



April 25, 2019

A Municipal Solid Waste Generation and Diversion Forecast for the City of Houston



Presented by:
David S. Yanke
President – Environmental Practice



ECONOMICS

STRATEGY

STAKEHOLDERS

SUSTAINABILITY

www.newgenstrategies.net

Project Purpose

The purpose of the waste generation forecast is to identify the following waste quantities over a 21-year period (2019-2040)

- Putrescible Waste
- Organics
- Recyclables
- Construction & Demolition Waste

Single-family, multi-family, and commercial putrescible waste is forecasted separately.

Methodology

- Utilized the waste generation methodology outlined in NewGen's 2017 H-GAC report ("A Municipal Solid Waste Generation and Diversion Forecast for the H-GAC Planning Region").
- Utilized H-GAC's current forecast for population, household count, and employment for the City of Houston.
- Utilized City of Houston specific data in the single-family per capita calculations for putrescible waste, recyclables, yard waste, and bulky waste.

Population, Households, and Employment Forecast

	2019	2020	2025	2030	2035	2040
Total Population						
Single-Family	1,313,556	1,316,795	1,336,256	1,362,049	1,383,652	1,395,743
Multi-Family	1,070,119	1,090,697	1,199,631	1,326,114	1,503,522	1,649,287
Total Population	2,383,675	2,407,492	2,535,887	2,688,163	2,887,174	3,045,030
Total Households						
Single-Family	462,736	464,696	474,620	484,756	495,109	505,683
Multi-Family	478,538	488,601	540,884	599,117	682,942	758,524
Total Households	941,274	953,297	1,015,504	1,083,873	1,178,051	1,264,207
Total Employment						
Employment	1,882,233	1,903,278	2,037,272	2,187,204	2,306,186	2,368,224

Data Sources – Disposal

Single-Family Waste

- Utilized City of Houston per capita calculation for putrescible waste & bulky waste
- Applied to single-family population projections

Multi-Family Waste

- Utilized City of Houston per capita calculation for putrescible waste & bulky waste
- Applied to multi-family population projections

Employment Waste

- Utilized average of 1.51 tons per employee per year (per 2017 H-GAC Study)
- Applied to employment population projections

Single-Family Waste Disposal

City of Houston Single-Family Waste Generation¹

	FY 2016 ²	FY 2017	FY 2018 ³
SF Population Served by the City	1,089,544	1,095,066	1,100,014
# of Single-Family (SF) Households Served	386,232	386,531	386,830
SF Garbage (tons/year)	385,660	431,717	445,397
SF Bulky Waste (tons/year)	287,064	174,742	195,829
SF Yard Waste (tons/year)	54,479	54,569	30,612
SF Recycling (tons/year)	62,287	51,497	36,595

1. This is tonnage that is collected by the City of Houston Solid Waste Management Department.
2. FY 2016 metrics, from the 2017 H-GAC Study, concerning the number of single-family homes and curbside recycling tonnage were modified slightly based on more accurate data that was provided by the City as part of this report.
3. The recycling and yard waste tonnage decreased in FY 2018 due to Hurricane Harvey and the City of Houston having to suspend these specific collection services for several months to focus on debris clean up.

Note: Approximately 84% of all single-family households located within the City of Houston are currently served by the City's Solid Waste Management Department. The remaining 16% are collected through subscription services.

Single-Family Per-Capita Disposal and Diversion

Table 3-3
Single-Family Per-Capita Disposal and Diversion
(Tons/Person/Year)¹

	FY 2016 Per Capita	FY 2017 Per Capita	FY 2018 Per Capita	Average per Capita ²
<u>SF Disposal</u>				
SF Garbage	0.3540	0.3942	0.4049	0.3741
SF Bulky Waste	0.2635	0.1596	0.1780	0.2115
SF Disposal	0.6175	0.5538	0.5829	0.5856
<u>SF Diversion</u>				
SF Recycling	0.0572	0.0470	0.0333	0.0521
SF Yard & Wood Waste	0.0500	0.0498	0.0278	0.0499
SF Diversion	0.1072	0.0968	0.0611	0.1020
Total Generation	0.7247	0.6506	0.6440	0.6876

1. Example: 385,660 tons (Table 3-1, 2016, Single-Family Garbage) / 1,089,544 SF Population (Table 3-2) = 0.3540 tons per person per year
2. The average per capita generation rates used to forecast waste disposal in this analysis are based on the averages of FY 2016 & FY 2017.

It is also worthwhile to note that after Hurricane Harvey impacted the City in August 2017 (FY 2018), the City of Houston's Solid Waste Management Department briefly suspended curbside collection of yard waste, and single-stream recycling.

- As such, the per capita metrics for FY 2018 were not representative of a typical year, and the per capita ratios used to forecast waste disposal for FY 2019 – FY 2040 are based on the averages of FY 2016 and FY 2017.
- The per capita disposal rate is held constant for the entire forecast, which is a similar approach utilized in the 2017 H-GAC Study.

Residential Disposal Forecast

**Table 3-4
City of Houston
Residential Disposal Forecast (Tons)**

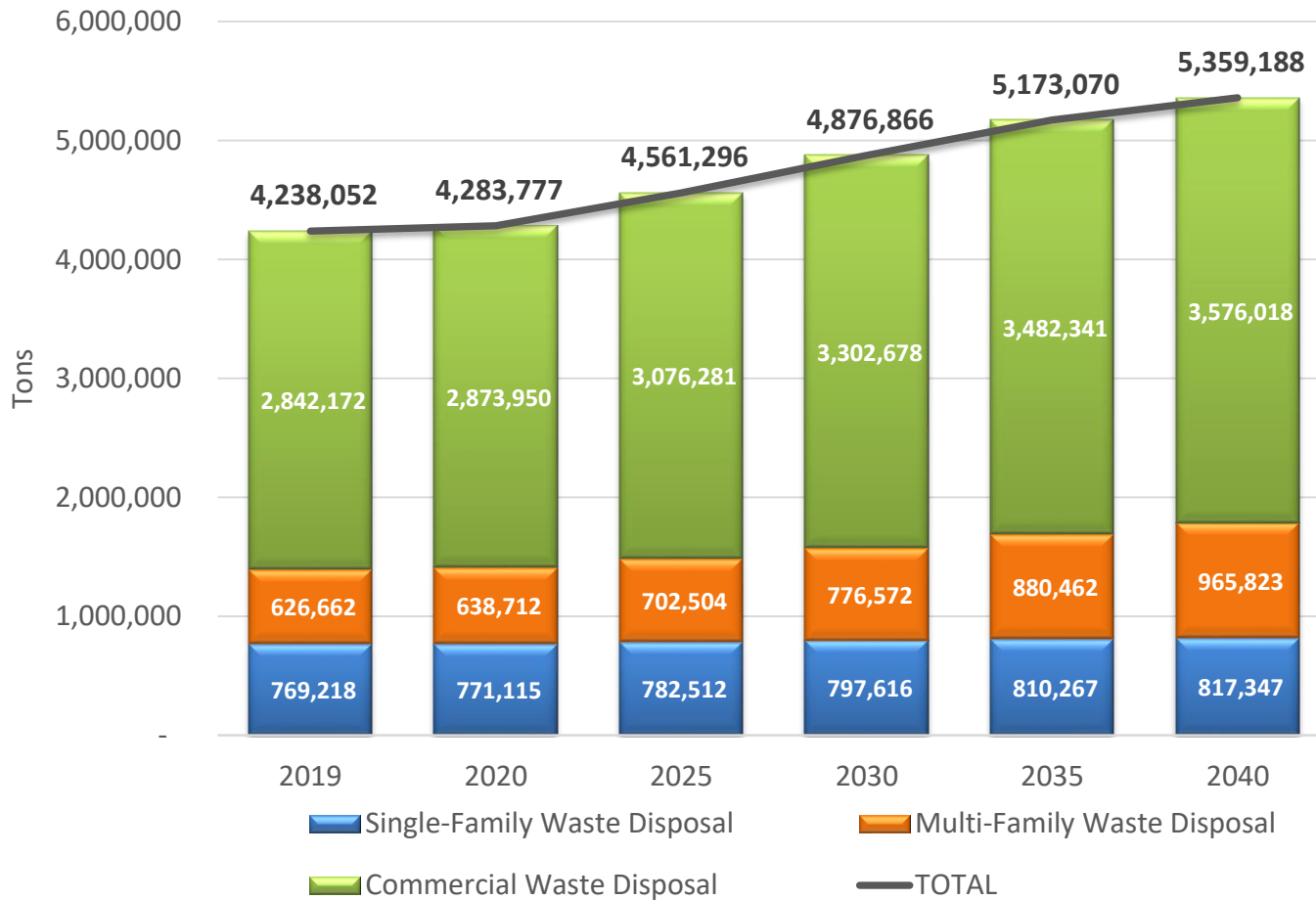
	2019	2020	2025	2030	2035	2040
Residential Disposal						
Single-Family ¹	769,218	771,115	782,512	797,616	810,267	817,347
Multi-Family ¹	626,662	638,712	702,504	776,572	880,462	965,823
Total Residential Disposal	1,395,880	1,409,827	1,485,016	1,574,188	1,690,729	1,783,170

