

Houston-Galveston Area Council

**Pedestrian and Bicycle Special Districts Study
Phase I Documentation**



conducted by
Walter P. Moore and Associates, Inc.

in association with

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Gulf Coast Institute
Euclid Studio
Transight, LLC
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Executive Summary

Purpose

In June 2003, the Houston-Galveston Area Council (H-GAC) selected the Walter P. Moore Bicycle and Pedestrian Study Team (WPM Study Team) to perform a study to **identify districts where there are significant opportunities to replace vehicle trips with pedestrian or bicycle trips and to improve pedestrian and bicycle safety**. H-GAC will use the results of the study to prioritize areas for strategic investments in improved pedestrian and bicycle facilities in its Regional Transportation Plan (RTP).

This report describes the activities of phase I, which consists of identifying and ranking districts on their potential for success. In phase II, the WPM Study Team will develop a conceptual plan for a pilot project consisting of comprehensive pedestrian and bicycle improvements in one of these districts and calculate the congestion mitigation, air quality, and safety benefits of implementing the pilot project.

The WPM Study Team consists of Walter P. Moore & Associates, Inc., Gulf Coast Institute, Euclid Studio, Lorin Gaertner, Transight, LLC (John Ciccarelli) and Walkable Communities, Inc. (Dan Burden). The WPM Study Team was guided by a Steering Committee consisting of members of the H-GAC Bicycle and Pedestrian Technical Advisory Committee.

Study Area

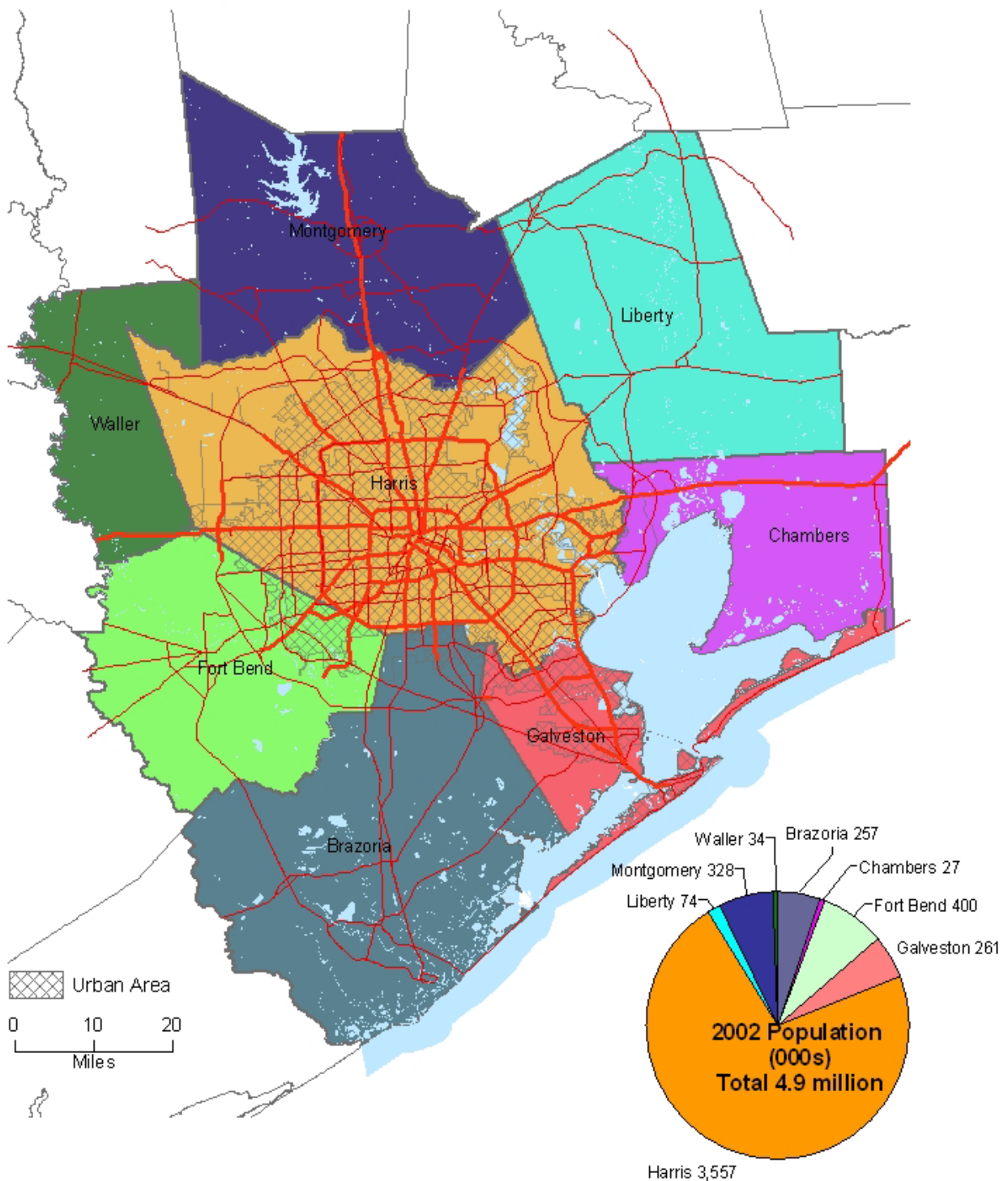
The study area for phase I consists of the following eight counties of Texas, shown in **Figure 1**:

