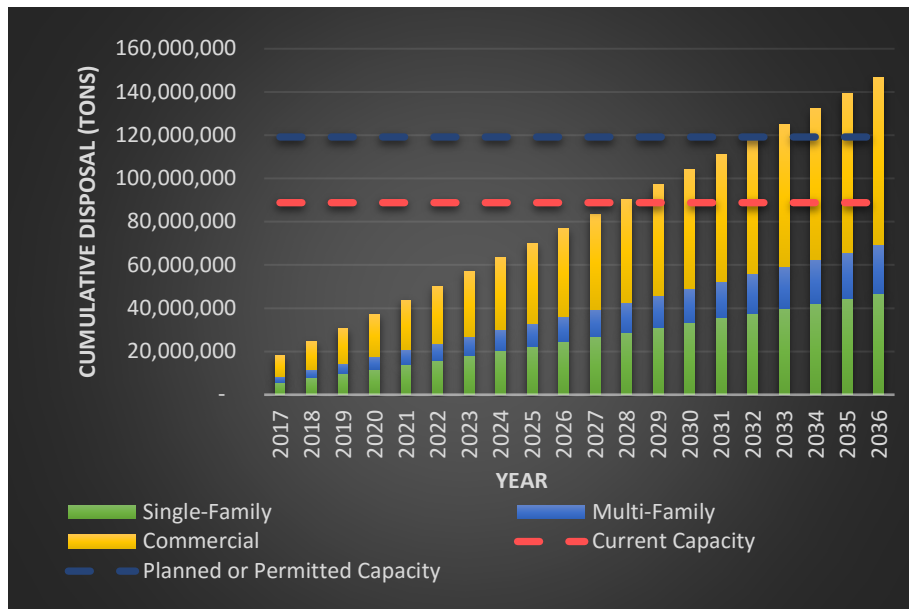


Figure 4-20: Subregion 8 Disposal Forecast vs. Disposal Capacity

4.4 Other Analyses

4.4.1 Per Capita Comparison 2005 Study vs. 2017 Study

NewGen evaluated the change in per capita disposal rates from the time the 2005 Study was completed until the conduct of the 2017 Study. The comparison can be seen below in Table 4-4.

**Table 4-4
Per Capita Comparison**

	2005 Study (tons/capita/year)	2017 Study (tons/capita/year)	% Change	2005 Study (lbs/capita/day)	2017 Study (lbs/capita/day)
Single-Family Garbage	0.7667	0.3885	-49%	4.20	2.13
Single-Family Brush	0.1198	0.0000	-100%	0.66	-
Single-Family Bulky	0.1078	0.2501	132%	0.59	1.37
Per Capita Disposal Rate	0.9934	0.6386	-36%	5.45	3.50
Recycling	N/A	0.0677	N/A	N/A	0.37

NewGen identified several significant trends that support the decrease in per capita disposal rates since the 2005 Study:

- The H-GAC per capita disposal rate has decreased 9% since the 2005 Study, based on TCEQ data.³⁶
- There has been a significant increase in brush/yard waste diversion since the 2005 Study.
- There has been a large increase in recycling programs in communities and increased movement from dual-stream to single-stream recycling programs since the 2005 Study.
- A decrease in packaging content associated with consumer goods (i.e., less plastic in water bottles, soda cans, etc.)

NewGen also evaluated the movement of tonnage between the three categories listed above. Brush diversion has increased significantly with more cities offering dedicated collection routes for brush, yard waste and leaves. In addition, there has been a significant growth in the number of composting and mulching facilities in the H-GAC region.³⁷ NewGen would emphasize that this **does not** mean no brush or yard waste is being disposed in landfills. Cities who still comingle brush waste and bulky waste pick-up or brush/yard waste with residential garbage collection are inevitably disposing of brush and yard waste in landfills across the region. One of NewGen’s recommendations at the end of this report is for the H-GAC to study the type of brush and yard waste collection services being offered by the cities in the H-GAC region, where the material is going to be diverted, etc.

Another reason for believing the 2017 Study data to be more representative of the Single-Family per capita generation rate is that in the 2005 Study, after removing brush from the bulky tonnage, the City of Houston had a bulky per capita rate of approximately 0.23 tons per person, per year, living in single-family residences.³⁸ At the time, this number appeared higher than normal when compared to other benchmarks, and was adjusted downward based on those benchmarks. However, in hindsight, it appears

³⁶ Per capita disposal rate of 7.74 pounds per person per day in 2003 TCEQ “MSW in Texas: A Year in Review” has decreased to 7.08 pounds per person per day in the 2015 edition of the TCEQ report.

³⁷ For instance, Living Earth had approximately six operating sites in the H-GAC region in 2005, as of August 2017 they have 15 sites. New Earth had no sites in the H-GAC region, and now they have two sites – both in rapidly growing areas – Katy and Conroe.

³⁸ 2005 *Regional Solid Waste Characterization Study*, page 4-3.

that the .23 factor in the 2005 Study was consistent with the .2501 factor that was calculated as part of the 2017 Study (see Table 3-6). NewGen would note that it is not only the City of Houston that is “driving” this higher bulky waste per capita rate. There are a number of other communities with a similar rate, and even higher. Based on conversations with various individuals, NewGen believes that one of the factors associated with having a potentially higher single family bulky waste factor is due to the fact that the H-GAC region is in a flood and hurricane prone area that can result in significant storm events that cause an increase in the bulky waste disposal rate. For instance, the storm events in the Houston area in 2015 are reflected in some of the bulky waste volumes provided by the City of Houston for this study.

4.4.2 Transfer Stations in the H-GAC Region

Table 4-5 lists the active transfer stations in the H-GAC region, if they were operational at the time of the 2005 Study, and the tonnage processed through the facilities in FY 2015. Since the 2005 Study, the H-GAC region has added six new transfer stations.

**Table 4-5
Transfer Stations in the H-GAC Region**

Permit	County	Permittee/ Registrant	Active in 2005 Study?	2015 Tonnage
40191	Austin	Country Waste	Y	7,959
2106	Colorado	City of Weimar TS	Y	35,889
40264	Fort Bend	Stericycle	N	2,801
164	Galveston	City of Galveston	Y	90,164
1355A	Harris	Ruffino Hills TS	N	422,691
1471	Harris	Sam Houston Recycling Center	Y	169,183
1483A	Harris	Koenig Street TS	Y	157,777
1578	Harris	Hardy Road TS	Y	405,600
1697	Harris	City of Deer Park	Y	16,092
40098	Harris	BFI Waste Services of Texas	Y	- (1)
40131	Harris	Houston Southeast TS	Y	219,022
40132	Harris	Houston Southwest TS	Y	292,856
40133	Harris	Houston Northwest TS	Y	226,364
40189	Harris	Egbert Type V TS	Y	56,282
40211	Harris	Sprint Recycling Center Northeast	N	128,800
40217	Harris	Tanner Road Facility	N	54,961
40236	Harris	Excell Disposal Waste Containers	N	17,516
40249	Harris	Lone Star Recycling & Disposal	N	199,983
40028	Matagorda	Matagorda County	Y	5,462
40056	Walker	City of Huntsville TS	Y	39,512
40014	Waller	City of Hempstead TS	Y	127
40282	Colorado	City of Weimar TS (New)	N	(2)
2387	Walker	City of Huntsville TS (New)	N	(2)
TOTAL TONS TRANSFERRED				2,549,040

1 The BFI Waste Services of Texas landfill is still active per TCEQ records.
 2 Will replace/expand existing facilities on the list.

Figure 4-21 shows the breakdown of where the tons are being transferred from, on a subregional level.

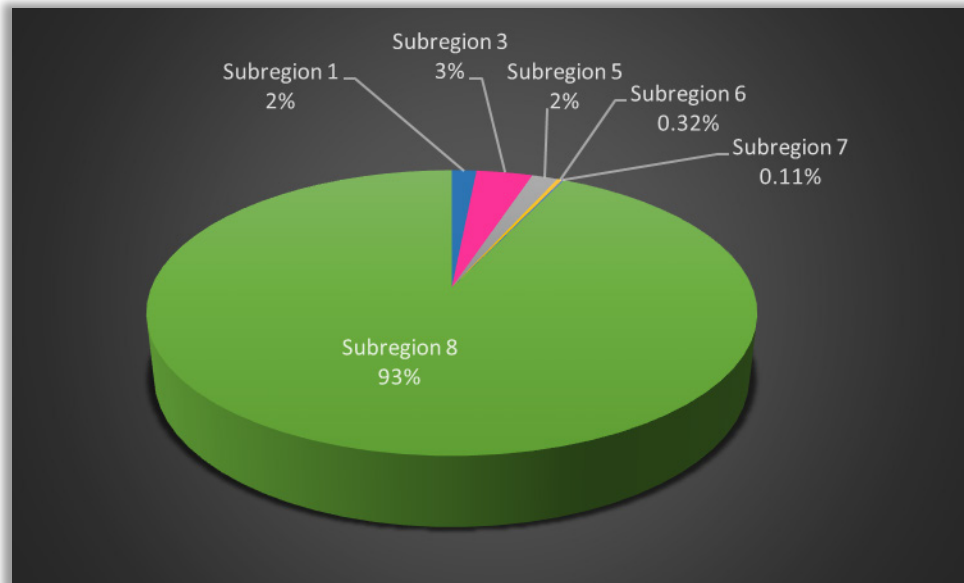


Figure 4-21: Transfer Station Tonnage by Subregion

4.4.3 Recycling and Diversion in the H-GAC Region

Figure 4-22 examines the recycling and diversion rates for the 14 surveyed cities. The average recycling rate of the surveyed cities was 13%, with two cities (Sugar Land and The Woodlands) greater than 20%. The average diversion rate of the surveyed cities was 19%, with the four highest cities diverting between 32% - 37% of material.³⁹ If a city has no brush/yard waste diversion, the recycling rate is equal to the diversion rate.

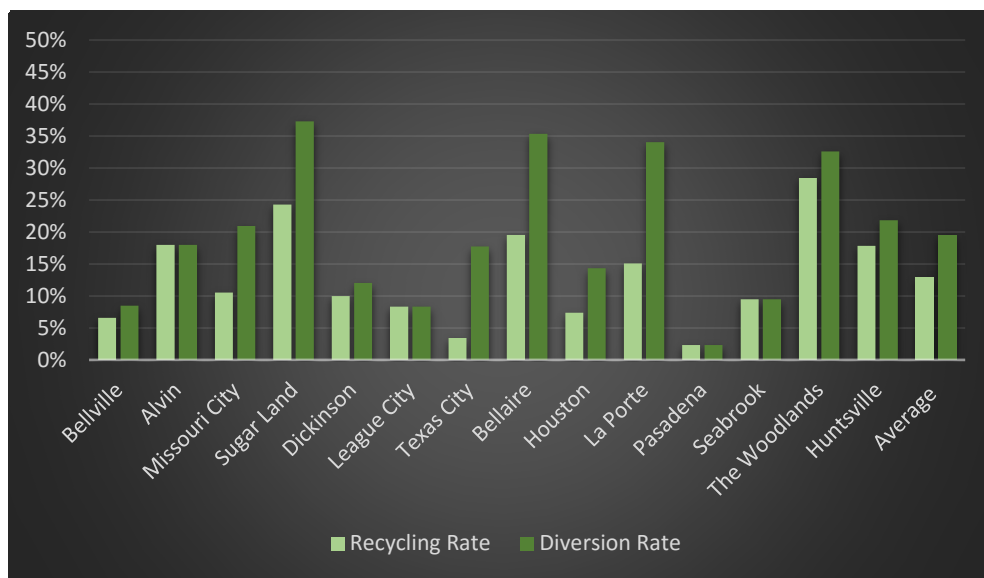


Figure 4-22: Recycling and Diversion Rates of Surveyed Cities

³⁹ Diversion rate is defined as the recycling rate plus the diversion of brush/yard waste.

4.4.4 County Analyses

NewGen attempted to gather data from some of the counties within the H-GAC region to conduct a comparison between rural and urban generation and disposal rates. However, due to the limited responses and lack of data provided by those counties that did respond, NewGen was unable to complete any analysis on this topical area of interest.

4.4.5 Growth in Mulch and Composting Facilities

One of the biggest changes identified by NewGen during the course of this study was the significant increase in the number of mulch and composting facilities, as well as the increase in volume of materials that are being diverted with regard to brush and yard waste. During the course of this study NewGen visited with individuals from Living Earth, New Earth and Nature's Way. They were willing to share information concerning their current facilities and the growth they have realized since the time of the 2005 Study. Listed below are some of the findings:

- **Living Earth** – at the time of the 2005 Study they had approximately six sites in operation within the H-GAC region. As of the 2017 Study they now have 15 active sites within the H-GAC region. It is estimated that conservatively, their volumes have more than doubled (more likely tripled) during this time frame, and it is estimated that the current sites collectively are operating at 70% of capacity. This means there is significant opportunity for municipalities throughout the H-GAC region to either start, or continue, to grow their current brush/yard waste diversion programs.
- **New Earth** – since the time of the 2005 Study, when they had no sites, they have now opened two sites. Their Conroe facility became operational in January 2008 and their Katy site became operational in March 2016. Both sites are allowed to accept biosolids, organic waste (i.e. food waste) and green waste (brush, grass trimmings, leaves, etc.). With regard to the Katy site they are allowed to accept up to 350,000 tons of green waste, annually, and approximately 250,000 tons of green waste at their Conroe facility, annually. The Katy site is still “ramping up” and is only at 10-15% of overall capacity, while the Conroe site is at approximately 65% of capacity and is continually looking for more material.
- **Nature's Way** – has been in operation for approximately 23 years, approximately 15 years at their current site in Conroe. Between their current excess capacity, and additional adjoining property that they have not yet developed, they could double their capacity.