1. Garbage and bulky waste

**Table 3-5
City of Houston
Commercial Disposal Forecast (Tons)**

	2019	2020	2025	2030	2035	2040
Commercial Disposal	2,842,172	2,873,950	3,076,281	3,302,678	3,482,341	3,576,018

Projected Disposal Forecast



Data Sources – Materials Generated and Diverted

Typical Recyclables

- Includes glass, metals, paper, plastics
- Utilized the Study on the Economic Impacts of Recycling to calculate benchmark

Organics

- Includes biosolids, food and beverage materials, yard trimmings, brush, and leaves
- Utilized the Study on the Economic Impacts of Recycling to calculate benchmark
- Utilized conversations with private operators

Construction & Demolition

- Includes concrete, steel, tires, reclaimed asphalt, asphalt shingles
- Utilized the Study on the Economic Impacts of Recycling to calculate benchmark
- Utilized conversation with Cherry Companies + Other Processors

Other Recyclables

- Includes electronic materials, household hazardous waste, textiles, and other uncategorized materials
- Utilized the Study on the Economic Impacts of Recycling to calculate benchmark

Diverted Material

State of Texas 2015 Diverted Material per 2017 TCEQ Study (Tons)

	Texas	Houston ⁵	% of Total
Typical Recyclable Material ¹	3,129,530	255,683	34.1%
Organics ²	2,747,128	224,440	30.0%
Construction & Demolition Material ³	3,136,727	256,271	34.2%
Other Recyclables ⁴	158,322	12,935	1.7%
Total	9,171,707	749,328	100%

1. Includes glass, metals, paper, and plastics.
2. Includes biosolids, food and beverage materials, yard trimmings, brush, and leaves.
3. Includes concrete aggregate.
4. Includes electronic materials, household hazardous waste, textiles, tires, and other uncategorized materials.
5. 8.17% of all Texas residents reside in Houston. Therefore, 8.17% of all recycling in Texas was assumed to occur within the City.

Curbside and Drop-off Recyclables Forecast

Table 4-3
City of Houston
Single-Family (SF) Curbside Recycling (Tons)²

	2019	2020	2025	2030	2035	2040
SF Curbside Recycling	68,436 ¹	68,605	69,619	70,963	72,088	72,718

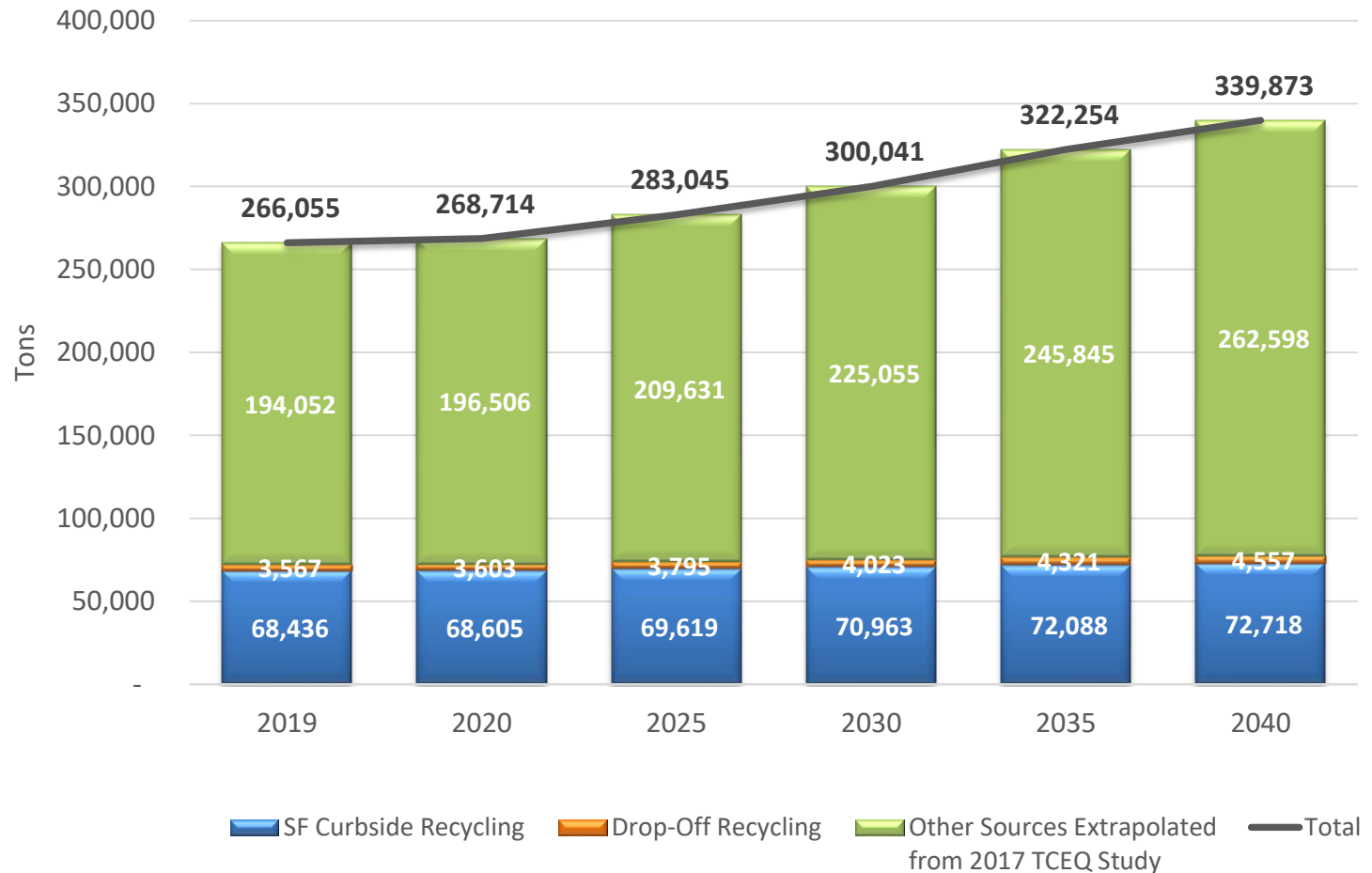
1. $0.0521 * 1,313,556$ (single-family population per Table 2-1) = 68,436 tons of single-family (SF) curbside recyclables.
2. This includes projected recycling tonnage for all single-family homes, both those collected by the City, and the 16% of single-family households collected by contracted service providers.

Table 4-4
City of Houston
Typical Recyclable Material Forecast (Tons)

	2019	2020	2025	2030	2035	2040
SF Curbside Recycling ¹	68,436 ¹	68,605	69,619	70,963	72,088	72,718
Drop-Off Recycling ²	3,567	3,603	3,795	4,023	4,321	4,557
Glass, Metals, Paper & Plastics Diversion from Other Sources ³	194,052	196,506	209,631	225,055	245,845	262,598
Total	266,055	268,714	283,045	300,041	322,254	339,873

1. Typical recyclables collected via curbside recycling for single-family units.
2. Tonnage sourced from the City of Houston depositories/recycling centers and drop-off locations (includes materials from multi-family households).
3. Tons of recyclables from other sources is extrapolated per the 2017 TCEQ Study.

Typical Recyclable Material Forecast (Tons)



City of Houston Compost Facilities

**Table 4-5
City of Houston
Compost Facilities Within Houston**

	Feedstocks	Products	Estimated Throughput (Tons/Year)	Estimated Capacity (Tons/Year)
Living Earth (LETCO) ¹	Yard waste from the City of Houston SWMD; yard waste from private contractors; pre-consumer food waste	Mulch, compost	183,388	375,000
The Ground Up ²	Trees, yard waste, pre-consumer food waste, dairy, soft drinks, stable bedding	Mulch, compost	50,000	100,000
The Farm Dirt Compost ³	Vegetative food and wood chips	Mulch, compost	1,000	1,000
Total			234,388	476,000

1. Includes seven facilities located in the City of Houston.
2. Includes one site located in the City of Houston.
3. Includes one site located in the City of Houston.

