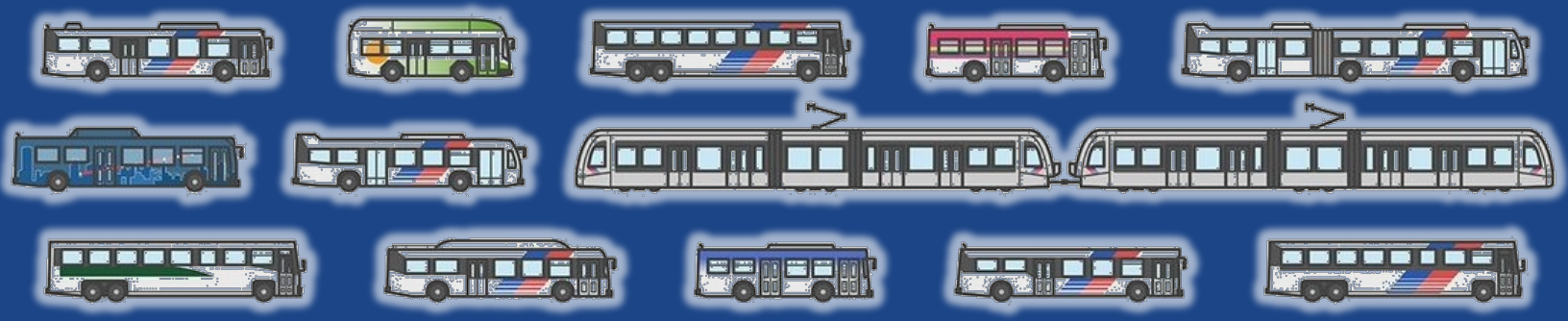
EQUITY IN TRANSIT

2018 REPORT



LINK HOUSTON

Advocates for a robust and equitable transportation network so that all people can reach opportunity.

LINK Houston

LINK Houston is a 501 (c) (3) non-profit organization that advocates for a robust and equitable transportation network so that all people can reach opportunity. We envision a world in which all people in Houston can easily access not only jobs, but also educational experiences, medical appointments, grocery stores, greenspace, and other important destinations, regardless of their mode of transportation. To make that vision a reality, we support transformative and inclusive policies, systems, initiatives, and infrastructure development that connect people to opportunity by transit, walking, and biking. We move ideas into action through community engagement, research, and shaping public policy. Through our advocacy activities we specifically aim to improve the accessibility, frequency, reliability and availability of the public transit network; expand safe pedestrian and bicycle infrastructure; and mitigate adverse impacts of transportation infrastructure.

Terminology

This report avoids the use of technical terminology as much as possible. Figures and tables enhance concise narrative. The report is intentionally phrased in present tense, in most cases. Please direct any questions to LINK Houston by visiting www.linkhouston.org or emailing info@linkhouston.org.

Disclaimer

LINK Houston is responsible for the facts and accuracy of the *Equity in Transit: 2018 Report*. The contents are believed to be accurate and rely on current, publicly available information. Data sources are cited.

Cover Images

Front Cover. The bottom image showing the livery of Houston transit vehicles is courtesy of the late Peter Dovak.
Rear Cover. The map on the rear cover illustrates the destinations where transit riders traveled to on a typical weekday in April 2017. An online, interactive version of the map is available here: https://linkhouston.carto.com/builder/1fe01842-3ef2-487a-8842-564920c3f05b/embed. LINK Houston created the map using CARTO. CARTO provides grant support to LINK Houston.

Executive Summary

An equitable transportation network starts with strong regional and local transportation policies and decisions so that the benefits of transportation, as well as the burdens, are fairly distributed across the Houston region's 6.9 million people. Equitable, affordable transportation will help the region pursue inclusive economic growth that further advances equity in incomes, education, and health outcomes rather than widening disparities between under-resourced communities and resourced communities.

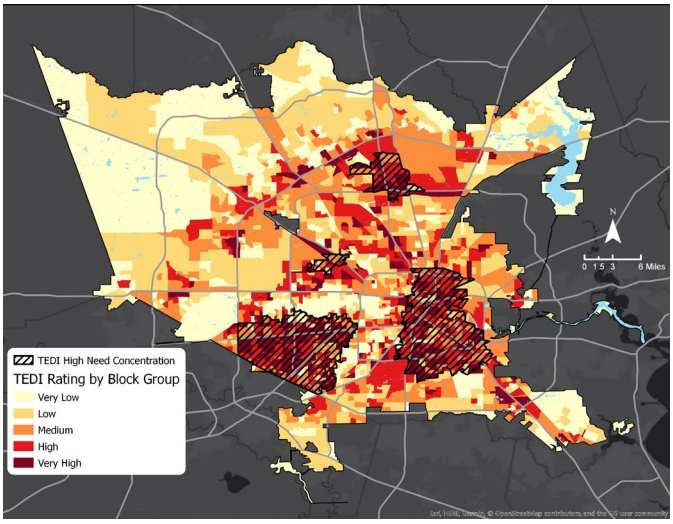


Figure ES-1. Transportation Equity Demand Index - TEDI, Houston METRO Service Area.

LINK Houston's *Equity in Transit: 2018 Report* examines current transit services in Houston, who rides transit, and the equitable distribution of transit options for those communities that need it the most. The report aims to inform conversation and decisions to ultimately improve equity in the bus and rail network, such as the frequency of the schedule, reliability of the bus's arrival, the hours of availability of services, and the rider's ease of access. These factors improve the ability of under-resourced communities – communities for which transit provides a much needed, affordable transportation option – to access opportunity.

The report relies on the Transportation Equity Demand Index - TEDI, a metric developed by LINK Houston that combines 15 indicators of demographic, economic, and built-environment conditions to identify areas in Houston where safe, affordable transportation is most needed to improve quality-of-life. The darker areas in Figure ES-1 are locations where affordable transportation (i.e., transit, walking, rolling, biking) is most needed to improve equity in Houston. Figure ES-2, on the reverse side, contains information about the need for equitable, affordable transportation by super neighborhood.

Equitably improving the frequency, reliability, availability, and accessibility of public transit is not the sole responsibility of transit providers but is rather a collaborative effort involving current and future riders, government at every level, metropolitan planning organizations, as well as municipal management districts, Tax Increment Reinvestment Zones, advocacy organizations, other stakeholders, and neighborhoods. To contribute to transit equity over the longer term, this report recommends that these stakeholders form and fund partnerships to systematically create more accessible infrastructure through policy and projects impacting TEDI high-need areas. To improve equity and quality-of-life across Houston in the near term, LINK Houston recommends specific operational changes to:

FREQUENCY

- Update 8 local bus routes so that the entire frequent network comes at least every 15 minutes all day, every day.
- Expand the frequent network by converting 10 specific 30-minute routes to 15-minute frequency.
- Make local bus routes come at least every 30 minutes, eliminating 60-minute wait times for local buses.
- Increase the frequency of all rail lines at night so that trains come at least every 15 minutes after 9 p.m.

SPAN OF SERVICE HOURS

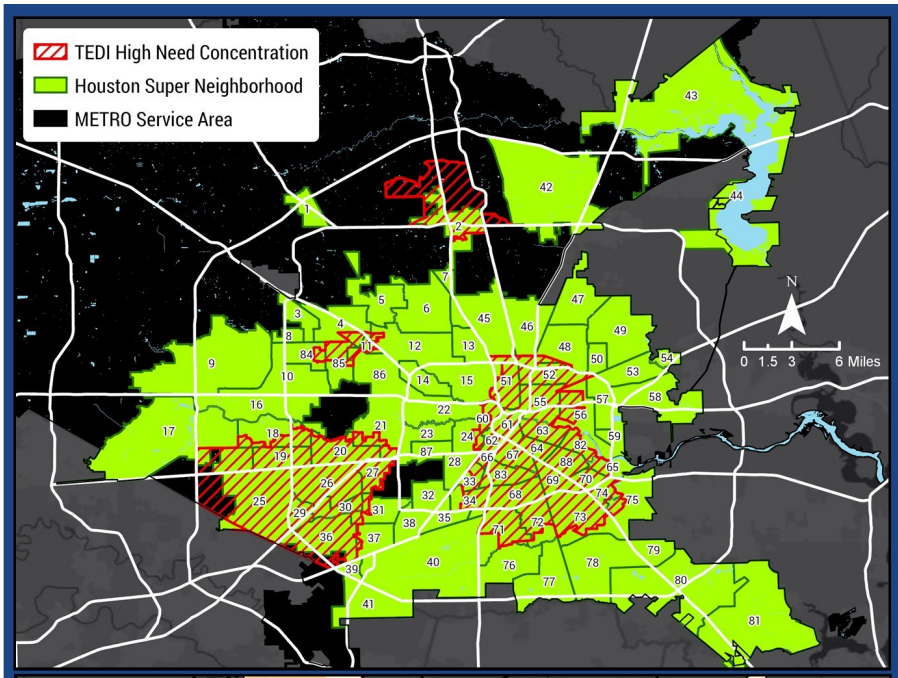
- Extend service hours on 12 local bus routes connecting under-resourced communities to extended-hour centers (i.e., the airports, Convention Center, Galleria/Uptown, higher education institutions, and the Texas Medical Center.)

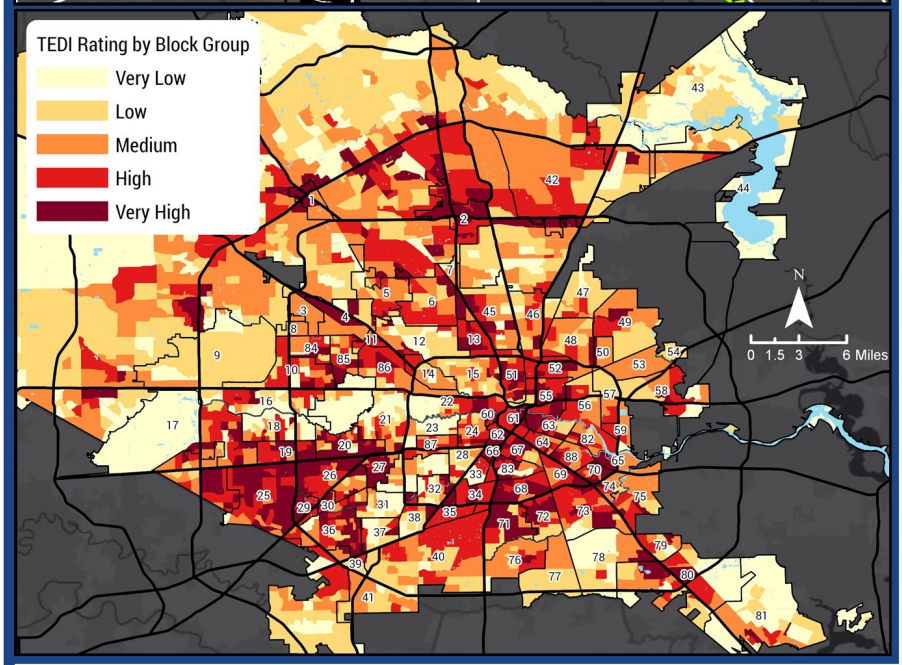
RELIABILITY

- Perform 90% of local bus trips on time (up from a target and reality of 75%).
- Eliminate schedules for routes/lines operating every 8 minutes or faster (e.g., Route 82).
- Post real-time next arrival/departure at all transit centers, transfer points, and heavily used stops (i.e., the top 4 %of boarding and alighting locations would impact 49% of all transit activity).
- Confirm schedules and frequency posted at stops match the information available on METRO's website and apps.

ACCESSIBILITY

- Fulfill commitments to universal accessibility so that stops are reachable regardless of age, size, or ability.
- Prioritize construction of bus stop amenities (i.e., shelters, seating, lighting, trash bins, etc.) where off-peak service frequency is 30 minutes or longer (because the longer you wait, the more you need a place to sit).





Super Neighborhood Key

Marks a neighborhood with a portion in TEDI highest need areas.

#	Name	TEDI Rating (1-10)	Category
1	Willowbrook	7.3	Medium
2	Greater Greenspoint	7.9	High
3	Carverdale	5.0	Low
4	Fairbanks / Northwest Crossing	7.1	Medium
5	Greater Inwood	5.5	Low
6	Acres Home	6.4	Medium
7	Hidden Valley	4.0	Very Low
8	Westbranch	6.0	Medium
9	Addicks Park Ten	3.6	Very Low
10	Spring Branch West	6.8	Medium
11	Langwood	7.0	Medium
12	Central Northwest	4.2	Very Low
13	Independence Heights	8.3	High
14	Lazybrook / Timbergrove	5.6	Low
15	Greater Heights	4.8	Very Low
16	Memorial	4.6	Very Low
17	Eldridge / West Oaks	5.9	Low
18	Briar Forest	5.2	Low
19	Westchase	8.9	High
20	Mid West	7.8	High
21	Greater Uptown	5.1	Low
22	Washington Avenue Coalition / Memorial Park	5.9	Low
23	Afton Oaks / River Oaks Area	3.2	Very Low
24	Neartown - Montrose	6.5	Medium
25	Alief	7.7	High
26	Sharpstown	8.3	High
27	Gulfton	8.5	High
28	University Place	4.2	Very Low
29	Westwood	9.2	High
30	Braeburn	7.5	Medium
31	Meyerland Area	4.1	Very Low
32	Braeswood	4.4	Very Low
33	Medical Center Area	3.3	Very Low
34	Astrodome Area	8.2	High
35	South Main	9.7	High
36	Brays Oaks	8.0	High
37	Westbury	4.4	Very Low
38	Willow Meadows / Willowbend Area	5.0	Low
39	Fondren Gardens	6.0	Low
40	Central Southwest	4.9	Very Low
41	Fort Bend Houston	4.8	Very Low
42	Iah / Airport Area	5.3	Low
43	Kingwood Area	2.3	Very Low
44	Lake Houston	1.5	Very Low
45	Northside/Northline	5.6	Low
46	Eastex - Jensen Area	5.3	Low
47	East Little York / Homestead	4.5	Very Low
48	Trinity / Houston Gardens	5.6	Low
49	East Houston	5.6	Low
50	Settegast	5.0	Low
51	Near Northside	7.7	High
52	Kashmere Gardens	7.7	High
53	El Dorado / Oates Prairie	5.0	Low
54	Hunterwood	2.3	Very Low
55	Greater Fifth Ward	8.5	High
56	Denver Harbor / Port Houston	7.0	Medium
57	Pleasantville Area	5.3	Low
58	Northshore	4.3	Very Low
59	Clinton Park Tri-Community	4.2	Very Low
60	Fourth Ward	9.0	High
61	Downtown	8.4	High
62	Midtown	8.6	High
63	Second Ward	8.1	High
64	Greater Eastwood	6.9	Medium
65	Harrisburg / Manchester	7.5	Medium
66	Museum Park	7.5	Medium
67	Greater Third Ward	8.3	High
68	Greater Ost / South Union	8.8	High
69	Gulfgate Riverview / Pine Valley	7.6	Medium
70	Pecan Park	7.8	High
71	Sunnyside	6.9	Medium

"Anyone working to improve public transit should engage the community from the ground up and from start to finish."

Ed Pettitt, MPH
Greater Third Ward Resident
Emancipation Economic Development Council Member

Continued

#	Name	TEDI Rating (1-10)	Category
72	South Park	7.8	High
73	Golfcrest / Bellfort / Reveille	7.2	Medium
74	Park Place	6.2	Medium
75	Meadowbrook / Allendale	5.9	Low
76	South Acres / Crestmont Park	5.3	Low
77	Minnetex	3.8	Very Low
78	Greater Hobby Area	4.0	Very Low
79	Edgebrook Area	5.6	Low
80	South Belt / Ellington	5.1	Low
81	Clear Lake	3.5	Very Low
82	Magnolia Park	6.5	Medium
83	Macgregor	7.0	Medium
84	Spring Branch North	6.4	Medium
85	Spring Branch Central	6.9	Medium
86	Spring Branch East	6.6	Medium
87	Greenway / Upper Kirby Area	5.9	Low
88	Lawndale / Wayside	7.4	Medium

Figure ES-2. Affordable, Equitable Transportation Need by Super Neighborhood.

Equity in Transit: 2018 Report by **LINK Houston** explores public transit's role in connecting people to opportunity in Houston. With 6.9 million[1] people in the region and population forecasts of 10.8 million people by 2045, public transit should be the backbone of the region's affordable, multi-modal personal transportation network, connecting people who walk, bike, and ride park-and-ride, light rail, and local buses to opportunity. More than 285,000 trips are taken each weekday on fixed-route transit in Houston – 67% on local bus.

A frequent, accessible, reliable, 24-hour public transit network, especially inside Houston's core, that serves people of all ages, abilities, and incomes.

LINK Houston's goal for great equitable transit in Houston

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INTRODUCTION

People take more than 285,000 trips each weekday on public transit in Houston – 67% on local bus, 22% on light rail, and 11% on park-and-ride. While cities across the country chase after new technologies, behemoth infrastructure, and new ridership in suburban areas, the reality in Houston is that the highest current ridership – and latent ridership – is on the local bus network.

In Houston, the placement of the local bus grid is not accidental; the current transit map is the result of "Reimagine," a 2015 ground-breaking redesign of the entire transit network that has now become an international model for transit systems new and old, including New York City. While Reimagine reconfigured Houston's bus routes to ensure that places with population density connected to activity centers, many communities still have limited access to this affordable travel mode connecting them to important destinations in their lives.

LINK Houston's *Equity in Transit: 2018 Report* is intended to equip residents, decisionmakers, business leaders, and advocates with basic facts, analysis, and recommendations regarding equity and public transit in Houston. This report aims to inform conversation and decision making that will ultimately improve equity in public transit in Houston, changing elements of the bus and rail design, schedule, reliability, and access to improve the ability of under-resourced communities – communities for which transit provides a much needed, affordable transportation option – to access opportunity. Public transit, as well as equity in the transit system, is not the sole responsibility of transit providers but is rather a collaborative effort involving government at every level and every type – from funding at the federal and state levels, the metropolitan planning organization at the regional level, county and city levels, and even the sub-city level, such as the commercial management districts and Tax Increment Reinvestment Zones. Community residents, community stakeholders, and advocacy organizations also play a key role; they know what their communities need and, in a best-case scenario, are involved in the development of transit decisions that affect their community.

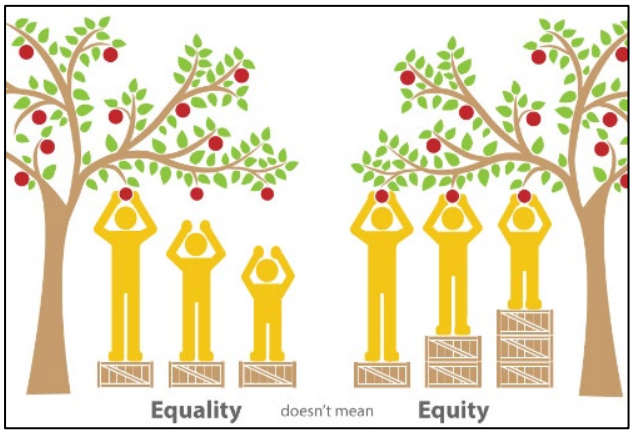


Figure 1. Personal Equity Concept.
Source: www.communityview.ca/infographic_SHR_health_equity.html

Equity in Transit provides a common baseline of fact about who uses transit, where, and how. This report examines current transit services in Houston, who rides transit, and analysis of the equitable distribution of transit options for those communities that need it the most. The report relies on the Transportation Equity Demand Index - TEDI, a metric developed by LINK Houston that combines 15 indicators of demographic, economic, and built environment conditions to identify areas in Houston where safe, affordable transportation is most needed to improve quality-of-life.

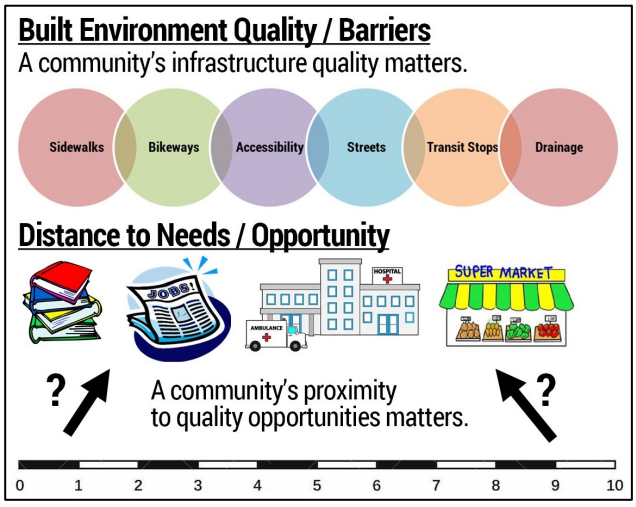


Figure 2. Community Equity in Transportation Concept.

What is Equity?

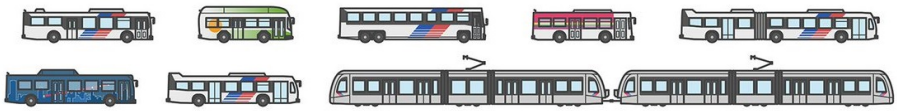
Personal equity is ensuring fair access to opportunities, which differs from ensuring the same access (see Figure 1). Equity is not the same as equality, which is giving everyone the same thing;

equality only results in equal outcomes if everyone starts in similar conditions and without systemic barriers or institutional disparities to overcome.

Community equity in affordable transportation means ensuring equal distribution of system benefits and burdens (see Figure 2). Every community should have acceptable sidewalks, crosswalks, bikeways, and public transit (i.e., local bus, light rail, regional express park-and-ride bus, paratransit, vanpool, or general public demand response bus), which may require investing more in certain communities.

Pursuing equity in transportation means intentionally creating systems so that our most disadvantaged populations can overcome institutional barriers and reach opportunity. In the long term, the goal should always remain to seek to remove systemic and institutional barriers.

What is Public Transit?



Transit services are mobility services available to the general public, that may require a fare and typically run at scheduled times along established routes or lines. There are many public transit travel modes such as local bus, bus rapid transit, express bus, light rail, commuter rail, subways, ferries, etc. Transit can also include paratransit (for riders with a disability), vanpool (for groups of riders traveling to locations not easily served by fixed route transit), and other tailored services in a region. Transit takes many of these forms in Houston.

The term high-capacity transit is used in the Houston region to describe transit with the ability to carry a large number of riders. A transit mode is high capacity if service is very frequent (more frequent vehicles means more capacity per hour) and/or the vehicle is very large (i.e., light rail, bus rapid transit, commuter rail, subway, etc.).

High-quality transit means service runs consistently on-time (not early or late), vehicles are clean and comfortable, staff are courteous, and stops are accessible. Service frequency, how often the bus comes, and service hours, early and late hours, are important to riders.

WHY is Equity in Transit Important in Houston?

For many people in Houston, especially those who live in under-resourced communities, public transit is the only option to access employment, education, medical care, healthy food, and other opportunities. Lack of safe and affordable transportation options exacerbates barriers to such opportunities. For example, the Texas Medical Center offers world-class health care; even for services that are available to anyone seeking treatment, there are barriers for some families, including the distance or means to get there. While some communities are able to remove such barriers by placing high-quality satellite medical centers nearby, for those that are under-resourced and unable to afford a high-quality health care center in their neighborhood, reliable transportation options play a key role in overcoming those barriers to medical care.

"We don't have many clinics in the neighborhood. Getting another connection to the Texas Medical Center or where there are more hospitals and clinics would be very beneficial to this community."

Jessica Fuentes
Northeast Houston Community Member and Advocate

Transportation policy decisions that do not account for equity in network distribution create additional hardships and barriers for under-resourced communities to access opportunities. Addressing transportation inequities is critical to advancing economic and social prosperity. Transportation is a means to an end and the ultimate shared interest affecting every individual, family, business, and level of government.

> Public transit transforms communities and the lives of the people living in them by spurring economic development, promoting sustainable lifestyles and providing a higher quality of life. Every segment of American society - individuals, families, communities, and businesses - benefits from public transit.
>
> *Source: American Public Transportation Association, www.apta.com/mediacenter/ptbenefits/Pages/default.aspx*

This report provides data analysis and recommendations to help improve equity in public transit in Houston so that communities for which transit provides a much needed, affordable transportation option can access opportunity. The report establishes baseline information about fixed-route transit – transit with schedules, timetables, and set stops or boarding location – in Houston so that efforts to improve transit services address the needs of existing riders, especially riders who rely on transit for affordable access to jobs, education, medical, and shopping destinations.

Equity in transit in Houston means ensuring that quality, frequent, and available transit is provided within communities where residents need it most, both for trips within their communities and trips to opportunities elsewhere in Houston (work, education, health care, shopping, etc.). Transit is an essential service for many of our region's residents (see Part 1 and Part 2) and should be improved to do more for Houstonians. (see Part 3). Our recommendations and next steps prioritize improvements for transit riders by intentionally focusing on frequency, availability, reliability, and accessibility as the most readily addressable aspects of equitable public transit. Other important aspects for future study include total travel time, system speed, and trips with standing room only.

Report Context: Transit in Houston

There are nine public transit operators in the Greater Houston Area. Figure 3 lists each operator and notes the transit modes they operate.

Equity in Transit: 2018 Report is the first such report by LINK Houston and intentionally focuses on the impact of the fixed-route transit operated by the Harris County Metropolitan Transit Authority (METRO), as such services are the backbone of the region's affordable, multi-modal personal transportation network. There are nine public transit operators in the greater Houston region that combined see about 295,000 riders each day; this report focuses only on METRO as the agency is the primary operator of fixed-route transit in the region (97% of transit trips are on METRO). Two-thirds of the region's transit agencies provide paratransit, such as METROLift, for riders with a disability. A future report may illustrate who utilizes paratransit and the role of such services in connecting riders to opportunity in Houston.

METRO is the primary operator of regularly scheduled fixed route transit in the region's core and the focus of ridership analysis and service recommendations provided in this report. METRO also operates complementary paratransit (for riders with a disability), vanpool, and most of the region's high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes.