- Brazoria,
- Chambers,
- Fort Bend,
- Galveston,
- Harris,
- Liberty,
- Montgomery,
- Waller.

These counties make up the Houston-Galveston Transportation Management Area (TMA) and also the Houston-Galveston-Brazoria Consolidated Metropolitan Statistical Area (CMSA). The study area has a population of approximately 5 million people and a land area of approximately 7,700 square miles; this land area is comparable to that of the state of Massachusetts.



Figure 1. Study Area with Population of Counties



The Challenge

There were several challenges for Phase I. The most significant was the sheer size of the study area, with tens of thousands of potential districts to examine. A sort of “automatic” means had to be found to focus attention on a very small number of places that could then be examined in a more subjective, first-hand way.

This large job was further affected by the constraints of time: less than six months were allowed to complete phase I. This, too, pointed to methods that do not require field research or time-intensive user intervention.

With no preset definition of a district and limited literature to guide the undertaking, the team had to assemble a fairly long list of characteristics that might suggest the best chance of success. Further, bicycle and pedestrian needs are not the same, and indeed the study areas for each would be far different, ranging from one-quarter mile from the district centers for walking and two miles for bicycling.

The pedestrian areas, then, would be very small and possibly difficult to determine considering the size of the study area. The potential bicycling districts would be larger, and have somewhat different indicators from the pedestrian areas. However, the study calls for identifying districts where strategies for both modes would likely be successful.

Summary of Approach

To meet the challenges outlined above, the WPM Study Team developed the following plan. First, we defined districts as circles around their centers. Centers were selected on the basis of a number of attractors important to bicycling and walking, such as schools, employers, public buildings and landmarks.

In particular, schools were felt to be very important centers for bicycling and pedestrian trips and effort was made to ensure that every school in the study area was found. The center may contain a civic amenity that provides a central focal point for activity, or there may be several smaller focal points within the district.

Using circles as delineators of districts allowed the ability to use more than one radius size, to differentiate between the likely walkable areas and the likely bikable areas.

Using a group of indicators believed to represent potential for biking and walking, the team developed a scoring system that would objectively identify a large number of districts as a first pass through the available data. This process is described in more detail in the **Methodology** section, beginning on page 15.

With the large number of points identified, and redundant data sources, many districts were on top of each other or nearly so. Therefore, a number of steps were performed to combine points if they were close to each other.