Organics Forecast

Table 4-6
City of Houston
Single-Family (SF) Wood & Yard Waste (Tons)²

	2019	2020	2025	2030	2035	2040
SF Wood & Yard Waste	65,546 ¹	65,708	66,679	67,966	69,044	69,648

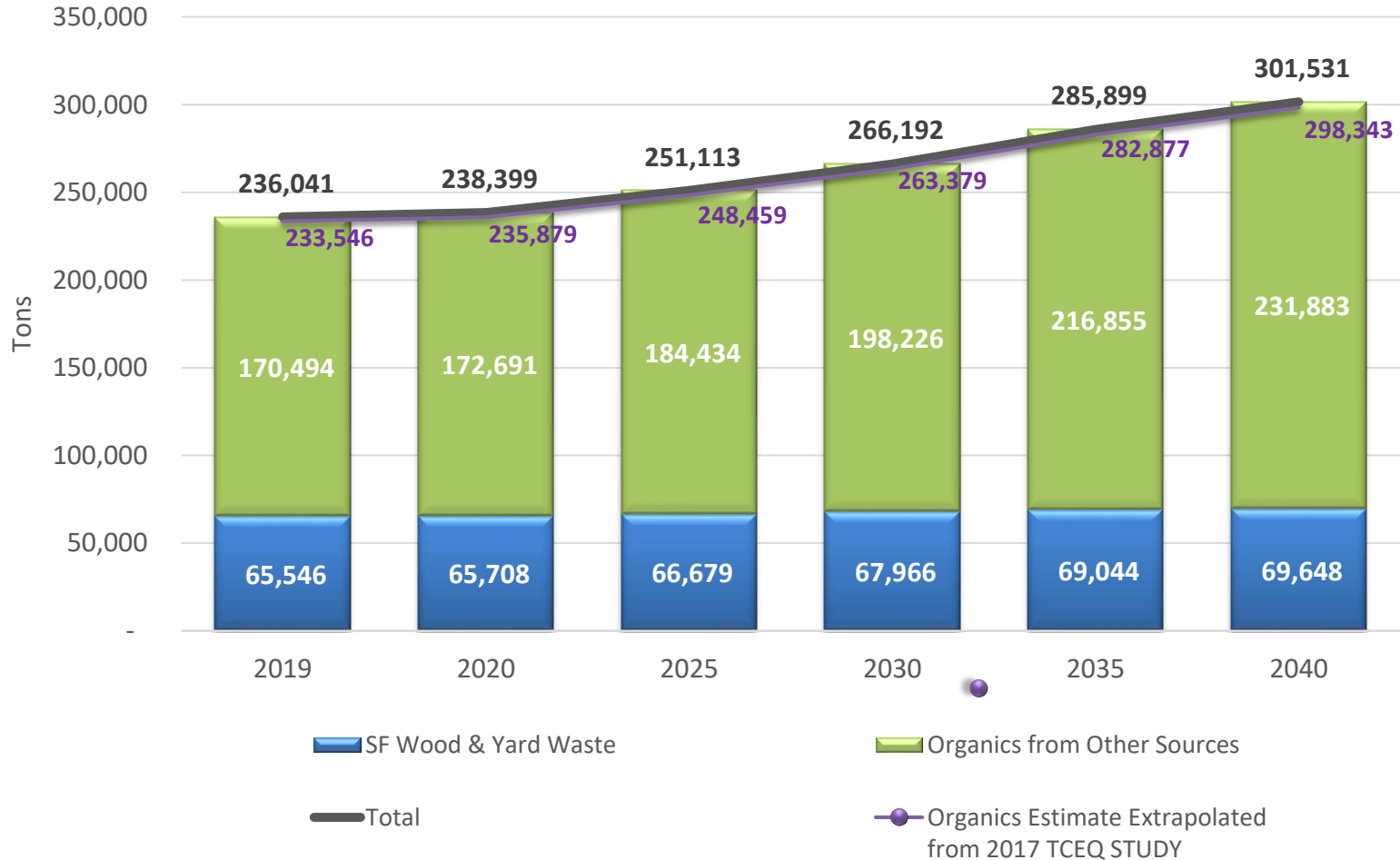
1. $0.0499 * 1,313,556 = 65,546$ tons of single-family (SF) curbside recyclables.
2. This includes projected wood and yard waste tonnage for all single-family homes, both those collected by the City, and the 16% of single-family households collected by contracted service providers.

Table 4-7
City of Houston
Organics Diversion Forecast (Tons)

	2019	2020	2025	2030	2035	2040
SF Wood & Yard Waste ¹	65,546	65,708	66,679	67,966	69,044	69,648
Organics Diverted from Other Sources ²	170,494	172,691	184,434	198,226	216,855	231,883
Total	236,041³	238,399	251,113	266,192	285,899	301,531

1. Yard waste and wood waste collected from single-family homes.
2. Forecast for organics tracks with population growth. See Section 2.1.
3. Values differ slightly from Table 4-5 because Table 4-7 was adjusted for growth. Table 4-5 was based on tonnage reported for 2018.

Organics Diversion Forecast



Construction & Demolition Waste Forecast

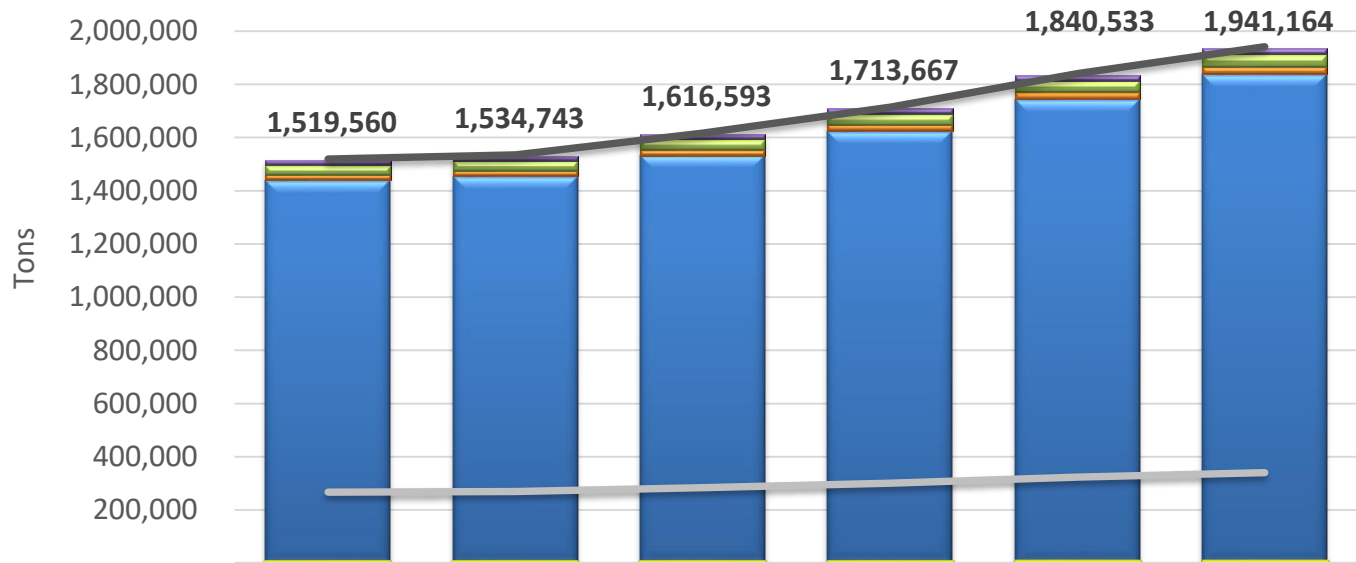
Table 4-8
City of Houston
Construction & Demolition Materials (Tons)

	2019	2020	2025	2030	2035	2040
C&D Materials	1,519,560	1,534,743	1,616,593	1,713,667	1,840,533	1,941,164

Cherry Companies noted that the following additional material could be diverted if a market for the following materials were established:

- Sheet rock
 - Carpet
 - Treated wood
 - Gypsum
 - Glass.
- » Approximately 350,000 cubic yards of this material is currently being landfilled by Cherry Company on an annual basis