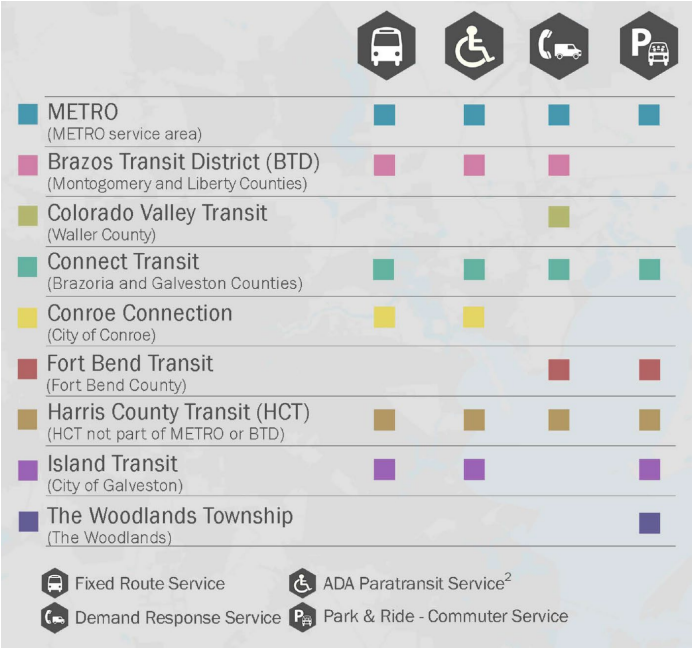


Figure 3. Houston Region Transit Operators.
Source: Texas A&M Transportation Institute, www.ghcommutes.org/wp-content/uploads/2016/10/Transit-Service-Guide-for-the-Greater-Houston-Region-July-2016.pdf

There are different ways to group transit riders. One common way is to talk about captive riders and choice riders, referring to a presumption about a rider's travel options. Another, perhaps more productive view, is to group riders into three groups as "transit riders are sensitive to transit quality, not 'captive' to transit":

- Occasional riders who use transit occasionally (about 61% of riders in Houston);
- All-purpose riders who use transit regularly for multiple purposes (about 23% of transit riders in Houston); and
- Commuters who use transit only to travel to and from work (about 15% of riders in Houston).

Transit agencies should strive to grow [all-purpose riders], as they are the most reliable and financially efficient customers to serve. All-purpose riders are more prevalent where it's easy to walk to transit, and where transit is frequent and provides access to many destinations.

Source: TransitCenter, Who's On Board 2016, transitcenter.org/publications/whos-on-board-2016/

Report Organization

The report is divided into three parts. Information is presented in a specific order by design: information about transit services, information about who rides and the kinds of trips made on transit, and finally information about where and how transit can be better at connecting people to opportunity in pursuit of equitable outcomes for the region.

Part 1. Houston METRO's Network highlights the existing transit network in Houston, describes recent network improvements, and illustrates the present level of ridership. The information is a baseline understanding of the types of fixed route transit services operated today.

Part 2. Who Rides Transit? builds upon Part 1 by exploring the role of fixed-route transit services in connecting people to opportunity in Houston by answering who rides, where they live, where they go, and how they complete their trip using transit. METRO's fixed-route services include park-and-ride, light rail, and local bus services. Regularly scheduled, fixed routes are the backbone of a transit network.

Part 3. Equity in Houston Transit concludes the informational portion of the report by exploring where transit is needed most based on demographic, population, economic, and built environment data, in a Transportation Equity Demand Index – TEDI, and compares areas of high-need to contextual information (i.e., neighborhoods and types of stakeholders who may be partners for better, equitable transportation) and present transit services.

Recommendations and Next Steps identifies how public transit can improve peoples' access to opportunity by being more frequent, available (with extended span of service hours), reliable, and universally accessible. The next steps describe additional issues for consideration for how individuals, communities, local government, and transit operators can play a role in improving transportation equity in Houston.

Transportation Equity Demand Index - TEDI Methodology

Every community and all residents need mobility to access opportunities for a full, productive life. While quality transportation is an interest shared by anyone living, working, or visiting in Houston, transportation conditions and needs vary from community to community and household to household. What is most warranted and needed in one community may not apply in another community. LINK Houston created the Transportation Equity Demand Index – TEDI to objectively identify where the high-need areas exist, as well as where locations where better and more equitable transportation will have the most positive impact on our region's development and residents' lives. LINK Houston considered the following questions:

- Where do people live in Houston that need access to opportunity via transit due to fundamental demographic or economic challenges?
- Where do people live in Houston that are more likely to ride transit due to other personal or family circumstances?
- Where in Houston is the environment (built and human) conducive to high-quality transit?

The Transportation Equity Demand Index combines 15 indicators to identify high-need areas in Houston where safe, affordable transportation is most needed to improve quality-of-life. There are three groups of indicators:

- Fundamental demographic need,
- Likely higher transit use (i.e., propensity, latent demand, or induced demand), and
- Human and built environment suitability indicators.

The indicators were chosen to ensure that many aspects of personal equity and community equity in affordable transportation are addressed. The TEDI indicators combine both percentage rates, such as poverty, and densities, such as work sites for hourly jobs. The human and built environment indicators each relate to the feasibility of operating fixed-route transit (i.e., walkable, bikeable compact neighborhoods are important for fixed routes). In addition, each indicator is from a publicly available source typically updated each year – enabling LINK Houston to periodically update the research to capture how the region changes and should adapt.

Table 1 provides details on each of the 15 indicators.

Table 1. Transportation Equity Demand Index Indicators.

CATEGORY	INDICATOR	FORMAT	GEOGRAPHY	YEAR	UPDATED	SOURCE
Fundamental Demographic Need	**Poverty (Low-income households)**	Percent	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Single Parent Female Headed Households with Children Under Age 18	Percent	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Population with a Disability	Percent	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Homes of Workers with Jobs Paying Less than $15,000 Annually	Number	Block	2015	Annual	U.S. Census Bureau, Longitudinal Employer-Household Dynamics
	Work Sites of Workers with Jobs Paying Less than $15,000 Annually	Number	Block	2015	Annual	U.S. Census Bureau, Longitudinal Employer-Household Dynamics
Likely Higher Transit Use *(i.e., propensity, latent demand, or induced demand)*	**Minority Population**	Percent	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Zero Vehicle Available Households	Percent	Tract	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Workers Commuting by Transit	Percent	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Homes of Workers with High School Education or Less	Number	Block	2015	Annual	U.S. Census Bureau, Longitudinal Employer-Household Dynamics
	Work Sites of Workers with High School Education or Less	Number	Block	2015	Annual	U.S. Census Bureau, Longitudinal Employer-Household Dynamics
Human and Built Environment Suitability	**Population Density**	Number	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Household Density	Number	Block Group	2012-2016	Annual	U.S. Census Bureau, American Community Survey
	Street Intersection Density	Number	Block Group	2015	Annual?	Center for Neighborhood Technology
	Average Block Perimeter - Feet	Number	Block Group	2015	Annual?	Center for Neighborhood Technology
	Compact Neighborhood Score	Number	Block Group	2015	Annual?	Center for Neighborhood Technology

The objective for TEDI was to identify the area of highest-need relative to all other parts of the METRO service area. Therefore, the primary statistical tool used was to transform each indicator value into a normalized percentile rank (with decimal points as necessary). In lay terms, changing whatever value was present into a 1-100 percentile ranking as compared to all other geographic areas for the same indicator. The percentile rank reveals how high or low the indicator was for a location in comparison to all others. Higher values mean higher relative priority and/or suitability for equitable transportation. The TEDI rating of a block group is the average of all 15 indicators, each given equal weight as each is important. The result is a TEDI rating of each block group in the METRO service area. Higher values mean higher relative need for future transportation investments and services in support of equitable long-term outcomes.

Figure 4 illustrates TEDI results by block group. The darker areas are locations where affordable transportation (i.e., transit, walking, biking) is most needed to improve equity in Houston.

Please note that some level of demand for equitable, affordable transportation exists everywhere. LINK Houston conducted further analysis to identify the highest-need areas of the region. ArcGIS Pro software tools were used, specifically the Getis-Ord Gi* and Moran's I statistics, to identify statistically significant concentrations of need. Figure 5 illustrates the results of the spatial statistics.

LINK Houston uses the High TEDI Need 99% Confidence areas as the priority list of high-need areas for equitable, affordable transportation – whether that be transportation infrastructure (sidewalks, crosswalks, bikeways, transit stops/stations) or transportation services (i.e., public transit operations).

Figure 6, on the next page, illustrates the four areas of highest confidence, high-need. Part 3 contains more information about each TEDI indicator and TEDI results. Please note that some level of need for equitable mobility exists everywhere. These high-need areas are not the only areas where equitable, affordable transportation is needed, but they are the most concentrated areas of high need. The four TEDI high-need

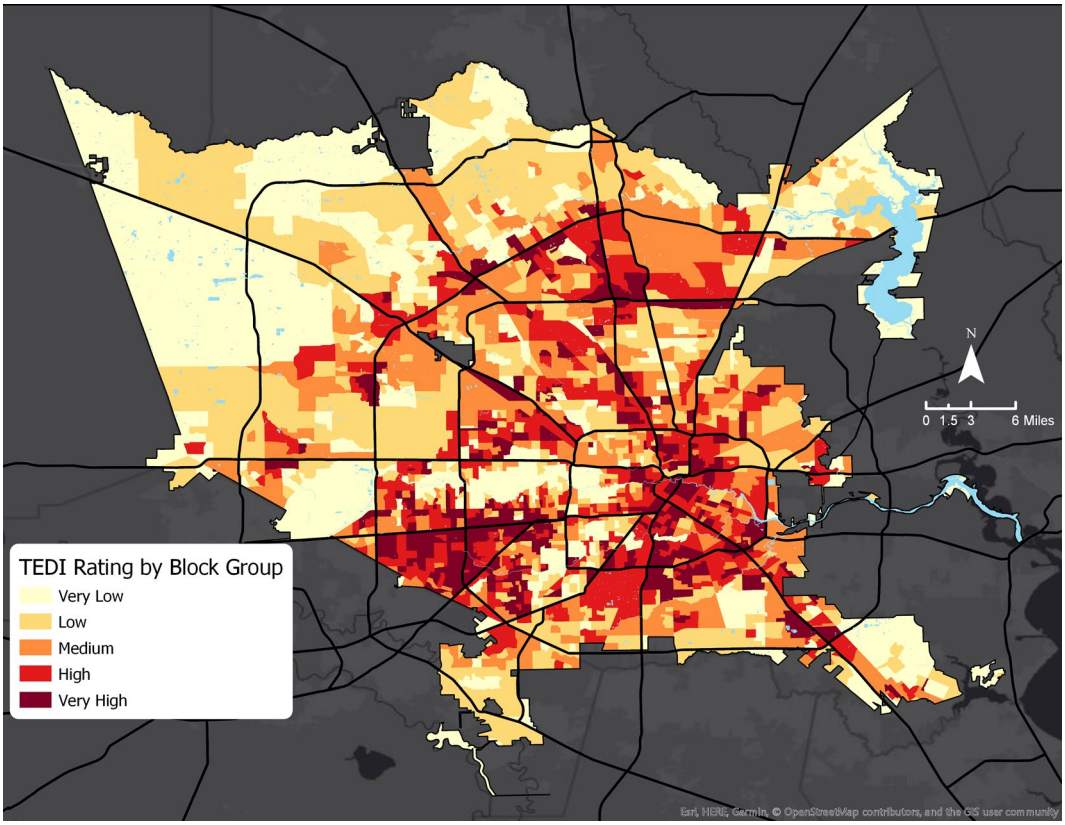


Figure 4. Transportation Equity Demand Index, Houston METRO Service Area.

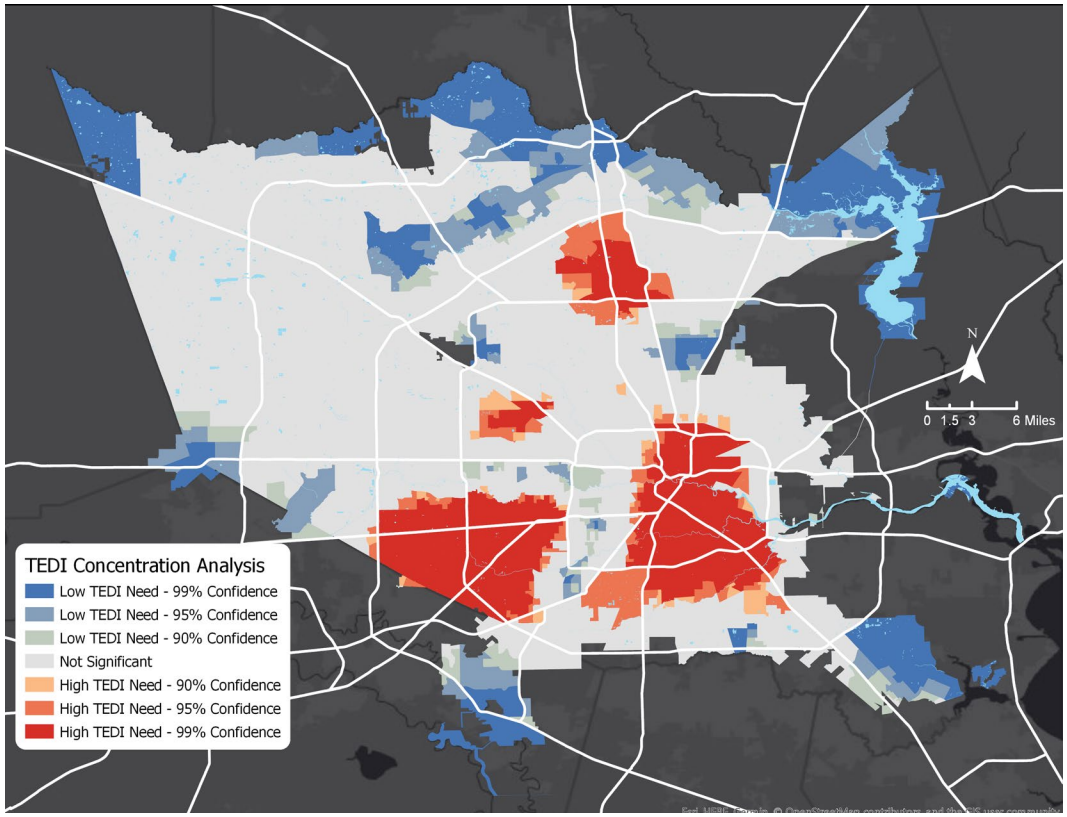


Figure 5. TEDI Concentration Analysis – "High TEDI Need 99% Confidence" Areas Used in Report.

areas should be the focus of policy decision-makers' efforts to improve transportation for our region's most disadvantaged, vulnerable populations and communities.

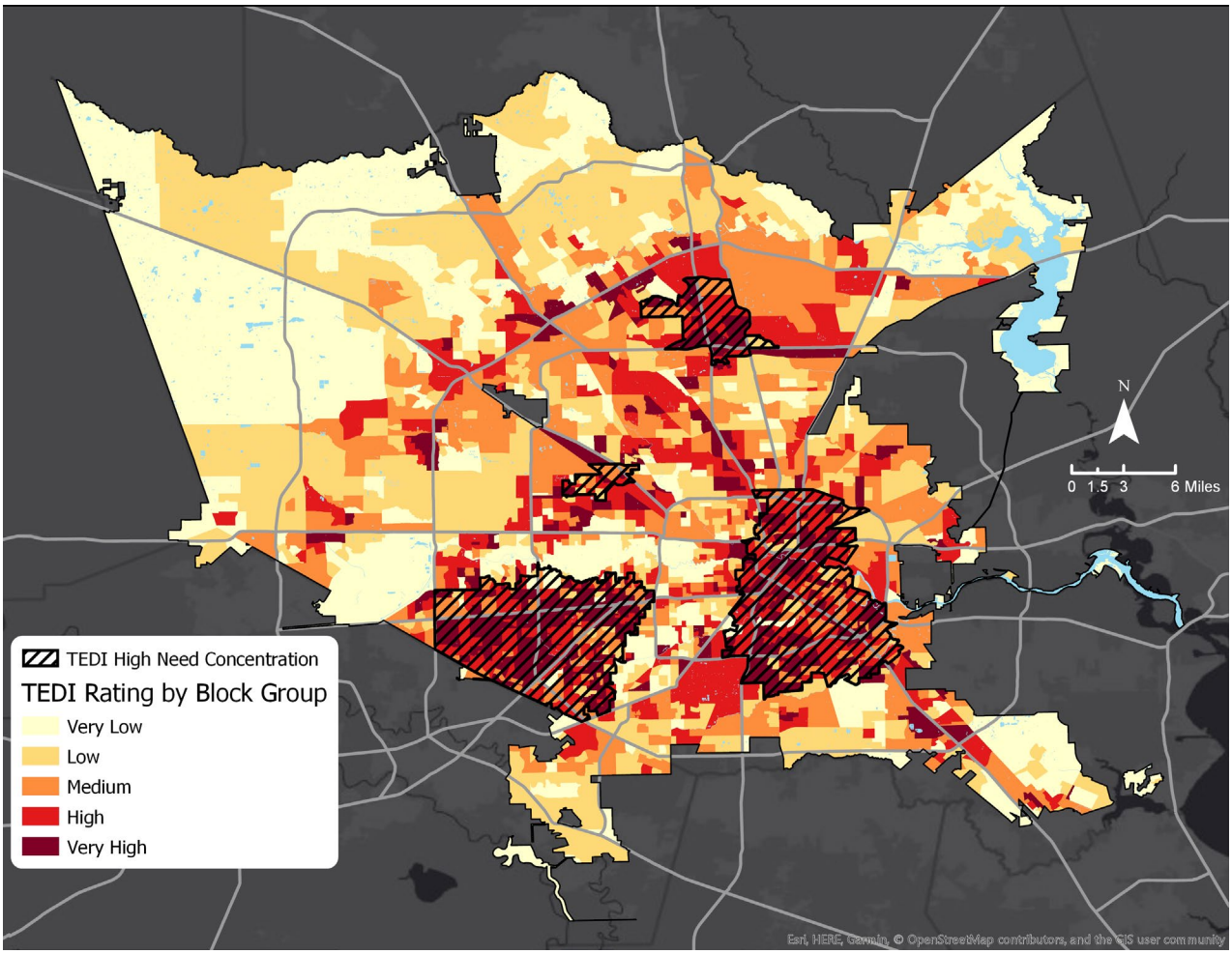


Figure 6. TEDI Results with High-Need Areas (used further in Part 3).

A Note About TEDI Use

The Transportation Equity Demand Index does not identify specific needs of each community as such can only be determined through effective, comprehensive community engagement. However, compiling and analyzing population, demographic, economic, and built environment did enable LINK Houston to identify high-need areas within the region where transportation equity is most fundamentally needed to improve quality-of-life for the most disadvantaged communities and residents.

This report concludes by making recommendations to improve transit and equitable transportation in general. Many of the recommendations are focused on service quality and coverage, but some recommendations are also about the distribution of transit options for those communities that need it the most.

- Where in Houston does frequent transit presently operate?
- In which communities might transit effectively improve access to opportunity to help people and families to improve their own quality-of-life?

The creation of TEDI enables LINK Houston and partners to help METRO and its stakeholder partners to more effectively meet two main public policy priorities: provide transit service to those who need it most and provide stakeholders with information needed to direct resources toward needs.

Please see Part 3 to learn more about the results of LINK Houston's Transportation Equity Demand Index research and how our findings support our recommendations for better, more equitable transit in Houston.

Primary Data Sources

Information in the report is from a variety of sources. A concerted effort was made to use the most recent, most authoritative sources available. Each of the primary data sources is briefly described below.

Transit Ridership Information is from Houston METRO's publicly available monthly ridership reports: www.ridemetro.org/Pages/RidershipReport.aspx.

Transit Service Information is from Houston METRO's posted schedules: www.ridemetro.org/Pages/SchedulesBusRail.aspx.

General Transit Feed Specification (GTFS) data was utilized by LINK Houston to evaluate the present distribution of service level by transit stop or station: www.ridemetro.org/Pages/NewsDownloads.aspx (accessed October 8, 2018). LINK Houston utilized ArcGIS Pro software to determine transit service levels for each stop in terms of the following: number of routes, average vehicle trips per hour by time period (early AM, AM peak, midday, PM peak, late PM), average route headway, fastest route headway, longest route headway, average maximum waiting time.

April 2018 Transit Activity by Stop data was provided by Houston METRO to LINK Houston by request. The data included transit boardings and alightings by stop/station on an average weekday, Saturday, and Sunday.

Transit Cost and Performance Data are from the Federal Transit Administration, National Transit Database, accessed both through the Florida Transit Information System, Urban iNTD (www.ftis.org/) and National Transit Database 2017 Annual Agency Profile (www.transit.dot.gov/sites/fta.dot.gov/files/transit_agency_profile_doc/2017/60008.pdf).

Transit Rider and Trips Characteristics data was provided by Houston-Galveston Area Council (H-GAC) from the *2017 Regional Transit Onboard Origin Destination Survey* by request of LINK Houston. The survey sample included 21,421 surveys of METRO riders. These surveys were statistically weighted to represent a typical weekday in April 2017, when riders made an average of 282,482 weekday boardings on fixed-route services, including park-and-ride, light rail, and local bus. LINK Houston uses this data in Part 2 to convey findings in terms of both the percentage of transit trips and the percentage of transit riders to maintain plain language; in fact, all percentages – trips or riders – are a percentage of transit boardings (except if noted otherwise).

Population and Demographic Data are from the United States Census Bureau's 2012-2016 American Community Survey (ACS) Five-Year Estimates.

Jobs Data are from the United States Census Bureau's 2015 Longitudinal Employer-Household Dynamics (LEHD).

Built Environment Data are from the Center for Neighborhood Technology (CNT) 2015 Census Block Group datafile.

Low-Income Housing Units Data are from the U. S. Department of Housing and Urban Development (HUD), Office of Policy Development & Research and were current as of June 6, 2018.

PART 1. HOUSTON METRO'S NETWORK

Part 1 provides baseline information about METRO's extensive fixed-route transit network – transit with schedules, timetables, and set stops or boarding locations.

Figure 7 illustrates the existing network of local bus, light rail, and regional express park-and-ride routes. The following page provides information on ridership from April 2010 to April 2018.

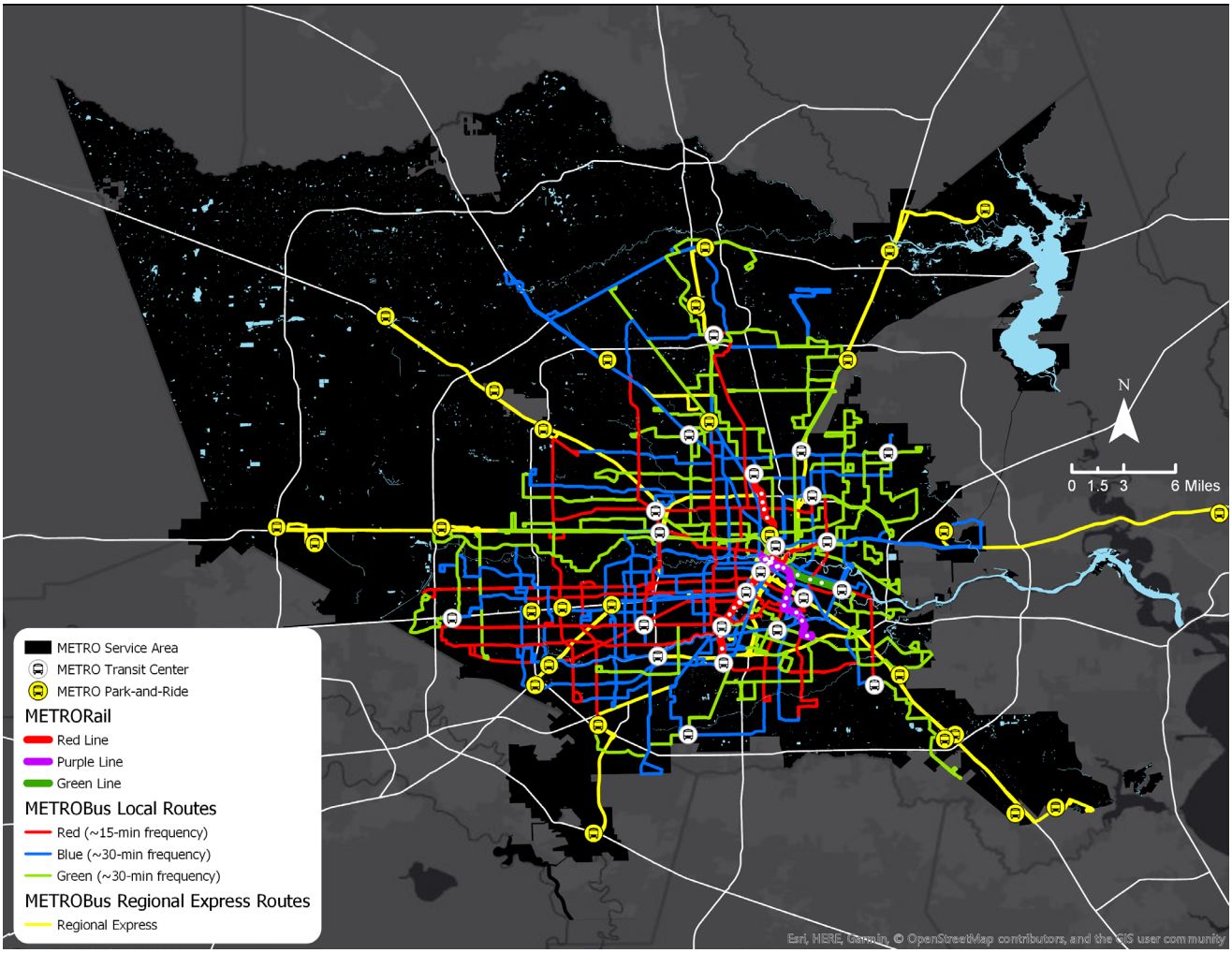


Figure 7. METRO Fixed-Route Transit Services.

Average weekday ridership **increased by about 6%** from April 2010 to April 2018 (see Figure 8).