There are other mulching and composting facilities within the H-GAC region as well, but these conversations with some of the larger mulch and composting operators is representative of the growth occurring within this market. Based on NewGen's analysis, and these conversations, we would continue to emphasize the importance of cities growing their brush/yard waste diversion programs in the most cost effective manner, whenever possible. As a point of reference, the 14 cities surveyed for the 2017 Study reported, collectively, 81,120 tons of brush/yard waste being diverted in 2016, and this only reflects what those cities or their private collection companies collected from their single family residences.

4.5 H-GAC Planning Region Maps

The following full-page maps for the H-GAC region are located on the following pages:

- | | |
|---------------------------------|--------------------------------|
| ■ Type I and Type IV Landfills | ■ Composters |
| ■ Transfer Stations | ■ Material Recovery Facilities |
| ■ Citizens' Collection Stations | |

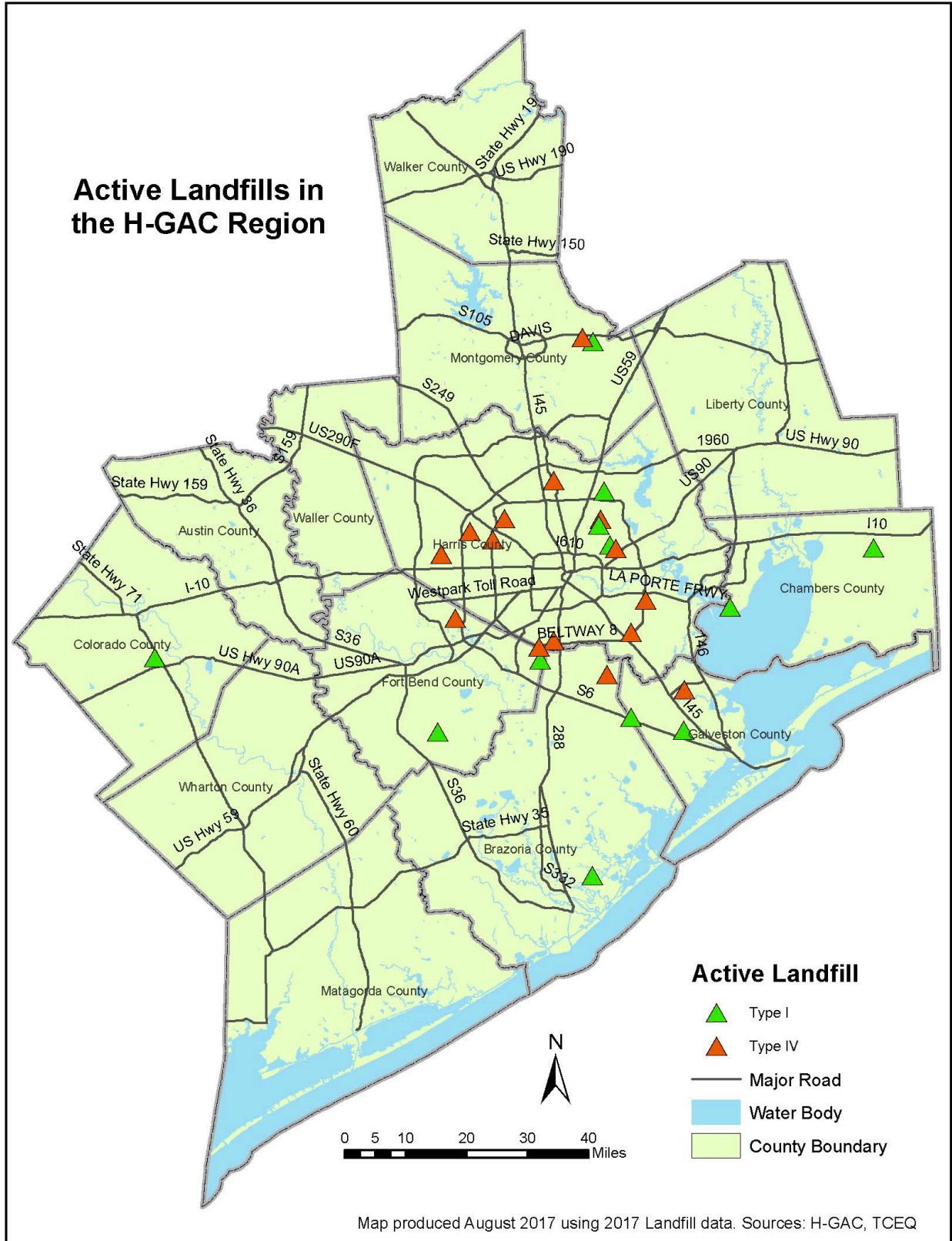


Figure 4-23: Active Landfills in the H-GAC Region

**Table 4-6
Listing of Active Landfills in the H-GAC Region**

Site Name	Site ID	Type	Address	City
ALTAIR DISPOSAL SERVICES LLC LANDFILL	203A	1	5464 HWY 71	ALTAIR
BAYTOWN LANDFILL FACILITY	1535B	1	4791 TRI CITY BEACH RD	BAYTOWN
BLUE RIDGE LANDFILL	1505A	1	2200 FM 521 RD	FRESNO
CHAMBERS COUNTY LANDFILL	1502A	1	7501 HIGHWAY 65	MONROE CITY
COASTAL PLAINS RECYCLING AND LANDFILL FACILITY	1721A	1	21000 E HIGHWAY 6	ALVIN
FORT BEND REGIONAL LANDFILL	2270	1	14115 DAVIS ESTATE RD	NEEDVILLE
GALVESTON COUNTY LANDFILL TX LP	1149B	1	3935 AVENUE A	ALTA LOMA
MCCARTY ROAD LANDFILL	261B	1	5757 OATES RD	HOUSTON
SEABREEZE ENVIRONMENTAL LANDFILL	1539A	1	10310 FM 523	ANGLETON
SECURITY RECYCLING AND DISPOSAL FACILITY	1752B	1	19248 HIGHWAY 105	CLEVELAND
WHISPERING PINES LANDFILL	1193	1	8101 LITTLE YORK RD	HOUSTON
WM ATASCOCITA RECYCLING DISPOSAL FACILITY	1307D	1	3623 WILSON RD	HUMBLE
ADDICKS FAIRBANKS LANDFILL	1301	4	6415 ADDICKS FAIRBANKS RD	HOUSTON
CASCO HAULING AND EXCAVATION LANDFILL	1403	4	1306 E ANDERSON RD	HOUSTON
COUGAR LANDFILL	1921A	4	8601 MOUNT HOUSTON RD	HOUSTON
DIXIE FARM ROAD LANDFILL	1708	4	4649 DIXIE FARM RD	PEARLAND
FAIRBANKS LANDFILL	1565B	4	8205 FAIRBANKS N HOUSTON RD	HOUSTON
FORT BEND COUNTY LANDFILL	1797A	4	16007 W BELLFORT ST	SUGAR LAND
GREENHOUSE ROAD LANDFILL	1599B	4	3510 GREENHOUSE RD	HOUSTON
GREENSHADOW LANDFILL	1540A	4	710 JANA LN	PASADENA
HAWTHORNE PARK LANDFILL	2185	4	10550 TANNER RD	HOUSTON
LONE STAR RECYCLING-DISPOSAL	2344	4	4107 S SAM HOUSTON PKWY W	HOUSTON
NORTH COUNTY LANDFILL	1849B	4	2015 WYOMING ST	LEAGUE CITY
RALSTON ROAD LANDFILL	2240B	4	6632 JOHN RALSTON RD	HOUSTON
TALL PINES DISPOSAL FACILITY	2304A	4	18710 E HARDY RD	HOUSTON
WCT/GREENBELT LANDFILL	1586A	4	600 OLD GENOA RED BLUFF RD	HOUSTON
SPRINT MONTGOMERY COUNTY LANDFILL	2324	4	17851 STATE HWY 105 E	CONROE

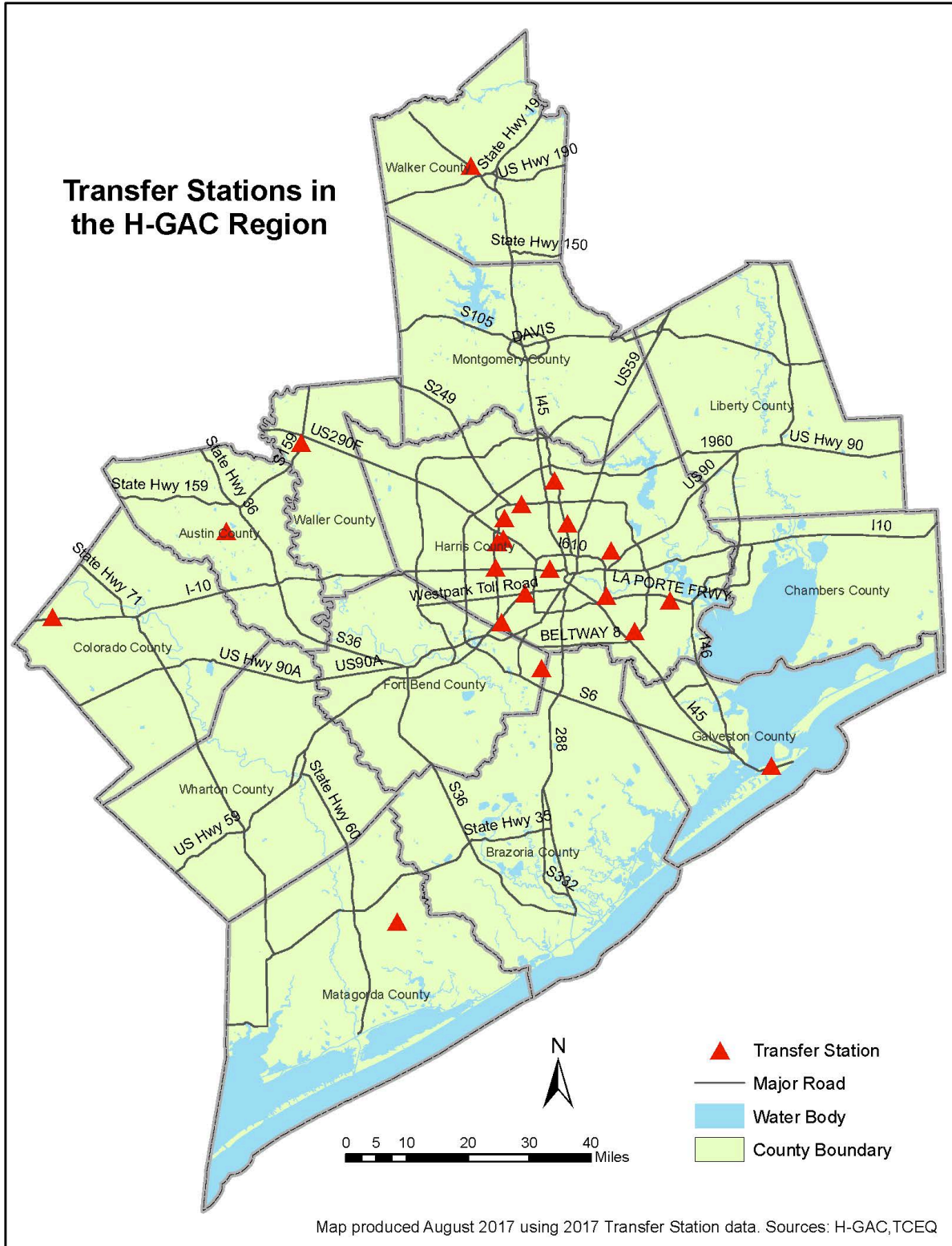


Figure 4-24: Transfer Stations in the H-GAC Region

**Table 4-7
Listing of Transfer Stations in the H-GAC Planning Region**

Site Name	Site ID	Address	City
RUFFINO HILLS TRANSFER STATION	1355A	9720 RUFFINO RD	HOUSTON
SAM HOUSTON RECYCLING CENTER TRANSFER STATION	1471	1138 W BELT DR N	HOUSTON
KOENIG STREET TRANSFER STATION	1483A	550 OLD GENOA RED BLUFF RD	HOUSTON
HARDY ROAD TRANSFER STATION	1578	18784 E HARDY RD	HOUSTON
CITY OF GALVESTON TRANSFER STATION FACILITY	164	5515 PORT INDUSTRIAL BLVD	GALVESTON
CITY OF DEER PARK TRANSFER STATION FACILITY	1697	610 OLD UNDERWOOD RD	DEER PARK
CITY OF HEMPSTEAD TRANSFER STATION FACILITY	40014	1125 AUSTIN ST	HEMPSTEAD
MATAGORDA COUNTY TRANSFER STATION	40028	FM 2540	BAY CITY
CITY OF HUNTSVILLE TRANSFER STATION FACILITY	40056	590 IH 45 N	HUNTSVILLE
HOUSTON RESOURCE RENEWAL COMPLEX TRANSFER STATION FACILITY	40098	5757 OATES RD	HOUSTON
HOUSTON SOUTHEAST TRANSFER STATION FACILITY	40131	9225 LAWDALE ST	HOUSTON
HOUSTON SOUTHWEST TRANSFER STATION FACILITY	40132	5904 WESTPARK DR	HOUSTON
HOUSTON NORTHWEST TRANSFER STATION FACILITY	40133	14400 SOMMERMEYER ST	HOUSTON
EGBERT TRANSFER STATION	40189	5200 EGBERT ST	HOUSTON
COUNTY WASTE INC	40191	7312 PALM RD	SEALY
SPRINT RECYCLING CENTER NORTHEAST	40211	BROOKLYN ST	HOUSTON
TANNER ROAD FACILITY	40217	10415 TANNER RD	HOUSTON
EXCELL TYPE V-TS MSW TRANSFER STATION	40236	8919 PRAIRIE DR	HOUSTON
LONE STAR RECYCLING & DISPOSAL FACILITY	40249	4107 S SAM HOUSTON PKWY W	HOUSTON
STERICYCLE FRESNO	40264	2725C FM 521 RD	FRESNO
CITY OF WEIMAR TRANSFER STATION	40282	801 E CHARLES ST	WEIMAR