Construction & Demolition Waste Forecast (Tons)



	2019	2020	2025	2030	2035	2040
Composition Asphalt Shingles	18,000	18,180	19,149	20,299	21,802	22,994
Steel	36,000	36,360	38,299	40,599	43,604	45,988
Reclaimed Asphalt	21,600	21,816	22,979	24,359	26,163	27,593
Concrete	1,440,000	1,454,388	1,531,952	1,623,944	1,744,168	1,839,530
Tires	3,960	4,000	4,213	4,466	4,796	5,059
TOTAL	1,519,560	1,534,743	1,616,593	1,713,667	1,840,533	1,941,164
Extrapolated C&D Tonnage from 2017 TCEQ STUDY	266,667	269,332	283,696	300,731	322,995	340,655

Other Recyclables Forecast

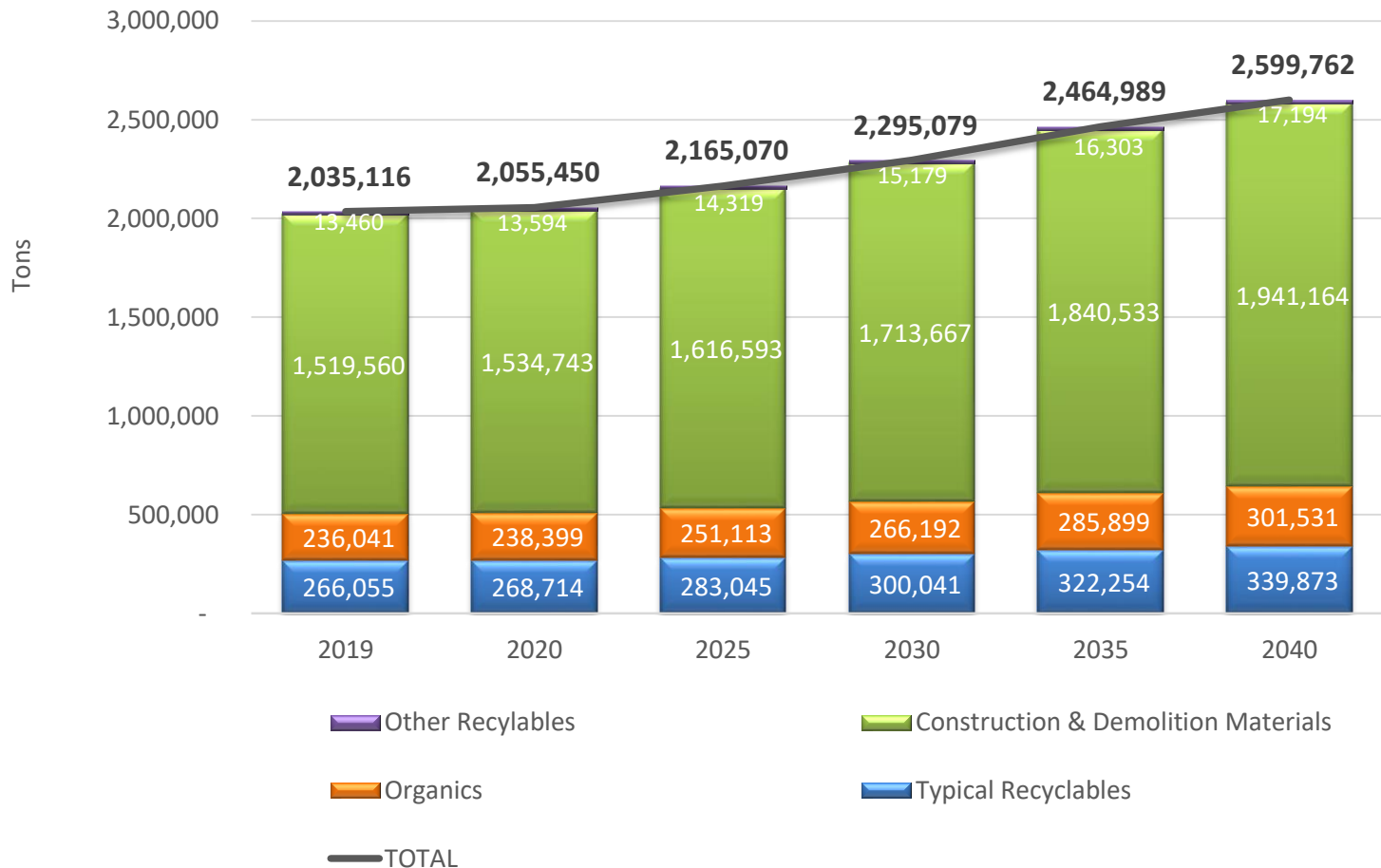
**Table 4-9
City of Houston
Other Recyclables (Tons)**

	2019	2020	2025	2030	2035	2040
Other Recyclables	13,460	13,594	14,319	15,179	16,303	17,194

**Table 4-10
City of Houston
Total Diversion Forecast (Tons)**

	2019	2020	2025	2030	2035	2040
Typical Recyclables	266,055	268,714	283,045	300,041	322,254	339,873
Organics	236,041	238,399	251,113	266,192	285,899	301,531
Construction & Demolition Waste	1,519,560	1,534,743	1,616,593	1,713,667	1,840,533	1,941,164
Other Recyclables	13,460	13,594	14,319	15,179	16,303	17,194
Total Diversion Tonnage	2,035,116	2,055,450	2,165,070	2,295,079	2,464,989	2,599,762

Total Diversion Forecast

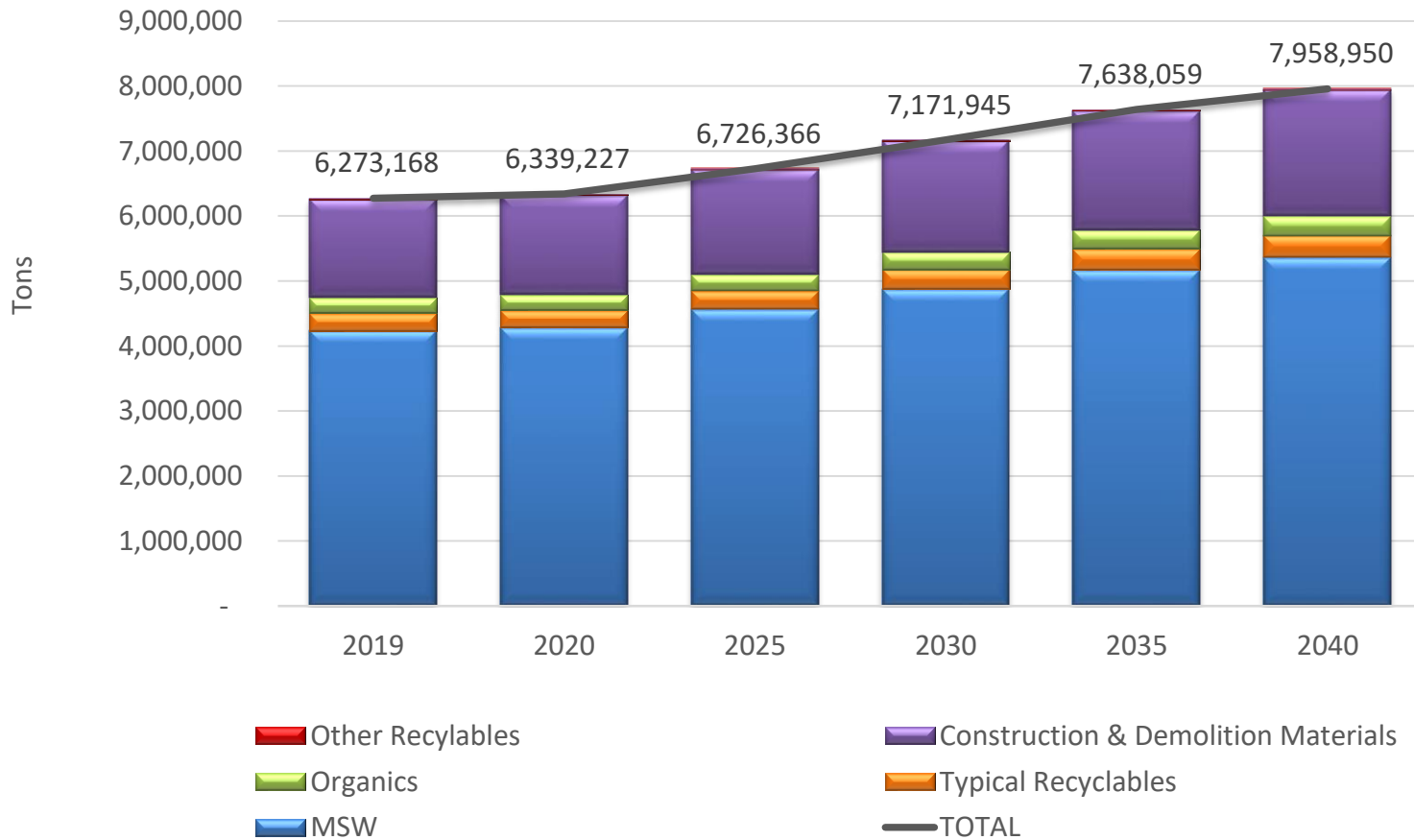


Total Generation Forecast

Table 5-1
City of Houston
Total Generation Forecast (Tons)