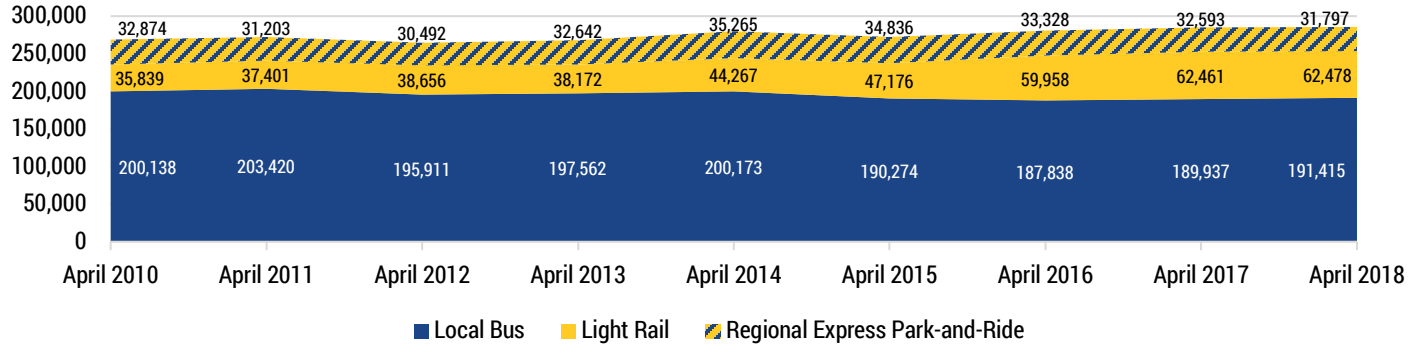


Figure 8. WEEKDAY, Combined Average Daily Ridership.

METRO refined and expanded weekend local bus service as part of the 2015 System Reimagining New Bus Network. Riders seem to have welcomed the service increase on weekends based on the **substantial increases in ridership from 2015 to 2016**. Saturday ridership **increased by about 21%** from April 2010 to April 2018 (see Figure 9).

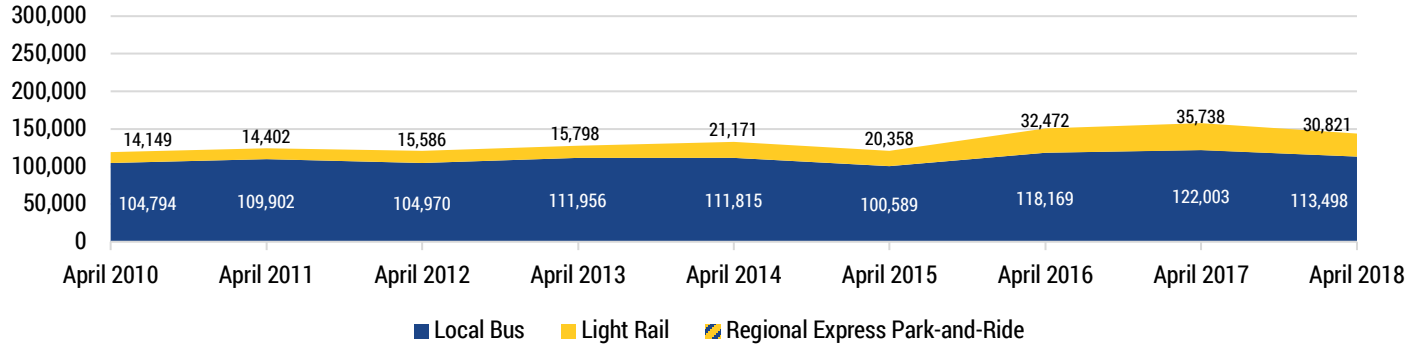


Figure 9. SATURDAY, Combined Average Daily Ridership.

Sunday ridership **increased by about 60%** from April 2010 to April 2018 (see Figure 10).

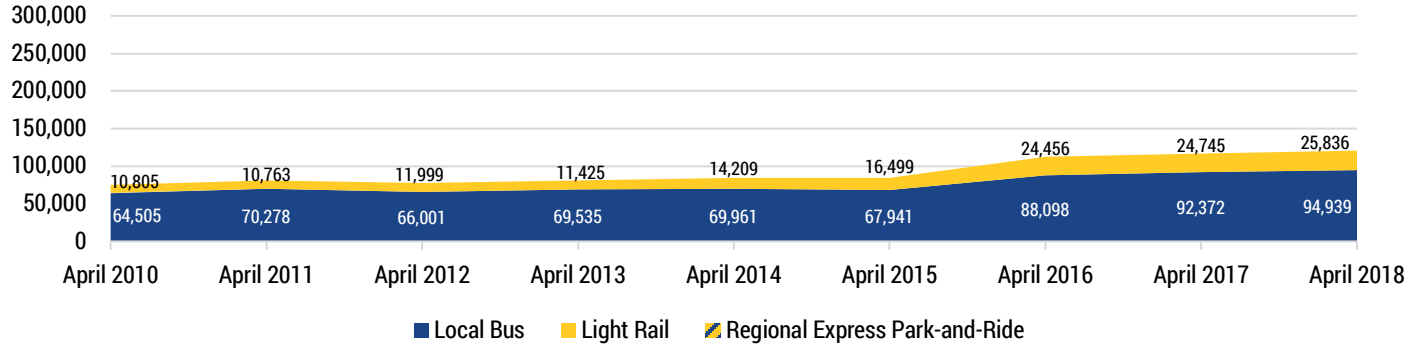
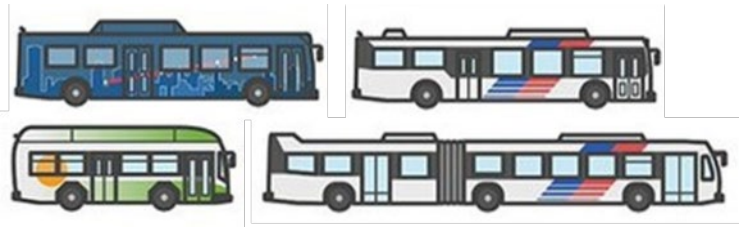


Figure 10. SUNDAY, Combined Average Daily Ridership.

The following pages contain more detailed, albeit brief information about local bus, light rail, and regional express park-and-ride services and ridership. Information on the bus rapid transit presently under construction in the Galleria-Uptown district is also provided. The information is provided to help readers understand the services utilized by riders. Part 2 builds on the information by relating how transit is an essential part of many Houstonians' safe, affordable access to opportunity.

LOCAL BUS



METRO operates 79 local bus routes. METRO Reimagined the local network in 2015 to create a more cohesive network of routes. Figure 11 illustrates how local bus routes extend across much of the core of the Houston region.

Routes generally operate 7-days a week from about 5:00 AM to about 12:00 midnight. Service frequency, sometimes called headway, varies between routes: red routes run at least every 15-minutes during peak periods, blue routes about every 30-minutes, and green routes about every 60-minutes. The most frequent route runs up to every 6-minutes. The average service frequency during weekday peak periods is about 25 minutes.

In 2017, METRO provided more than 58 million trips on local bus. Ridership on local bus accounted for about 67% of the agency's total.

- 692 buses on-the-road during peak service.
- 1.7 boardings per mile operated.
- 20.4 boardings per hour operated.
- $5.73 cost per trip.

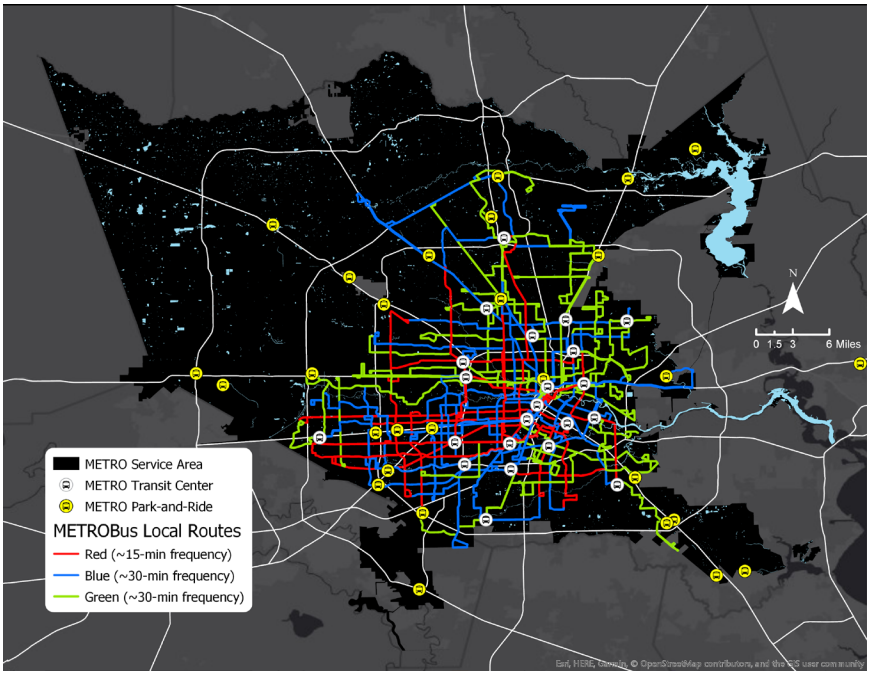


Figure 11. METRO Local Bus Network.

The average bus speed was 12.16 miles per hour and the average rider rode for 4.9 miles – making the average trip take about 24 minutes. Figure 12 illustrates that local bus ridership on weekdays has remained strong during the last eight years of economic expansion and ridership has increased on weekends. Please note that in 2013 and 2015 METRO expanded light rail service, which likely contributed to the small decline in local bus in 2015 to present. METRO systemwide ridership has increased in that period.

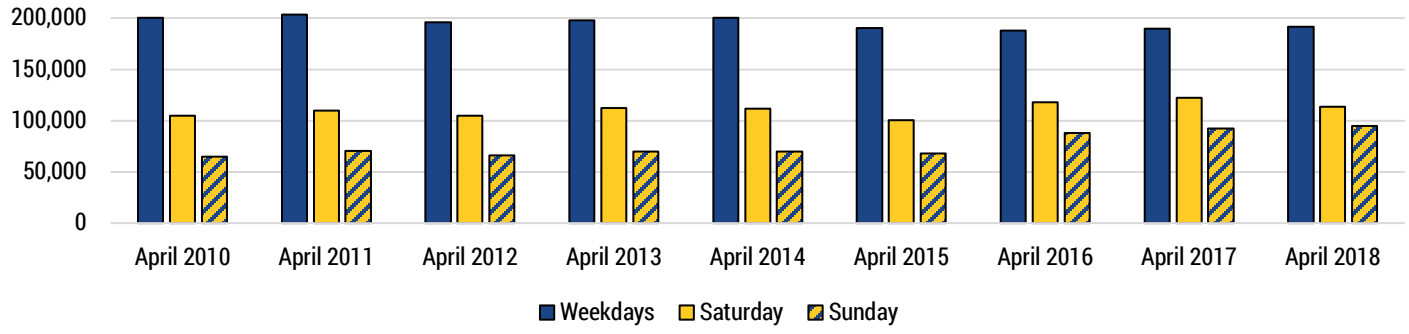
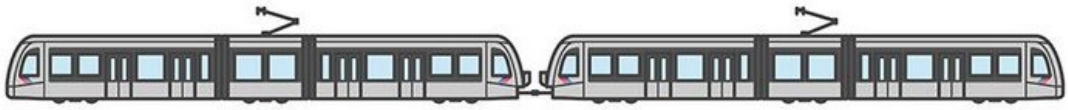


Figure 12. LOCAL BUS, Average Daily Ridership.

LIGHT RAIL



METRO operates three light rail lines – Red, Purple, and Green Lines. Figure 13 illustrates the alignment of the light rail lines in the core of the region.

Rail service operates every day from about 4:30 AM to about 1:00 AM. Service frequency varies between the three lines and by time-of-day, but generally is between 6-minutes and 15-minutes.

The Red Line began service in 2004 and was extended further north in 2013. The Purple and Green Lines opened in 2015. METRO presently has 43.6 miles of rail. In 2017, METRO provided more than 18 million trips on rail, which accounted for about 22% of system ridership.

- 54 trains on-the-track during peak service.
- 5.5 boardings per mile operated.
- 63.8 boardings per hour operated.
- $3.56 cost per trip.

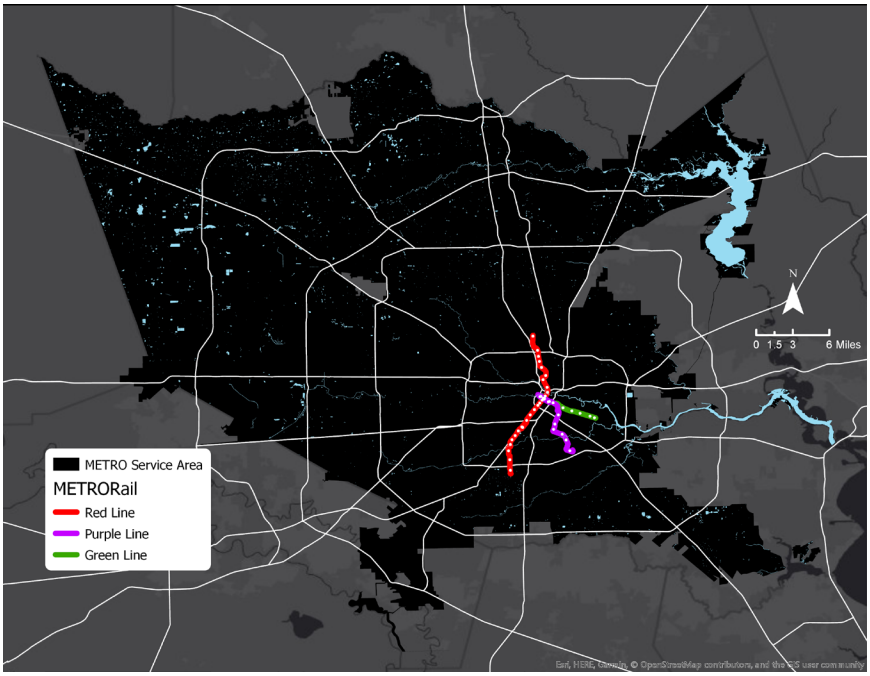


Figure 13. METRO Light Rail Network.

The average train speed was 11.6 miles per hour and the average rider rode for 2.8 miles – making the average trip take about 14 minutes. Figure 14 illustrates that light rail ridership has increased over the period from 2010 to 2018. Please note that the introduction of expanded rail service in 2013 and 2015 contributed to the ridership increase from 2013 to present.

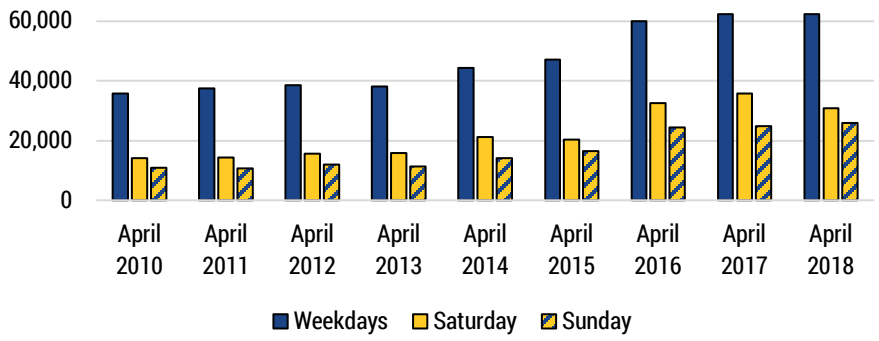


Figure 14. LIGHT RAIL, Average Daily Ridership.

"The Palm Center Line, which travels down the eastern boarder of Martin Luther King Jr. Boulevard, has really expanded mobility opportunities for people living in this neighborhood."

Paulette Wagner
President
MacGregor Trail Civic Club

REGIONAL EXPRESS PARK-AND-RIDE

METRO operates an extensive network of regional express park-and-ride service – 32 routes supported by more than 30,000 parking spaces at park-and-ride or transit center facilities. Figure 15 illustrates how the regional express routes extend outside the core of the Houston region.

Regional express routes operate only on weekdays and primarily only during peak hours. Peak hour services are frequent (every 5 to 20 minutes) and operate primarily in the peak travel direction (inbound toward Downtown in the morning from 5:00 AM to 9:00 AM and outbound in the afternoon from 3:00 PM to 7:00 PM). METRO also operates some midday and late evening regional express routes, usually on an hourly schedule along each major service corridor (e.g., US 290, IH-10W Katy Freeway, etc.).

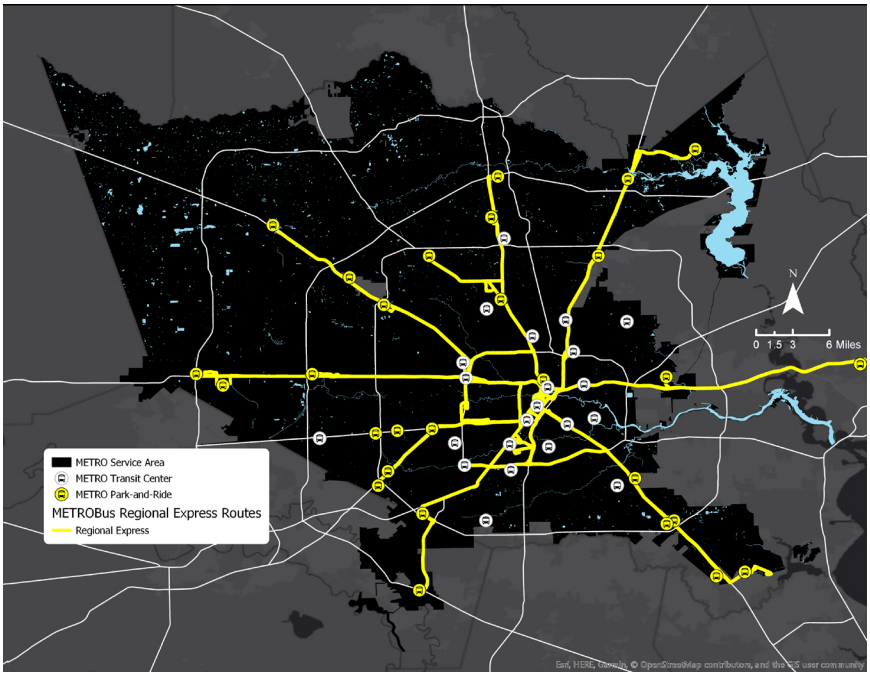


Figure 15. METRO Regional Express Park-and-Ride Network.

As their name denotes, regional express park-and-ride routes are limited stop services focused on connecting riders to destinations concentrated in Downtown, Texas Medical Center, Galleria-Uptown, and Greenway Plaza.

In 2017, METRO provided nearly 8 million trips on regional express, representing about 11% of the agency's total.

- 310 buses on-the-road during peak service.
- 0.9 boardings per mile operated.
- 24.0 boardings per hour operated.
- $7.98 cost per trip.

The average bus speed was 25.61 miles per hour and the average rider rode for 18.9 miles – making the average trip take about 44 minutes. Figure 16 illustrates that regional express ridership peaked in 2015, but overall has remained relatively constant when comparing 2010 to 2018.

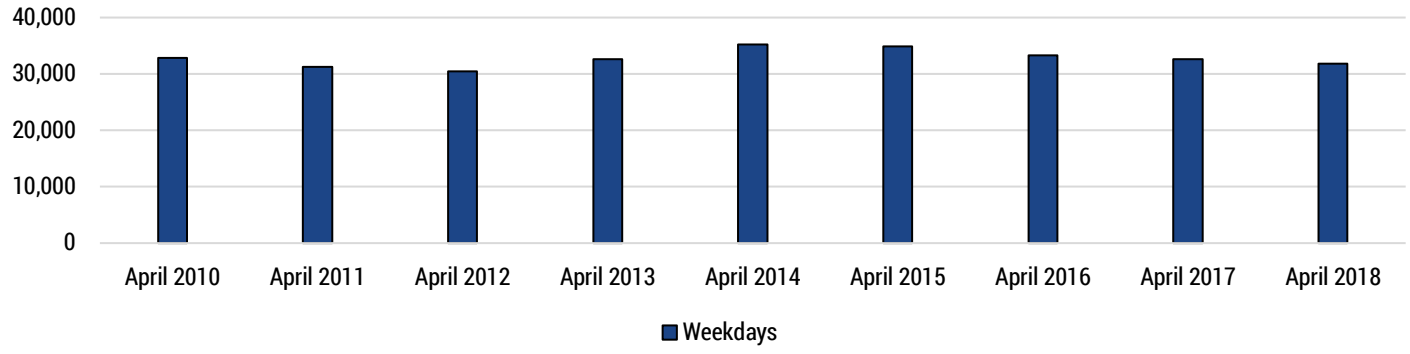


Figure 16. REGIONAL EXPRESS PARK-AND-RIDE, Average Daily Ridership.

Note: Regional express park-and-ride services do not presently operate on Saturday or Sunday.

Bus Rapid Transit (Future)

The Uptown Development Authority (Galleria-Uptown) is currently constructing a bus rapid transit (BRT) line to connect the Galleria to Westpark to the south and Northwest Transit Center to the north. The project is a partnership between Uptown, METRO, Texas Department of Transportation, and City of Houston. Construction began in 2013 and will be complete in the next few years. METRO will operate the BRT line as a specially branded service. This will be the first BRT line in Houston.

What is BRT?

Bus rapid transit, or BRT, uses specialty buses to operate high-quality, high-capacity service on dedicated travel lanes, similar to light rail but with less infrastructure required. Well-executed bus rapid transit is a similar level of transit service as light rail, equally reliable and comfortable. According to the Federal Transit Administration, bus rapid transit lines…

> *"have defined passenger stations, traffic signal priority or preemption, short headway bidirectional services for a substantial part of weekdays and weekend days; low-floor vehicles or level-platform boarding, and separate branding of the service. Agencies typically use off-board fare collection as well. This is often a lower-cost alternative to light rail."*
>
> (source: www.transit.dot.gov/ntd/national-transit-database-ntd-glossary)

What will the Uptown BRT be like?

In short, light rail on rubber-tires: frequent service by specialty buses operating reliable service due to fully dedicated travel lanes. Figure 17 is a conceptual drawing of the BRT line in the middle Post Oak Blvd.

Figure 17. Bus Rapid Transit Concept, Presently Under Construction in Galleria-Uptown.
Source: www.uptown-houston.com/news/page/post-oak-boulevard-dedicated-bus-lanes

The BRT line will connect residents to the south and north to opportunities in the Galleria district, including many hourly or lower-wage jobs. There are likely other corridors in the Houston region where BRT service is feasible and warranted.

Observations

Ridership on METRO fixed-route services is growing. The highest ridership increases are on the local network of bus and rail on weekends. The 2015 New Bus Network, the result of METRO's Reimagining, resulted in significant increases in ridership on weekends – an indication that if services are improved then more riders make more trips. Light rail expansion has attracted a larger portion of rides on the local network and continues to increase each year. The Uptown BRT line project illustrates how a group of stakeholders can partner to expand the transit network.

PART 2. WHO RIDES TRANSIT?

Part 2. Who Rides Transit? explores the role of fixed-route services in connecting people to opportunity in Houston by answering the following questions:

- **Who rides transit in Houston?**
- **Where do transit riders live?**
- **Where do people go on transit?**
- **How does a trip using transit work?**

METRO fixed-route services include park-and-ride, light rail, and local bus services. Regularly scheduled, fixed routes are the backbone of a transit network.

WHO RIDES TRANSIT IN HOUSTON?

What types of people ride public transit in Houston?

EVERYONE.

People of all ages, genders, racial/ethnic backgrounds, languages, employment levels, and income levels use public transit. However, the types of service utilized by each demographic and community varies.

Residents

Of all transit trips, **98% are by area residents,** and 2% are by visitors to Houston. Visitors mostly ride rail compared to other transit options.

Age

Of all transit riders, **87% are adults between the ages of 20 and 65.** Children and teenagers comprise 8% of transit riders, while persons 65 or older comprise 5% of transit riders.

The largest cohort of local bus and rail riders are ages 20-34 (41% and 45% respectively), whereas the dominant cohort for park-and-ride riders are ages 35-50 (41%).

Gender

Of all riders, 53% are men and 47% women. More men ride rail (55.8%), whereas more women ride park-and-ride (55.7%).

Race/Ethnicity

Communities of color make up about 75% of Houston residents according to 2017 U.S. Census data and 78% of transit riders:

- 43% Black/African-American,
- 25% Hispanic/Latino(a),
- 22% White/Caucasian (not Hispanic),
- 6% Asian,
- 3% Two or more race/ethnicities, and
- <1% Alaska Native, Pacific Islander, or Native American.

Language

Among all transit users, 82% identified themselves as speaking English "very well" or "well", 15% "not well", and 4% "not at all". **Survey responses were obtained in multiple languages, 6.4% responded in a language other than English.** Among all transit users, **27% responded that they speak a language other than English at home**. This rate was similar for all three transit modes.

Employment

Most transit riders are employed:

- **63% employed full-time,**
- **15% employed part-time,**
- 15% not currently employed,
- 3% have a disability and are unable to work,
- 3% retired, and
- 1% homemakers.

Employment rates specifically for rail and local bus are comparable, with 65% and 76% of riders employed.

Park-and-ride services are weekday only and focused on peak travel hours (6 a.m. to 9 a.m. and 3 p.m. to 6 p.m.). The rider employment rate reflects the service's limited utility for non-work trips with 94% of riders being employed full-time.

Income

The 2017 poverty rate for a family of four in Houston was household income below $24,858. About 27% of households in Houston and about **33% of transit riders live in households in poverty**[2]: a higher proportion of rail (19%) and local bus (20%) riders are in households in poverty than are park-and-ride riders (3%).

About 22% of Houston households earn $100,000-or-more; about 9% of transit-using households are high-income. The disparity between transit modes is substantial: 2% of local bus and 6% of rail riders are in households with income $100,000-or-more – **whereas for park-and-ride 43% of rider households earn $100,000-or-more.**

Student Status

About 20% of all riders are pursuing education: 15% college/university, 4% K-12th grade, and 1% vocational, technical, or trade school. Those rates are similar between rail, local bus, and park-and-ride.

History Using Transit

Most riders (60%) are long-term riders that have used transit for three or more years; 21% began riding one to two years ago and 19% in the last year.

Approximately 0.6% of transit trips in a given weekday are first time riders – equal to several hundred people trying transit each day.

WHERE DO TRANSIT RIDERS LIVE?

Where do people live that ride transit in Houston?

ALL OVER.