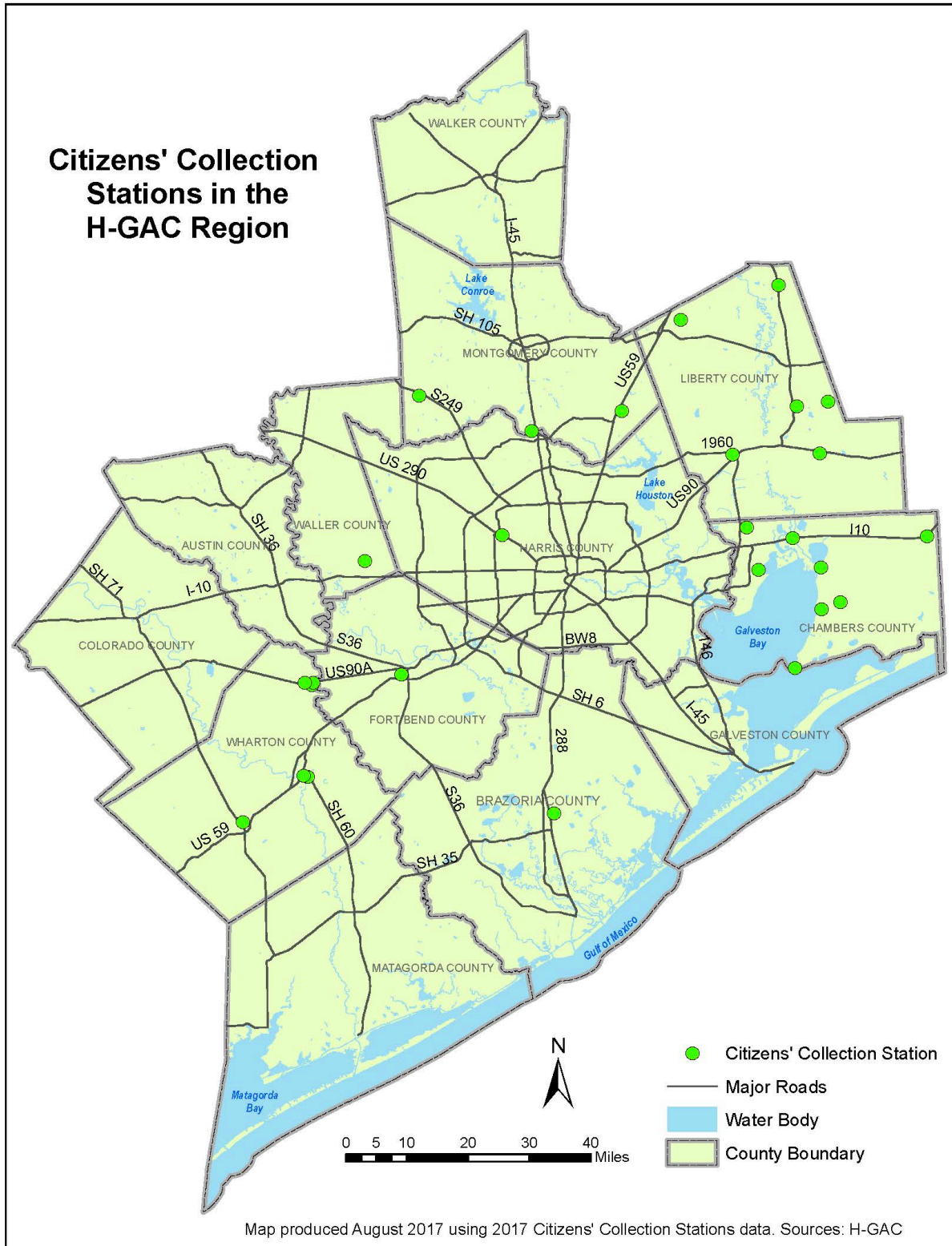


Figure 4-25: Citizens' Collection Stations in the H-GAC Region

Table 4-8
Listing of Citizens' Convenience Centers in the H-GAC Region

Site Name	Address	Phone
BRAZORIA COUNTY ENVIRONMENTAL CENTER	10310 FM 523, ANGLETON, TX	979-864-4409
ANAHUAC CITIZENS' COLLECTION STATION	1811 BELTON LANE, ANAHUAC, TX	409-267-8202
OAK ISLAND CITIZENS' COLLECTION STATION	308 OAK ISLAND ROAD, ANAHUAC, TX	409-267-8202
SMITH POINT CITIZENS' COLLECTION STATION	806 PLUMMER CAMP ROAD, ANAHUAC, TX	409-267-8202
BEACH CITY CITIZENS' COLLECTION STATION	5121 LAWRENCE ROAD, BEACH CITY, TX	409-267-8202
MONT BELVIEU AND OLD RIVER-WINFREE CITIZENS' COLLECTION STATION	10610 EAGLE DRIVE, DAYTON, TX	409-267-8202
DOUBLE BAYOU CITIZENS' COLLECTION STATION	2817 EAGLE FERRY ROAD, DOUBLE BAYOU, TX	409-267-8202
WALLISVILLE CITIZENS' COLLECTION STATION	24138 INTERSTATE 10, WALLISVILLE, TX	409-267-8202
WINNIE AND STOWELL CITIZENS' COLLECTION STATION	47414 INTERSTATE 10, WINNIE, TX	409-267-8202
FORT BEND COUNTY RECYCLING AND ENVIRONMENTAL CENTER	1200 BLUME ROAD, ROSENBERG, TX	281-633-7581
HARRIS COUNTY MULTI USE HHW COLLECTION FACILITY	6900 HAHN ROAD, HOUSTON, TX	281-560-6200
LIBERTY COUNTY PRECINCT 2	367 COUNTY ROAD 2206, CLEVELAND, TX	281-592-3571
PRECINCT 4 BARN	1034 COUNTY ROAD 605, DAYTON, TX	936-258-5202
LIBERTY COUNTY PRECINCT 2 BARN	588 COUNTY ROAD 2010, HARDIN, TX	936-298-2790
HULL CITIZENS' COLLECTION STATION	7981 FM 834 EAST, HULL, TX	936-587-4922
RAYWOOD CITIZENS' COLLECTION STATION	FM 770 SOUTH, RAYWOOD, TX	936-587-4922
SOUTH RYE CITIZENS' COLLECTION STATION	27869 HIGHWAY 146 NORTH, RYE, TX	936-298-2790
MATAGORDA COUNTY TRANSFER STATION	FM 2540, BAY CITY, TX	979-245-4547
MONTGOMERY COUNTY PRECINCT 2	31354 FRIENDSHIP DRIVE, MAGNOLIA, TX	832-934-2193
MONTGOMERY COUNTY PRECINCT 4	23628 ROBERTS ROAD, NEW CANEY, TX	281-577-8919
MONTGOMERY COUNTY PRECINCT 3	1122 PRUITT ROAD, SPRING, TX	281-367-7283
WALLER COUNTY RECYCLE CENTER	32159 MORTON ROAD, BROOKSHIRE, TX	281-391-2009
WHARTON COUNTY PRECINCT 2	606 SOUTH DILL STREET, EAST BERNARD, TX	979-335-7541
WHARTON COUNTY PRECINCT 2	706 MORRIS STREET, EAST BERNARD, TX	979-335-7541
WHARTON COUNTY TRANSFER STATION	17423 NORTH FOUNDATION LOOP, EAST BERNARD, TX	979-335-6159
WHARTON COUNTY PRECINCT 2	605 EAST CALHOUN STREET, EL CAMPO, TX	979-335-7541
WHARTON COUNTY PRECINCT 2	1005 EAST MILAM STREET, WHARTON, TX	979-335-7541
WHARTON COUNTY PRECINCT 2	100 BLOCK OF RESIDENT STREET, WHARTON, TX	979-335-7541

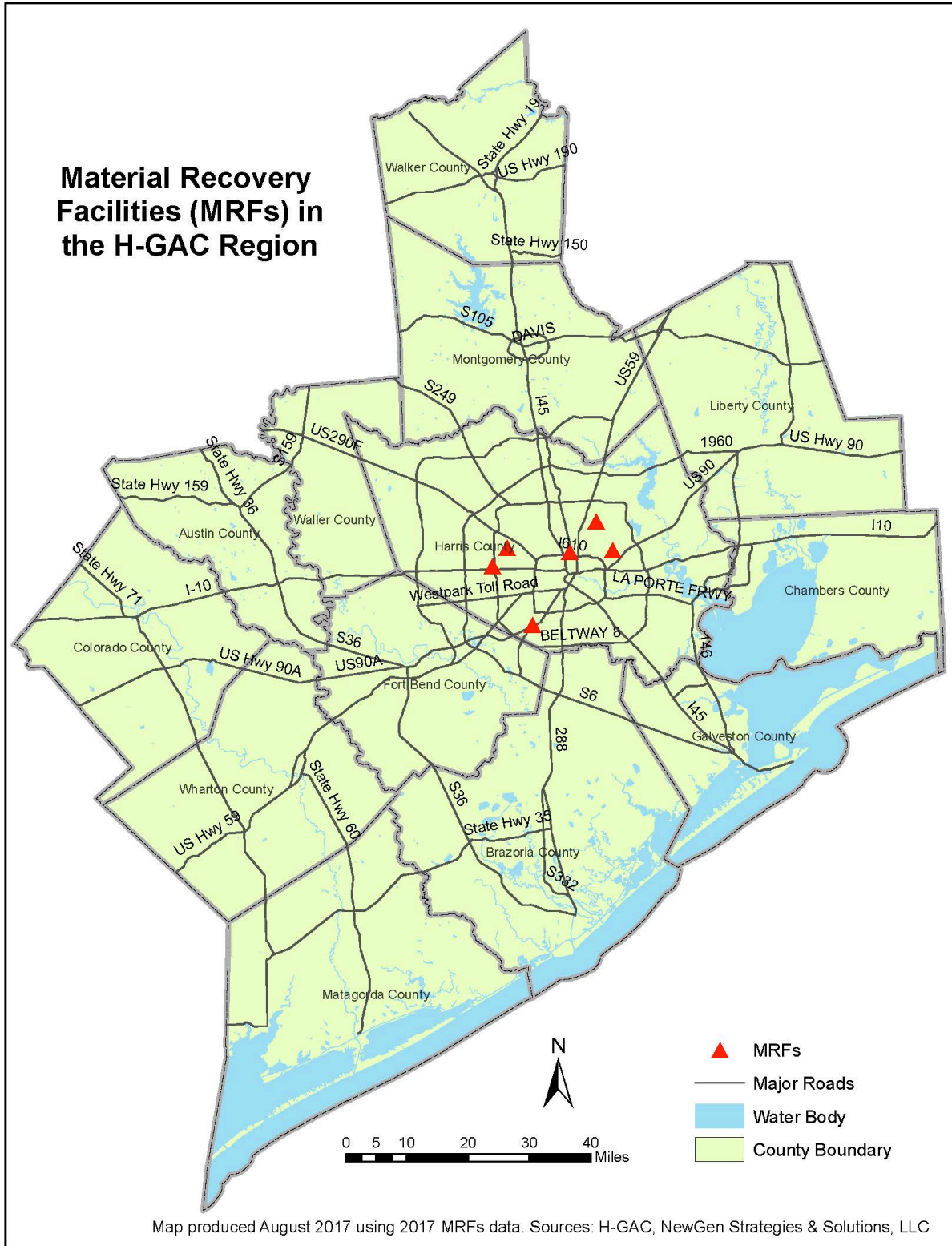


Figure 4-26: Material Recovery Facilities in the H-GAC Region

Table 4-9
Listing of Material Recovery Facilities in the H-GAC Region

Site Name	Address	Phone
GASMER MRF	4939 GASMER DR, HOUSTON, TX	800-772-8653
HOUSTON CLAY ROAD MRF	9590 CLAY ROAD, HOUSTON, TX	713-772-9100
BRITTMORE (GREENSTAR)	1200 BRITTMORE RD, HOUSTON, TX	713-461-9933
GLOBAL WASTE SERVICES	7172 E MT HOUSTON RD, HOUSTON, TX	281-449-8500
HOUSTON SORT CENTER	5757 B OATES ROAD, HOUSTON, TX	713-674-7400
INDEPENDENT TEXAS RECYCLERS	6810 IRVINGTON BLVD, HOUSTON, TX	832-215-9531