After cleaning, a total of 9,219 district centers were identified. This may seem excessive, but it was felt to be safer to err on the side of thoroughness and completeness rather than risk missing a potentially promising area, or have to go back and revisit the process because a group felt left out of the analysis. After the first pass narrowed down the number of districts, the team began to look at top contenders in more detail, identifying the potential and challenges for each in meeting the objectives.



A second round of narrowing the number of indicators and combining several into composite indicators confirmed the first pass choices and produced the final list of prioritized districts.

Top-Ranked Districts

All of the top 500 districts are found in Harris or Galveston counties, as shown in **Figure 2** through **Figure 4**. Most, but not all, of the top 500 districts are in the city of Houston or the city of Galveston. This is partly a function of density based on an older street grid of traditional design, which produces tighter clusters of residences and activities. Although by necessity the remainder of this report concentrates on the top-ranked districts, there is a need for bicycle and pedestrian improvements in many of the lower-ranked areas. **Figures 5** and **6** show the high-ranking districts in Houston and Galveston in the context of the street network serving the districts.

Combining Districts by Neighborhood

High-scoring districts tended to cluster together, in part because of the overlapping nature of the circular districts identified. These clusters can be readily identified by looking at a map (e.g. **Figures 5** and **6**). For naming and discussion purposes, districts were assigned to Super Neighborhoods (for the City of Houston), or incorporated places (outside the City of Houston) based on their center. The clusters generally corresponded to a portion of a neighborhood, and so the neighborhood naming convention was useful in labelling district clusters. **Table 1** shows the top 20 neighborhoods (district clusters), which in turn represent the top 218 districts. Because each neighborhood may have many districts within it, only the rank for the highest scoring district is shown in the District Rank column; for example the Sharpstown district is rank 10 because District Ranks 2-9 are in Gulfton.

Gulfton and Montrose are the top scoring areas (the top Sharpstown district overlaps with the Gulfton Super Neighborhood). The top-scoring individual district is centered on Benavidez Elementary School in Gulfton.

Table 1. Top Districts Grouped by Neighborhoods

Neighborhood / District Cluster	Highest Scoring District Center in Neighborhood	District Rank*	District Score
GULFTON	Benavidez Elementary School +	1	80
SHARPSTOWN	Christus Southwest Comm Health +	10	61
MONTROSE	Rothko Chapel	11	58
WOODLAKE/BRIARMEADOW	Block Group 2014327005	17	56
GREATER THIRD WARD	Riverside General Hospital +	30	51
NEAR NORTHSIDE	Marshall Junior High School +	32	50
DOWNTOWN	McKinney/Lamar +	34	50
GALVESTON	Broadway Church +	39	49
UNIVERSITY PLACE	TAZ 864	44	49
PECAN PARK	Crespo Elementary School +	47	48
WESTWOOD	TAZ1009	71	44
MAGNOLIA PARK	Edison Junior High School +	85	43
BINZ	TAZ 464	103	42
EASTWOOD LAWNSDALE	Cage School +	118	40
MIDTOWN	Fannin School +	123	40
MACGREGOR	Stretch Campbell Ent & Med	126	40
GREENWAY/UPPER KIRBY AREA	TAZ 878	164	38
MEDICAL CENTER AREA	Cravens Parkway	182	37
GREATER FIFTH WARD	Block Group 2012113002	196	36
SPRING BRANCH EAST	Spring Valley Shopping Center	218	35