Riders of local bus and light rail are most concentrated in the core of Houston's most populated, diverse neighborhoods… Whereas riders of park-and-ride live mostly in suburban areas inside or outside Houston (some even in exurban rural areas).

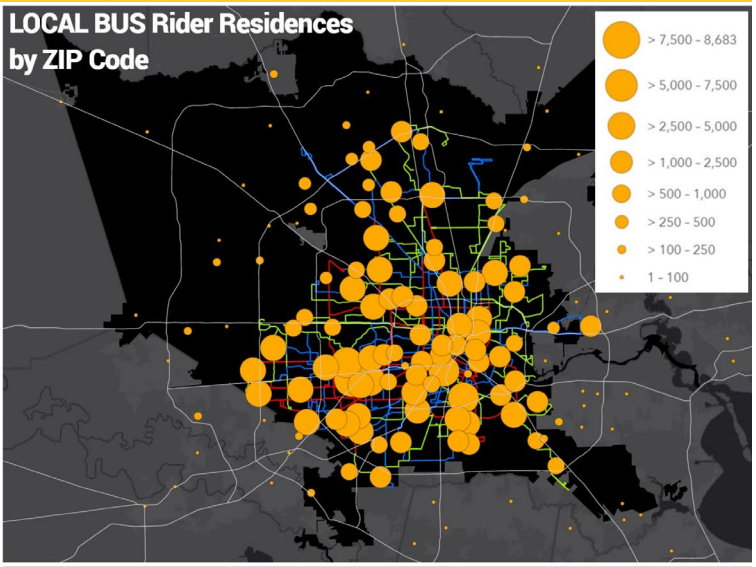
Note

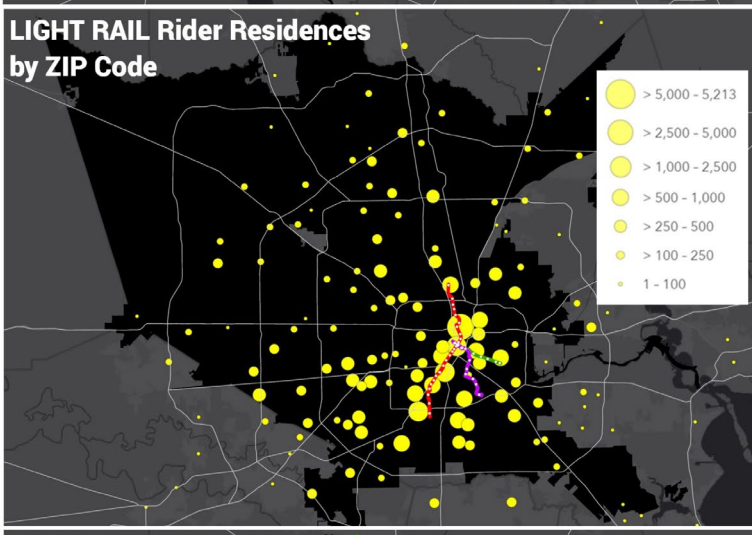
Each map in Figure 18 depicts only residence locations aggregated by ZIP code.

About 28% of all trips on transit involve one or two transfers from one route/line to another to complete. A portion of transfers are between transit modes, such as local bus to light rail.

"One day on METRO I ended up sitting down next to the fundraising director of the Houston Grand Opera. I am a Fine Arts minor, so it was very exciting to meet someone that high up in the Grand Opera here in Houston that I might otherwise not have met."

Veronica Ordonez
Student, UH Honors College
College of Liberal Arts & Social Sciences
College of Arts





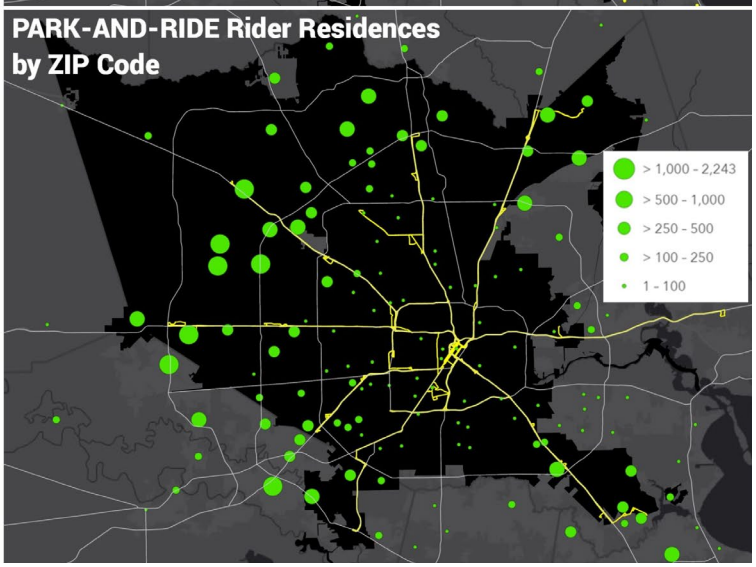


Figure 18. Transit Rider Residences by ZIP Code.

WHERE DO PEOPLE GO ON TRANSIT?

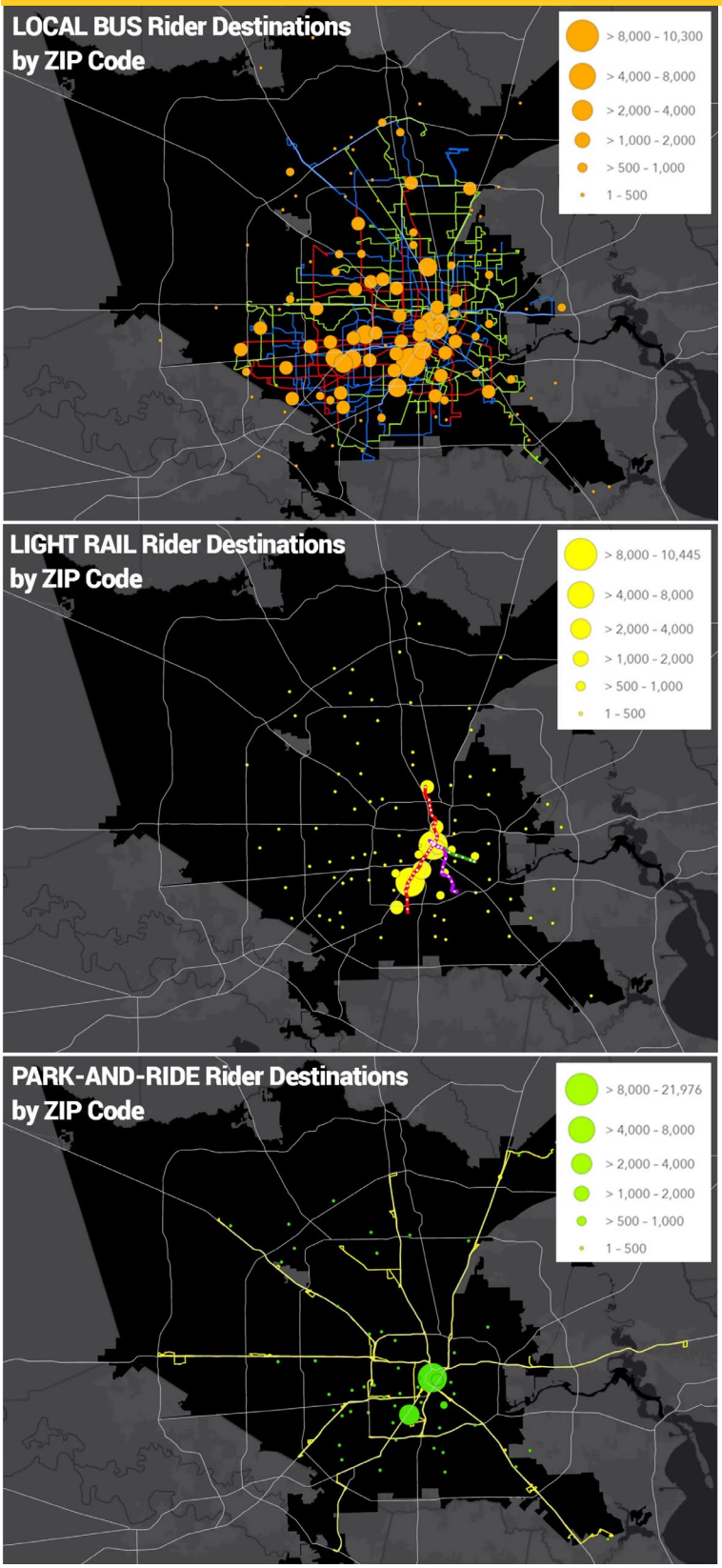


Figure 19. Transit Rider Destinations by ZIP Code.

Where do people go on transit in Houston?

MANY PLACES.

Riders travel to destinations all over the area. Local bus and light rail destinations are concentrated in several areas and generally are more widely distributed than park-and-ride. Park-and-ride destinations are concentrated in Downtown and in the Texas Medical Center.

Note

Each map in Figure 19 depicts only non-residence destinations aggregated by ZIP code.

About 28% of all trips on transit involve one or two transfers from one route/line to another to complete. A portion of transfers are between transit modes, such as local bus to light rail. All three maps on this page illustrate where riders were ultimately headed based on the mode a rider was using when surveyed.

How Does a Trip using Transit Work?

When and how do riders use transit to reach places?

ALL DAY. WITH PLANNING.

Trips on transit occur throughout the day and for many riders at night too. All trips involve other travel modes. People use transit to reach a wide variety of places.

Time-of-Day

Most trips on park-and-ride occur during the AM and PM peak hours (92%), when the service is offered. Trips on local transit (bus/rail) occur throughout the day:

- 4% before 6:00 am,
- 21% during AM peak,
- 33% midday (9:00 am – 3:00 pm),
- 25% during PM peak, and
- 18% after 6:00 pm (until midnight).

The time-of-day of a trip is a result of both rider demand (i.e., choice, preference) and when services are available.

Starting from Home

Most transit riders start their trip as a pedestrian walking to a stop (93% local bus, 79% rail), being dropped-off (5% local bus, 17% rail), or bicycling (1.2% local bus, 3.2% rail). Park-and-ride, as the name denotes, is the exception: 91% drive or are dropped-off (referred to as kiss-and-ride), and only 5% walk.

Fare Payment

Every trip on transit involves the rider paying fare; some riders qualify for reduced fare or free fare. The fare amount and type depend both on the transit service utilized and rider personal circumstance. Most riders pay the regular, full fare for their trip:

- 82% regular full fare.
- 14% reduced fare,
  - 9% student,
  - 2.4% disability,
  - 1.9% senior.
- 4% free fare,
  - 0.7% METRO (employee, spouse, or retiree),
  - 0.5% Age 70+ Lifetime Pass,
  - 0.3% Veteran Pass,
  - 0.2% Freedom Q (paratransit riders).

Riders may use a variety of fare cards (i.e., Q Card, Day Pass), mobile app tickets, or cash (no change given) to pay fare. Using a fare card or mobile ticket means a rider can make transfers between routes in any direction for up to three hours with no additional fare. Riders using cash must pay fare again when transferring.

Transferring

Of all trips on transit, 28% included one or two transfers from bus route or rail line to another to complete. Transferring between routes is an inconvenient necessity when a rider cannot directly reach, or get close to, their destination using only one route.

Reaching the Destination

Most transit riders – 90% to be exact – walk to their (non-home) destination to complete their trip. The other 10% either bike (2%), drive or are picked up (7%), or do something else (<1%).

Bike egress is more common on rail (3.4%) than on local bus (1.6%) or on park-and-ride (0.5%).

Trip Purpose

Riders access a variety of places on transit trips:

- 56% work,
- 12% personal business,
- 8% shops,
- 7% college/university,
- 4% medical purposes,
- 3% social visits or church,
- 3% K-12 school,
- 3% restaurants,
- 2% recreation/sightseeing, or
- 2% all other purposes.

Riders' transit use varies a great deal between transit modes. For example, park-and-ride is used almost exclusively to travel to or from work (93%), a consequence of its peak-hour limited stop service design, or college/university (4%). However, about half of trips on local bus and rail are to work.

This does not mean the proportion of local bus and rail riders traveling to work via transit is necessarily lower; rather, it likely means that most local riders are traveling on transit to access work and education, but they also make other trips on transit for other purposes (i.e., multi-purpose riders for whom transit is a primary means of mobility).

Local bus and rail riders take more trips on transit each week in general and travel for a wider variety of purposes than riders on park-and-ride.

In other words, rail and local bus provide riders with affordable and available transportation for all trip purposes – especially apparent and crucial to mobility for riders from households in poverty.

What are Riders' Travel Options?

Most Riders Have a Driver's License

Most transit riders, 65%, have a driver's license, an indication that they may have some flexibility in travel mode even if a vehicle was not immediately available for the trip they were on while being surveyed.

Many Riders Have No Vehicle Available

Among all riders, 31% belong to a household with no vehicle, 34% one household vehicle, 25% two vehicles, and 9% 3-or-more vehicles. Vehicle ownership varies by riders using various modes:

- 40% of local bus riders live in households with no vehicle (5% have three-or-more vehicles).
- 34% of light rail riders live in households with no vehicle (10% have three-or-more vehicles).
- 2% of park-and-ride riders live in households with no vehicle (27% have three-or-more vehicles).

Some riders choose not to own a vehicle. Some other riders cannot afford to own and operate a vehicle. Still some other riders cannot drive due to a disability, age, ability, or a medical condition.

Riders in Households with Vehicles Do Not Always Have the Option to Drive

About 69% of transit riders live in households with one or more vehicles. When asked if they could drive if transit was not available for their trip, many riders did not have the option to drive despite their household owning a vehicle:

- 58% of local bus riders have no option to drive.
- 22% of light rail riders have no option to drive.
- 13% of park-and-ride have no option to drive.

Some Riders Have No Other Travel Alternatives of Any Kind

The survey asked transit riders about their travel alternatives for the trip they were on while being interviewed. Among all riders, nearly 14% indicated they had no other travel alternative for their trip if transit were not available:

- 19% of local bus riders had no alternative.
- 34% of light rail riders had no alternative.
- 2% of park-and-ride riders had no alternative.

For riders with travel alternatives the most common options are to drive themselves (31% overall, 17% local bus), catch a ride with someone else (31% overall, 39% local bus), walk (9% overall, 10% local bus), or by some other means (16% overall, 18% local bus). Some other means options include bicycle, taxi, TNC (e.g., Uber, Lyft), and car share.

Observations

People of all ages, genders, racial/ethnic backgrounds, languages, employment levels, and income levels use public transit. However, the types of service utilized by each demographic and community varies.

Riders of local bus and light rail are most concentrated in the core of Houston's most populated, diverse neighborhoods, whereas riders of park-and-ride live mostly in suburban areas inside or outside of Houston.

Riders travel to destinations all over the area. Local bus and light rail destinations are concentrated in several areas and generally are more widely distributed than park-and-ride. Park-and-ride destinations are concentrated in Downtown and the Texas Medical Center.

Trips on transit occur throughout the day and for many riders at night too. All trips involve other travel modes, primarily walking or biking. People use transit to reach a wide variety of places.

Local bus and rail riders take more trips on transit each week in general and travel for a wider variety of purposes than riders on park-and-ride. In other words, rail and local bus provide riders with affordable and available transportation for all trip purposes – especially apparent and crucial to mobility for riders from households in poverty. These local fixed-route services seem best able to attract all-purpose riders.

Want to learn more? The appendix summarizes how ridership and rider characteristics vary between counties, cities, city council districts, and super neighborhoods. A separate supplement compares individual local bus, light rail, and park-and-ride routes/lines (available by request from LINK Houston).

PART 3. EQUITY IN HOUSTON TRANSIT

Part 3. Equity in Houston Transit concludes the informational portion of the report by exploring where transit is needed most, based on demographic, population, economic, and built environment data combined in the Transportation Equity Demand Index – TEDI. Using the TEDI, Part 3 compares high-need areas to contextual information (i.e., neighborhoods and types of stakeholders who may be partners for better, equitable transportation) and present fixed-route transit services.

Every community and all residents need mobility to access opportunities for a full, productive life. While quality transportation is an interest shared by anyone living, working, or visiting in Houston, transportation conditions and needs vary from community to community and household to household. What is most warranted and needed in one community may not apply in another community. LINK Houston created the Transportation Equity Demand Index – TEDI to objectively identify where the high-need areas exist, as well as where locations where better and more equitable transportation will have the most positive impact on our region's development and residents' lives. (See "Transportation Equity Demand Index - TEDI Methodology" in the Introduction.)

This portion of the *Equity in Transit: 2018 Report*:

- Relates more detail about the distribution of each TEDI indicator;
- Discusses where high-need areas intersect communities and stakeholders who may be concerned about the need for equitable transportation to improve access to opportunity; and
- Presents analysis of TEDI high-need areas compared to present fixed-route transit.

Applying the Transportation Equity Demand Index – TEDI

The Transportation Equity Demand Index combines 15 indicators to identify areas in Houston where public transit is most needed to improve quality-of-life. Figure 20 illustrates LINK Houston's process in creating the index and how the high-need areas are compared to transit services, communities, and other stakeholder partners. (See also "Transportation Equity Demand Index - TEDI Methodology" in the Introduction.)

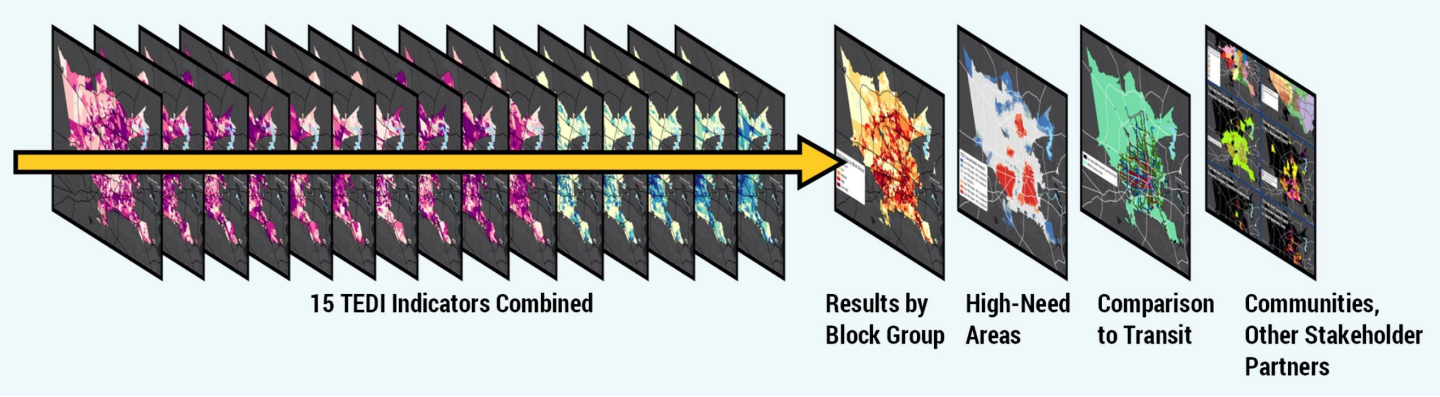


Figure 20. TEDI Methodology and Use Case for Recommendations and Next Steps to Advance Transportation Equity.

Figure 21, on the next page, contains a map of each indicator. Higher values are darker and mean higher relative priority and/or suitability for equitable transportation. The indicators were chosen to ensure that many aspects of personal equity and community equity in affordable transportation are included. The TEDI indicators combine both percentage rates, such as poverty, and densities, such as work sites for hourly jobs. The human and built environment indicators each relate to the feasibility of operating fixed-route transit (i.e., walkable, bikeable compact neighborhoods are important for fixed routes). The TEDI rating of a block group is the average of all 15 indicators, each given equal weight as each is important. The result is a TEDI rating of each block group in the METRO service area. Higher values mean higher relative need for future transportation investments and services in support of equitable long-term outcomes.

In addition, each indicator is from a publicly available source typically updated each year – enabling LINK Houston to periodically update the research to understand how the region is changing and how transportation stakeholders can adapt.

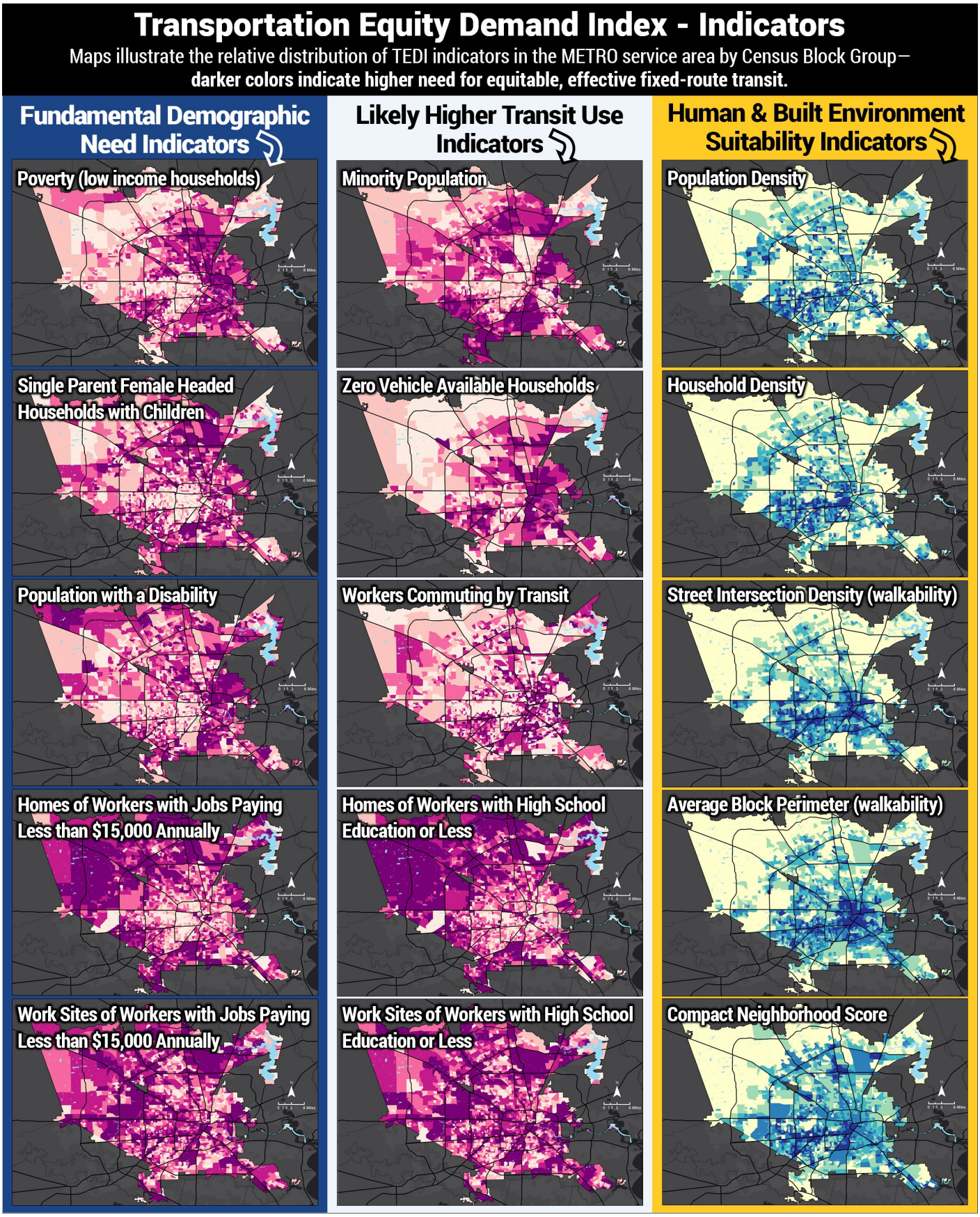


Figure 21. Maps of Each of the 15 TEDI Indicators.

TEDI – High-Need Areas

Figure 22 illustrates the results of the TEDI analysis. The black diagonal bars mark the four high-need areas, clusters of block groups where need for equitable transportation is statistically concentrated.

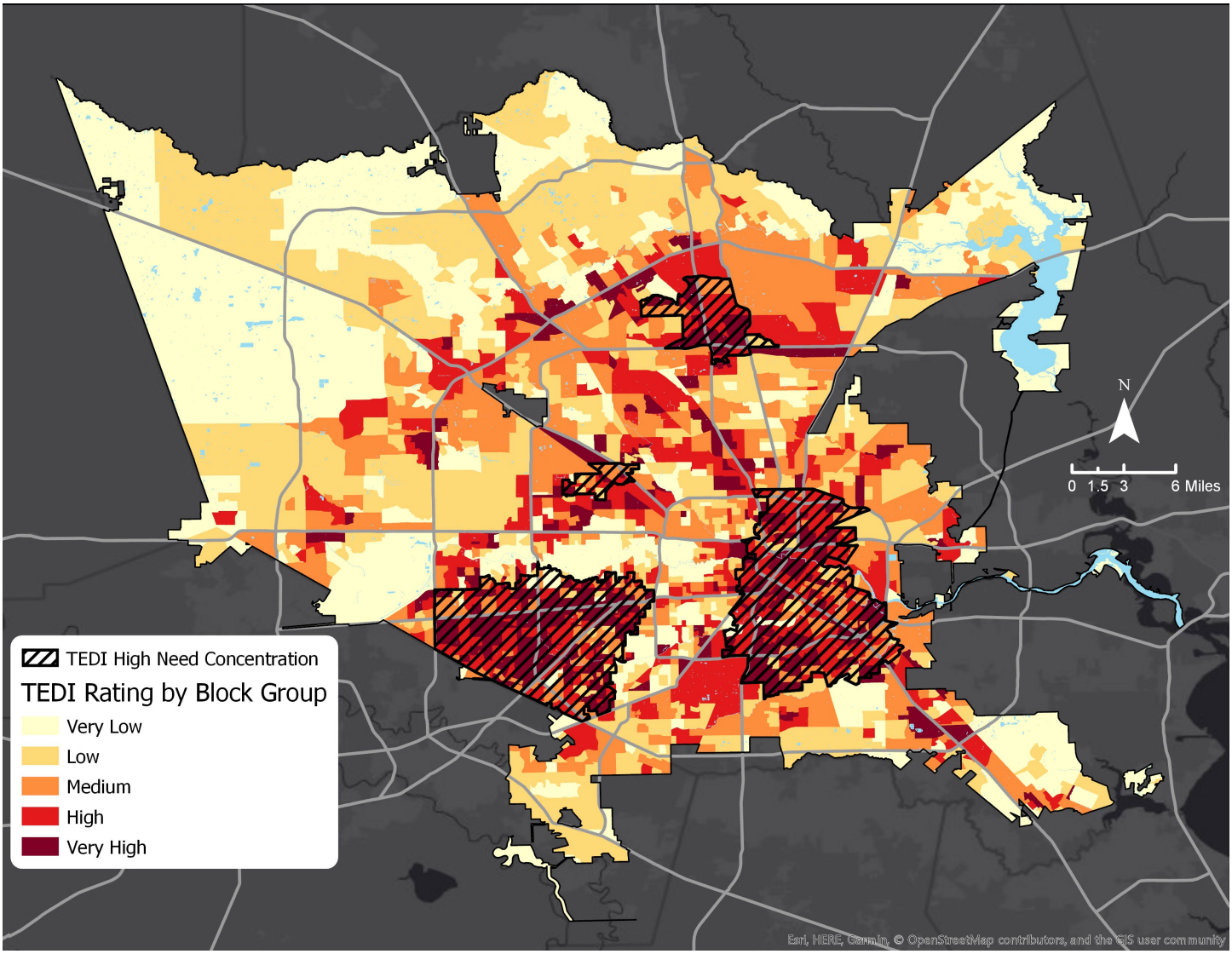


Figure 22. TEDI Results with High-Need Areas.