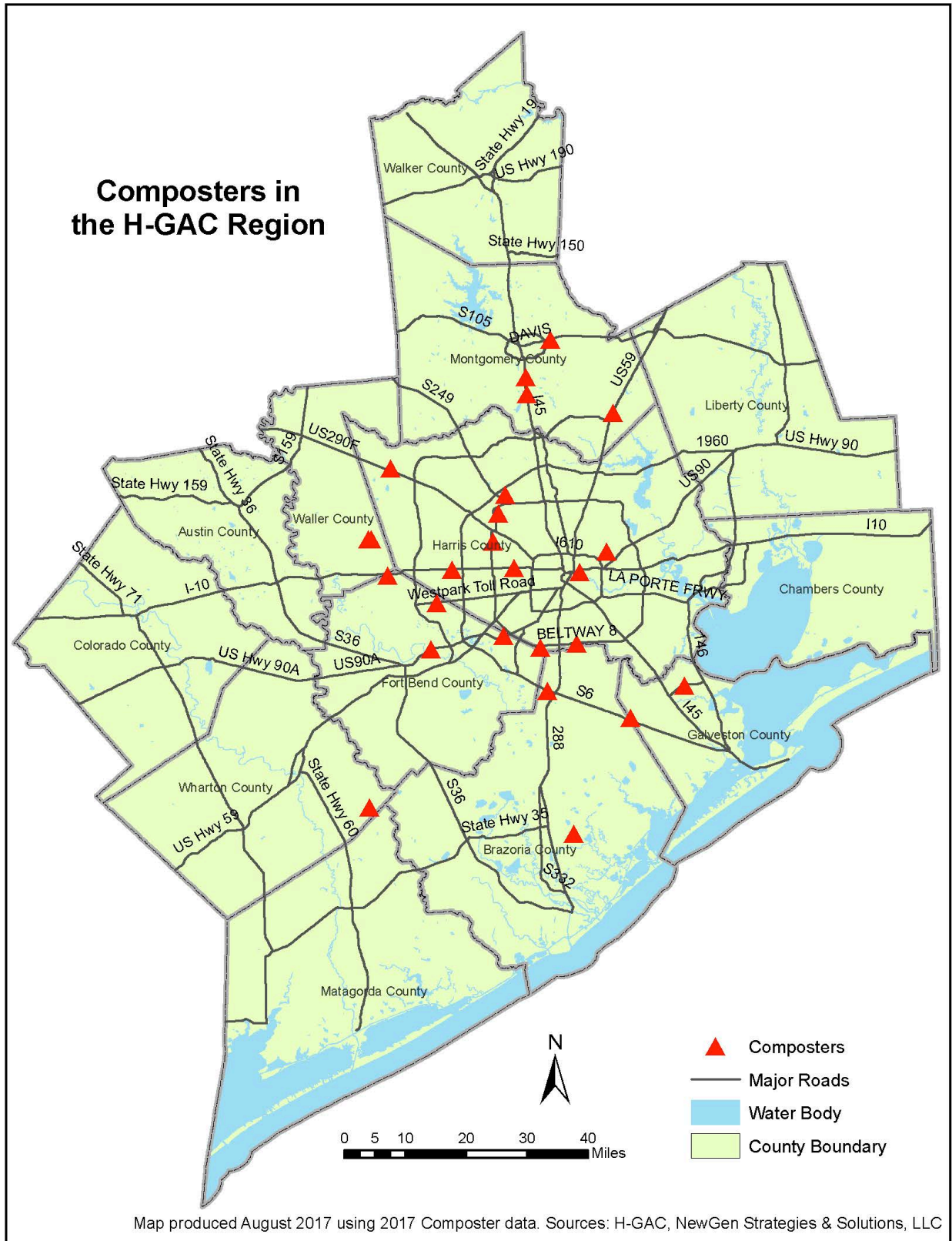


Figure 4-27: Compost Facilities in the H-GAC Region

Table 4-10
Listing of Composting Facilities in the H-GAC Region

Site Owner	Site Name	Address	Phone
LIVING EARTH	THE WOODLANDS	17555 I-45 SOUTH CONROE, THE WOODLANDS, TX	936-321-4001
LIVING EARTH	NEW CANEY	20611 US HIGHWAY 59, NEW CANEY, TX	281-689-6083
LIVING EARTH	CUTTEN ROAD	12200 CUTTEN ROAD, HOUSTON, TX	281-537-2377
LIVING EARTH	KATY WEST	27733 KATY FREEWAY, KATY, TX	281-392-0300
LIVING EARTH	CRAWFORD ROAD	5802 CRAWFORD ROAD, HOUSTON, TX	713-466-7360
LIVING EARTH	KATY FREEWAY	16717 KATY FREEWAY, HOUSTON, TX	281-579-1472
LIVING EARTH	MCCARTY	10310 BEAUMONT HIGHWAY, HOUSTON, TX	713-670-0810
LIVING EARTH	BEAUMONT HIGHWAY	10310 BEAUMONT HIGHWAY, HOUSTON, TX	713-670-0810
LIVING EARTH	RICHMOND	1700 HIGHWAY 90A, EAST RICHMOND, TX	281-342-6113
LIVING EARTH	MISSOURI CITY	1503 INDUSTRIAL DRIVE, MISSOURI CITY, TX	281-499-5641
LIVING EARTH	SOUTH BELTWAY	5210 S SAM HOUSTON PKWY, HOUSTON, TX	713-581-3290
LIVING EARTH	IOWA COLONY	16138 HIGHWAY 6, IOWA COLONY, TX	281-431-3400
LIVING EARTH	LEAGUE CITY	1000 DICKINSON AVE, DICKINSON, TX	281-337-7800
LIVING EARTH	CYPRESS NORTHWEST	16955 KATY-HOCKLEY ROAD, HOCKELY, TX	713-466-7360
LIVING EARTH	LAKE JACKSON	9306 FM 523, FREEPORT, TX	713-466-7360
NATURE'S WAY	CONROE	101 SHERBROOK CIRCLE, CONROE, TX	936-321-6990
NEW EARTH	HOUSTON/CONROE	12286 HWY 105 EAST, CONROE, TX	936-756-4846
NEW EARTH	HOUSTON/KATY	6205 FM 2855, KATY, TX 77493	281-574-0316
WASTE MANAGEMENT	COASTAL PLAINS RDF	21000 E HIGHWAY 6, ALVIN, TX	800-963-4776
CERES ENVIRONMENTAL	THE GROUND UP - NORTHWEST	9945 WINDFERN RD, HOUSTON, TX	281-970-0003
CERES ENVIRONMENTAL	THE GROUND UP - MEMORIA	8705 KATY FWY, HOUSTON, TX	832-284-2647
CERES ENVIRONMENTAL	THE GROUND UP - RICHMOND	19102 FM 1093 RD, RICHMOND, TX	281-829-9595
LONESTAR DISPOSAL	LONESTAR DISPOSAL	4107 S SAM HOUSTON PKWY, HOUSTON, TX	713-466-6767
DON TOL COMPOST	DON TOL COMPOST	112 DON TOL ROAD	979-245-5656

Section 5

FINDINGS AND RECOMMENDATIONS

Based on the research and analysis completed by NewGen in the conduct of the 2017 Study, NewGen has the following recommendations for the H-GAC Region:

- **Conduct an Analysis of Brush and Yard Waste Collection Programs Provided by Municipalities within the H-GAC Region.** NewGen recommends H-GAC perform a study that evaluates the current state of brush and yard waste diversion for the region. Diversion of brush and yard waste has seen substantial growth since the 2005 Study but it is currently unknown who provides dedicated brush pick-up and/or yard waste services for all cities within the H-GAC region. NewGen would recommend that all cities above 5,000 in population be surveyed (or met with in person and/or conduct an internet search) to gather the following information:
 - Current brush and yard waste services provided by city (if any)
 - Where green waste is delivered for processing if diverted
 - Volumes or weight diverted for most recent year (calendar or fiscal year)
 - If green waste materials are not diverted, identify how they are handled
 - Identify potential options for diversion for cities not currently diverting green waste
 - Meet with private mulch and composting processors to identify volumes collected and opportunities for further expansion of services to cities
 - Identify current volumes collectively diverted by municipalities within the H-GAC region, and potential volumes that could be further diverted
 - Develop a brush and yard waste diversion program/strategy for the H-GAC region
- **Identify Cities in the Region with above Average Recycling Rates.** NewGen recommends H-GAC identify those cities with above average recycling rates and determine what best management practices can be replicated in other cities to encourage increasing recycling rates, in the most cost effective manner.
- **Survey Cities every Two Years to Calculate Their Generation, Disposal and Diversion Rates.** NewGen would recommend H-GAC survey cities, similarly to what was done in the 2017 Study (potentially using the 2017 Study survey mechanism, or modified mechanism), every two years to collect data on generation, diversion and disposal rates in the region. Tracking these statistics more frequently will assist the region in tracking the trends and better determine more accurate generation, diversion and disposal rates for single-family, multi-family and commercial businesses within the H-GAC region.
- **Subregion 5.** It is projected Subregion 5 (Colorado, Matagorda, and Wharton Counties) cumulative disposal will surpass current permitted capacity during the forecast period (in 2018), H-GAC should examine opportunities to expand landfill capacity in the region or ensure adequate transfer stations are in place.

Section 5

- **Subregion 6.** Subregion 6 (Austin and Waller Counties) contains no active landfills and thus no current disposal capacity. Subregion 6 is a net exporter of waste. H-GAC should ensure adequate transfer stations are in place.
- **Subregion 8.** It is projected Subregion 8 (Harris County) cumulative disposal will surpass current permitted capacity during the forecast period (2028). Further transfer station and landfill expansion in the subregion should be evaluated.
- **Impact of Hurricane Harvey.** NewGen would recommend that in two to three years H-GAC revisit and determine the impact that Hurricane Harvey has had on landfill capacity within the H-GAC planning region.

Appendix A SCHEDULES

The following schedules are included in Appendix A:

- Schedule 1 Single-Family / Multi-Family Ratios
- Schedule 2 Total Population Forecast (2015-2036)
- Schedule 3 Single-Family Population Forecast (2015-2036)
- Schedule 4 Multi-Family Population Forecast (2015-2036)
- Schedule 5 Employment Forecast (2015-2036)
- Schedule 6 Total H-GAC Disposal Forecast (2015-2036)
- Schedule 7 Single-Family Disposal Forecast (2015-2036)
- Schedule 8 Multi-Family Disposal Forecast (2015-2036)
- Schedule 9 Commercial Disposal Forecast (2015-2036)

**Schedule 1
Single-Family/Multi-Family Ratios**

SINGLE FAMILY/MULTI-FAMILY RATIOS																			
2015 American Community Survey																			
County	Austin				Brazoria								Chambers			Colorado			
	Total	Bellville	Sealy	Remaining Area	Total	Alvin	Angleton	Clute	Freeport	Lake Jackson	Manvel	Pearland	Remaining Area	Total	Mont Belvieu	Remaining Area	Total	Columbus	Remaining Area
Occupied Housing Units	11,038	1,832	2,263	6,943	112,510	8,876	6,998	4,089	4,097	10,621	2,212	34,776	40,841	13,018	1,457	11,561	7,657	1,440	6,217
UNITS IN STRUCTURE																			
1-unit, detached	8,191	1,302	1,568	5,305	79,963	4,861	4,249	1,832	2,864	7,601	1,772	28,098	28,935	9,600	1,142	8,460	6,032	1,160	4,875
1-unit, attached	196	97	32	69	1,162	185	59	15	52	98	127	279	349	103	26	78	91	29	64
2 units	66	33	30	7	792	95	123	18	159	55	-	142	189	39	-	39	68	32	38
3 or 4 units	358	167	210	2	2,033	542	187	289	204	174	-	313	301	51	8	43	23	11	12
5 to 9 units	202	132	47	29	4,352	912	545	493	103	603	-	1,260	469	220	89	133	75	78	5
10 to 19 units	48	27	20	3	6,379	488	854	696	310	1,128	-	1,840	1,071	59	-	59	47	37	14
20 or more units	98	-	92	13	5,620	512	298	469	227	947	-	1,893	1,300	185	138	50	88	40	51
Mobile home	1,866	74	265	1,501	11,936	1,229	683	258	159	6	314	950	8,062	2,733	54	2,671	1,218	53	1,142
Boat, RV, van, etc.	14	-	-	13	274	53	-	19	20	7	-	-	166	29	-	28	17	-	16
TOTAL HOUSING UNITS	11,038	1,832	2,263	6,943	112,510	8,876	6,998	4,089	4,097	10,621	2,212	34,776	40,841	13,018	1,457	11,561	7,657	1,440	6,217
Single Family	93.49%	82.21%	83.74%	99.12%	83.42%	71.77%	73.08%	51.90%	78.92%	73.07%	100.00%	84.74%	91.90%	95.83%	83.88%	97.29%	96.75%	88.44%	98.42%
Multi-Family	6.51%	17.79%	16.26%	0.88%	16.58%	28.23%	26.92%	48.10%	21.08%	26.93%	0.00%	15.26%	8.10%	4.17%	16.12%	2.71%	3.25%	11.56%	1.58%