	2019	2020	2025	2030	2035	2040
Total Disposal	4,238,052	4,283,777	4,561,296	4,876,866	5,173,070	5,359,188
Total Diversion	2,035,116	2,055,450	2,165,070	2,295,079	2,464,989	2,599,762
Total Generation	6,273,168	6,339,227	6,726,366	7,171,945	7,638,059	7,958,950

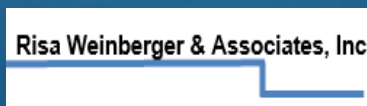
Total Generation Forecast (Tons)



The City has an estimated diversion rate of approximately 32.4%. However, it should be noted that 75% of the diversion rate is due to C&D. Excluding C&D, the diversion rate is approximately 10.9%

City of Houston Integrated Resource Recovery Management Plan

DRAFT Facilities Report



The existing integrated resource management system



Facility Policy Issues

3

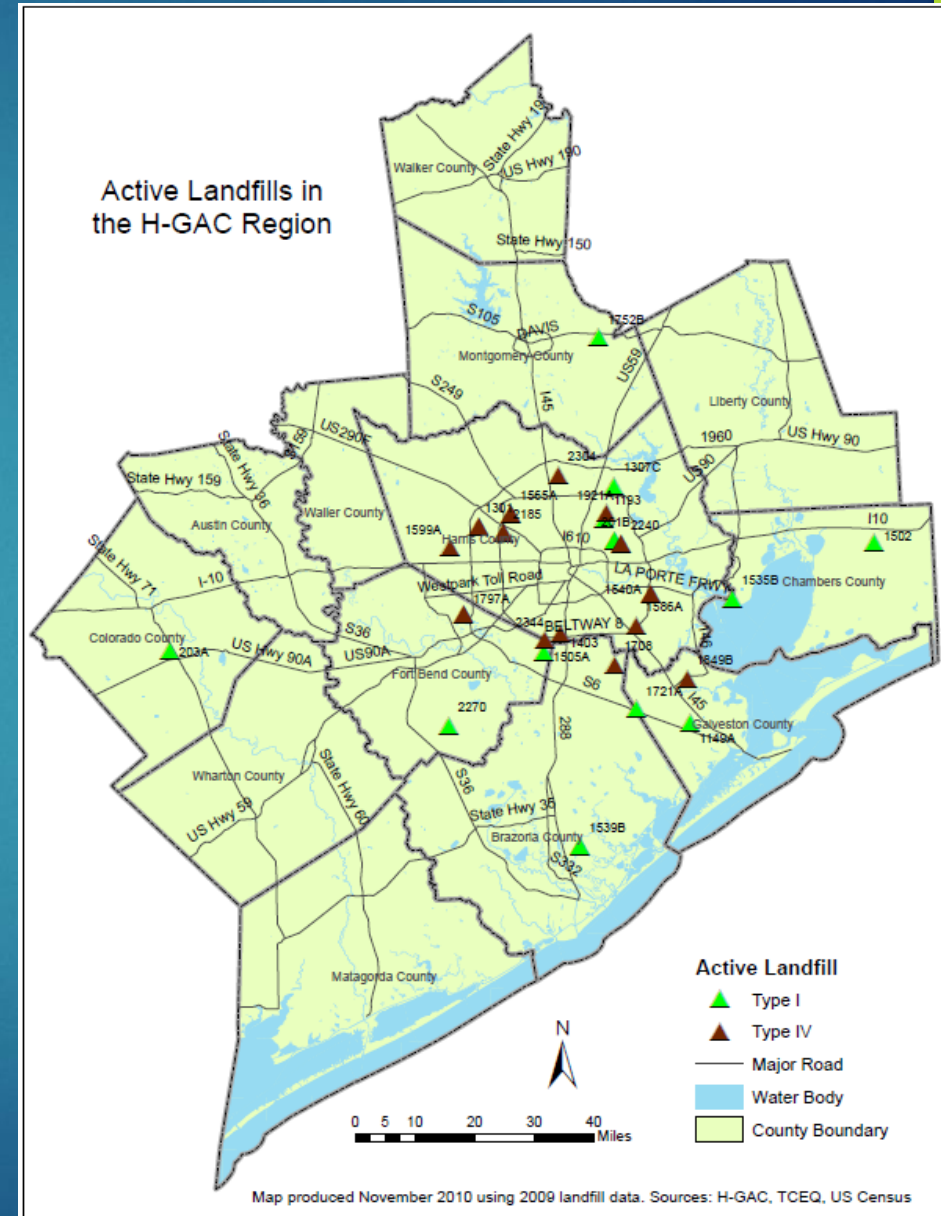
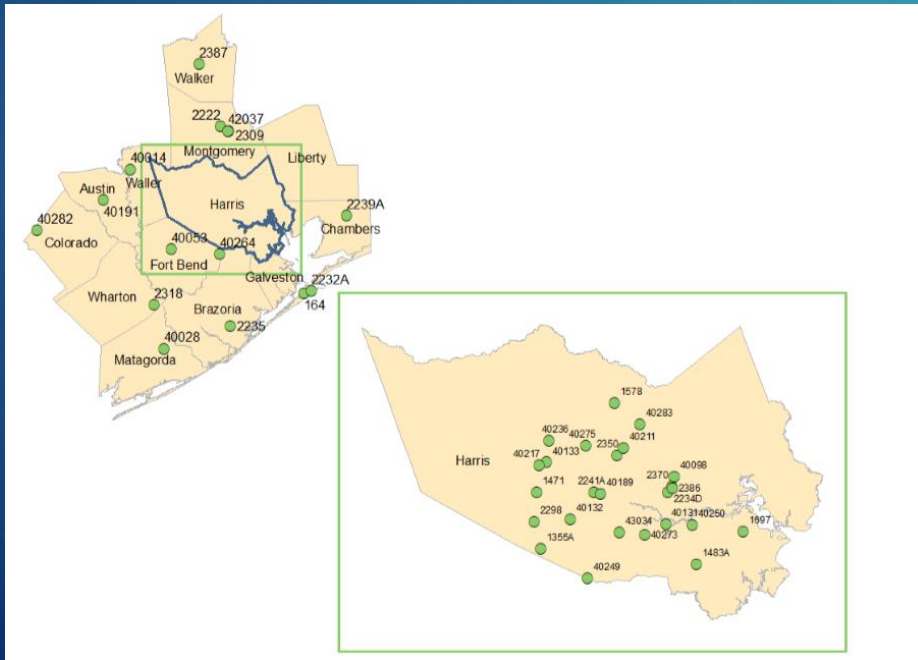
- ▶ Regional System
- ▶ Predominantly Private Sector
- ▶ Fully integrated
- ▶ Identifying new sites for facilities will be a challenge



DRAFT

Regional System

- ▶ Facilities across the region accept Houston waste
- ▶ Waste is being imported and exported out of the City. More waste is going out.