Table 2 compares the high-need areas in Figure 22 to the remainder of the METRO service area and to the service area total. TEDI high-need areas are 8% of land area but 23% of population, 22% of the workforce, and 24% of households. TEDI high-need areas have twice the rate of poverty (24% of households are in poverty), nearly three times the rate of zero-vehicle households (12%), and commuters are 2.5x more likely to already be using transit to access work. The human environment in high-need areas is far more conducive to operating fixed-route transit as density is more than three times (3x) that in all other areas (though there are of course pockets of density elsewhere). The built environment in TEDI high-need areas is similarly conducive to transit with higher intersection density, shorter blocks, and more compact street networks, which all make walking or biking more reasonable.

Table 2. TEDI Applied: Indicator Values for High-Need Areas Compared to All Other Areas.

		HIGH-NEED AREAS		ALL OTHER AREAS		SERVICE AREA TOTAL	
	CHARACTERISTIC	*Percent of Total*	*Number*	*Percent of Total*	*Number*	*Percent of Total*	*Number*
	Population	23%	983,678	77%	3,316,225	100%	4,299,903
	Working Population	22%	460,680	78%	1,589,870	100%	2,050,550
	Households	24%	354,791	76%	1,137,175	100%	1,491,966
	Land Area (Square miles)	8%	155	92%	1,729	100%	1,884
CATEGORY	INDICATOR	*(% of households, population, workers, jobs within high-need areas)* *Percent Rate*	*(number of households, population, workers, jobs)* *Number*	*(% of households, population, workers, jobs within all other areas)* *Percent Rate*	*(number of households, population, workers, jobs)* *Number*	*(% of households, population, workers, jobs within the whole service area)* *Percent Rate*	*(number of households, population, workers, jobs)* *Number*
Fundamental Demographic Need	**Households in Poverty (Low-income)**	24%	86,221	12%	133,593	15%	219,814
	Single Parent Female Headed Households with Children Under Age 18	11%	40,297	7.9%	90,285	8.8%	130,582
	Population with a Disability	9.3%	91,466	7.2%	237,272	7.6%	328,739
	Homes of Workers with Jobs Paying Less than $15,000 Annually	25%	97,347	20%	253,039	21%	350,386
	Work Sites of Workers with Jobs Paying Less than $15,000 Annually	19%	123,433	19%	278,496	19%	401,929
Likely Higher Transit Use *(i.e., propensity, latent demand, or induced demand)*	**Minority Population**	50%	488,933	36%	1,187,376	39%	1,676,309
	Zero-Vehicle Available Households	12%	42,420	4.5%	50,796	6.2%	93,216
	Workers Commuting by Transit	5.5%	25,331	2.2%	35,037	2.9%	60,368
	Homes of Workers with High School Education or Less	48%	142,331	43%	429,240	44%	571,571
	Work Sites of Workers with High School Education or Less	41%	212,150	43%	494,539	42%	706,689
Human and Built Environment Suitability	**Population Density**	x	6,341	x	1,918	x	2,282
	Household Density	x	2,287	x	658	x	792
	Street Intersection Density (walkability)	x	338	x	189	x	231
	Average Block Perimeter - Feet (walkability)	x	2,299	x	3,356	x	3,059
	Compact Neighborhood Score (1-10 rating)	x	7.99	x	5.59	x	6.27

Please note as there is no regional sidewalk presence and condition data-set available, it is not possible to specifically assess walking conditions (such an indicator could be added to TEDI in the future if data becomes available). LINK Houston welcomes questions or suggestions about the Transportation Equity Demand Index – TEDI. LINK Houston will release periodic updates, likely each fall, with an updated index that reflects current conditions and the latest data/thinking.

TEDI – Stakeholders

The Transportation Equity Demand Index does not identify the specific needs of each community and stakeholders as such can only be determined through effective, comprehensive engagement. However, compiling and analyzing population, demographic, economic, and built environment in the TEDI enabled LINK Houston to identify areas within the region where transportation equity is most fundamentally needed to improve quality-of-life for the most disadvantaged communities and residents. This section identifies how those four high-need areas relate in context of Houston's neighborhoods and stakeholder areas of responsibility. This additional context is intended to spur collaboration between communities and the region's many public, private, and non-profit stakeholders to collectively address how to provide transit service to those who need it most and provide stakeholders with information needed to direct resources toward those areas in need.

Figure 23 contains six maps depicting how TEDI high-need areas relate to stakeholders:

- Houston City Council Districts,
- Harris County Commissioner Precincts,
- Houston Super Neighborhoods,
- TIRZs,
- Management districts,
- Complete Communities,
- Low-income housing, and
- Federal Opportunity Zones.

The following pages provide larger maps and brief discussion for each in roughly the same order.

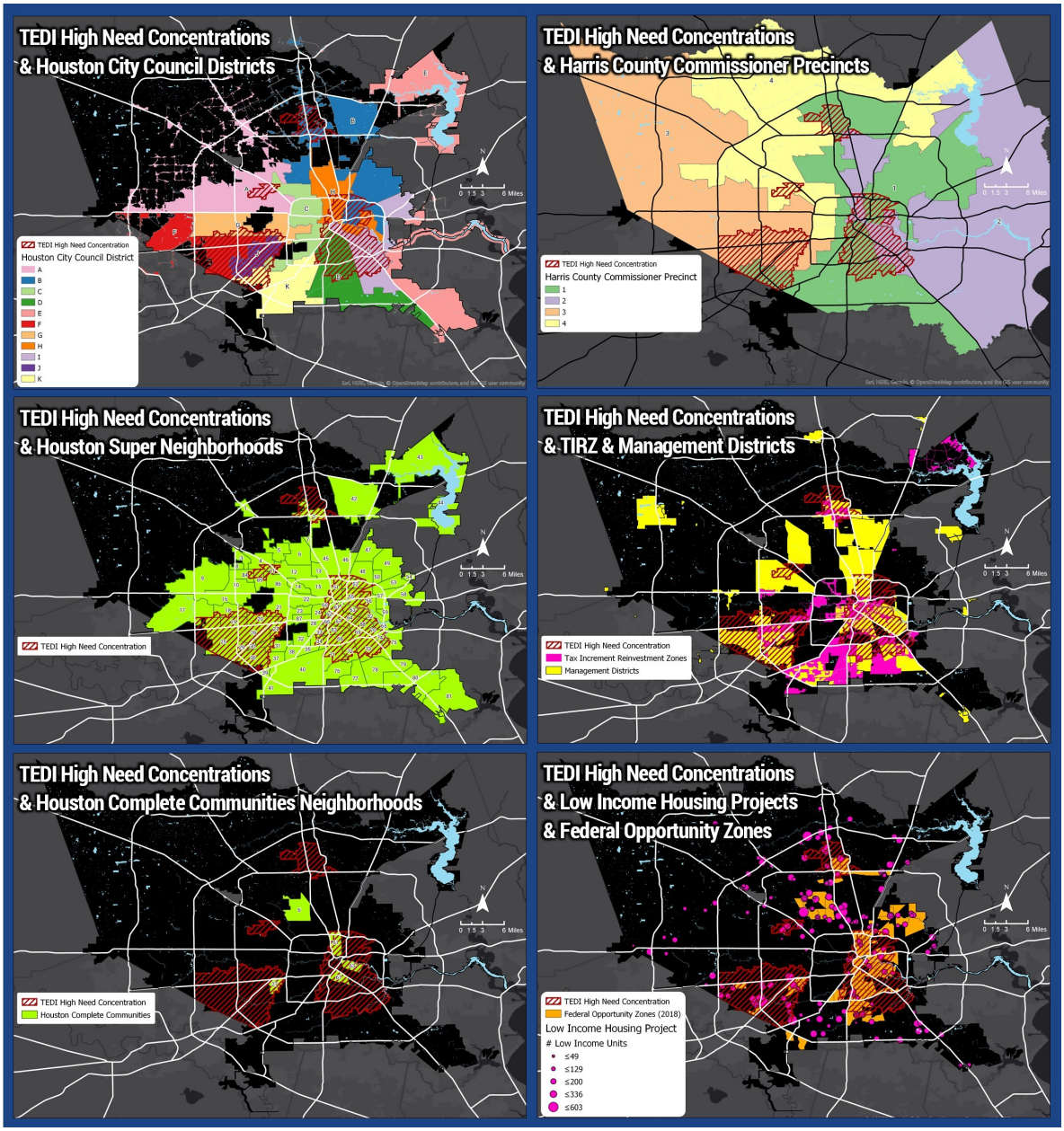


Figure 23. Summary of Stakeholder Context for Transportation Equity.

TEDI by Harris County Commissioner Precinct

The four Harris County Commissioner Precincts each contain a portion of at least one of the four TEDI high-need areas (see Figure 24).

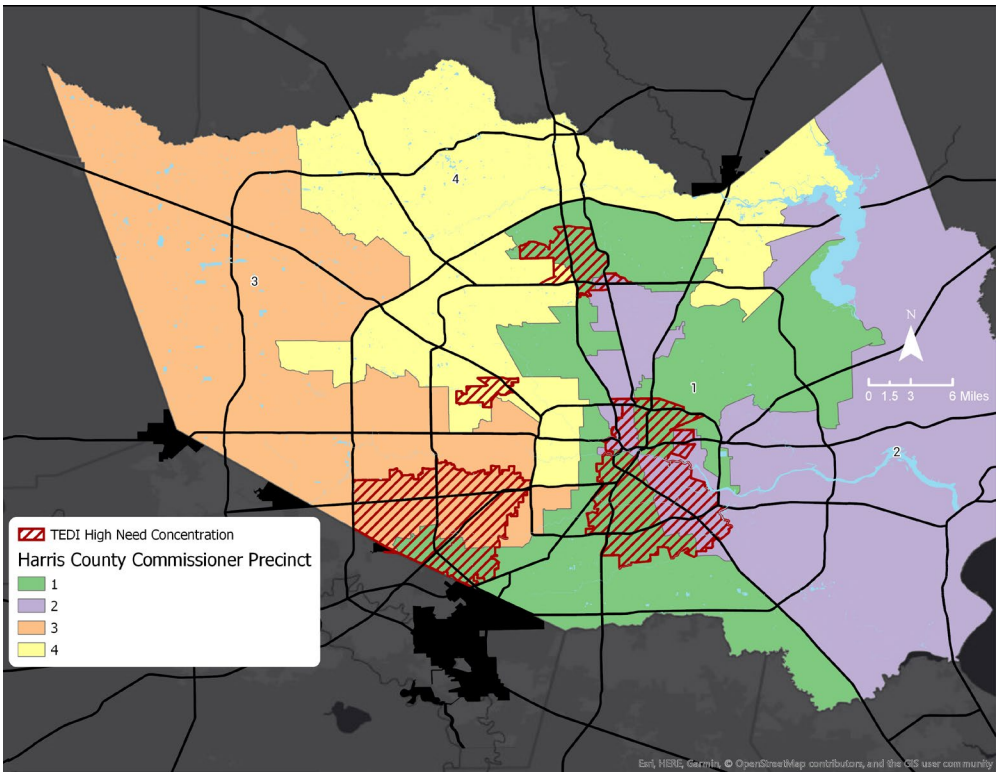


Figure 24.TEDI High-Need Areas and Harris County Commissioner Precincts.

TEDI by Houston City Council District

There are eleven Houston City Council Districts, each containing a portion of one or more of the four TEDI high-need areas (see Figure 25).

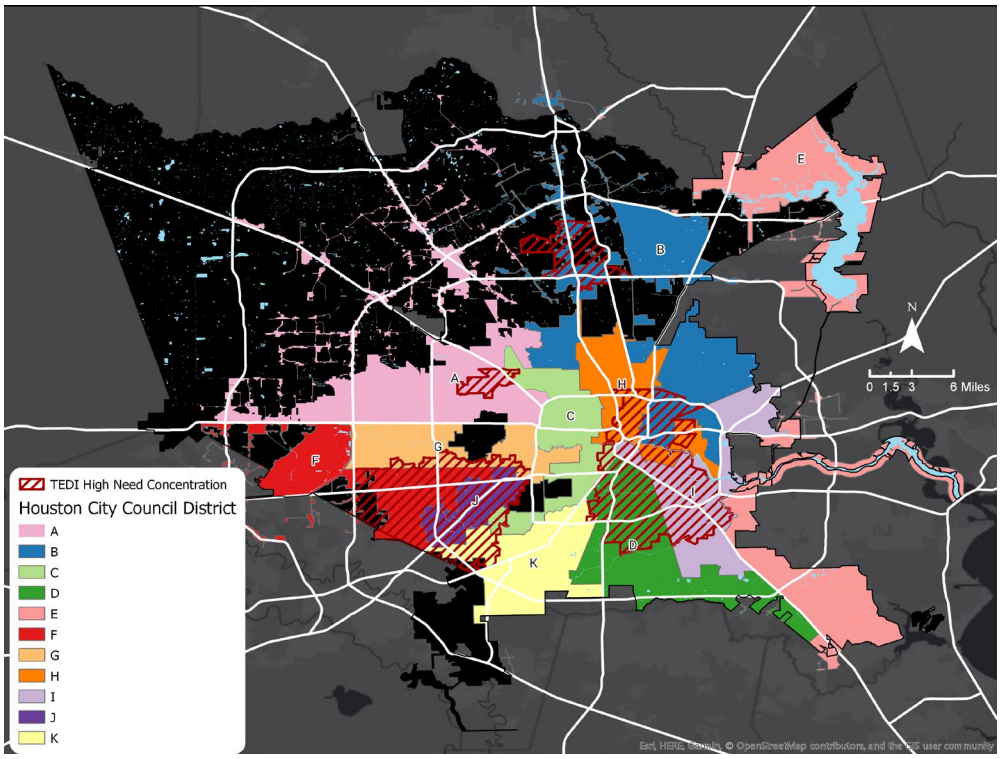
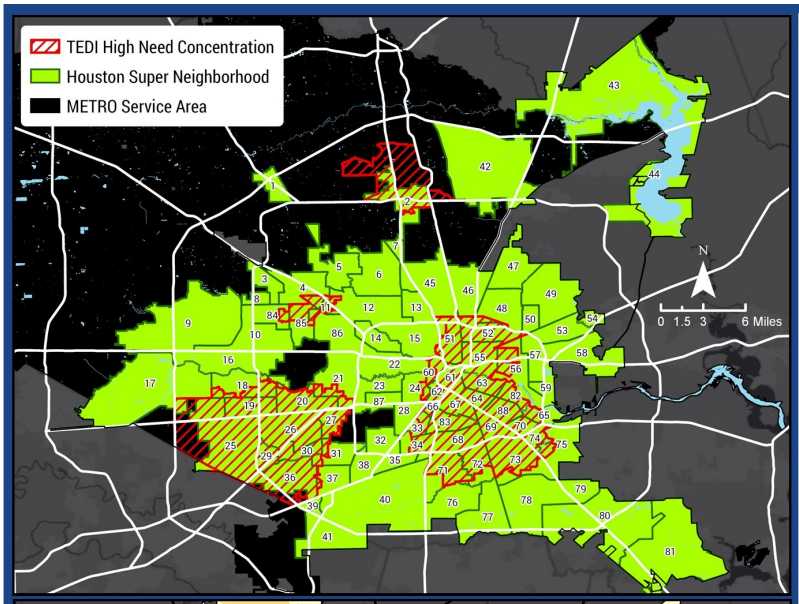
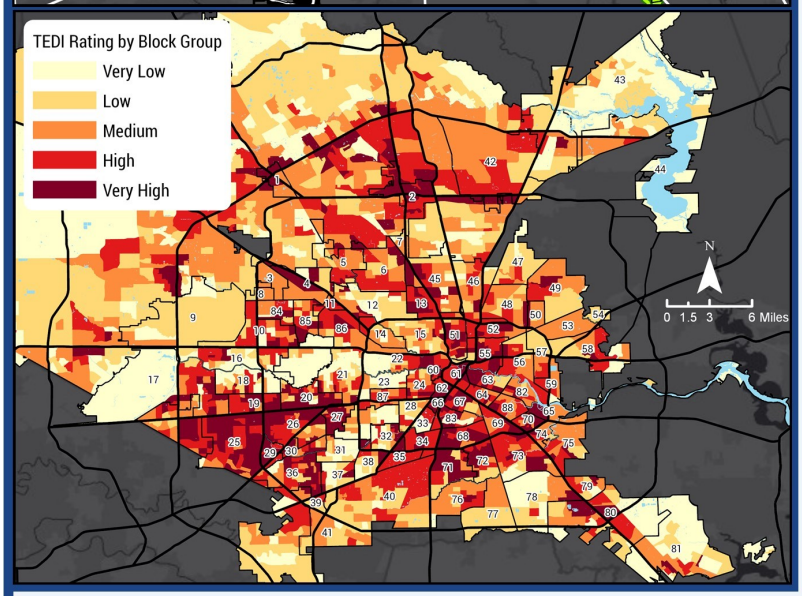


Figure 25. TEDI High-Need Areas and Houston City Council Districts.

TEDI by Houston Super Neighborhood

Most super neighborhoods, 52 of 88, have a portion of their area within a TEDI high-need area – 20 are completely inside. Figure 26 maps and rates each neighborhood in terms of need for affordable, equitable transportation, including transit.





Super Neighborhood Key

Marks a neighborhood with a portion in TEDI highest need areas.

#	Name	TEDI Rating (1-10)	Category
1	Willowbrook	7.3	Medium
2	Greater Greenspoint	7.9	High
3	Carverdale	5.0	Low
4	Fairbanks / Northwest Crossing	7.1	Medium
5	Greater Inwood	5.5	Low
6	Acres Home	6.4	Medium
7	Hidden Valley	4.0	Very Low
8	Westbranch	6.0	Medium
9	Addicks Park Ten	3.6	Very Low
10	Spring Branch West	6.8	Medium
11	Langwood	7.0	Medium
12	Central Northwest	4.2	Very Low
13	Independence Heights	8.3	High
14	Lazybrook / Timbergrove	5.6	Low
15	Greater Heights	4.8	Very Low
16	Memorial	4.6	Very Low
17	Eldridge / West Oaks	5.9	Low
18	Briar Forest	5.2	Low
19	Westchase	8.9	High
20	Mid West	7.8	High
21	Greater Uptown	5.1	Low
22	Washington Avenue Coalition / Memorial Park	5.9	Low
23	Afton Oaks / River Oaks Area	3.2	Very Low
24	Neartown - Montrose	6.5	Medium
25	Alief	7.7	High
26	Sharpstown	8.3	High
27	Gulfton	8.5	High
28	University Place	4.2	Very Low
29	Westwood	9.2	High
30	Braeburn	7.5	Medium
31	Meyerland Area	4.1	Very Low
32	Braeswood	4.4	Very Low
33	Medical Center Area	3.3	Very Low
34	Astrodome Area	8.2	High
35	South Main	9.7	High
36	Brays Oaks	8.0	High
37	Westbury	4.4	Very Low
38	Willow Meadows / Willowbend Area	5.0	Low
39	Fondren Gardens	6.0	Low
40	Central Southwest	4.9	Very Low
41	Fort Bend Houston	4.8	Very Low
42	Iah / Airport Area	5.3	Low
43	Kingwood Area	2.3	Very Low
44	Lake Houston	1.5	Very Low
45	Northside/Northline	5.6	Low
46	Eastex - Jensen Area	5.3	Low
47	East Little York / Homestead	4.5	Very Low
48	Trinity / Houston Gardens	5.6	Low
49	East Houston	5.6	Low
50	Settegast	5.0	Low
51	Near Northside	7.7	High
52	Kashmere Gardens	7.7	High
53	El Dorado / Oates Prairie	5.0	Low
54	Hunterwood	2.3	Very Low
55	Greater Fifth Ward	8.5	High
56	Denver Harbor / Port Houston	7.0	Medium
57	Pleasantville Area	5.3	Low
58	Northshore	4.3	Very Low
59	Clinton Park Tri-Community	4.2	Very Low
60	Fourth Ward	9.0	High
61	Downtown	8.4	High
62	Midtown	8.6	High
63	Second Ward	8.1	High
64	Greater Eastwood	6.9	Medium
65	Harrisburg / Manchester	7.5	Medium
66	Museum Park	7.5	Medium
67	Greater Third Ward	8.3	High
68	Greater Ost / South Union	8.8	High
69	Gulfgate Riverview / Pine Valley	7.6	Medium
70	Pecan Park	7.8	High
71	Sunnyside	6.9	Medium

"Anyone working to improve public transit should engage the community from the ground up and from start to finish."

Ed Pettitt, MPH
Greater Third Ward Resident
Emancipation Economic Development Council Member

Continued

#	Name	TEDI Rating (1-10)	Category
72	South Park	7.8	High
73	Golfcrest / Bellfort / Reveille	7.2	Medium
74	Park Place	6.2	Medium
75	Meadowbrook / Allendale	5.9	Low
76	South Acres / Crestmont Park	5.3	Low
77	Minnetex	3.8	Very Low
78	Greater Hobby Area	4.0	Very Low
79	Edgebrook Area	5.6	Low
80	South Belt / Ellington	5.1	Low
81	Clear Lake	3.5	Very Low
82	Magnolia Park	6.5	Medium
83	Macgregor	7.0	Medium
84	Spring Branch North	6.4	Medium
85	Spring Branch Central	6.9	Medium
86	Spring Branch East	6.6	Medium
87	Greenway / Upper Kirby Area	5.9	Low
88	Lawndale / Wayside	7.4	Medium

Figure 26. TEDI Results by Houston Super Neighborhood.

TEDI and Houston Complete Communities

Five of Houston's 88 super neighborhoods are currently part of City of Houston Complete Communities initiative.

> Complete Communities is about improving neighborhoods so that all of Houston's residents and business owners can have access to quality services and amenities. It's about working closely with the residents of communities that haven't reached their full potential, understanding their strengths and opportunities, and collaborating with partners across the city to strengthen them. While working to improve these communities, we must also work to ensure existing residents can stay in homes that remain affordable.
>
> *Source: www.houstontx.gov/completecommunities/*

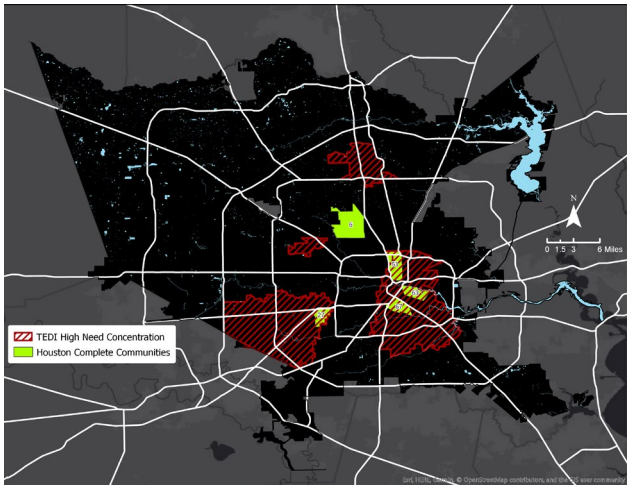


Figure 27. TEDI High-Need Areas Cover Four of Five Houston Complete Communities Neighborhoods.

Four of these neighborhoods almost entirely overlay within TEDI high-need areas. Acres Home, the one community outside of the TEDI high-need areas, has considerable demand for equitable transportation (see previous section), but the neighborhood is not located within a highest need area. The neighborhood warrants transit improvements, as community members have indicated through community engagement with the Complete Communities initiative and other processes. Indicators in the TEDI, such as density and the built environment, when applied demonstrate a demand for equity in transit but not the highest area of need in comparison to other neighborhoods.

TEDI and Special Districts

The Houston area contains several special government districts, the two most relevant for equitable transportation are municipal management districts and Tax Increment Reinvestment Zones (TIRZs). Both types of districts are involved in planning and constructing infrastructure improvements, some even help to fund transit operations (i.e., the downtown circulators are funded by the Houston Downtown Management District). Notably, several TEDI high-need areas have neither a management district nor a TIRZ, further limiting options for funding transit-related improvements.

TIRZs

Twenty of the 27 TIRZs in the area intersect a TEDI high-need area.

Management Districts

Fourteen management districts intersect a TEDI high-need area.