Schedule 1
Single-Family/Multi-Family Ratios

SINGLE FAMILY/MULTI-FAMILY RATIOS																
2015 American Community Survey																
County City	Fort Bend							Galveston								
	Total	Missouri City	Richmond	Rosenberg	Stafford	Sugar Land	Remaining Area	Total	Dickinson	Galveston	Hitchcock	La Marque	League City	Santa Fe	Texas City	Remaining Area
Occupied Housing Units	206,188	23,231	3,661	10,853	6,805	27,587	134,051	113,866	6,634	20,320	2,677	5,568	32,840	4,717	16,610	24,500
UNITS IN STRUCTURE																
1-unit, detached	174,220	21,066	1,796	6,488	3,558	24,089	117,418	81,599	4,816	11,286	1,900	4,964	25,102	3,890	11,434	19,463
1-unit, attached	4,098	1,050	60	111	172	978	1,738	2,184	84	333	7	10	1,179	62	168	421
2 units	585	-	83	135	41	45	275	2,622	12	1,144	34	24	201	157	520	247
3 or 4 units	1,015	73	106	277	54	203	290	3,158	238	1,077	198	75	461	45	397	440
5 to 9 units	3,247	108	159	657	366	362	1,564	4,254	296	1,270	145	42	1,084	57	921	265
10 to 19 units	8,657	417	636	1,312	1,267	730	4,226	6,358	266	2,057	97	67	1,818	4	1,560	197
20 or more units	7,516	502	118	700	1,085	1,114	3,968	8,360	233	3,116	34	202	2,492	133	1,376	262
Mobile home	6,780	15	703	1,174	246	67	4,518	4,988	677	27	255	173	419	349	234	2,988
Boat, RV, van, etc.	70	-	-	-	16	-	54	343	12	8	5	11	83	20	-	215
TOTAL HOUSING UNITS	206,188	23,231	3,661	10,853	6,805	27,587	134,051	113,866	6,634	20,320	2,677	5,568	32,840	4,717	16,610	24,500
Single Family	90.06%	95.27%	72.16%	72.86%	59.04%	91.27%	92.46%	80.26%	84.25%	62.94%	82.06%	92.87%	81.92%	94.51%	74.39%	94.37%
Multi-Family	9.94%	4.73%	27.84%	27.14%	40.96%	8.73%	7.54%	19.74%	15.75%	37.06%	17.94%	7.13%	18.08%	5.49%	25.61%	5.63%

Schedule 1
Single-Family/Multi-Family Ratios

SINGLE FAMILY/MULTI-FAMILY RATIOS																			
2015 American Community Survey																			
County																			
City																			
Harris																			
Total	Baytown	Bellaire	Deer Park	Friendswood	Galena Park	Houston	Humble	Jacinto City	Jersey Village	Katy	La Porte	Pasadena	Seabrook	South Houston	Tomball	Webster	West University Place	Remaining Area	
Occupied Housing Units	1,499,528	25,793	6,222	11,176	13,125	2,965	814,599	5,352	3,167	3,513	5,571	12,170	49,256	5,003	4,707	4,077	4,673	5,532	522,627
UNITS IN STRUCTURE																			
1-unit, detached	860,390	15,585	5,401	8,866	10,763	2,628	367,559	2,310	2,459	2,045	4,292	9,609	28,492	2,904	2,897	2,271	404	5,192	394,104
1-unit, attached	60,842	703	450	130	290	60	41,991	243	70	44	142	386	978	132	56	60	101	261	14,297
2 units	19,040	287	25	20	67	105	14,457	189	20	-	10	65	888	48	47	34	17	6	2,448
3 or 4 units	45,312	926	-	407	195	37	29,862	505	30	96	151	268	1,982	219	130	426	213	10	9,381
5 to 9 units	85,012	2,138	34	454	619	45	59,156	557	70	343	218	549	3,521	304	219	346	1,019	-	14,317
10 to 19 units	168,171	2,213	105	312	515	46	117,295	752	88	435	260	234	4,670	876	401	358	1,218	23	36,512
20 or more units	221,836	2,259	198	594	591	21	176,270	383	391	543	209	555	6,685	507	422	447	1,681	-	26,170
Mobile home	37,661	1,460	9	393	86	23	7,658	412	40	7	289	482	1,939	12	525	135	19	41	24,937
Boat, RV, van, etc.	1,164	222	-	-	-	-	351	-	-	-	-	21	102	-	10	-	-	-	461
TOTAL HOUSING UNITS	1,499,528	25,793	6,222	11,176	13,125	2,965	814,599	5,352	3,167	3,513	5,571	12,170	49,256	5,003	4,707	4,077	4,673	5,532	522,627
Single Family	65.22%	69.92%	94.59%	84.19%	85.37%	94.95%	52.99%	58.93%	81.73%	59.67%	84.95%	86.63%	65.57%	61.89%	74.88%	61.31%	11.58%	99.40%	83.38%
Multi-Family	34.78%	30.08%	5.41%	15.81%	14.63%	5.05%	47.01%	41.07%	18.27%	40.33%	15.05%	13.37%	34.43%	38.11%	25.12%	38.69%	88.42%	0.60%	16.62%

Schedule 1
Single-Family/Multi-Family Ratios

SINGLE FAMILY/MULTI-FAMILY RATIOS																	
2015 American Community Survey																	
County	Liberty					Matagorda				Montgomery					Walker		
	Total	Cleveland	Dayton	Liberty	Remaining Area	Total	Bay City	Palacios	Remaining Area	Total	Conroe	Willis	The Woodlands	Remaining Area	Total	Huntsville	Remaining Area
Occupied Housing Units	25,319	2,472	2,837	3,111	16,899	13,382	6,333	1,709	5,340	173,238	22,350	1,877	38,114	110,897	20,685	10,881	9,804
UNITS IN STRUCTURE																	
1-unit, detached	15,188	1,267	1,622	2,304	9,995	9,144	3,808	1,111	4,066	117,686	11,258	885	28,798	76,786	10,074	3,923	5,983
1-unit, attached	282	33	20	103	126	142	129	16	13	3,774	552	13	1,871	1,361	484	407	95
2 units	376	206	59	95	15	106	102	-	14	1,268	223	7	501	541	927	619	324
3 or 4 units	420	118	118	174	15	469	440	81	15	2,345	1,166	65	319	794	672	700	14
5 to 9 units	183	30	67	78	11	796	817	59	27	4,439	1,642	22	734	2,032	871	921	6
10 to 19 units	481	175	322	-	4	290	317	-	11	7,127	2,271	15	1,372	3,459	1,820	1,940	-
20 or more units	448	235	189	27	6	197	204	9	9	11,614	3,331	53	4,422	3,844	1,231	1,300	11
Mobile home	7,738	408	388	314	6,590	2,189	517	434	1,145	24,453	1,866	818	79	21,612	4,568	1,039	3,363
Boat, RV, van, etc.	203	-	52	15	138	49	-	-	40	531	42	-	19	468	37	31	8
TOTAL HOUSING UNITS	25,319	2,472	2,837	3,111	16,899	13,382	6,333	1,709	5,340	173,238	22,350	1,877	38,114	110,897	20,685	10,881	9,804
Single Family	93.15%	77.40%	73.61%	90.53%	98.97%	86.55%	71.94%	91.34%	98.09%	84.96%	62.19%	91.77%	81.99%	90.44%	77.61%	55.03%	99.60%
Multi-Family	6.85%	22.60%	26.39%	9.47%	1.03%	13.45%	28.06%	8.66%	1.91%	15.04%	37.81%	8.23%	18.01%	9.56%	22.39%	44.97%	0.40%

Schedule 1
Single-Family/Multi-Family Ratios

SINGLE FAMILY/MULTI-FAMILY RATIOS								
2015 American Community Survey								
County City	Waller				Wharton			
	Total	Hempstead	Prairie View	Remaining Area	Total	El Campo	Wharton	Remaining Area
Occupied Housing Units	13,937	2,074	554	11,309	14,741	3,875	3,264	7,602
UNITS IN STRUCTURE								
1-unit, detached	8,386	1,074	241	7,109	11,008	3,002	1,895	6,113
1-unit, attached	377	81	23	270	68	44	13	13
2 units	281	49	104	99	255	151	71	38
3 or 4 units	706	283	48	358	344	94	185	67
5 to 9 units	549	224	70	233	286	67	200	19
10 to 19 units	96	23	31	35	277	122	137	23
20 or more units	163	95	12	50	506	61	413	29
Mobile home	3,306	245	25	3,082	1,959	334	350	1,261
Boat, RV, van, etc.	73	-	-	75	39	-	-	38
TOTAL HOUSING UNITS	13,937	2,074	554	11,309	14,741	3,875	3,264	7,602
Single Family	88.61%	69.89%	71.04%	93.38%	90.16%	91.11%	71.38%	97.68%
Multi-Family	11.39%	30.11%	28.96%	6.62%	9.84%	8.89%	28.62%	2.32%

Schedule 3
Single-Family Population Forecast (2015 - 2036)

	SF Ratio	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																							
Cleveland	77.40%	5,994	6,005	6,016	6,027	6,038	6,049	6,059	6,069	6,078	6,088	6,098	6,108	6,118	6,128	6,138	6,148	6,158	6,168	6,178	6,188	6,198	6,209
Dayton	73.61%	6,333	6,555	6,785	7,022	7,269	7,523	7,722	7,927	8,137	8,352	8,573	8,800	9,033	9,272	9,517	9,769	9,964	10,163	10,366	10,574	10,785	11,000
Liberty	90.53%	7,915	7,979	8,044	8,109	8,175	8,242	8,305	8,369	8,433	8,498	8,563	8,629	8,696	8,763	8,830	8,898	8,959	9,020	9,081	9,143	9,205	9,268
Small and Unincorporated	98.97%	55,131	55,810	56,492	57,176	57,864	58,553	59,228	59,907	60,591	61,279	61,972	62,669	63,371	64,076	64,787	65,501	66,141	66,786	67,435	68,089	68,747	69,409
Matagorda County																							
Bay City	71.94%	13,090	13,175	13,261	13,347	13,434	13,522	13,592	13,661	13,732	13,802	13,873	13,945	14,016	14,088	14,161	14,234	14,279	14,324	14,369	14,414	14,460	14,505
Palacios	91.34%	4,452	4,481	4,510	4,540	4,569	4,599	4,623	4,647	4,670	4,694	4,719	4,743	4,767	4,792	4,816	4,841	4,857	4,872	4,887	4,903	4,918	4,934
Small and Unincorporated	98.09%	14,561	14,656	14,751	14,847	14,944	15,041	15,119	15,196	15,274	15,353	15,431	15,511	15,590	15,670	15,751	15,832	15,882	15,932	15,983	16,033	16,084	16,135
Montgomery County																							
Conroe	62.19%	41,157	42,524	43,936	45,395	46,903	48,461	49,352	50,261	51,186	52,128	53,087	54,064	55,059	56,073	57,105	58,156	58,969	59,795	60,631	61,480	62,340	63,212
Willis	91.77%	5,581	5,662	5,743	5,826	5,910	5,995	6,016	6,038	6,059	6,080	6,102	6,124	6,145	6,167	6,189	6,211	6,258	6,305	6,352	6,400	6,448	6,497
The Woodlands	81.99%	88,605	91,141	93,750	96,434	99,194	102,034	102,280	102,527	102,775	103,023	103,272	103,521	103,771	104,021	104,273	104,524	104,522	104,520	104,518	104,516	104,513	104,511
Small and Unincorporated	90.44%	320,731	331,623	342,880	354,516	366,542	378,972	392,118	405,622	419,494	433,742	448,378	463,410	478,851	494,710	510,998	527,728	543,442	559,531	576,003	592,867	610,132	627,808
Walker County																							
Huntsville	55.03%	21,822	21,945	22,070	22,195	22,320	22,447	22,552	22,658	22,765	22,872	22,979	23,087	23,196	23,305	23,414	23,524	23,601	23,678	23,755	23,832	23,909	23,987
Small and Unincorporated	99.60%	30,031	30,200	30,371	30,543	30,715	30,889	31,034	31,179	31,325	31,472	31,620	31,768	31,917	32,066	32,217	32,368	32,473	32,578	32,684	32,790	32,896	33,003
Waller County																							
Hempstead	69.89%	4,354	4,421	4,489	4,559	4,629	4,701	4,773	4,847	4,922	4,999	5,076	5,155	5,234	5,315	5,398	5,481	5,562	5,644	5,728	5,812	5,898	5,985
Prairie View	71.04%	4,313	4,386	4,462	4,538	4,616	4,695	4,774	4,855	4,937	5,021	5,106	5,192	5,280	5,369	5,460	5,552	5,641	5,731	5,822	5,915	6,009	6,105
Small and Unincorporated	93.38%	33,002	33,694	34,400	35,120	35,856	36,606	37,339	38,086	38,848	39,624	40,417	41,224	42,048	42,889	43,745	44,619	45,437	46,270	47,119	47,982	48,862	49,757
Wharton County																							
El Campo	91.11%	10,800	10,847	10,894	10,940	10,988	11,035	11,085	11,136	11,187	11,238	11,290	11,341	11,393	11,445	11,498	11,550	11,591	11,632	11,673	11,713	11,755	11,796
Wharton	71.38%	6,494	6,533	6,571	6,611	6,650	6,689	6,731	6,773	6,816	6,858	6,901	6,944	6,987	7,031	7,075	7,119	7,153	7,186	7,220	7,254	7,288	7,323
Small and Unincorporated	97.68%	21,072	21,216	21,362	21,508	21,656	21,804	21,959	22,116	22,274	22,432	22,592	22,753	22,915	23,078	23,242	23,408	23,533	23,659	23,786	23,913	24,041	24,170
TOTAL H-GAC SINGLE-FAMILY POPULATION FORECAST		4,920,732	5,022,001	5,125,780	5,232,145	5,341,178	5,452,960	5,518,631	5,585,367	5,653,190	5,722,120	5,792,181	5,863,395	5,935,786	6,009,378	6,084,195	6,160,262	6,221,656	6,283,873	6,346,927	6,410,833	6,475,604	6,541,256

Schedule 4
Multi-Family Population Forecast (2015 - 2036)