City & Private Sector's Role in Waste Management

- ▶ City provides services at facilities including:
 - ▶ Depositories & Recycling Centers
 - ▶ Environmental Service Centers
- ▶ Private entities are responsible for largest percentage of recyclables recovered – combination of sustainable programs and market driven recycling
- ▶ City owns 3 transfer stations that are privately operated
- ▶ With few exceptions, all processing & disposal sites are privately owned and operated
- ▶ Private firms generally determine where and when capacity and new facilities are added

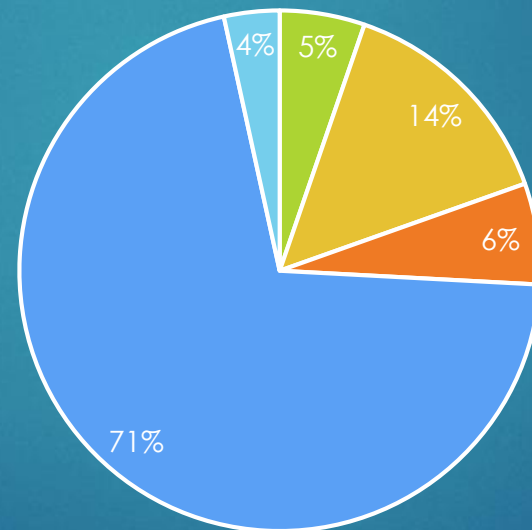


Recycling Facilities

- ▶ City Facilities
 - ▶ Depositories & Recycling Centers
 - ▶ Environmental Service Centers
- ▶ Private Facilities – **over 150 – 200 businesses** involved at some level in recycling
- ▶ Markets challenges

Estimated 23% state-wide recycling rate

Typical Recyclables



- Glass
- Metals - Ferrous
- Metals - non-ferrous
- Paper
- Plastics



Material Recovery Facilities

- ▶ Process recovered materials and prepare for market
- ▶ Manual and mechanical separation
- ▶ 6 facilities identified in region
- ▶ Market conditions affecting value of materials
- ▶ All residential recyclables collected by City go to FCC starting in March 2019 – distance issue

Of the facilities reporting, the region has over 630,000 tons of annual capacity with approximately 300,000 tons processed in 2017

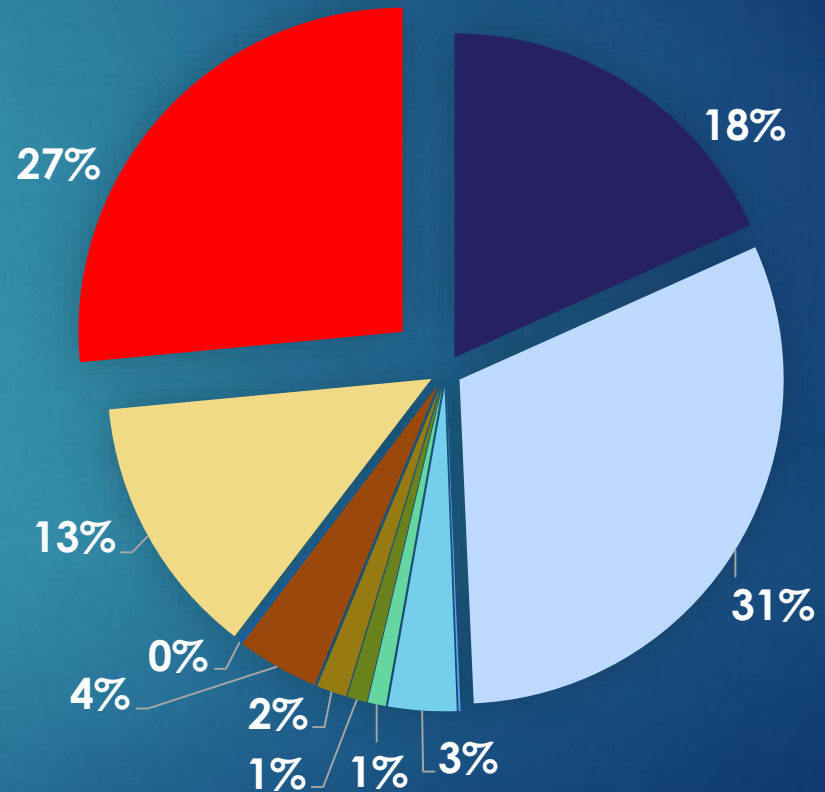


MRF designs incorporates both manual and mechanical separation

Materials Recovered & Contamination

- ▶ Largest streams are
 - ▶ Mixed Paper at 31%
 - ▶ Glass at 13%
 - ▶ OCC at 18%
 - ▶ Plastics at 7%
 - ▶ **CONTAMINATION AT 27%**

Composition of Single Stream Materials



Material	% by weight
Old Corrugated Containers	18.30
Mixed Paper	31.00
Newspaper Aseptic	-
Packaging metal	0.10
Steel cans metal	3.40
Aluminum	0.90
Plastics - natural HDPE	1.00
Plastics - colored HDPE	1.50
Plastics - PET	4.10
Plastics - comingled	0.10
Glas - 3 mix*	13.10
Trash	26.50

Construction & Demolition Material Recycling

- ▶ Over 2.5 million tons recovered
- ▶ Types of materials include:
 - ▶ Concrete
 - ▶ Wood
 - ▶ Metals
 - ▶ Glass
- ▶ Industries dedicated to recovering materials and landfills with recovery operations

In 2018, an estimated 2.8 million tons of C&D were disposed at Type IV landfills. There are businesses that are currently processing construction & demolition waste in the region. Approximately 2.5 million tons of C&D are processed and recycled annually.



Cherry Company was responsible for demolition of Old Houston Chronicle Building –

Over 95% of building materials were recycled

Approximately 58,000 tons

Organics Management

10

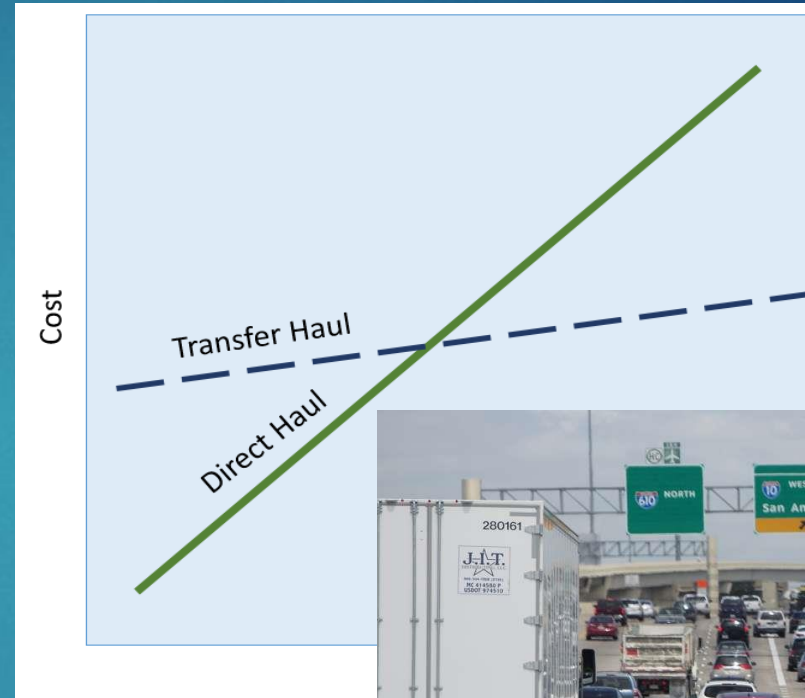
- ▶ Materials Processed
 - ▶ Yard Waste
 - ▶ Brush
 - ▶ Wood
 - ▶ Food Waste
 - ▶ Biosolids (sludge)
- ▶ Over 50 facilities throughout the H-GAC Region

In 2017, the Region has Over 1.2 million tons of processing capacity. Over 850,000 tons were actually processed regionally.