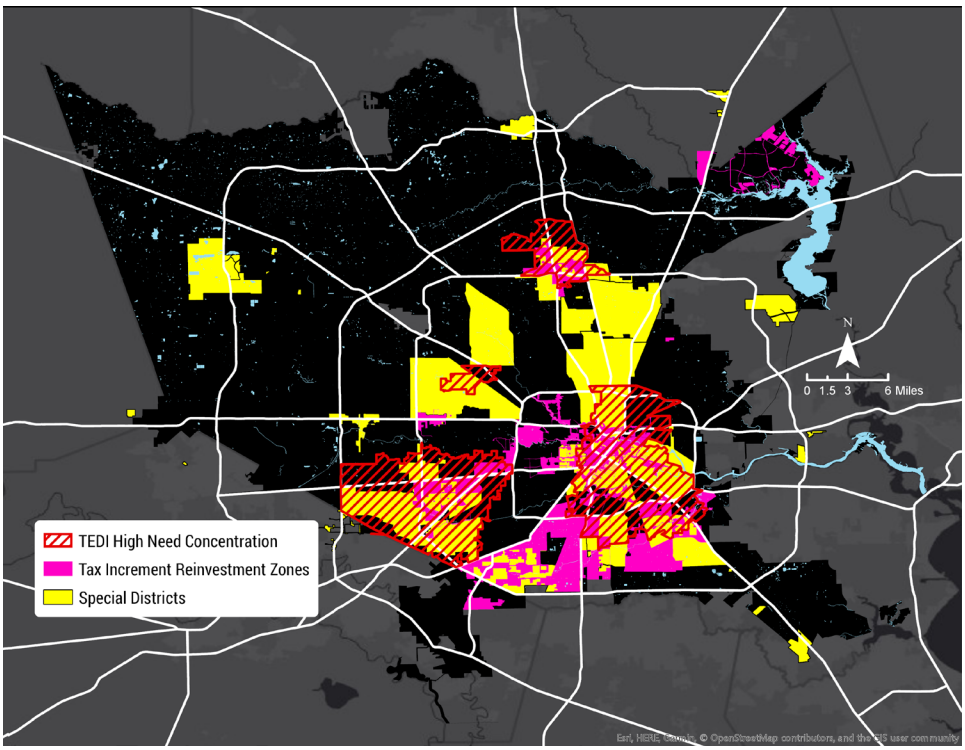


Figure 28. TEDI High-Need Areas Overlay Many Management Districts and TIRZs.

TEDI and Opportunity Zones / Low-Income Housing Units

Low-Income Housing

Affordable housing is a significant challenge in Houston. Figure 29 illustrates where the region has previously developed low-income housing units to provide affordable housing. The data is from U. S. Department of Housing and Urban Development's Low-Income Housing Tax Credit (LIHTC) database.

There have been about 32,500 low-income housing units developed in Houston through the LIHTC program – 33% are within TEDI high-need areas.

Low-income housing units, or some other housing related measure, could be incorporated into a future version of the Transportation Equity Demand Index. At present, housing affordability is indirectly included through residence location of low-wage jobs.

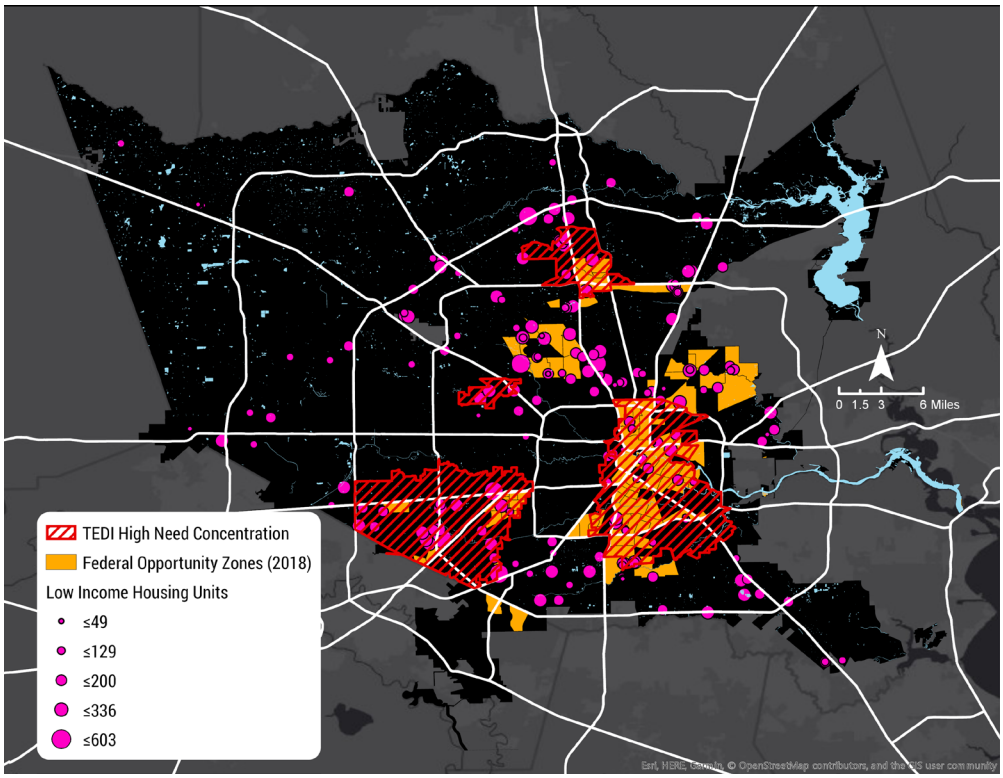


Figure 29. TEDI High-Need Areas in Relation to Opportunity Zones and Low-Income Housing.

Opportunity Zones

The U.S. Department of the Treasury and the Internal Revenue Service (IRS) designated Opportunity Zones in Houston in July 2018, based on State of Texas recommendations for certain Census tracts containing low-income populations.

The most recent federal tax law created Opportunity Zones to spur investment in distressed communities. New investments in Opportunity Zones can receive preferential tax treatment through 2026. Figure 29 illustrates the location of the 101 tracts designated as opportunity zones in our region. TEDI high-need areas intersect 77 of the 101 opportunity zone tracts.

Learn more: https://home.treasury.gov/news/press-releases/sm0341

TEDI – Transit Coverage / Frequency

Fixed routes – scheduled movements to pre-set locations on transit (i.e. local bus, light rail, park-and-ride) – need to be within reasonable distance of riders' origins and destinations. Fixed routes need to operate frequently, as well as on-time. Routes in Houston range in frequency from the least frequent green routes, which typically arrive every 60 minutes, down to the red routes, which are the most frequent routes and typically arrive every 15 minutes or faster.

Figure 30 explores transit service coverage and frequency by comparing present local fixed routes (bus and rail) to TEDI high-need areas. Red, blue, and green lines are ¼-mile buffers around bus stops and indicate the relative coverage of fixed routes by frequency of service.

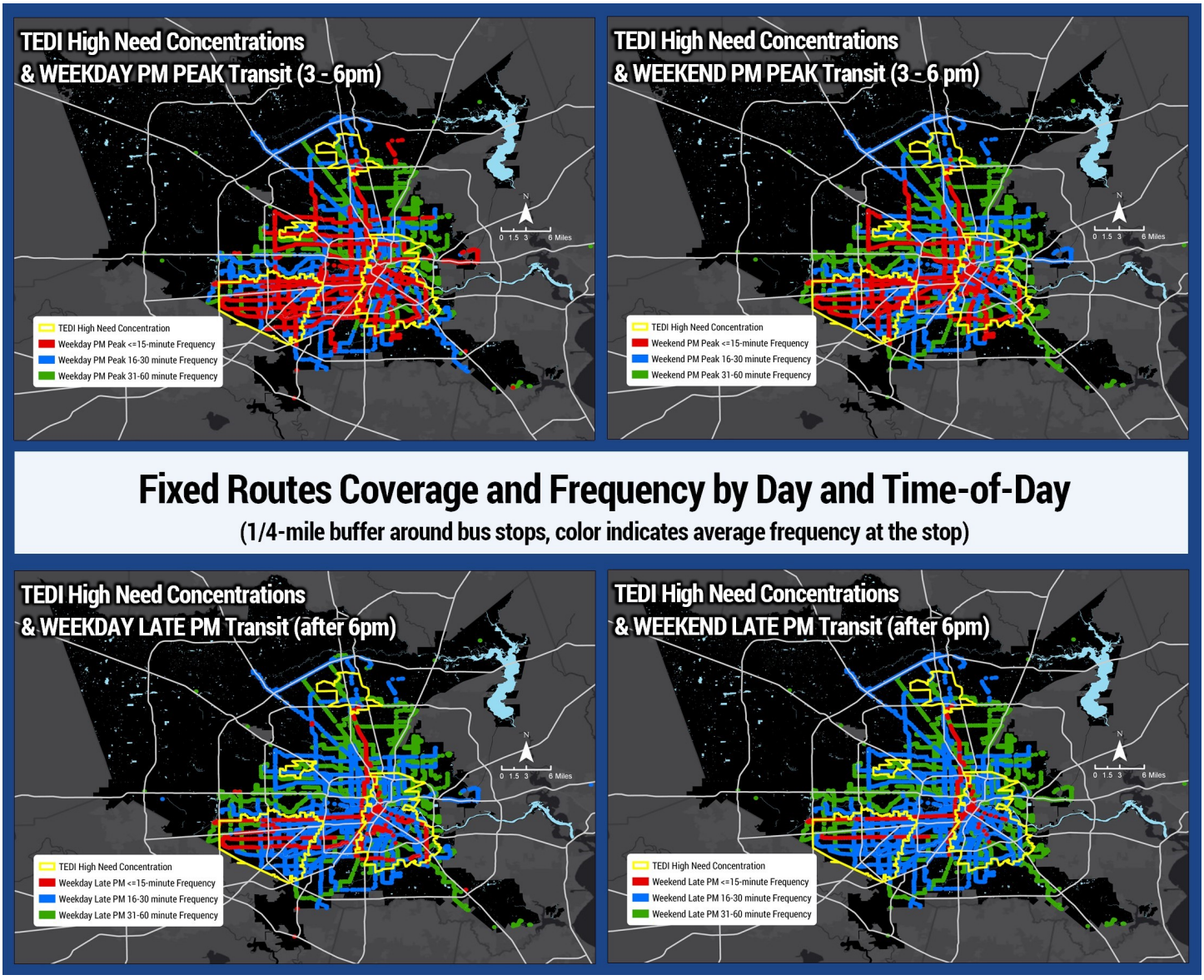


Figure 30. TEDI High-Need Areas and Local Fixed Routes Comparison.

If resources were unlimited all fixed routes would run on red frequency. However, METRO and partners operate within budgetary constraints and must make difficult decisions on where and when to provide frequent service. As a result, service levels vary from weekdays to weekends and by time-of-day periods (see Table 3). The existing network of local fixed routes cover the two southern, larger TEDI high-need areas quite well – the question becomes service frequency and

reliability. The same cannot be said of fixed routes serving the two northern high-need areas. In those two areas the coverage from existing fixed routes is more limited and frequency is lower.

TEDI high-need areas contain 152 square miles of METRO's service area (details previously related in Table 2). About 72% of the communities within TEDI high-need areas are within ¼-mile of fixed-route transit, irrespective of frequency. Adding a qualifier, 15-minute average frequency in a time period, sheds light on actual service availability and utility.

Table 3. Transit Coverage and Frequency within TEDI High-Need Areas.

TEDI High-Need Areas Cover 152 Square Miles	Square Miles Served		Percent of High-Need Area Served	
	Weekday	Weekend	Weekday	Weekend
Area Within 1/4-mile of Any Fixed Route:	110.1	108.6	72.5%	71.5%
Area Within 1/4-mile of 15-minute or Better Frequency Fixed Route:				
Early AM (before 6am)	62.6	44.9	41.2%	29.6%
AM Peak (6 to 9am)	68.0	49.5	44.8%	32.6%
Midday (9am to 3pm)	50.7	49.7	33.4%	32.7%
PM Peak (3pm to 6pm)	66.2	49.7	43.6%	32.7%
Late PM (after 6pm)	32.2	15.7	21.2%	10.3%

Frequent transit covers about 40% of TEDI high-need areas on a weekday, with around 30% coverage on weekends. The most pronounced difference by time-of-day is the level of service after 6pm. Most fixed routes operate near to or past 12:00 am midnight. However, service frequency in the evening is significantly reduced, resulting in half the coverage on a weekday and one third on a weekend. Access to frequent transit options in the evening matters to TEDI high-need areas, as these areas represent higher concentrations of hourly workers, who may be working jobs outside of the daytime hours, as well as areas where there are higher concentrations of all-purpose riders, using transit for a variety of reasons in addition to work trips.

"Longer and more frequent service hours would be amazing because sometimes I have to be Downtown to work shows or be in shows that end around 11:00 p.m. [when transit is limited] so it would be nice to take the train or bus back home later at night rather than having to find a place to stay or have someone pick me up that late at night."

Veronica Ordonez
Student, UH Honors College
College of Liberal Arts & Social Sciences
College of Arts

OBSERVATIONS

The Transportation Equity Demand Index does not identify specific needs of each community as such can only be determined through effective, comprehensive community engagement. However, compiling and analyzing population, demographic, economic, and built environment enabled LINK Houston to identify areas within the region where transportation equity is most fundamentally needed to improve quality-of-life for the most disadvantaged communities and residents.

Figure 31 illustrates how TEDI statistical concentrations of low and high need for equitable transportation relate to transit supportive housing density. There is a national manual called the Transit Capacity and Quality of Service Manual (TCQSM), 3rd Edition, published by the National Academies of Science: Transportation Research Board. The TCQSM suggests 3+ housing units per acre as a minimum density to support transit and 10.5+ housing units per acre as desirable for frequent transit (service at least every 30 minutes). Many developed areas, including much of the TEDI high-need area, contain housing at the minimum density. Pockets of the higher density threshold also exist. Low-income housing units seem to generally exist where the TEDI identified need for equitable transportation is high.

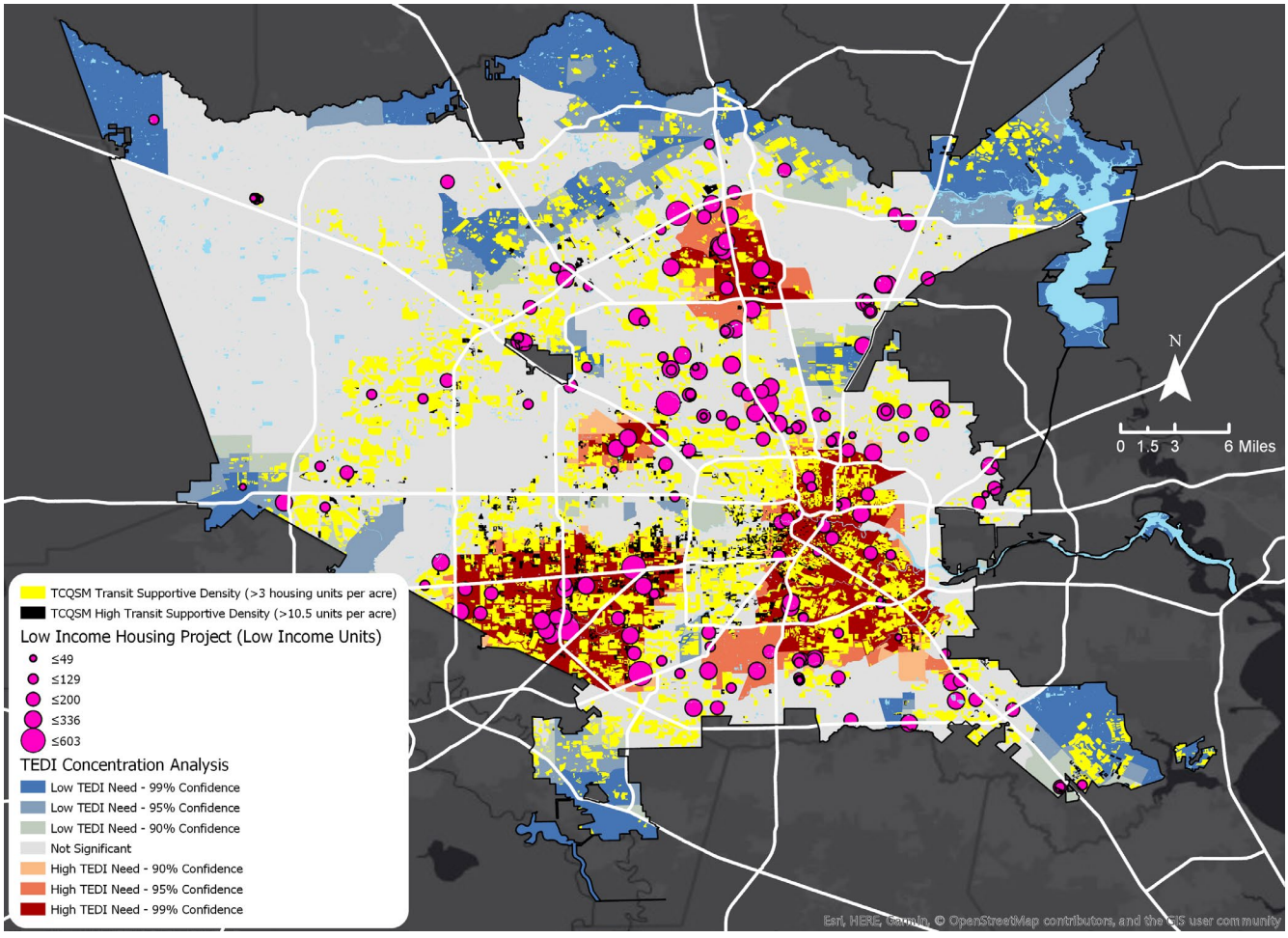


Figure 31. Observations on TEDI, Housing, and Transit Supportive Housing Densities (present).

The creation of TEDI enables LINK Houston and partners to help METRO and its stakeholder partners to more effectively meet two main public policy priorities: provide transit service to those who need it most and provide stakeholders with information needed to direct resources toward needs. This report concludes by making recommendations to improve transit and equitable transportation in general. Many of the recommendations are focused on service quality and coverage, but many are also about the distribution of transit options for those communities that need service the most.

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RECOMMENDATIONS AND NEXT STEPS

Recommendations and Next Steps identifies how public transit can improve peoples' access to opportunity by being more frequent, available (with extended span of service hours), reliable, and universally accessible. The next steps describe additional issues for consideration for how individuals, communities, local government, and transit operators can play a role in improving transportation equity in Houston.

Fixed-route transit directly and indirectly influences many aspects of a community and has a variety of stakeholders. Perspective and opinions about service quality vary depending on the type of stakeholder (see also Figure 32):

- Transit riders…whose travel options may be constrained by the quality of the service;
- Transit providers, local government, management districts, TIRZs…who have to make choices about how to allocate a finite amount of resources to best meet organizational goals and objectives, and who also may have to report on transit performance;
- Motorists…who interact with transit vehicles on the road and who may benefit when other motorists decide to use transit, and roadway agency staff and decision makers, who have their own sets of stakeholders, goals, and objectives, and need to become partners in order to implement roadway infrastructure improvements that can benefit transit; and
- Other residents and decision makers…who may directly support transit service through taxes and who may indirectly benefit from the role that transit plays in the community (e.g., affordable mobility, congestion relief, air quality, source of employment, etc.).

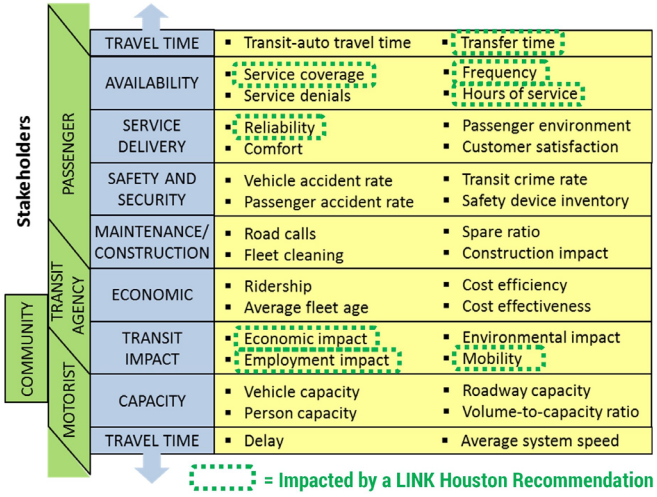

Figure 32. Comparison of Stakeholder Interests.

Source: Text and figure adapted from Transit Capacity and Quality of Service Manual, 3rd Edition, page 4-4 to 4-5, www.trb.org/Main/Blurbs/169437.aspx.

LINK Houston's recommendations and next steps prioritize improvements for transit riders and TEDI high-need area communities. We intentionally focus on frequency, availability, reliability, and accessibility as the most readily addressable aspects of equitable public transit. Other important aspects of quality fixed routes for all-purpose riders include total travel time, system speed, trips with standing room only, etc. Notably, total travel time is impacted by frequency and speed is affected by many of the same elements impacting reliability (additional different aspects include strategically reducing the number of bus stops on routes). These other elements are a natural follow-up in future LINK Houston reports.

RECOMMENDATIONS FOR EQUITABLE TRANSIT

The **frequency**, **availability**, **reliability**, and **accessibility** of public transit services impact the lives of riders and how well they can reach their destinations t access opportunities. The importance of those four aspects for quality transit are obvious to someone who rides transit.

Recognizing that there are limited funding resources and unpredictable support for public transit in Houston makes improving equity in transit challenging, but not insurmountable. Most important to understand, the cost or burden to implement improvements does not lie solely with the public transit authority. Many other stakeholders have a role in improving equitable transportation, including public transit.

To make a more equitable transportation network means starting with good regional and local transportation policies and decision making so that the benefits of transportation, as well as the burdens, are equally distributed across communities. Targeting specific high-need communities with transit improvements – frequency, availability, reliability, and accessibility – in the near term would improve equity across the public transit system and result in travel options that better connect people to opportunity.

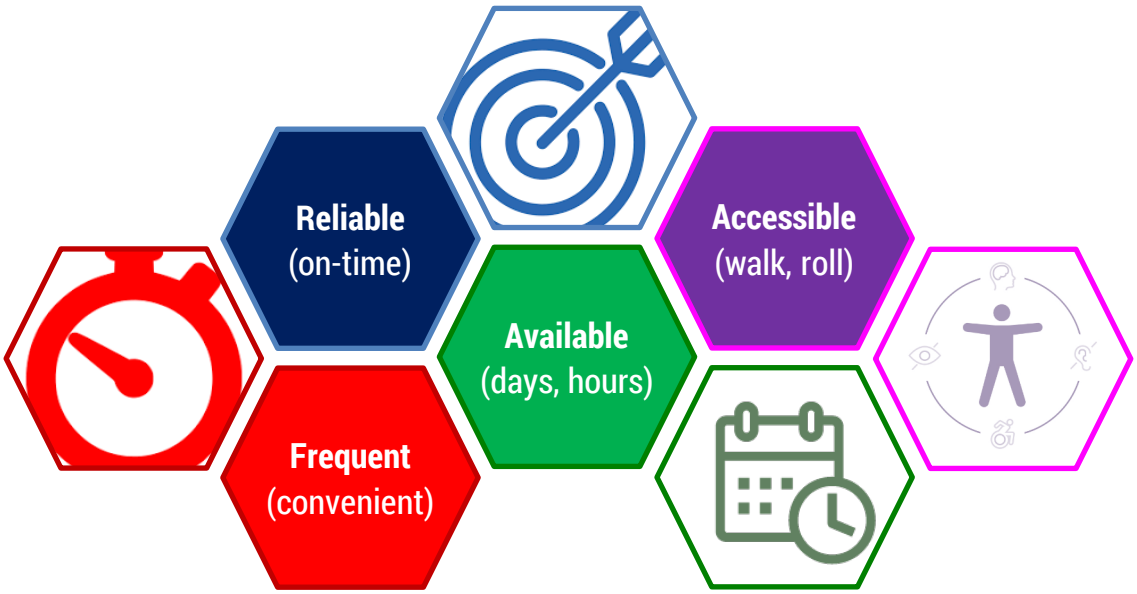

Figure 33. Characteristics of Great, Equitable Transit.

Recommendation Cost Calculation

Some recommendations will require additional resources to implement. As applicable and feasible, LINK Houston prepared magnitude of order cost estimates including both costs for additional buses and for additional service hours (i.e., vehicle revenue hours). The general method for cost estimates was to calculate the total of both:

- Annualized cost for additional buses (assuming 12-year life span) = # additional buses X ($500,000 / 12 years).
- Annualized cost for additional service hours = # additional hours X cost per hour.
    - $116.98 cost per hour for local bus in fiscal year 2017.
    - $227.04 cost per hour for light rail in fiscal year 2017.

The estimate cost estimates are meant only for relative understanding of how a recommendation may change the bottom line for providing fixed routes. METRO planners can produce far more accurate cost models for each recommendation using the agency's service planning systems and staff expertise.

Create More Frequent Transit

Our public transit system must be more frequent. People living in Transit Equity Demand Index – TEDI high-need areas need reduced wait times at local bus stops, but all too often bear the burden of 60-minute bus routes (these routes are too common in TEDI high-need areas in the East and North of the region, see Figure 30 on page 31).

Improving how often a bus comes on a route reduces the time that people wait. More frequent service will also attract more trips by existing riders and individuals willing to ride if transit were more available (i.e., latent, existing unrealized demand) and entice more people to try transit (i.e., induced, attracted demand) who are presently on the cusp of deciding to use transit instead of another alternative (such as carpooling or driving alone). A TransitCenter survey[3] in 2016, which included Houston riders, found "that transit riders greatly value improvements in frequency and travel time, and these two factors appear to drive overall satisfaction with transit… [and showed] that all-purpose transit riders tend to live in neighborhoods with frequent transit that provides access to many destinations."

Currently, METRO local bus routes operate in three color-coded categories, see Local Bus on page 11 for more explanation. There are 79 local bus fixed routes in Houston and their average length is about 21 miles end-to-end. A majority, 68 out of 79, pass through a portion of TEDI high-need area for some distance. Any improvement to frequency will shorten wait times for all riders. While residents and workers of high-need areas will benefit from increased public transit frequency, so would anyone else who does – or wants to – ride transit. A more frequent route is more frequent along its entire length, regardless of which community is being served at a point. Waiting less time to get on transit means spending less time to reach destinations.