	MF Ratio	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																							
Cleveland	22.60%	1,750	1,753	1,757	1,760	1,763	1,766	1,769	1,772	1,775	1,778	1,781	1,783	1,786	1,789	1,792	1,795	1,798	1,801	1,804	1,807	1,810	1,813
Dayton	26.39%	2,270	2,350	2,432	2,517	2,605	2,697	2,768	2,841	2,917	2,994	3,073	3,154	3,238	3,324	3,412	3,502	3,572	3,643	3,716	3,790	3,866	3,943
Liberty	9.47%	828	835	842	849	855	862	869	876	882	889	896	903	910	917	924	931	937	944	950	957	963	970
Small and Unincorporated	1.03%	575	582	589	596	603	611	618	625	632	639	646	654	661	668	676	683	690	696	703	710	717	724
Matagorda County																							
Bay City	28.06%	5,106	5,140	5,173	5,207	5,241	5,275	5,302	5,329	5,357	5,384	5,412	5,440	5,468	5,496	5,524	5,552	5,570	5,588	5,605	5,623	5,641	5,659
Palacios	8.66%	422	425	427	430	433	436	438	440	443	445	447	449	452	454	456	459	460	462	463	465	466	468
Small and Unincorporated	1.91%	283	285	287	289	291	293	294	296	297	299	300	302	303	305	307	308	309	310	311	312	313	314
Montgomery County																							
Conroe	37.81%	25,025	25,856	26,714	27,602	28,518	29,465	30,008	30,560	31,122	31,695	32,279	32,873	33,478	34,094	34,721	35,360	35,855	36,357	36,866	37,381	37,905	38,435
Willis	8.23%	501	508	515	523	530	538	540	542	544	546	547	549	551	553	555	557	561	566	570	574	579	583
The Woodlands	18.01%	19,465	20,022	20,596	21,185	21,792	22,415	22,470	22,524	22,578	22,633	22,687	22,742	22,797	22,852	22,907	22,963	22,962	22,962	22,961	22,961	22,960	22,960
Small and Unincorporated	9.56%	33,884	35,035	36,224	37,454	38,724	40,037	41,426	42,853	44,318	45,824	47,370	48,958	50,589	52,265	53,986	55,753	57,413	59,113	60,853	62,635	64,459	66,326
Walker County																							
Huntsville	44.97%	17,831	17,932	18,033	18,135	18,238	18,341	18,427	18,514	18,601	18,689	18,776	18,865	18,953	19,042	19,132	19,222	19,284	19,347	19,410	19,473	19,536	19,600
Small and Unincorporated	0.40%	120	120	121	122	123	123	124	124	125	126	126	127	127	128	129	129	130	130	130	131	131	132
Waller County																							
Hempstead	30.11%	1,876	1,905	1,934	1,964	1,995	2,025	2,057	2,089	2,121	2,154	2,187	2,221	2,255	2,290	2,326	2,362	2,397	2,432	2,468	2,504	2,541	2,579
Prairie View	28.96%	1,758	1,788	1,819	1,850	1,882	1,914	1,946	1,979	2,013	2,047	2,081	2,117	2,152	2,189	2,226	2,264	2,300	2,336	2,373	2,411	2,450	2,489
Small and Unincorporated	6.62%	2,341	2,390	2,440	2,491	2,543	2,597	2,648	2,701	2,755	2,811	2,867	2,924	2,983	3,042	3,103	3,165	3,223	3,282	3,342	3,403	3,466	3,529
Wharton County																							
El Campo	8.89%	1,053	1,058	1,062	1,067	1,072	1,076	1,081	1,086	1,091	1,096	1,101	1,106	1,111	1,116	1,121	1,127	1,130	1,134	1,138	1,142	1,146	1,150
Wharton	28.62%	2,604	2,620	2,635	2,651	2,667	2,683	2,699	2,716	2,733	2,750	2,767	2,785	2,802	2,820	2,837	2,855	2,868	2,882	2,895	2,909	2,923	2,937
Small and Unincorporated	2.32%	500	503	507	510	514	517	521	525	528	532	536	540	544	547	551	555	558	561	564	567	570	573
TOTAL H-GAC MULTI-FAMILY POPULATION FORECAST		1,743,386	1,765,681	1,788,376	1,811,483	1,835,010	1,858,969	1,875,081	1,891,369	1,907,839	1,924,491	1,941,329	1,958,356	1,975,574	1,992,987	2,010,597	2,028,406	2,043,724	2,059,186	2,074,796	2,090,554	2,106,463	2,122,525

Schedule 5
Employment Forecast (2015 - 2036)

	Ratio	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County		27,767																					
Cleveland	31.45%	2,436	2,440	2,445	2,449	2,454	2,458	2,462	2,466	2,470	2,474	2,478	2,482	2,486	2,490	2,494	2,498	2,502	2,507	2,511	2,515	2,519	2,523
Dayton	39.28%	3,379	3,497	3,620	3,747	3,878	4,014	4,120	4,229	4,341	4,456	4,574	4,695	4,819	4,947	5,078	5,212	5,317	5,423	5,531	5,642	5,754	5,869
Liberty	39.01%	3,411	3,439	3,467	3,495	3,523	3,552	3,579	3,607	3,634	3,662	3,690	3,719	3,747	3,776	3,805	3,835	3,861	3,887	3,913	3,940	3,967	3,994
Small and Unincorporated	33.28%	18,541	18,769	18,999	19,229	19,460	19,692	19,919	20,147	20,377	20,608	20,841	21,076	21,312	21,549	21,788	22,028	22,244	22,461	22,679	22,899	23,120	23,343
Matagorda County		15,874																					
Bay City	42.48%	7,729	7,779	7,830	7,881	7,933	7,984	8,025	8,067	8,108	8,150	8,192	8,234	8,276	8,319	8,361	8,404	8,431	8,458	8,484	8,511	8,538	8,565
Palacios	45.73%	2,229	2,244	2,258	2,273	2,288	2,303	2,315	2,326	2,338	2,350	2,362	2,375	2,387	2,399	2,411	2,424	2,432	2,439	2,447	2,455	2,462	2,470
Small and Unincorporated	39.85%	5,916	5,955	5,993	6,032	6,072	6,111	6,143	6,174	6,206	6,238	6,270	6,302	6,334	6,367	6,400	6,432	6,453	6,473	6,494	6,514	6,535	6,556
Montgomery County		230,258																					
Conroe	44.46%	29,426	30,403	31,413	32,456	33,534	34,648	35,286	35,935	36,596	37,270	37,956	38,654	39,366	40,090	40,828	41,580	42,161	42,751	43,350	43,956	44,571	45,195
Willis	38.16%	2,321	2,354	2,388	2,423	2,458	2,493	2,502	2,511	2,520	2,529	2,538	2,547	2,556	2,565	2,574	2,583	2,602	2,622	2,642	2,662	2,682	2,702
The Woodlands	44.79%	48,400	49,785	51,211	52,676	54,184	55,735	55,870	56,005	56,140	56,276	56,412	56,548	56,684	56,821	56,958	57,096	57,095	57,094	57,092	57,091	57,090	57,089
Small and Unincorporated	42.33%	150,111	155,209	160,477	165,923	171,552	177,369	183,522	189,842	196,335	203,003	209,853	216,889	224,115	231,538	239,161	246,991	254,346	261,876	269,585	277,478	285,558	293,831
Walker County		22,612																					
Huntsville	30.56%	12,117	12,186	12,255	12,324	12,394	12,464	12,523	12,582	12,641	12,700	12,760	12,820	12,880	12,940	13,001	13,062	13,105	13,148	13,190	13,233	13,276	13,319
Small and Unincorporated	34.81%	10,495	10,554	10,614	10,674	10,734	10,795	10,845	10,896	10,947	10,999	11,050	11,102	11,154	11,206	11,259	11,312	11,348	11,385	11,422	11,459	11,496	11,534
Waller County		20,127																					
Hempstead	39.81%	2,480	2,518	2,557	2,597	2,637	2,678	2,719	2,761	2,804	2,847	2,891	2,936	2,982	3,028	3,075	3,122	3,168	3,215	3,263	3,311	3,360	3,409
Prairie View	39.22%	2,381	2,422	2,463	2,506	2,548	2,592	2,636	2,681	2,726	2,772	2,819	2,867	2,915	2,964	3,015	3,066	3,114	3,164	3,214	3,266	3,318	3,370
Small and Unincorporated	43.19%	15,266	15,586	15,912	16,246	16,586	16,933	17,272	17,617	17,970	18,329	18,696	19,069	19,450	19,839	20,235	20,640	21,018	21,403	21,796	22,195	22,602	23,016
Wharton County		18,584																					
El Campo	44.51%	5,276	5,299	5,322	5,344	5,367	5,390	5,415	5,440	5,465	5,490	5,515	5,540	5,566	5,591	5,617	5,642	5,662	5,682	5,702	5,722	5,742	5,762
Wharton	38.57%	3,509	3,530	3,551	3,572	3,593	3,615	3,637	3,660	3,683	3,706	3,729	3,752	3,776	3,799	3,823	3,847	3,865	3,883	3,901	3,920	3,938	3,957
Small and Unincorporated	45.43%	9,799	9,866	9,934	10,002	10,070	10,139	10,212	10,285	10,358	10,432	10,506	10,581	10,656	10,732	10,808	10,885	10,944	11,002	11,061	11,120	11,180	11,240
TOTAL H-GAC EMPLOYMENT FORECAST		3,067,434	3,122,941	3,179,732	3,237,843	3,297,315	3,358,188	3,394,831	3,432,018	3,469,758	3,508,063	3,546,942	3,586,407	3,626,470	3,667,141	3,708,433	3,750,358	3,784,766	3,819,599	3,854,862	3,890,563	3,926,710	3,963,309

Schedule 6
Total H-GAC Disposal Forecast (2015 - 2036)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																						
Cleveland	8,628	8,646	8,664	8,682	8,700	8,718	8,733	8,748	8,764	8,779	8,794	8,810	8,825	8,841	8,856	8,872	8,887	8,902	8,918	8,933	8,949	8,964
Dayton	10,602	10,976	11,364	11,766	12,182	12,613	12,948	13,293	13,647	14,010	14,383	14,766	15,159	15,562	15,977	16,402	16,731	17,067	17,410	17,759	18,116	18,479
Liberty	10,740	10,830	10,921	11,013	11,106	11,199	11,287	11,375	11,464	11,554	11,645	11,736	11,828	11,921	12,014	12,108	12,192	12,276	12,361	12,446	12,532	12,619
Small and Unincorporated	63,600	64,401	65,205	66,013	66,825	67,640	68,428	69,221	70,020	70,825	71,635	72,451	73,272	74,098	74,929	75,766	76,513	77,266	78,023	78,786	79,554	80,327
Matagorda County																						
Bay City	23,303	23,462	23,622	23,784	23,946	24,110	24,237	24,366	24,494	24,624	24,754	24,885	25,017	25,150	25,283	25,417	25,499	25,582	25,666	25,749	25,833	25,918
Palacios	6,482	6,526	6,571	6,616	6,661	6,707	6,742	6,778	6,814	6,850	6,886	6,923	6,959	6,996	7,033	7,071	7,094	7,117	7,140	7,164	7,187	7,210
Small and Unincorporated	18,422	18,548	18,674	18,801	18,929	19,058	19,159	19,260	19,362	19,464	19,567	19,670	19,774	19,879	19,984	20,089	20,155	20,221	20,286	20,353	20,419	20,486
Montgomery County																						
Conroe	86,743	89,652	92,659	95,767	98,978	102,298	104,196	106,130	108,100	110,106	112,150	114,231	116,352	118,512	120,712	122,953	124,686	126,443	128,225	130,033	131,866	133,725
Willis	7,392	7,501	7,611	7,723	7,837	7,952	7,981	8,011	8,040	8,070	8,100	8,129	8,159	8,189	8,220	8,250	8,313	8,376	8,440	8,505	8,570	8,635
The Woodlands	112,753	116,026	119,395	122,862	126,429	130,101	130,439	130,779	131,120	131,462	131,805	132,149	132,494	132,841	133,188	133,536	133,550	133,564	133,578	133,592	133,607	133,621
Small and Unincorporated	453,363	468,902	484,969	501,581	518,756	536,513	555,206	574,411	594,142	614,414	635,241	656,638	678,619	701,202	724,401	748,233	770,588	793,478	816,916	840,916	865,491	890,654
Walker County																						
Huntsville	29,797	29,977	30,158	30,341	30,524	30,709	30,858	31,009	31,160	31,313	31,466	31,619	31,774	31,929	32,085	32,242	32,351	32,460	32,569	32,679	32,790	32,900
Small and Unincorporated	35,118	35,326	35,536	35,747	35,959	36,172	36,346	36,522	36,698	36,875	37,053	37,231	37,411	37,592	37,773	37,956	38,082	38,209	38,336	38,464	38,592	38,721
Waller County																						
Hempstead	7,727	7,849	7,972	8,098	8,226	8,355	8,486	8,618	8,753	8,890	9,029	9,170	9,313	9,459	9,607	9,757	9,902	10,049	10,198	10,350	10,504	10,660
Prairie View	7,476	7,606	7,739	7,874	8,011	8,151	8,290	8,431	8,575	8,721	8,870	9,022	9,176	9,332	9,491	9,653	9,808	9,965	10,125	10,287	10,452	10,619
Small and Unincorporated	45,646	46,617	47,609	48,621	49,654	50,710	51,732	52,775	53,838	54,923	56,029	57,158	58,309	59,484	60,682	61,903	63,045	64,207	65,390	66,596	67,823	69,073
Wharton County																						
El Campo	15,545	15,617	15,689	15,761	15,834	15,907	15,983	16,058	16,134	16,210	16,287	16,364	16,442	16,520	16,598	16,676	16,737	16,797	16,858	16,919	16,980	17,041
Wharton	11,114	11,184	11,253	11,324	11,394	11,466	11,539	11,613	11,687	11,761	11,837	11,912	11,988	12,065	12,142	12,220	12,278	12,337	12,397	12,456	12,516	12,576
Small and Unincorporated	28,588	28,793	28,999	29,208	29,417	29,628	29,844	30,061	30,280	30,501	30,723	30,946	31,172	31,399	31,627	31,857	32,031	32,206	32,382	32,558	32,736	32,915
TOTAL H-GAC DISPOSAL FORECAST	8,820,636	8,984,184	9,151,586	9,322,956	9,498,413	9,678,079	9,786,327	9,896,219	10,007,788	10,121,065	10,236,085	10,352,881	10,471,488	10,591,941	10,714,277	10,838,532	10,940,068	11,042,885	11,147,004	11,252,447	11,359,236	11,467,393