Transfer Stations

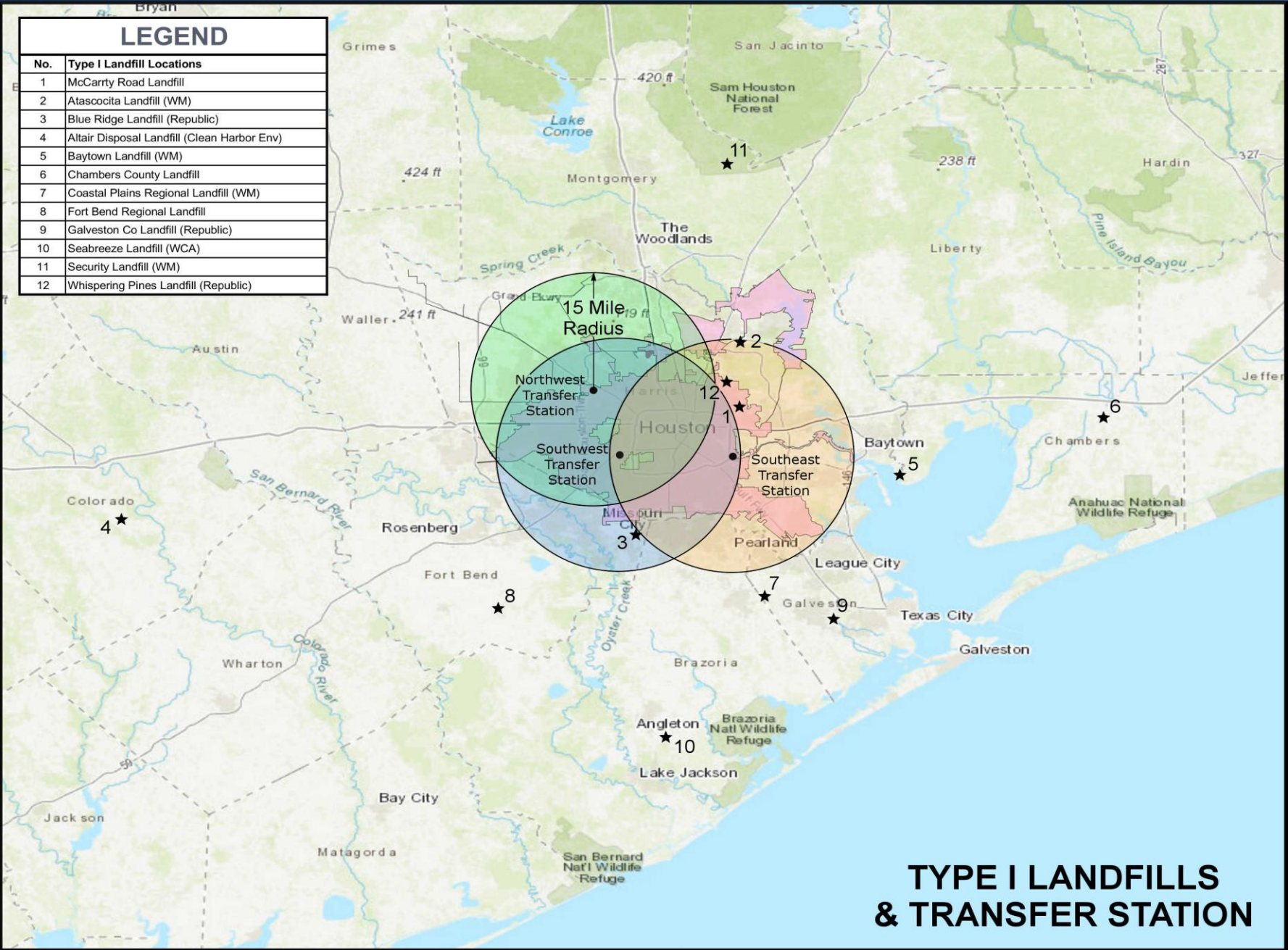
- ▶ Necessary to reduce haul costs in Houston traffic
- ▶ City owns three transfer stations with capacities of 2000 tons per day
- ▶ Privately operated by Republic
- ▶ Approximately 75% of City collected waste goes to Transfer Stations before Landfill
- ▶ In 2017, **2.5 million tons** of the total **9.9 million tons** of waste went to one of 21 transfer stations operating in the Region



As distances from collection point to landfill increase, it becomes cost-effective to use transfer stations to haul waste to the landfill

SE Transfer Station Site Configuration





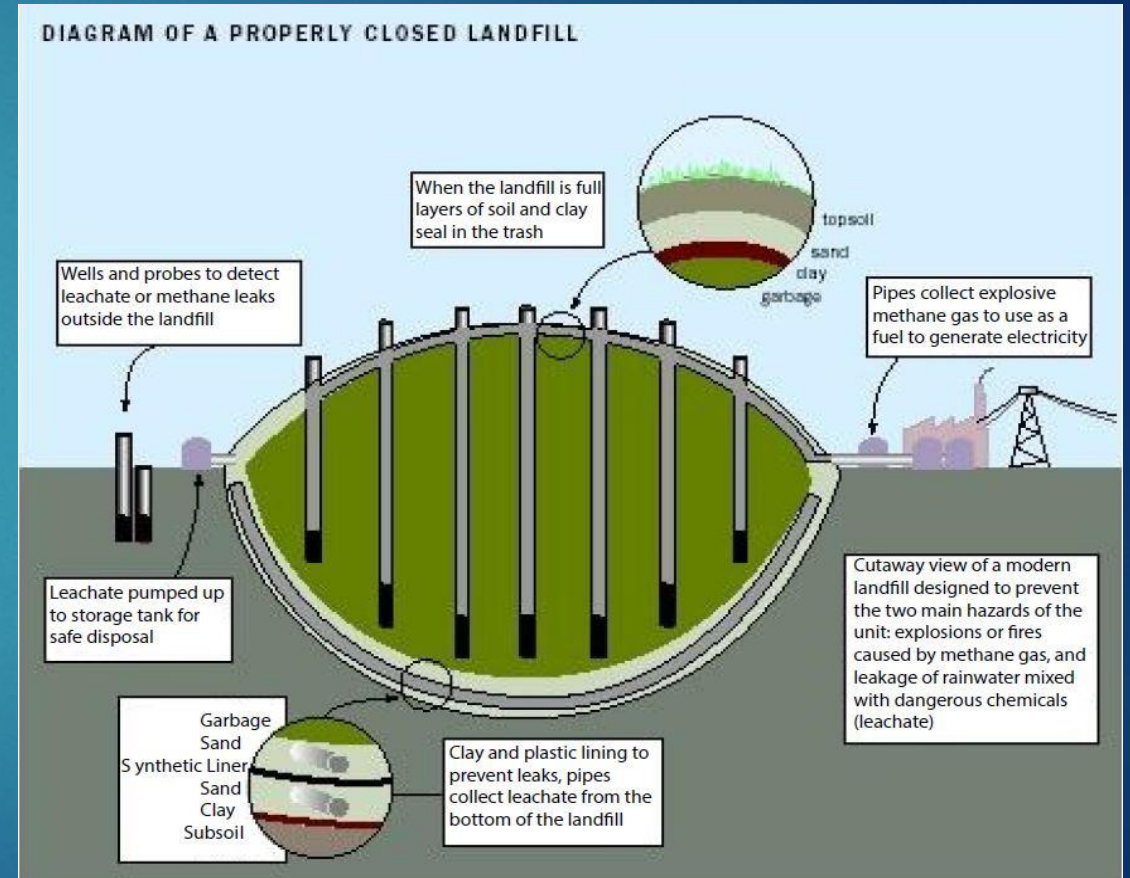
TYPE I LANDFILLS & TRANSFER STATION

Majority of Houston's waste goes to one of 26 regional landfills

The City relies primarily on privately owned and operated landfills

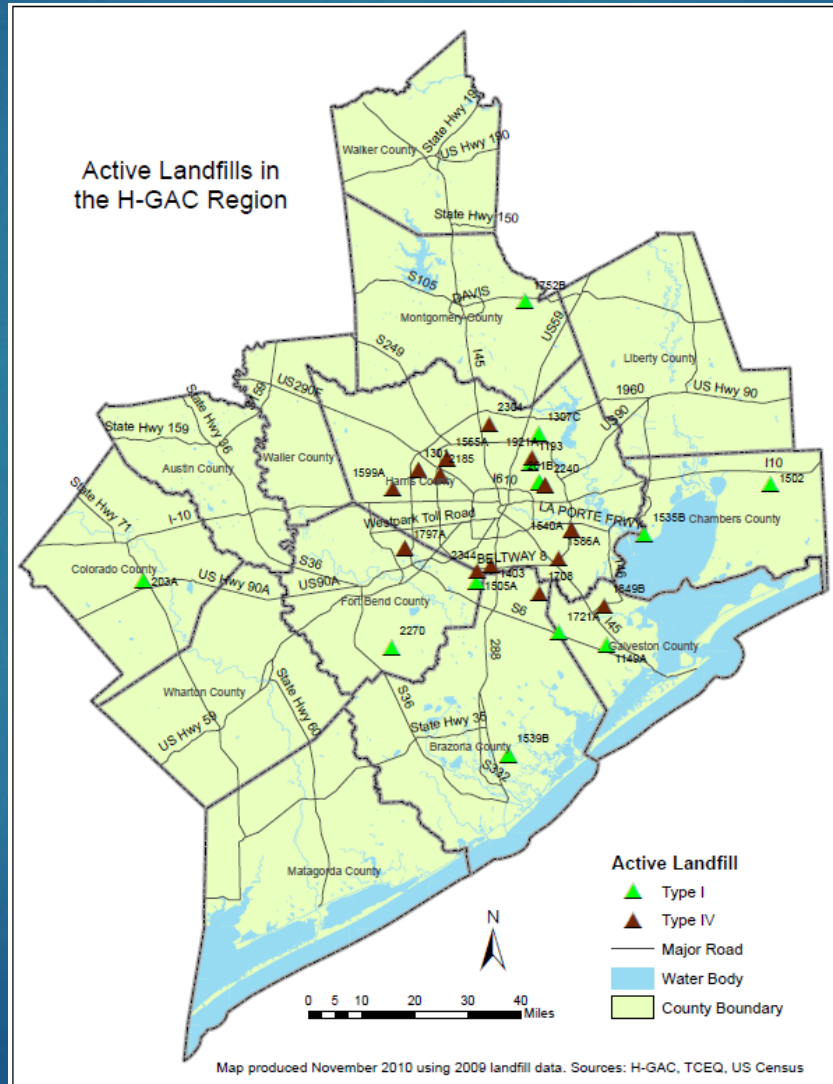
Landfill Type	Capacity (tons)	Capacity (years)	Number reaching capacity by 2038
Type I (MSW)	267 million	25-30	4 of 11
Type IV (C&D)	61 million	20-25	10 of 15