To improve the frequency of public transit, METRO should:

- Make all "red" frequent network non-express local bus routes come every 15-minutes all-day, every day.
    - Service implication. Eight routes will have all-day 15-minute frequency: 25, 40, 41, 51, 52, 54, 80, and 85.
    - Resources required: ~42 more buses, ~152,000 more revenue hours, estimated $19.5m annual cost.
- Expand the frequent network by converting up to ten "blue" 30-minute routes to 15-minute "red" frequency, prioritized by ridership and equity criteria.
    - Prioritization criteria: Ridership (daily boardings), ridership per hour of service (a measure of service effectiveness), TEDI rating (measure of need along route).
    - Service implication: Ten routes improved to 15-minute frequent network service all-day: 6, 8, 9, 14, 28, 29, 45, 60, 68, and 86.
    - Resources required: ~43 more buses, ~158,000 more revenue hours, estimated $20.3m annual cost.
- Make the minimum headway 30-minutes or better on all local bus routes; effectively eliminating the 13 routes presently at 60-

"A lot of people in the Third Ward use the bus to commute to work. Third Ward has one of the highest percentages of folks with no car for the household. The bus system does well East to West, but it doesn't have great North to South lines so it's hard for Third Ward residents to use the bus to commute to work. We are working with METRO to address this."

Ed Pettitt, MPH
Third Ward Community Resident
Emancipation Economic Development Council Member

ILLUSTRATIVE EXAMPLE. Route #32 Renwick/San Felipe currently departs downtown every 30 minutes, heads west out of Downtown on West Gray and passes through apartment-lined streets with the occasional riders sitting at bus stops, connects to Uptown, and veers south to finally end up in Gulfton (the highest density neighborhood, 7th highest TEDI rating). Assuming it may not be feasible to change the directness of the route (Downtown > Uptown > Gulfton is time consuming), imagine if that bus came every 15 minutes during peak hours instead of every 30 minutes on the current schedule? Many people may think about Downtown as being primarily for higher-wage, salaried jobs, but in fact many lower-wage hourly and salary jobs exist and are filled by people living in TEDI high-need areas –including Gulfton.

minute frequency during peak and off-peak times and the 20 routes at 60-minute frequency during off-peak times.
    - Service implication: Thirteen more routes will now have 30-minute service during peak and off-peak hours: 3, 38, 59, 64, 71, 77, 78, 83, 96, 97, 160, 360, and 399. Twenty routes will now have 30-minute service during off-peak hours: 5, 10, 11, 23, 30, 39, 48, 58, 60, 66, 67, 70, 72, 75, 76, 79, 87, 88, 98, and 162.
    - Resources required: ~46 more buses, ~164,000 more revenue hours, estimated $21.1m annual cost.
- Increase the late-night frequency of all rail lines to at least 15-minutes between trains.
    - Service implication: ~112 additional one-way train trips operated each week in late evening time periods.
    - Resources required: ~3,200 more revenue hours, estimated $0.8m annual cost (likely a low estimate as does not include train vehicle capital costs or any other considerations specific to light rail).

Making these service improvements will increase operating costs (i.e., wages, fuel, buses). However, improving frequency for high-need areas will benefit many communities and is therefore a worthwhile, equitable use of resources. More frequent service also benefits all-purpose, occasional, and commute-only riders alike. More frequent service supports more affordable living within the region's core communities by alleviating the pressure to own one-or-more vehicles. Ultimately, improved frequency, especially when combined with other changes, contributes to shorter travel times, shorter waiting times in the elements outside (Houston is in fact hot for several months of the year), and the increased likelihood that people can get to their destinations when they need to be there.

Extend Hours to Make Transit More Available

Our public transit system must be available for more hours of the day. TEDI high-need areas are locations with higher densities of low-income wage earners – typically hourly jobs held by people with a high school diploma or GED (who may be pursuing further education and/or hold multiple jobs). Many hourly jobs – restaurant workers, building cleaning and maintenance, health care support, airport workers, hotel and convention center staff, retail sales – are not 8 to 5 jobs. People who earn hourly wages in these areas need affordable transportation options that can get them to and from work on time early in the morning and late at night. In addition to TEDI high-need areas, other residents, regional visitors, and international tourists alike who want to enjoy dinner in the Culinary Capital of the South, attend a show in the Theater District, join fans for a concert at NRG, venture outside of industry gatherings at the Convention Center between sessions, support our sports teams, kick it at the Rodeo, or simply try to get back and forth to campus for classes would all benefit from late-night public transit service.

"Extended hours in the evening would help those like me. Some people probably think 'oh people like her don't get out as much,' but disabled people, people in wheelchairs, walkers, canes – they get out as much as anyone else."

Kathryn Nowlin
Houston Heights Community Member and Advocate

To improve the span of service hours on public transit, METRO should:

- Extend hours on 12 priority local bus routes to near 24-hours to provide early morning and late-night services connecting under-resourced communities to extended-hour activity centers, specifically the airports, Convention Center, Galleria/Uptown, universities, community colleges, and Texas Medical Center.
    - Service implication: Eleven local bus routes will have extended hours: 2, 6, 9, 11, 14, 26, 33, 36, 40, 50, 73, and 102.
    - Resources required: ~45,000 additional revenue hours, estimated $5.2m annual cost.

Residents, workers, employers, and stakeholders (i.e., business organizations, management districts, etc.) concerned about early and late hour access for transit riders should share their opinions and needs with METRO. Figure 34, on the next page, illustrates the location of the twelve recommended routes on which to extend service to at or near 24-hours.

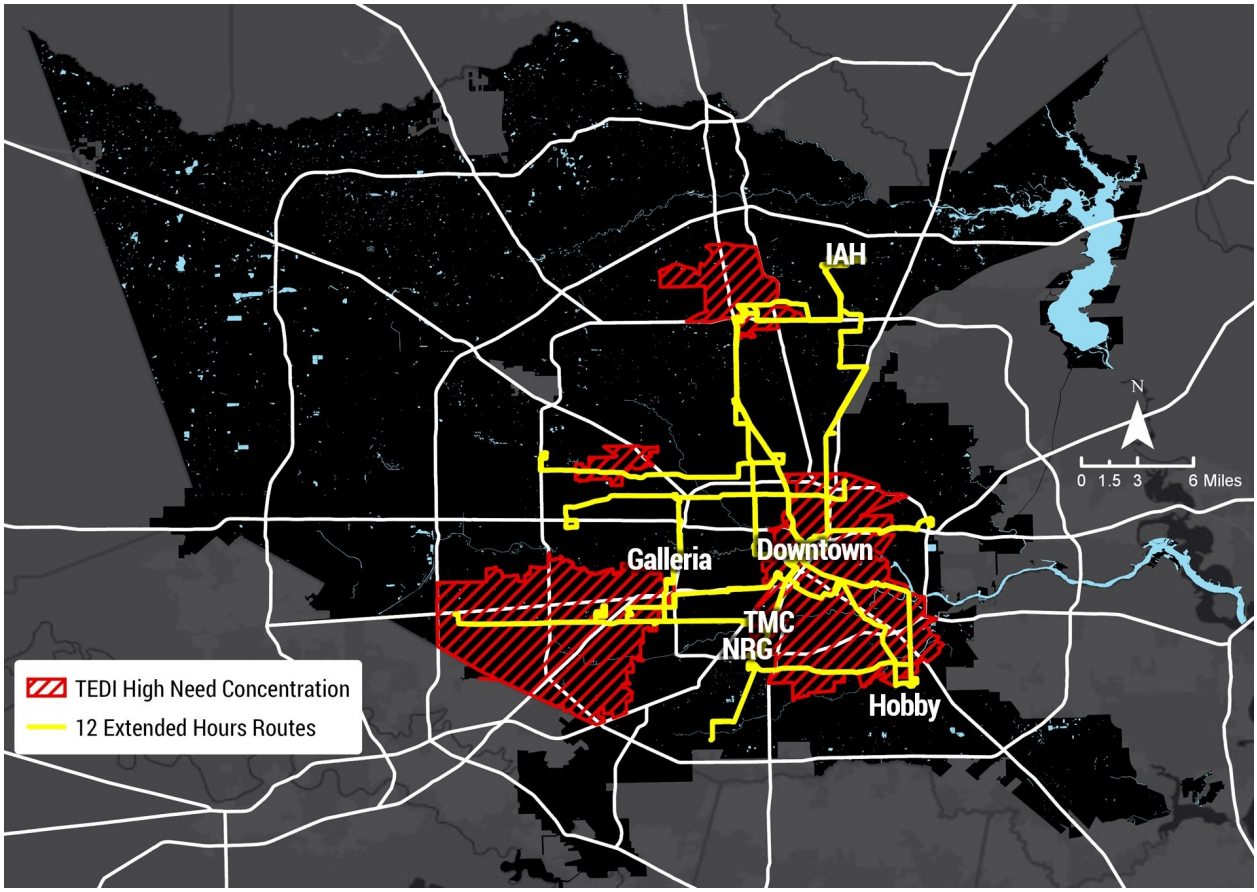

Figure 34. Recommended Extended Hours Fixed Routes.

Make Transit More Reliable

Our public transit system must be more reliable. That means that buses and trains should come on time as noted in a schedule. According to METRO's October 2018 Monthly Performance Report, 75% of local bus trips were on-time, 78% of regional express park-and-ride trips were on-time, and more than 92% of light rail trips were on-time (92% of Red Line trips, 98% of Purple Line trips, and 99% of Green Line trips) last month.

Currently, in Houston a bus trip from route beginning to end is considered on-time if the bus did not leave early from the first stop, did leave within 5-minutes of the scheduled time, and arrived at the last stop within 5-minutes of the scheduled time. This leaves a lot of room in the middle when a bus may be significantly off-schedule for long periods. The present practice of measuring on-time reliability of whole route trips does not make it possible to evaluate reliability within TEDI high-need areas as compared to other areas. Some regions (e.g., Boston, New York City, Chicago, etc.) have used their real-time data feed to Google to monitor reliability and other quality measures (bus speed, bus trips not operated, etc.) along segments of routes and between communities. A similar data feed is available in Houston and could be leveraged to understand service in TEDI high-need areas, communities, and by route segment.

Reliability is also about transparency in systems to let people know at stops how close the bus is to staying on schedule. While METRO has improved mobile apps and texting services so that riders can check when the next bus will arrive, many riders with lower incomes, disabilities, language barriers, or unfamiliarity with technology may not have access to or the ability to use the "smart" technology on a phone. Communicating the reliability on the bus in real-time could be as straightforward as a pictographic with the bus number and the number of minutes until the next one arrives on a digital sign at important stops and transfer points. While improving reliability for TEDI high-need areas is important, improved reliability is something that every current rider wants, and every potential rider needs to convince them that public transit is a viable option. Communicating that reliability at the stop also benefits tourists or infrequent riders, who even with access

to smart-phone technology, are far less likely to bother to understand how to find out when the next bus comes. While keeping transit running on-time should be the first priority, communicating the reality of the system can give riders the tools to make informed decisions about how to get to their next appointment on-time.

To improve the reliability of public transit, METRO should:

- Change the local network on-time target from present 75% of trips to 90% of trips and meet the target.
    - Service implication: elevates operator/partners motivation and accountability to be on-time.
    - Resources required: minimal operating resources. Rigorous planning to make feasible, focused management to create on-the-ground results, staff time to monitor, and effort to coordinate and hold accountable partner stakeholders that control traffic management systems (an absolutely essential ingredient for success).
      Note: Achieving the higher target for on-time local fixed routes will require significant effort by METRO and partners, most especially the City of Houston. The following are some tools that may be necessary: standby buses prepositioned near on-time trouble spots to pull into service to sub in in place of a delayed bus, operator restrooms at end of line so operators don't have to stop on the way, traffic signal priority, bus lanes, overpasses over freight rail lines where buses frequently wait, better bus stop boarding areas for faster boarding, far side of intersection bus stops (instead of near side stops), and better training on wheelchair boarding practices. The reality may be that METRO will only be able to phase in the 90% target on particular routes or route segments.
- Eliminate schedules for routes/lines operating at 8 minutes or better frequency (e.g., Route 82).
    - Service implication: reduces complexity for riders and operators.
    - Resources required: minimal; transit must maintain a high-level of reliability to make this work.
- Post real-time next arrival/departure at all transit centers, transfer points, and heavily used stops (i.e., top 4 percent of boarding and alighting locations would impact 49 percent of all transit activity).
    - Service implication: better information accessible to all users at important stops/stations and transfer points.
    - Resources required: modest. Investment for real-time displays, staff time, on-going maintenance.
- Confirm that schedules and frequency posted at stops match the information available on METRO's website and fed into apps through the General Transit Feed Specification (GTFS) Realtime feed to Google.
    - Service implication: accurate trip planning.
    - Resources required: minimal.

In addition, METRO and partners, including LINK Houston, should collaborate to utilize the GTFS Realtime feed to establish reporting of on-time performance by segments of each route and by neighborhood. Performance can be shared in a publicly accessible dashboard. Understanding where buses get off-schedule along their route will help METRO coordinate with partners (i.e., City of Houston, Texas Department of Transportation, management districts, etc.) to resolve issues with traffic signal timing, traffic queues, road construction traffic management, and other related matters that impact the ability to operate reliable transit but that are outside the control of METRO.

More Accessible Transit and Infrastructure

Our public transit system must be more accessible. Every METRO vehicle is wheelchair accessible. All rail stations and transit centers are constructed to meet accessibility standards at the time. Some bus stops are accessible. The greater challenge is ensuring walking and rolling infrastructure can safely connect riders to transit. METRO has already publicly committed to universal accessibility[4] – ensuring that every bus stop and station is compliant with the Americans with Disabilities Act (ADA) Standards established by the U.S. Department of Transportation: Federal Transit Administration.

While improving accessibility for TEDI high-need areas is important, improved accessibility is far more fundamental. People with one or more disabilities live all over the region, many in TEDI high-need areas. The quality of our built environment, which includes all street elements (sidewalks, curb cut ramps, crosswalks, crossing signals, etc.), is the result of public policy and development decisions. Creating safe access to transit for riders with a disability also results in great infrastructure for anyone walking, rolling, or helping another person on Houston streets.

To improve the accessibility of the built environment communities and transportation stakeholders (i.e., transit providers, cities, counties, TIRZs, management districts, etc.) should:

- **Form and fund partnerships to systematically create more accessible infrastructure** through policy and projects, most especially around transit services in TEDI high-need areas.

To improve the accessibility of public transit, METRO should:

- **Systematically fulfill commitments to universal accessibility**, both in current 5-year initiative and METRONext long-range planning.
- **Prioritize construction of bus stop amenities (i.e., shelters, seating, lighting, trash bins, etc.) at stops with off-peak service frequency of 30-minutes or longer**, especially where transfers are made (the longer you wait, the more you need a place to sit).

LINK Houston advocates for these accessibility improvements on behalf of people with a disability. However, universal accessibility is challenging and needs the support, energy, and experience of all residents. We encourage everyone to share their personal opinions and experiences with civic and government leaders so that informed, focused decision making can occur even more frequently.

More about ADA Standards

Learn more about U.S. DOT Federal Transit Administration ADA Standards for public transit facilities, stations, and stops here: www.transit.dot.gov/sites/fta.dot.gov/files/docs/Tips_for_ADA_Compliance_4-22-14.pdf.

Learn more about ADA Standards for Transportation Facilities by visiting the United States Access Board's website: www.access-board.gov/guidelines-and-standards/transportation/facilities/ada-standards-for-transportation-facilities.

NEXT STEPS

Our recommendations to improve equity in transit in Houston focus on the near-term operational changes that are largely – though not entirely – within the scope of the public transit authority. While many of these changes have been discussed as part of METRONext, METRO's long-term vision for the region, change over the medium and longer term by METRO must be matched in political will and execution by state and local authorities. Funding decisions that determine the distribution of federal and state spending on transportation infrastructure must change to ensure that the network improves and advances equity. Whether a person chooses not to use a car, cannot drive because of a disability, is uncomfortable with or not permitted to drive, lost their car to flooding or some other disaster, or cannot afford a vehicle to drive, there are a host of reasons that mean that there will always be people who need to travel yet do not have a personal vehicle available as their means to get there. Increasing car ownership and highway capacity alone cannot accommodate the needs of the region; according to population estimates released by the U.S. Census Bureau in 2018, Harris County is the fourth highest growth (i.e., number of people) county in the country and the highest population increase county in Texas[5]. Public transit is necessary to absorb the increased mobility needs of the region. Equitable, affordable transportation will help the region pursue inclusive economic growth that further advances equity in incomes, education, and health outcomes rather than widening disparities between under-resourced communities and resourced communities.

Resources Needed to Support for More Equitable Transit. The state allocates less than 1% of the $42.9 billion in federal and state funding for public transit in the Texas Department of Transportation's annual budget. Over the longer term, for public transit to keep up with our population growth, the region will need more federal and state funding; dollars allocated for and spent on public transit should constitute a larger total amount and a greater proportion of the state's annual transportation budget in comparison with other modes. This requires legislators to appropriate greater spending for public transit in the Houston region and other urban areas and to identify the funding streams to support that spending. Increased funding is an important step in prioritizing public transit and demonstrating a commitment to this travel mode as an important part of the transportation system.

Regional Priorities and Decision Making to Support Transportation Equity and Transit. The regional transportation decision-making body must prioritize public transit for funding and implementation as a necessary step to improving affordable transportation options for people in the Greater Houston Area. The Houston-Galveston Area Council, the metropolitan planning organization designated by the federal government to carry out the 8-county region's metropolitan transportation planning, plays a significant role in shaping decisions on public transit. From predictive modeling of regional transportation plans for high-capacity transit to the criteria for selecting Transportation Improvement Program projects, incorporating transportation equity demand variables – not just including Title VI populations – into decision making is an important step to improving equity in transit and equity in transportation at-large.

Role of Cities, Counties, TIRZs, and Management Districts. At the local level, the county and city-level governments' appointments to govern the public transit authority should begin with the question, "Who rides transit?" Every appointee should develop a deep understanding from first-hand experience of what it is like to use public transit to reach a work site, a meeting or appointment, or a class; the finite timeframe underscores the need to focus on frequency, reliability, availability, and accessibility. Furthermore, local-level government officials must be willing to make the tough choices that prioritize high-capacity transit over single-occupancy vehicles. Those decisions to advocate for more transit at the state and regional levels, trade car lanes for dedicated transit lanes, and adjust street signals to allow transit to move reliably and quickly through the streets are decisions that ultimately prioritize people and the need to move people in high-capacity modes over individual modes. Sub-local government, such as the management districts and Tax Increment Redevelopment Zones, can also advance transportation equity with street-level infrastructure improvements, such as sidewalk maintenance or expansion and utility relocation. These improvements allow for better streets for people connecting to transit as well as for the transit authority to better use limited funding on their area of expertise – transit operations.

Role of Everyone, Including You. The challenges are real, and resources are limited. We hope *Equity in Transit: 2018 Report* has provided you with information you need to form educated opinions about transportation equity at-large and most especially regarding public transit. So, what do you do with this information? Advocate! Whether you are an elected

official, a decisionmaker on the METRO Board, a staff member working on transit projects, or a concerned person, you can use this information to advocate for transit improvements. Share your support for improved equity in transit, especially in the TEDI high-need areas, at a METRO Board meeting and at any upcoming public meetings on METRONext. Let your Congressional representatives, state legislators, and especially your local government elected officials know that public transit and equity in transit are important to you. Write a letter, share a post on social media (#transitequityhtx), participate in a public comment session, or ask to meet with your elected official to share your transit experiences and the experiences you'd like to have on transit to better help you reach where you want to go. Urge your management district and TIRZ leaders to start funding projects that complement transit, walking, and biking. Show up at an H-GAC meeting, especially a High-Capacity Transit Task Force meeting or a Transportation Policy Council meeting, to share that transit is important to fund and offer ideas on what would make it better. Let people around you – local business leaders, your employers, and your neighbor – know how transit helps you or someone you know connect to opportunity.

Please use this report as a resource for your engagements and know that we at LINK Houston are also a resource. Advocacy for transit service improvements that will benefit your community and TEDI high-need areas starts with you.

One Final Closing Note About the Importance of Transit Service Frequency

There is a national manual called the *Transit Capacity and Quality of Service Manual* by the National Academies of Science: Transportation Research Board. The manual is highly regarded by transit planners and is an exhaustive reference with more than 800 pages of detailed information. The following excerpt is from Chapter 4. Quality of Service Framework (we lightly edited to use laymen's terms in this report):

> Frequency was consistently reported as the top factor influencing overall trip satisfaction in a survey administered in several cities around the U.S.... Riders also respond strongly in the form of increased ridership when frequency is improved, particularly when the previous service was relatively infrequent. The less frequent a bus route is, the more inconvenient bus service becomes, both because riders have to plan their trip around the bus service and because they incur more unproductive time during their trip. With infrequent bus services, riders budget extra time into their trip to ensure they do not miss their bus and, as a result, have to wait longer for the next departure. Increasing bus frequency is expensive for transit agencies, so it is important to consider whether the land uses served by a transit route are capable of supporting higher frequencies.
>
> *Source: TCQSM, Chapter 4, page 4-28. The manual is accessible online here: http://www.trb.org/Main/Blurbs/169437.aspx.*

LINK Houston created the Transportation Equity Demand Index to identify high-need areas that also possess human density and built environments that "are capable of supporting higher frequencies". The highest frequency of transit that ridership, funding, and equitable need can support should be provided by transit providers in partnership with other stakeholders.

APPENDIX A. RIDERSHIP BY GEOGRAPHY

This appendix contains summary tables of METRO ridership by transit rider residence location for the following geographies:

- County
- Harris County Precinct
- Incorporated City
- Houston City Council District
- Houston Super Neighborhood

LINK Houston will prepare additional summary tables comparing fixed routes ridership by geography to TEDI high-need areas to ascertain additional levels of priority for stakeholders to consider.

METRO Ridership by County (rider residence)

County	Weekday METRO Transit Boardings by Resident	Percent of Boardings by Transit Mode			Percent of Boardings by Demographic				Percent of Boardings by Destination (all trips whose origin/destination was not home)					
		Local Bus	Light Rail	Park-and-Ride	Poverty	Minority	Age 20-65	Student	Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
Harris	266,148	69%	23%	9%	19%	81%	87%	19%	53%	15%	17%	11%	5%	0.1%
Fort Bend	11,240	21%	15%	64%	7%	78%	94%	22%	81%	5%	6%	6%	2%	0%
Galveston	1,658	7%	20%	73%	0%	41%	90%	17%	85%	5%	4%	4%	2%	0%
Montgomery	1,444	8%	23%	70%	3%	28%	93%	17%	77%	5%	6%	7%	5%	0%
Brazoria	1,371	7%	62%	31%	3%	55%	94%	11%	77%	11%	5%	2%	4%	1%
Waller	294	12%	4%	84%	0%	24%	100%	17%	68%	16%	8%	8%	0%	0%
Liberty	30	0%	30%	70%	30%	0%	100%	30%	70%	0%	0%	30%	0%	0%
Chambers	15	0%	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
All Other Counties	283	4%	53%	43%	22%	20%	86%	17%	46%	33%	20%	1%	0%	0%

METRO Ridership by Harris County Precinct (rider residence)

	Harris County Precinct / Context	Weekday METRO Transit Boardings by Resident	Percent of Boardings by Transit Mode			Percent of Boardings by Demographic				Percent of Boardings by Destination (all trips whose origin/destination was not home)					
			Local Bus	Light Rail	Park-and-Ride	Poverty	Minority	Age 20-65	Student	Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
1	Incorporated City	114,601	70%	28%	2%	21%	82%	86%	20%	48%	16%	18%	12%	6%	0.2%
	Unincorporated Territory	7,371	66%	17%	17%	21%	89%	89%	18%	60%	13%	15%	8%	4%	0%
	Total	121,972	70%	27%	3%	21%	82%	86%	20%	49%	16%	18%	11%	6%	0.1%
2	Incorporated City	41,474	59%	36%	5%	23%	83%	85%	17%	47%	18%	19%	9%	7%	0.04%
	Unincorporated Territory	2,598	61%	24%	15%	21%	89%	88%	18%	59%	12%	13%	9%	7%	0%
	Total	44,073	59%	36%	6%	23%	83%	85%	17%	49%	17%	18%	9%	6%	0.03%
3	Incorporated City	59,893	85%	10%	4%	15%	83%	87%	20%	56%	13%	16%	11%	4%	0.1%
	Unincorporated Territory	9,758	34%	10%	56%	9%	68%	91%	24%	73%	5%	7%	13%	2%	0%
	Total	69,651	78%	10%	12%	14%	81%	88%	21%	48%	17%	18%	9%	7%	0.04%
4	Incorporated City	18,029	74%	14%	12%	16%	70%	90%	15%	58%	13%	17%	8%	4%	0.1%
	Unincorporated Territory	12,423	32%	15%	53%	11%	67%	91%	21%	70%	10%	8%	10%	3%	0%
	Total	30,452	57%	14%	29%	14%	68%	90%	18%	56%	13%	16%	11%	4%	0.1%
TOTAL	**Incorporated City**	233,997	72%	24%	4%	19%	81%	86%	19%	51%	15%	18%	11%	5%	0.1%
	Unincorporated Territory	32,151	43%	15%	42%	13%	74%	90%	21%	68%	9%	10%	10%	3%	0%
	Total	266,148	69%	23%	9%	19%	81%	87%	19%	53%	15%	17%	11%	5%	0.1%

METRO Ridership by City (Harris & adjacent counties, rider residence)