Schedule 7
Single-Family Disposal Forecast (2015 - 2036)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																						
Cleveland	3,828	3,835	3,842	3,849	3,856	3,863	3,869	3,875	3,882	3,888	3,894	3,901	3,907	3,913	3,920	3,926	3,933	3,939	3,945	3,952	3,958	3,965
Dayton	4,044	4,186	4,333	4,485	4,642	4,804	4,932	5,062	5,196	5,334	5,475	5,620	5,768	5,921	6,078	6,239	6,363	6,490	6,620	6,752	6,887	7,025
Liberty	5,055	5,096	5,137	5,179	5,221	5,263	5,304	5,344	5,386	5,427	5,469	5,511	5,553	5,596	5,639	5,682	5,721	5,760	5,799	5,839	5,878	5,918
Small and Unincorporated	35,208	35,641	36,076	36,514	36,952	37,393	37,824	38,257	38,694	39,133	39,576	40,021	40,469	40,920	41,373	41,830	42,239	42,651	43,065	43,482	43,902	44,325
Matagorda County																						
Bay City	8,359	8,414	8,469	8,524	8,579	8,635	8,680	8,724	8,769	8,814	8,860	8,905	8,951	8,997	9,043	9,090	9,118	9,147	9,176	9,205	9,234	9,263
Palacios	2,843	2,862	2,880	2,899	2,918	2,937	2,952	2,967	2,983	2,998	3,013	3,029	3,044	3,060	3,076	3,092	3,101	3,111	3,121	3,131	3,141	3,151
Small and Unincorporated	9,299	9,359	9,420	9,482	9,543	9,606	9,655	9,704	9,754	9,804	9,855	9,905	9,956	10,007	10,059	10,110	10,142	10,174	10,207	10,239	10,271	10,304
Montgomery County																						
Conroe	26,283	27,156	28,058	28,990	29,953	30,947	31,517	32,097	32,688	33,289	33,902	34,526	35,162	35,809	36,468	37,139	37,659	38,186	38,720	39,262	39,811	40,368
Willis	3,564	3,616	3,668	3,721	3,774	3,829	3,842	3,856	3,869	3,883	3,897	3,911	3,924	3,938	3,952	3,966	3,996	4,026	4,057	4,087	4,118	4,149
The Woodlands	32,462	33,391	34,347	35,330	36,341	37,382	37,472	37,562	37,653	37,744	37,835	37,926	38,018	38,110	38,202	38,294	38,293	38,293	38,292	38,291	38,290	38,289
Small and Unincorporated	204,823	211,778	218,967	226,398	234,078	242,016	250,411	259,035	267,894	276,993	286,339	295,939	305,800	315,927	326,330	337,013	347,049	357,323	367,842	378,612	389,637	400,925
Walker County																						
Huntsville	6,319	6,354	6,390	6,427	6,463	6,500	6,530	6,561	6,592	6,623	6,654	6,685	6,716	6,748	6,780	6,812	6,834	6,856	6,878	6,901	6,923	6,946
Small and Unincorporated	19,178	19,286	19,395	19,505	19,615	19,726	19,818	19,911	20,005	20,098	20,193	20,287	20,382	20,478	20,574	20,671	20,738	20,805	20,872	20,940	21,008	21,076
Waller County																						
Hempstead	2,780	2,823	2,867	2,911	2,956	3,002	3,048	3,096	3,143	3,192	3,242	3,292	3,343	3,394	3,447	3,500	3,552	3,605	3,658	3,712	3,767	3,822
Prairie View	2,754	2,801	2,849	2,898	2,948	2,998	3,049	3,101	3,153	3,206	3,261	3,316	3,372	3,429	3,487	3,546	3,602	3,660	3,718	3,777	3,837	3,899
Small and Unincorporated	21,076	21,517	21,968	22,428	22,898	23,377	23,845	24,322	24,809	25,305	25,810	26,326	26,853	27,389	27,936	28,494	29,017	29,549	30,091	30,642	31,204	31,776
Wharton County																						
El Campo	6,897	6,927	6,957	6,987	7,017	7,047	7,079	7,112	7,144	7,177	7,210	7,243	7,276	7,309	7,343	7,376	7,402	7,428	7,454	7,480	7,507	7,533
Wharton	4,147	4,172	4,197	4,222	4,247	4,272	4,299	4,325	4,352	4,380	4,407	4,435	4,462	4,490	4,518	4,546	4,568	4,589	4,611	4,633	4,654	4,676
Small and Unincorporated	13,457	13,549	13,642	13,735	13,829	13,924	14,024	14,124	14,224	14,326	14,428	14,530	14,634	14,738	14,843	14,948	15,029	15,109	15,190	15,271	15,353	15,435
TOTAL H-GAC SINGLE-FAMILY DISPOSAL FORECAST	3,075,162	3,137,926	3,202,242	3,268,159	3,335,726	3,404,995	3,445,950	3,487,569	3,529,865	3,572,851	3,616,542	3,660,951	3,706,095	3,751,986	3,798,642	3,846,076	3,884,426	3,923,288	3,962,672	4,002,587	4,043,042	4,084,045

Schedule 8
Multi-Family Disposal Forecast (2015 - 2036)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																						
Cleveland	1,118	1,120	1,122	1,124	1,126	1,128	1,130	1,132	1,133	1,135	1,137	1,139	1,141	1,143	1,144	1,146	1,148	1,150	1,152	1,154	1,156	1,158
Dayton	1,450	1,501	1,553	1,608	1,664	1,722	1,768	1,815	1,863	1,912	1,962	2,014	2,068	2,122	2,179	2,236	2,281	2,327	2,373	2,420	2,469	2,518
Liberty	529	533	538	542	546	551	555	559	564	568	572	577	581	586	590	595	599	603	607	611	615	619
Small and Unincorporated	367	372	376	381	385	390	394	399	403	408	413	417	422	427	431	436	440	445	449	453	458	462
Matagorda County																						
Bay City	3,261	3,282	3,304	3,325	3,347	3,369	3,386	3,403	3,421	3,438	3,456	3,474	3,492	3,510	3,528	3,546	3,557	3,568	3,580	3,591	3,602	3,614
Palacios	269	271	273	275	277	278	280	281	283	284	286	287	289	290	291	293	294	295	296	297	298	299
Small and Unincorporated	181	182	183	185	186	187	188	189	190	191	192	193	194	195	196	197	197	198	199	199	200	201
Montgomery County																						
Conroe	15,981	16,512	17,060	17,627	18,212	18,817	19,163	19,516	19,875	20,241	20,613	20,993	21,379	21,773	22,173	22,582	22,898	23,218	23,543	23,872	24,206	24,545
Willis	320	324	329	334	339	344	345	346	347	348	350	351	352	353	355	356	359	361	364	367	369	372
The Woodlands	7,131	7,336	7,546	7,762	7,984	8,212	8,232	8,252	8,272	8,292	8,312	8,332	8,352	8,372	8,392	8,413	8,413	8,412	8,412	8,412	8,412	8,412
Small and Unincorporated	21,639	22,374	23,133	23,918	24,730	25,568	26,455	27,366	28,302	29,264	30,251	31,265	32,307	33,377	34,476	35,605	36,665	37,750	38,862	39,999	41,164	42,357
Walker County																						
Huntsville	5,163	5,192	5,222	5,251	5,281	5,311	5,336	5,361	5,386	5,411	5,437	5,462	5,488	5,514	5,540	5,566	5,584	5,602	5,620	5,639	5,657	5,675
Small and Unincorporated	77	77	77	78	78	79	79	79	80	80	81	81	81	82	82	82	83	83	83	84	84	84
Waller County																						
Hempstead	1,198	1,216	1,235	1,254	1,274	1,293	1,313	1,334	1,354	1,375	1,397	1,418	1,440	1,463	1,485	1,508	1,531	1,553	1,576	1,599	1,623	1,647
Prairie View	1,123	1,142	1,162	1,181	1,202	1,222	1,243	1,264	1,285	1,307	1,329	1,352	1,375	1,398	1,421	1,446	1,469	1,492	1,516	1,540	1,564	1,589
Small and Unincorporated	1,495	1,526	1,558	1,591	1,624	1,658	1,691	1,725	1,760	1,795	1,831	1,867	1,905	1,943	1,982	2,021	2,058	2,096	2,134	2,173	2,213	2,254
Wharton County																						
El Campo	673	676	678	681	684	687	690	694	697	700	703	706	710	713	716	719	722	724	727	730	732	735
Wharton	1,663	1,673	1,683	1,693	1,703	1,713	1,724	1,735	1,745	1,756	1,767	1,778	1,789	1,801	1,812	1,823	1,832	1,840	1,849	1,858	1,867	1,875
Small and Unincorporated	319	321	324	326	328	330	333	335	337	340	342	345	347	350	352	355	356	358	360	362	364	366
TOTAL H-GAC MULTI-FAMILY DISPOSAL FORECAST	1,108,871	1,122,859	1,137,095	1,151,585	1,166,337	1,181,356	1,191,597	1,201,950	1,212,418	1,223,002	1,233,703	1,244,525	1,255,467	1,266,533	1,277,724	1,289,041	1,298,804	1,308,658	1,318,606	1,328,649	1,338,787	1,349,023

Schedule 9
Commercial Disposal Forecast (2015 - 2036)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Liberty County																						
Cleveland	3,682	3,691	3,700	3,709	3,718	3,727	3,734	3,741	3,749	3,756	3,763	3,770	3,777	3,785	3,792	3,799	3,806	3,813	3,820	3,827	3,834	3,841
Dayton	5,108	5,290	5,479	5,674	5,876	6,086	6,249	6,416	6,588	6,764	6,946	7,132	7,323	7,519	7,720	7,927	8,087	8,250	8,416	8,586	8,759	8,936
Liberty	5,156	5,201	5,246	5,292	5,338	5,385	5,428	5,471	5,515	5,559	5,604	5,648	5,694	5,739	5,785	5,831	5,872	5,913	5,955	5,996	6,039	6,081
Small and Unincorporated	28,026	28,388	28,753	29,119	29,487	29,857	30,210	30,565	30,923	31,284	31,647	32,012	32,381	32,751	33,124	33,500	33,834	34,170	34,509	34,850	35,194	35,540
Matagorda County																						
Bay City	11,683	11,766	11,850	11,935	12,020	12,106	12,172	12,238	12,304	12,371	12,439	12,506	12,574	12,643	12,712	12,781	12,824	12,867	12,910	12,953	12,997	13,041
Palacios	3,369	3,393	3,418	3,442	3,467	3,491	3,510	3,529	3,549	3,568	3,587	3,607	3,626	3,646	3,666	3,686	3,698	3,711	3,723	3,736	3,748	3,761
Small and Unincorporated	8,942	9,006	9,070	9,135	9,200	9,266	9,316	9,367	9,418	9,469	9,520	9,572	9,624	9,677	9,729	9,782	9,815	9,848	9,881	9,914	9,948	9,981
Montgomery County																						
Conroe	44,479	45,984	47,541	49,150	50,814	52,534	53,516	54,517	55,537	56,575	57,634	58,712	59,811	60,930	62,071	63,233	64,130	65,040	65,963	66,899	67,848	68,811
Willis	3,508	3,561	3,615	3,669	3,724	3,780	3,795	3,809	3,824	3,838	3,853	3,868	3,883	3,898	3,913	3,928	3,958	3,989	4,020	4,051	4,082	4,114
The Woodlands	73,159	75,300	77,503	79,770	82,104	84,507	84,735	84,965	85,195	85,426	85,658	85,891	86,124	86,358	86,594	86,830	86,844	86,859	86,874	86,889	86,905	86,920
Small and Unincorporated	226,901	234,750	242,869	251,265	259,948	268,929	278,339	288,009	297,946	308,157	318,651	329,433	340,513	351,897	363,596	375,616	386,874	398,404	410,212	422,305	434,689	447,372
Walker County																						
Huntsville	18,316	18,431	18,546	18,663	18,780	18,898	18,993	19,087	19,183	19,279	19,375	19,472	19,569	19,667	19,766	19,865	19,933	20,002	20,071	20,140	20,210	20,279
Small and Unincorporated	15,864	15,963	16,063	16,164	16,265	16,367	16,449	16,531	16,613	16,696	16,779	16,863	16,947	17,032	17,117	17,203	17,262	17,321	17,381	17,440	17,500	17,561
Waller County																						
Hempstead	3,749	3,809	3,870	3,932	3,996	4,060	4,124	4,189	4,255	4,322	4,390	4,460	4,530	4,602	4,674	4,748	4,819	4,891	4,965	5,039	5,114	5,191
Prairie View	3,599	3,663	3,728	3,794	3,862	3,930	3,998	4,067	4,137	4,208	4,280	4,354	4,429	4,505	4,583	4,662	4,737	4,814	4,891	4,970	5,050	5,132
Small and Unincorporated	23,075	23,573	24,082	24,602	25,132	25,674	26,196	26,727	27,270	27,824	28,388	28,964	29,552	30,152	30,764	31,388	31,970	32,562	33,165	33,780	34,406	35,043
Wharton County																						
El Campo	7,975	8,014	8,054	8,093	8,133	8,173	8,213	8,253	8,293	8,334	8,374	8,415	8,456	8,498	8,539	8,581	8,613	8,644	8,676	8,709	8,741	8,773
Wharton	5,304	5,339	5,374	5,409	5,445	5,481	5,516	5,553	5,589	5,625	5,662	5,699	5,737	5,774	5,812	5,850	5,879	5,908	5,937	5,966	5,995	6,025
Small and Unincorporated	14,812	14,922	15,034	15,146	15,260	15,374	15,488	15,603	15,719	15,835	15,953	16,071	16,191	16,311	16,432	16,554	16,646	16,738	16,831	16,925	17,019	17,113
TOTAL H-GAC COMMERCIAL DISPOSAL FORECAST	4,636,602	4,723,400	4,812,250	4,903,212	4,996,350	5,091,728	5,148,780	5,206,700	5,265,505	5,325,213	5,385,840	5,447,405	5,509,926	5,573,422	5,637,912	5,703,415	5,756,838	5,810,938	5,865,725	5,921,211	5,977,407	6,034,325