*assumes no expansions between now and then



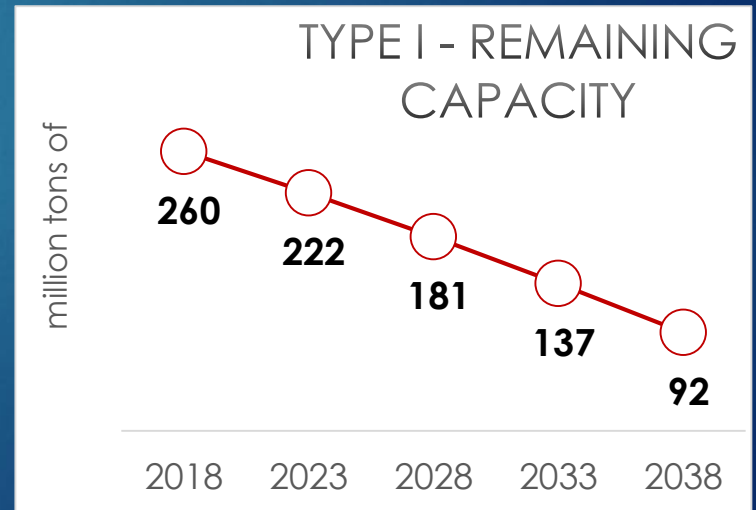
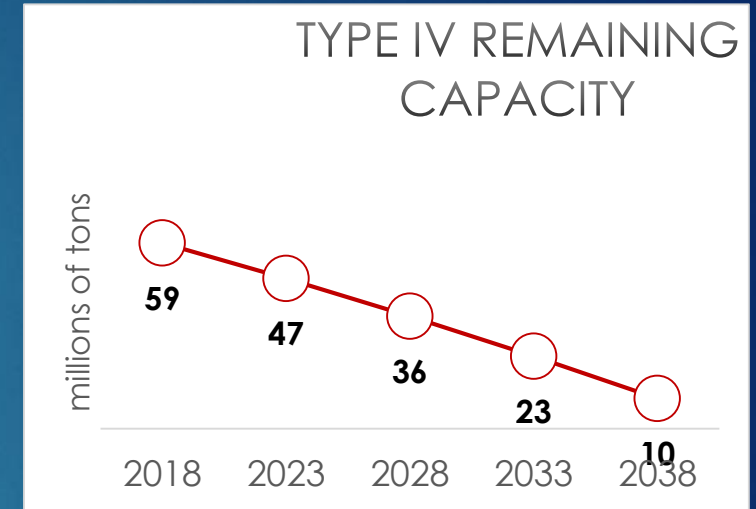
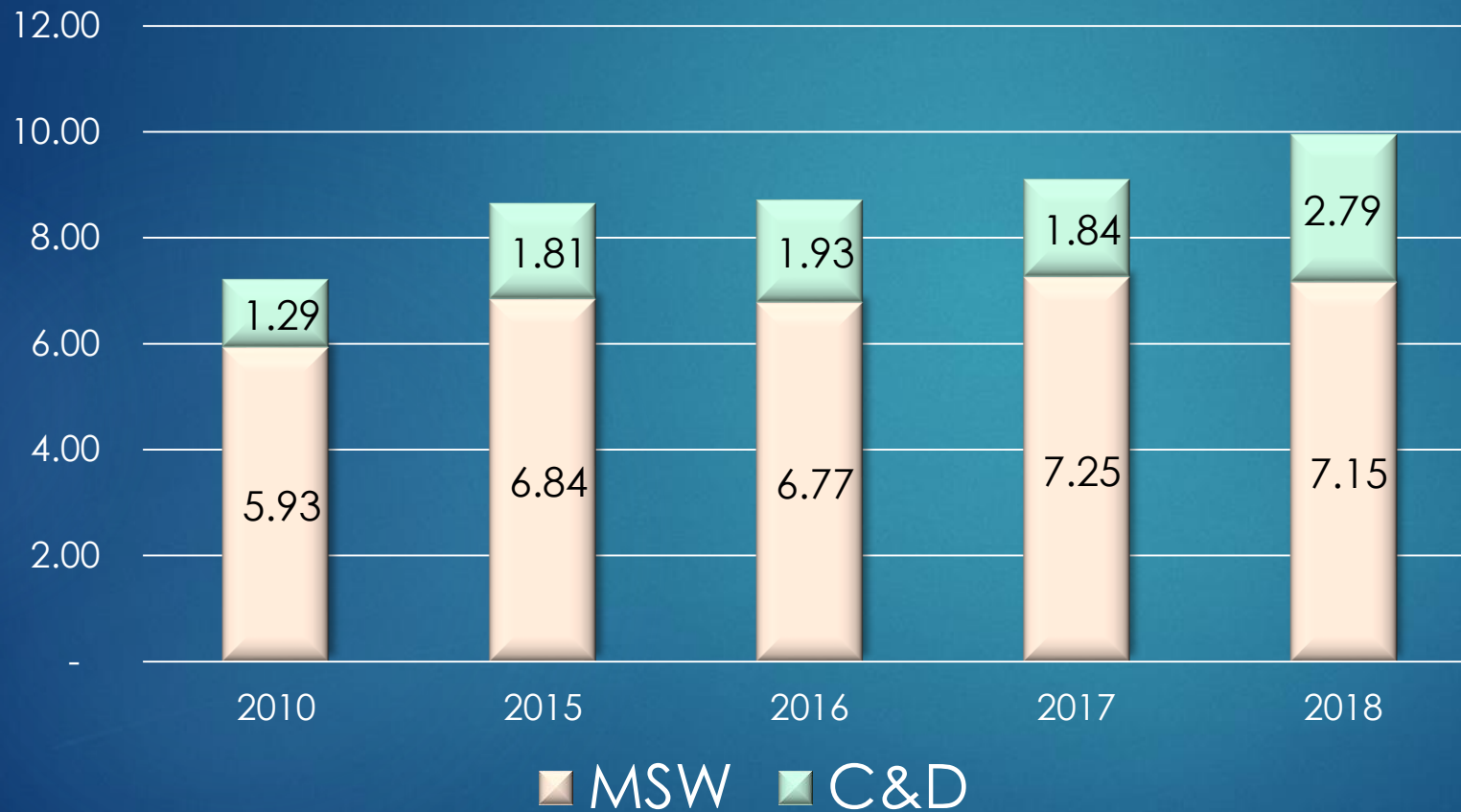
It takes between 10 – 15 years to site, permit and construct a new landfill

Regional Landfills



Landfill Capacity & Growth

Disposal Quantities in H-GAC Region
(million tons/year)



Permit amendments filed with: Seabreeze (I), Greenhouse(IV) & Tall Pines IV)

Other Waste Facilities

- ▶ Grease & Grit Trap
- ▶ Tires
- ▶ Medical Wastes
- ▶ Ash
- ▶ Batteries & Electronics





Questions?

David S. Yanke
President – Environmental Practice
3420 Executive Center Drive, Suite 165
Austin, Texas 78731
512.649.1254
dyanke@newgenstrategies.net