Incorporated City	Weekday METRO Transit Boardings by Resident	Boardings by Transit Mode			Percent of Boardings by Demographic				Percent of Boardings by Destination (all trips whose origin/destination was not home)					
		Local Bus	Light Rail	Park-and-Ride	Poverty	Minority	Age 20-65	Student	Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
Alvin	72	0%	78%	22%	0%	46%	78%	0%	100%	0%	0%	0%	0%	0%
Arcola	30	0%	74%	26%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%
Bayou Vista	19	23%	0%	77%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Baytown	126	57%	43%	0%	58%	13%	100%	30%	29%	55%	10%	6%	0%	0%
Bellaire	1,100	86%	14%	1%	10%	62%	87%	23%	57%	9%	18%	13%	2%	1%
Brookside Village	23	0%	100%	0%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%
Bunker Hill Village	84	85%	15%	0%	0%	68%	100%	0%	74%	15%	11%	0%	0%	0%
Cleveland	9	0%	100%	0%	100%	0%	100%	100%	0%	0%	0%	100%	0%	0%
Conroe	86	0%	44%	56%	0%	10%	100%	10%	100%	0%	0%	0%	0%	0%
Dayton	12	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Deer Park	36	23%	0%	77%	0%	49%	100%	26%	81%	19%	0%	0%	0%	0%
Dickinson	77	0%	26%	74%	0%	9%	74%	9%	91%	0%	0%	9%	0%	0%
Friendswood	403	6%	24%	70%	0%	47%	82%	15%	77%	13%	0%	5%	4%	0%
Fulshear	102	0%	0%	100%	0%	60%	100%	10%	100%	0%	0%	0%	0%	0%
Galena Park	179	29%	71%	0%	39%	82%	100%	14%	64%	24%	7%	0%	5%	0%
Galveston	67	0%	41%	59%	0%	55%	100%	0%	71%	0%	29%	0%	0%	0%
Hedwig Village	28	70%	30%	0%	0%	59%	100%	30%	40%	0%	0%	30%	30%	0%
Hempstead	19	100%	0%	0%	0%	100%	100%	0%	0%	50%	50%	0%	0%	0%
Houston	230,767	73%	24%	4%	20%	82%	86%	19%	50%	15%	18%	11%	5%	0.1%
Humble	277	8%	24%	68%	8%	75%	100%	20%	76%	4%	8%	12%	0%	0%
Hunters Creek Village	22	74%	0%	26%	0%	100%	100%	74%	21%	59%	21%	0%	0%	0%
Jacinto City	120	95%	5%	0%	6%	88%	100%	0%	85%	0%	15%	0%	0%	0%
Jersey Village	199	7%	38%	55%	4%	67%	96%	26%	73%	2%	3%	17%	4%	0%
Katy	401	2%	6%	92%	6%	36%	100%	28%	85%	6%	0%	9%	0%	0%
Kemah	12	0%	100%	0%	0%	0%	100%	100%	100%	0%	0%	0%	0%	0%
La Marque	51	48%	0%	52%	0%	74%	52%	48%	36%	0%	32%	32%	0%	0%
La Porte	118	0%	60%	40%	19%	31%	100%	21%	78%	0%	0%	12%	10%	0%
League City	981	5%	15%	80%	0%	37%	95%	16%	92%	4%	1%	1%	2%	0%
Manvel	87	34%	53%	14%	0%	55%	100%	0%	100%	0%	0%	0%	0%	0%
Meadows Place	57	38%	0%	62%	0%	50%	100%	15%	100%	0%	0%	0%	0%	0%
Missouri City	1,480	19%	33%	47%	3%	88%	95%	20%	75%	3%	13%	7%	1%	0%
Nassau Bay	56	46%	0%	54%	0%	17%	100%	0%	68%	0%	32%	0%	0%	0%
Needville	24	0%	64%	36%	0%	36%	100%	0%	100%	0%	0%	0%	0%	0%
Pasadena	1,116	22%	34%	45%	6%	59%	96%	15%	72%	15%	5%	1%	7%	0%
Pearland	991	8%	57%	36%	3%	46%	91%	12%	74%	10%	7%	5%	4%	1%
Piney Point Village	20	72%	0%	28%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Prairie View	16	100%	0%	0%	0%	100%	100%	0%	28%	43%	28%	0%	0%	0%
Richmond	42	0%	0%	100%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%
Roman Forest	17	0%	0%	100%	0%	50%	50%	50%	100%	0%	0%	0%	0%	0%
Rosenberg	107	58%	35%	7%	0%	81%	80%	0%	58%	14%	28%	0%	0%	0%
Santa Fe	42	0%	0%	100%	0%	32%	100%	0%	100%	0%	0%	0%	0%	0%
Seabrook	62	0%	0%	100%	0%	22%	100%	22%	78%	22%	0%	0%	0%	0%
South Houston	194	76%	17%	7%	37%	72%	100%	5%	55%	39%	6%	0%	0%	0%
Southside Place	132	54%	46%	0%	33%	34%	91%	31%	59%	19%	0%	22%	0%	0%
Splendora	13	100%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Spring Valley Village	32	86%	14%	0%	0%	100%	100%	14%	75%	0%	13%	13%	0%	0%
Stafford	475	25%	29%	47%	2%	81%	78%	20%	67%	4%	10%	9%	11%	0%
Sugar Land	1,033	1%	12%	87%	1%	66%	99%	21%	95%	1%	1%	2%	1%	0%
Surfside Beach	19	0%	100%	0%	100%	0%	100%	100%	0%	100%	0%	0%	0%	0%
Taylor Lake Village	27	0%	0%	100%	0%	50%	100%	50%	100%	0%	0%	0%	0%	0%
Texas City	62	0%	41%	59%	0%	85%	100%	37%	78%	22%	0%	0%	0%	0%
Tomball	136	24%	15%	61%	0%	17%	100%	12%	83%	13%	0%	0%	4%	0%
Waller	23	0%	0%	100%	0%	100%	100%	50%	100%	0%	0%	0%	0%	0%
Webster	201	14%	8%	78%	0%	45%	82%	19%	79%	7%	0%	3%	11%	0%
West University Place	513	84%	16%	0%	12%	52%	95%	16%	58%	6%	20%	12%	4%	0%
Weston Lakes	31	0%	0%	100%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Willis	29	100%	0%	0%	0%	0%	100%	0%	0%	50%	50%	0%	0%	0%

METRO Ridership by Houston City Council District (rider residence)

Council District	(Census ACS 2011-2015 Estimates) Total Population	Population Density	Weekday METRO Transit Boardings by Resident	Boardings by Transit Mode: Local Bus	Light Rail	Park-and-Ride	Percent of Boardings by Demographic: Poverty	Minority	Age 20-65	Student	Percent of Boardings by Destination (all trips whose origin/destination was not home): Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
A (Stardig)	281,067	3,194	14,353	80%	10%	9%	17%	80%	90%	14%	55%	14%	20%	6%	5%	0%
B (Davis)	212,473	2,146	26,591	82%	16%	1%	26%	94%	84%	16%	48%	17%	20%	9%	6%	0.2%
C (Cohen)	199,432	5,114	21,866	70%	29%	1%	10%	56%	88%	21%	53%	13%	19%	11%	5%	0.1%
D (Boykins)	199,885	3,173	34,334	66%	32%	1%	24%	86%	83%	22%	44%	17%	19%	13%	7%	0.1%
E (Martin)	221,483	1,691	4,458	27%	18%	54%	11%	57%	92%	18%	75%	8%	6%	7%	4%	0.3%
F (Le)	214,418	4,123	21,521	85%	10%	5%	17%	88%	87%	21%	56%	13%	15%	11%	4%	0.04%
G (Travis)	194,091	5,591	12,790	85%	9%	6%	9%	70%	87%	20%	57%	11%	17%	11%	4%	0.3%
H (Cisneros)	163,897	4,313	25,622	55%	45%	0.2%	26%	84%	82%	19%	40%	19%	22%	12%	8%	0%
I (Gallegos)	172,180	3,376	21,298	65%	33%	1%	20%	81%	88%	15%	47%	18%	19%	9%	7%	0.2%
J (Laster)	168,842	8,442	23,306	88%	10%	2%	20%	91%	86%	19%	53%	16%	15%	12%	4%	0.05%
K (Castex-Tatum)	189,938	4,129	24,450	71%	26%	3%	18%	85%	89%	23%	57%	12%	14%	13%	4%	0.2%

METRO Ridership by Houston Super Neighborhood (rider residence)

City of Houston - Super Neighborhood	(Census ACS 2011-2015 Estimates) Total Population	Population Density	Weekday METRO Transit Boardings by Resident	Boardings by Transit Mode: Local Bus	Light Rail	Park-and-Ride	Percent of Boardings by Demographic: Poverty	Minority	Age 20-65	Student	Percent of Boardings by Destination (all trips whose origin/destination was not home): Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
1 Willowbrook	8,509	2,818	281	77%	6%	16%	17%	79%	97%	25%	67%	3%	7%	13%	10%	0%
2 Greater Greenspoint	41,392	5,951	5,997	89%	10%	0.7%	23%	94%	89%	13%	58%	12%	20%	6%	4%	1%
3 Carverdale	3,903	1,759	366	85%	8%	7%	30%	88%	87%	21%	47%	30%	19%	3%	0%	0%
4 Fairbanks / Northwest Crossing	18,007	2,644	917	88%	7%	4%	13%	82%	97%	14%	50%	24%	13%	12%	1%	0%
5 Greater Inwood	37,056	5,539	3,732	87%	12%	1%	23%	88%	88%	12%	52%	14%	21%	7%	6%	0%
6 Acres Home	25,828	2,883	3,253	87%	12%	1%	34%	95%	84%	17%	48%	21%	17%	11%	3%	0.2%
7 Hidden Valley	3,569	4,055	103	38%	62%	0%	25%	84%	95%	0%	58%	9%	32%	0%	1%	0%
8 Westbranch	3,633	2,631	116	89%	0%	11%	33%	81%	73%	0%	39%	10%	34%	0%	17%	0%
9 Addicks Park Ten	19,683	840	301	26%	11%	60%	0%	78%	95%	17%	79%	3%	10%	8%	0%	0%
10 Spring Branch West	31,878	3,880	2,042	91%	7%	2%	23%	84%	89%	15%	48%	15%	26%	6%	4%	0%
11 Langwood	9,744	7,746	314	88%	9%	3%	14%	78%	100%	9%	60%	17%	12%	9%	2%	0%
12 Central Northwest	41,993	4,849	2,683	83%	16%	1%	18%	76%	80%	18%	48%	17%	17%	14%	5%	0.5%
13 Independence Heights	13,728	4,020	2,307	75%	24%	0%	18%	88%	83%	16%	42%	15%	19%	13%	10%	0%
14 Lazybrook / Timbergrove	13,099	3,728	526	88%	11%	1%	21%	76%	90%	10%	60%	11%	16%	10%	2%	0%
15 Greater Heights	41,362	5,654	3,635	76%	23%	0.3%	15%	59%	87%	13%	45%	22%	19%	6%	8%	0%
16 Memorial	47,604	4,820	1,554	69%	11%	19%	11%	64%	90%	19%	58%	12%	10%	11%	7%	1%
17 Eldridge / West Oaks	72,347	2,452	5,009	84%	8%	8%	10%	87%	87%	22%	58%	12%	15%	12%	3%	0%
18 Briar Forest	43,018	6,396	2,422	89%	7%	4%	21%	88%	82%	24%	57%	11%	12%	17%	2%	0.4%
19 Westchase	29,149	6,745	4,741	89%	10%	1%	15%	87%	89%	29%	51%	13%	19%	14%	3%	0.2%
20 Mid West	50,017	9,259	7,741	88%	12%	0.2%	13%	85%	87%	19%	59%	12%	16%	10%	3%	0%
21 Greater Uptown	50,731	6,155	3,771	90%	9%	0.5%	4%	59%	89%	18%	55%	10%	23%	10%	2%	0.2%
22 Washington Ave Coalition / Memorial Park	29,033	3,657	1,721	80%	20%	0.1%	10%	62%	86%	14%	53%	14%	18%	7%	8%	0%
23 Afton Oaks / River Oaks Area	14,518	4,021	896	80%	20%	0.0%	11%	49%	86%	22%	49%	9%	27%	11%	6%	0%
24 Neartown - Montrose	31,073	9,491	4,752	67%	33%	0.3%	5%	36%	88%	20%	52%	12%	22%	10%	4%	0%
25 Alief	106,657	7,544	7,799	84%	9%	7%	23%	89%	85%	14%	54%	19%	14%	7%	6%	0%
26 Sharpstown	77,220	9,045	9,840	91%	8%	1%	21%	90%	84%	20%	54%	13%	16%	13%	5%	0.1%
27 Gulfton	41,089	14,508	5,742	89%	11%	0%	17%	92%	88%	20%	55%	13%	15%	13%	4%	0%
28 University Place	16,342	5,912	1,808	52%	46%	1%	10%	51%	88%	38%	53%	5%	28%	9%	5%	0%
29 Westwood	19,530	8,951	2,233	89%	8%	3%	26%	93%	84%	24%	47%	16%	16%	13%	7%	0%
30 Braeburn	18,843	4,711	2,600	92%	6%	2%	21%	89%	87%	16%	55%	15%	13%	14%	3%	0%
31 Meyerland Area	21,445	5,221	2,025	78%	17%	5%	7%	68%	93%	21%	65%	9%	9%	12%	5%	0%
32 Braeswood	21,835	6,996	2,857	71%	28%	1%	9%	54%	88%	36%	59%	11%	9%	19%	1%	0.4%
33 Medical Center Area	2,717	1,551	621	29%	68%	1%	7%	56%	83%	29%	35%	15%	31%	13%	6%	0%
34 Astrodome Area	18,223	4,846	5,292	50%	50%	0.03%	11%	68%	95%	35%	54%	8%	14%	21%	2%	0.2%
35 South Main	6,006	2,147	1,687	54%	46%	0%	11%	76%	88%	21%	63%	11%	12%	11%	3%	0%
36 Brays Oaks	64,548	8,160	9,078	84%	11%	4%	21%	93%	85%	19%	53%	18%	13%	11%	6%	0%
37 Westbury	20,963	5,665	2,235	82%	17%	1%	21%	85%	89%	17%	57%	9%	21%	11%	3%	0%
38 Willow Meadows / Willowbend Area	14,014	2,667	1,508	75%	24%	0%	14%	80%	84%	21%	55%	12%	13%	13%	5%	2%
39 Fondren Gardens	2,730	2,292	347	72%	24%	4%	14%	89%	95%	2%	67%	2%	23%	0%	8%	0%
40 Central Southwest	66,918	2,817	4,868	72%	27%	1%	30%	92%	87%	17%	56%	15%	13%	10%	5%	0.2%
41 Fort Bend Houston	33,630	4,463	1,585	71%	11%	18%	25%	96%	90%	23%	61%	15%	12%	9%	2%	0%
42 IAH / Airport Area	15,752	588	321	52%	36%	11%	22%	94%	94%	20%	62%	15%	11%	11%	0%	1%
43 Kingwood Area	62,067	2,071	1,458	1%	17%	81%	11%	34%	91%	21%	82%	4%	0%	11%	3%	0%
44 Lake Houston	22,280	634	214	0%	25%	75%	4%	54%	100%	13%	96%	0%	0%	4%	0%	0%
45 Northside/Northline	59,410	5,868	5,938	63%	37%	0.2%	28%	88%	82%	22%	35%	20%	21%	16%	8%	0%

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METRO Ridership by Houston Super Neighborhood, Continued (rider residence)

City of Houston - Super Neighborhood	(Census ACS 2011-2015 Estimates) Total Population	Population Density	Weekday METRO Transit Boardings by Resident	Boardings by Transit Mode: Local Bus	Light Rail	Park-and-Ride	Percent of Boardings by Demographic: Poverty	Minority	Age 20-65	Student	Percent of Boardings by Destination (all trips whose origin/destination was not home): Work	Personal Business	Shopping, Restaurant, Social/Church	Education	Medical (non-work)	Other
46 Eastex - Jensen Area	25,724	3,347	2,596	81%	19%	0.4%	35%	92%	77%	20%	41%	23%	17%	14%	5%	0%
47 East Little York / Homestead	19,607	2,839	1,650	80%	18%	2%	26%	98%	84%	18%	50%	17%	17%	10%	6%	0%
48 Trinity / Houston Gardens	15,798	2,301	2,855	80%	19%	0%	21%	93%	80%	17%	41%	19%	21%	11%	7%	0%
49 East Houston	18,580	1,740	2,452	86%	14%	0%	25%	93%	83%	16%	44%	21%	20%	10%	4%	0%
50 Settegast	2,981	1,492	696	83%	17%	0%	31%	96%	87%	30%	42%	27%	10%	20%	1%	0%
51 Near Northside	27,348	6,298	8,022	31%	68%	0%	29%	82%	81%	19%	36%	18%	27%	11%	8%	0%
52 Kashmere Gardens	10,055	2,493	2,563	85%	15%	0%	22%	96%	81%	13%	43%	15%	26%	7%	10%	0%
53 El Dorado / Oates Prairie	3,852	856	631	82%	13%	5%	55%	54%	95%	0%	18%	44%	27%	0%	11%	0%
54 Hunterwood	1,951	1,480	0													
55 Greater Fifth Ward	19,687	3,947	4,860	80%	20%	0%	29%	93%	83%	16%	46%	17%	18%	11%	8%	0%
56 Denver Harbor / Port Houston	17,571	2,749	999	84%	16%	0%	23%	89%	85%	18%	53%	18%	7%	16%	7%	0%
57 Pleasantville Area	2,860	808	472	82%	16%	3%	39%	97%	75%	15%	30%	13%	34%	14%	9%	0%
58 Northshore	28,790	3,105	892	76%	14%	9%	19%	85%	89%	22%	47%	19%	12%	14%	8%	0%
59 Clinton Park Tri-Community	3,140	1,144	372	77%	23%	0%	35%	92%	75%	8%	40%	38%	8%	1%	13%	0%
60 Fourth Ward	4,085	8,781	526	51%	45%	2%	26%	73%	79%	32%	24%	19%	27%	24%	7%	0%
61 Downtown	12,088	4,464	4,964	26%	71%	0.5%	16%	58%	94%	18%	30%	23%	27%	12%	7%	1%
62 Midtown	8,597	6,909	4,775	29%	71%	0%	11%	58%	93%	16%	39%	20%	24%	10%	7%	0%
63 Second Ward	13,139	4,556	3,010	42%	57%	0%	21%	83%	89%	14%	44%	17%	24%	7%	7%	0%
64 Greater Eastwood	10,776	5,747	2,035	65%	34%	1%	20%	84%	90%	12%	54%	17%	17%	7%	5%	0%
65 Harrisburg / Manchester	2,926	1,208	227	50%	50%	0%	16%	92%	99%	4%	53%	30%	17%	0%	0%	0%
66 Museum Park	5,509	9,809	1,131	32%	68%	0%	13%	48%	87%	22%	46%	13%	13%	13%	13%	1%
67 Greater Third Ward	14,295	4,941	5,079	64%	36%	0%	28%	87%	79%	27%	39%	19%	21%	15%	6%	0%
68 Greater Ost / South Union	19,141	4,418	5,852	70%	30%	0.03%	22%	91%	81%	23%	43%	17%	17%	16%	7%	0%
69 Gulfgate Riverview / Pine Valley	12,723	4,993	902	85%	15%	0%	22%	85%	93%	5%	54%	14%	26%	2%	4%	0%
70 Pecan Park	16,245	9,762	817	75%	25%	0%	34%	96%	95%	8%	61%	10%	9%	9%	11%	0%
71 Sunnyside	20,071	3,162	5,436	74%	26%	0.1%	26%	96%	84%	17%	53%	15%	18%	8%	6%	0%
72 South Park	21,208	4,848	3,610	79%	21%	1%	27%	94%	83%	18%	42%	20%	19%	11%	8%	0.2%
73 Golfcrest / Bellfort / Reveille	51,423	5,589	5,998	78%	21%	1%	17%	92%	85%	15%	56%	15%	13%	9%	6%	0.3%
74 Park Place	9,898	5,346	815	85%	15%	0%	13%	86%	82%	14%	54%	10%	16%	10%	9%	0%
75 Meadowbrook / Allendale	24,134	3,448	777	82%	12%	6%	26%	82%	74%	20%	48%	18%	22%	6%	6%	0%
76 South Acres / Crestmont Park	19,137	2,833	2,510	81%	18%	0.8%	28%	97%	78%	18%	43%	18%	20%	14%	6%	0%
77 Minnetex	6,303	752	535	69%	31%	0%	36%	88%	78%	27%	43%	18%	19%	12%	8%	0%
78 Greater Hobby Area	25,385	2,102	684	65%	23%	12%	16%	80%	93%	16%	57%	28%	11%	2%	2%	0%
79 Edgebrook Area	23,584	7,860	217	31%	43%	17%	24%	78%	100%	12%	84%	0%	8%	8%	0%	0%
80 South Belt / Ellington	64,667	3,135	1,265	52%	16%	32%	12%	82%	92%	15%	70%	13%	8%	8%	2%	0%
81 Clear Lake	62,026	2,710	993	7%	16%	77%	4%	56%	96%	19%	89%	2%	0%	6%	1%	1%
82 Magnolia Park	16,999	6,720	2,651	71%	29%	0%	18%	86%	81%	12%	51%	11%	28%	5%	4%	0%
83 Macgregor	18,459	5,475	3,691	75%	25%	0%	24%	86%	83%	35%	45%	14%	16%	20%	6%	0.5%
84 Spring Branch North	20,942	6,201	1,038	93%	4%	4%	24%	82%	93%	12%	68%	15%	12%	2%	4%	0%
85 Spring Branch Central	28,080	7,512	1,529	97%	3%	0%	25%	80%	86%	10%	54%	13%	23%	4%	5%	0%
86 Spring Branch East	26,877	4,397	2,171	91%	7%	1%	14%	71%	92%	12%	46%	22%	22%	2%	8%	0%
87 Greenway / Upper Kirby Area	21,120	7,117	2,219	84%	16%	0%	3%	52%	93%	18%	61%	7%	17%	13%	2%	0%
88 Lawndale / Wayside	12,982	4,602	1,160	76%	24%	0%	28%	94%	81%	29%	47%	17%	16%	10%	9%	0%

Additional References

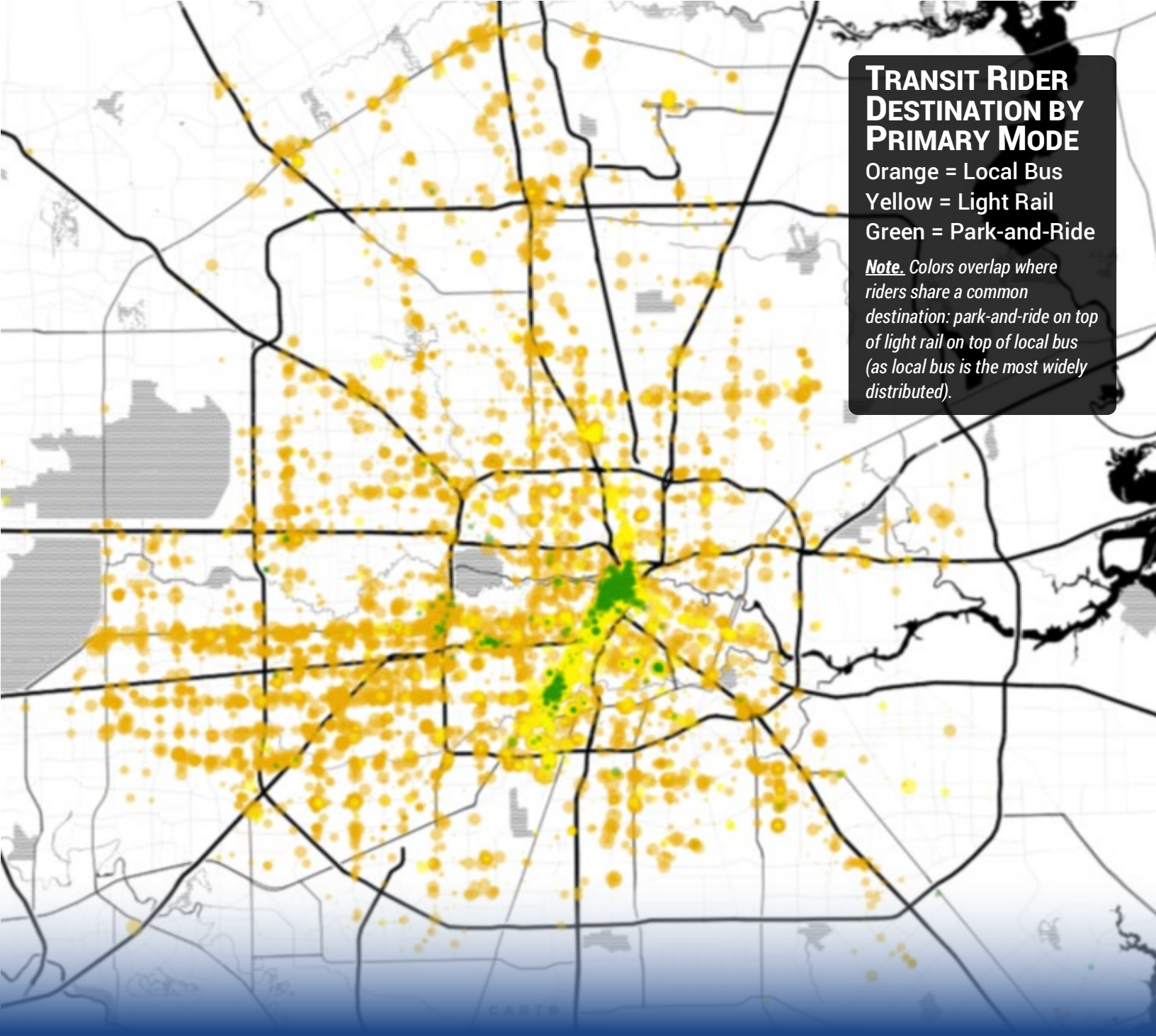
[1] *2017 Regional Population Forecast* [For year 2045]. Houston-Galveston Area Council, accessed April 23, 2018: /www.h-gac.com/community/socioeconomic/2040-regional-growth-forecast/default.aspx.

[2] The *2017 Regional Transit Onboard Origin Destination Survey* used different income brackets than used by the Census Bureau. Therefore, 33% is for transit riders whose household income was below $23,999.

[3] *Who's On Board 2016: What Today's Riders Teach Us About Transit That Works.* TransitCenter, 2016. Available here: http://transitcenter.org/publications/whos-on-board-2016/#summary-of-key-findings.

[4] *Metro Tries to Smooth Mass Transit Woes for Riders with Disabilities.* Houston Chronicle, April 9, 2017, accessed October 18, 2018: www.houstonchronicle.com/news/transportation/article/Metro-tries-to-smooth-mass-transit-woes-for-11058074.php.

[5] *Census Estimates Show Another Year of Rapid Growth for Texas Suburbs*. The Texas Tribune (citing recent U.S. Census Bureau data), March 22, 2018, accessed October 14, 2018: www.texastribune.org/2018/03/22/census-estimates-show-another-year-rapid-growth-texas-suburbs/.



Transportation is at the center of opportunity. It provides access to all the resources necessary for a healthy, prosperous life. Transportation should provide access to jobs and opportunity across gender, class, race, and ability. Access to jobs is essential to accessing economic opportunity. Being forced to rely on long, complex transit trips or spending money on auto travel is not a fair trade-off.

Transportation + Social Equity: Opportunity Follows Mobility
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