Appendix B SURVEYS

The following blank surveys are included in Appendix B:

- H-GAC MSW Generation and Diversion Survey – CITY SURVEY
- H-GAC MSW Generation and Diversion Survey – COUNTY SURVEY

H-GAC MSW GENERATION AND DIVERSION SURVEY

City Survey

1. General Information

1. Please complete the following contact information.

2. Where the survey asks for tonnage data, please provide for the most recent calendar or fiscal year. Please indicate the year for which you have provided data, below.

3. Please provide the most recent number of households for both single-family and multi-family units for your city.

Please use the following U.S. Census definitions of single-family and multi-family units:

Single-family units: include fully detached, semidetached (semi-attached, side-by-side), row houses, and townhouses. In the case of attached units, each must be separated from the adjacent unit by a ground-to-roof wall in order to be classified as a single-family structure. Also, these units must not share heating/air-conditioning systems or utilities.

Multi-family units: residential buildings containing units built one on top of another and those built side-by-side which do not have a ground-to-roof wall and/or have common facilities (i.e., attic, basement, heating plant, plumbing, etc.)

4. Please indicate who provides the following collection, recycling, and disposal services (check all that apply). If the City and Private Contractor(s) share in a particular service offering, please select the "City & Private Contractor(s)" column.

	City	Private Contractor(s)	City & Private Contractor(s)	N/A
Single-family Garbage				
Single-family Recycling				
Single-family Yard Waste				
Single-family Bulky				
Multi-family Garbage				
Multi-family Recycling				
Multi-family Yard Waste				
Multi-family Bulky				
Commercial Garbage				
Commercial Recycling				
Landfill				
Transfer Station				
Citizens' Collection Stations				
Recycling Drop-off Centers				

5. How many customers does the City have (please specify those served by the City and those served by private contractor(s))?

	Number of Customers Served by City	Number of Customers Served by Private Contractor(s)
Single-family Garbage		
Single-family Recycling		
Single-family Yard Waste		
Single-family Bulky		
Multi-family Garbage		
Multi-family Recycling		
Multi-family Yard Waste		
Multi-family Bulky		
Commercial Garbage		
Commercial Recycling		

2. Disposal

For **garbage collection** services provided by **City Crews** (contracted services are addressed in question 7), please estimate the annual tonnage disposed for each of the following customer types and services. Please do not include tonnage diverted from the landfill, as this is addressed in a later section of this survey. **PLEASE NOTE that if Multi-family and Commercial material is collected together, please enter tonnage in the "Multi-family & Commercial" column.**

	Single-family	Multi-family	Commercial	Multi-family & Commercial
Garbage (tons)				
Yard Waste (tons)				
Bulky (tons)				
C&D (tons) - commercial only				
Industrial Non-Hazardous (tons) - commercial only				

For **garbage collection** services provided by **private contractors**, please estimate the annual tonnage disposed of for each of the following customer types and services. Please do not include tonnage diverted from the landfill, as this is addressed in a later section of this survey. **PLEASE NOTE that if Multi-family and Commercial material is collected together, please enter tonnage in the "Multi-family & Commercial" column.**

	Single-family	Multi-family	Commercial	Multi-Family & Commercial
Garbage (tons)				
Yard Waste (tons)				
Bulky (tons)				
C&D (tons) - commercial only				
Industrial Non-Hazardous (tons) - commercial only				

If available, please list the names of the private contractors that provide **garbage collection** services and indicate which services they provide for the City.

	Name(s) of Private Contractor
Single-family Garbage	
Single-family Yard Waste	
Single-family Bulky	
Multi-family Garbage	
Multi-family Yard Waste	
Multi-family Bulky	
Commercial Garbage	
Commercial C&D	
Commercial Industrial Non-Hazardous	

Does the tonnage in questions 6 and 7 represent all garbage, yard waste, bulky items, C&D, and industrial non-hazardous solid waste collected in the City? If no, please explain and list additional annual tonnage collected, if necessary. (i.e., community clean-up days)

Please list the annual tonnage disposed of directly by self-haulers (e.g., residents, small businesses) at the following facilities, whether operated by the City or a private contractor.

	Landfill	Transfer Station	Citizens' Collection Stations
Garbage (tons)			
Yard Waste (tons)			
Bulky (tons)			
C&D (tons)			
Industrial Non-Hazardous (tons)			

3. Recycling/Diversion

Where curbside recycling services are provided by City Crews (contracted services are addressed in question 12), please indicate the annual tonnage collected. Materials received at recycling drop-off centers are addressed later in this survey.

	Single-family	Multi-family	Commercial
Plastics (tons)			
Glass (tons)			
Paper (tons)			
Steel (tons)			
Aluminum (tons)			
Cardboard (tons)			
Other (tons)			

Where curbside recycling services are provided by a private contractor, please indicate the annual tonnage received if data is available. Materials received at recycling drop-off centers are addressed later in this survey.

	Single-family	Multi-family	Commercial
Plastics (tons)			
Glass (tons)			
Paper (tons)			
Steel (tons)			
Aluminum (tons)			
Cardboard (tons)			
Other (tons)			

If available, please list the names of the private contractors that provide curbside recycling services and indicate which type of customers they serve on behalf of the City.

	Name(s) of Private Contractor
Single-family	
Multi-family	
Commercial	

Where recycling drop-off centers are operated by the City (privately operated centers are addressed in question 15), please indicate the annual tonnage received.

	Tonnage Received
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

Where recycling drop-off centers are operated by a private contractor, please indicate the annual tonnage received.

	Tonnage Received
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

If available, please list the names of the private contractors that own and/or operate the recycling drop-off centers.

	Names of Private Contractor(s)
1	

4. Solid Waste Facilities

Please provide information about the landfills used by the City. (Leave blank if this question does not apply.)

	Name	Location	Owner	Own	Own/Operate	City's Role (Own, Own/Operate, or Use)
1						
2						
3						

Does the City (or the private operator, if the landfill is privately operated) anticipate the need to develop a landfill (new or expand the current landfill) in the future?

If the answer to number 18 is yes, estimate the year the landfill would be needed and the additional capacity.

Are there any special issues that the City (or private operator) faces if additional landfill capacity is sought?

Please provide information about the material recovery facilities (MRFs) used by the City. (Leave blank if this question does not apply.)

	Name	Location	Processing Capacity (Tons Per Day)	Owner	Own	Own/Operate	City's Role (Own, Own/Operate, or Use)
1							
2							
3							
4							

Does the City (or the private operator, if the MRF is privately operated) anticipate the need to construct a MRF (new or additional capacity) in the future? If yes, estimate the year the MRF would be needed and processing capacity.

Please provide information about the transfer stations used by the City. (Leave blank if this question does not apply.)

	Name	Location	Owner	Own	Own/Operate	City's Role (Own, Own/Operate, or Use)
1						
2						
3						
4						

Does the City (or the private operator, if the transfer station is privately operated) anticipate the need to construct a transfer station (new or additional capacity) in the future? If yes, estimate the year the transfer station would be needed.

Please provide information about the citizens' collection stations used by the City. (Leave blank if this question does not apply.)

	Name	Location	Owner	Own	Own/Operate	City's Role (Own, Own/Operate, or Use)
1						
2						
3						
4						
5						
6						

If necessary, please list additional facilities used by the City in the space provided.

5. Thank You!

Thank you for taking our survey. Your response is very important to us.

Should you have any questions, comments, or concerns about this survey, please contact:

Ms. Mandy Sines
Analyst
NewGen Strategies & Solutions, LLC
(512) 649-1309
msines@newgenstrategies.net

Ms. Erin Livingston
Senior Environmental Planner
Houston-Galveston Area Council
(832) 681-2525
Erin.Livingston@h-gac.com

Confirmation Email

Confirmation Email for H-GAC Survey

H-GAC MSW GENERATION AND DIVERSION SURVEY

County Survey

1. General Information

1. Please complete the following contact information

County Name : County Name
Contact Name : Contact Name
Phone Number : Phone Number
Email Address : Email Address

2. Where the survey asks for tonnage data, please provide for the most recent calendar or fiscal year. Please indicate the year for which you have provided data, below.

Data year : FY or CY

3. Please provide the most recent number of households for both single-family and multi-family units for your county. (Please provide data for only the unincorporated areas of the county, if possible. Information regarding the incorporated areas [i.e., cities] is being collected through a separate survey.)

Please use the following U.S. Census definitions of single-family and multi-family units:

Single-family units: include fully detached, semidetached (semi-attached, side-by-side), row houses, and townhouses. In the case of attached units, each must be separated from the adjacent unit by a ground-to-roof wall in order to be classified as a single-family structure. Also, these units must not share heating/air-conditioning systems or utilities.

Multi-family units: residential buildings containing units built one on top of another and those built side-by-side which do not have a ground-to-roof wall and/or have common facilities (i.e., attic, basement, heating plant, plumbing, etc.)

2. Garbage Collection & Recycling

4. Please indicate who provides the following collection, recycling, and disposal services in the County (check all that apply). If the County and private contractor(s) share in a particular service offering, please select the "County & Private Contractor(s)" column.

	County	Private Contractor(s)	County & Private Contractor(s)	N/A
Single-family Garbage				
Single-family Recycling				
Single-family Yard Waste				
Single-family Bulky				
Citizens' Collection Stations				
Other				

5. How many customers does the County have (those served by the County and those served by private contractors)?

	Number of Customers Served by County	Number of Customers Served by Private Contractor
Single-family Garbage		
Single-family Recycling		
Single-family Yard Waste		
Single-family Bulky		
Other		

6. For **garbage collection** services provided by **County Crews** (contracted services are addressed in question 7), please estimate the annual tonnage disposed for each of the following:

	Single-family
Garbage (tons)	
Yard Waste (tons)	
Bulky (tons)	
Other (tons)	

7. For **garbage collection** services provided by **private contractors** within the County, please estimate the annual tonnage disposed for each of the following:

	Single-family
Garbage (tons)	
Yard Waste (tons)	
Bulky (tons)	
Other (tons)	

8. If available, please list the names of the private contractors that provide **garbage collection** services and indicate which services they provide for the County.

	Name(s) of Private Contractor
Single-family Garbage	
Single-family Yard Waste	
Single-family Bulky	
Other	

9. Where **curbside recycling** services are provided by **County Crews** (contracted services are addressed in question 10), please indicate the annual tonnage received if data is available. Materials received at citizens' collection stations are addressed in Questions 12 and 13.

	Single-family
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

10. Where curbside recycling services are provided by a private contractor, please indicate the annual tonnage received if data is available. Materials received at citizens' collection stations are addressed in questions 12 and 13.

	Single-family
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

11. If available, please list the names of the private contractors that provide curbside recycling services and indicate which type of customers they serve on behalf of the County.

	Name(s) of Private Contractor
Single-family	

12. Where citizens' collection stations are operated by the County (privately operated stations are addressed in question 13), please indicate the annual tonnage received. *PLEASE NOTE that garbage, yard waste, and bulky items are listed first, before the recyclable materials.*

	Annual Tonnage Received
Garbage (tons)	
Yard Waste (tons)	
Bulky (tons)	
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

13. Where citizens' collection stations are operated by a private contractor, please indicate the annual tonnage received. *PLEASE NOTE that garbage, yard waste, and bulky items are listed first, before the recyclable materials.*

	Annual Tonnage Received
Garbage (tons)	
Yard Waste (tons)	
Bulky (tons)	
Plastics (tons)	
Glass (tons)	
Paper (tons)	
Steel (tons)	
Aluminum (tons)	
Cardboard (tons)	
Other (tons)	

14. If available, please list the names of the private contractors that own and/or operate the citizens' collection stations in the County.

15. Please use the space below to share any additional pertinent information regarding the waste and recycling data for your County that was not addressed by this survey.

3. Thank You!

Confirmation Email

Jul 11, 2017 13:26:54 Success: Email Sent to: msines@newgenstrategies.net

Confirmation Email

Jul 11, 2017 13:26:55 Success: Email Sent to: Email Address