* Please see text on p.8 for explanation

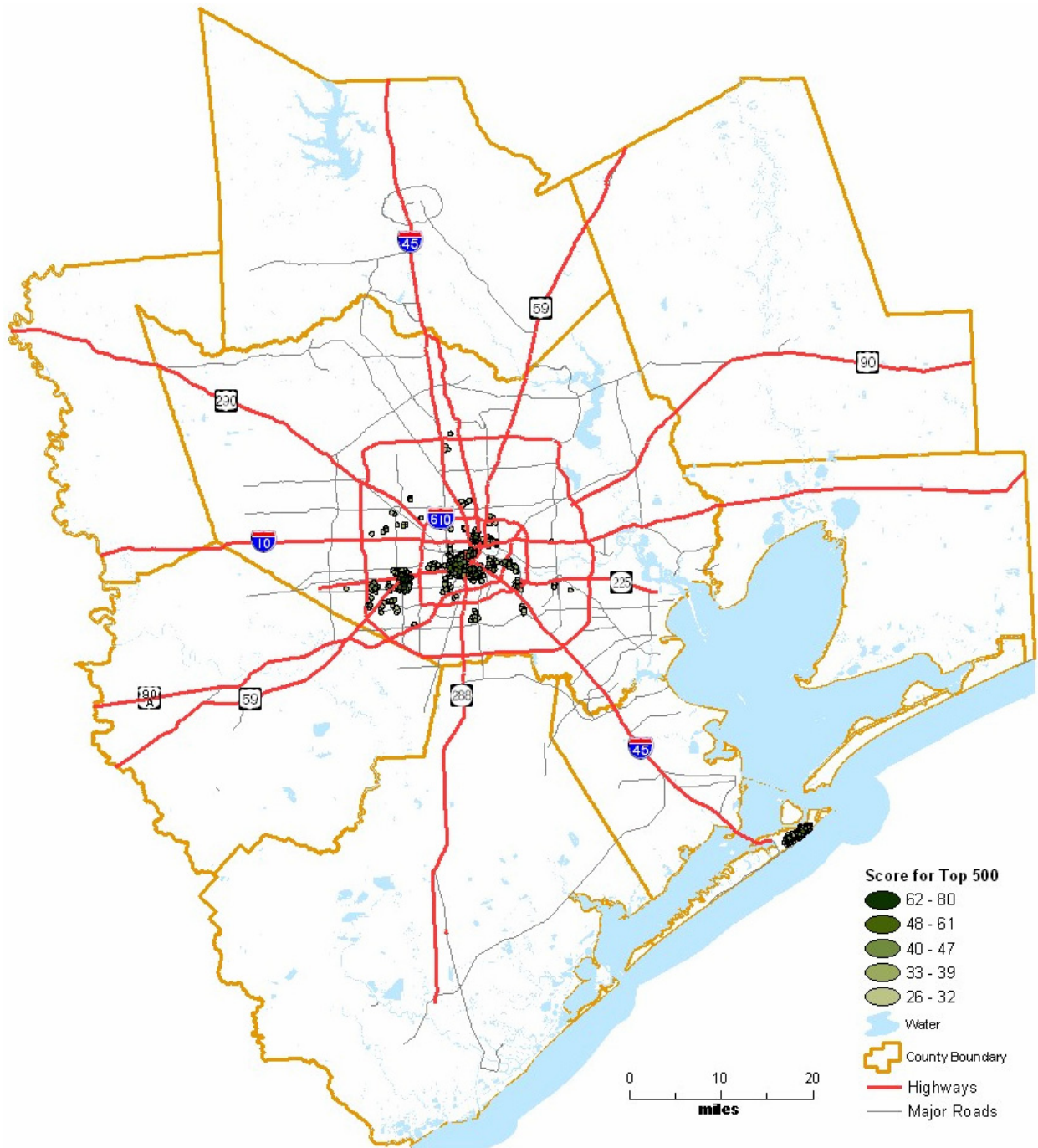
+ indicates that several attractors were merged to create that center (see appendix A for details)

Because districts are assigned based on their center, districts may actually overlap two or more neighborhoods. The highest scoring districts in the University Place & Binz Super Neighborhoods overlapped with the Montrose neighborhoods. The highest scoring district in the Sharpstown neighborhood overlapped with Gulfton, but a separate cluster of districts in Sharpstown, if considered separately, scores in the top 12 also. This pattern is particularly evident when scores are visualized on a map. In the “Profiles of Top Districts” section beginning on page 32, 12 distinctive districts from the top neighborhoods were chosen.

Next Steps

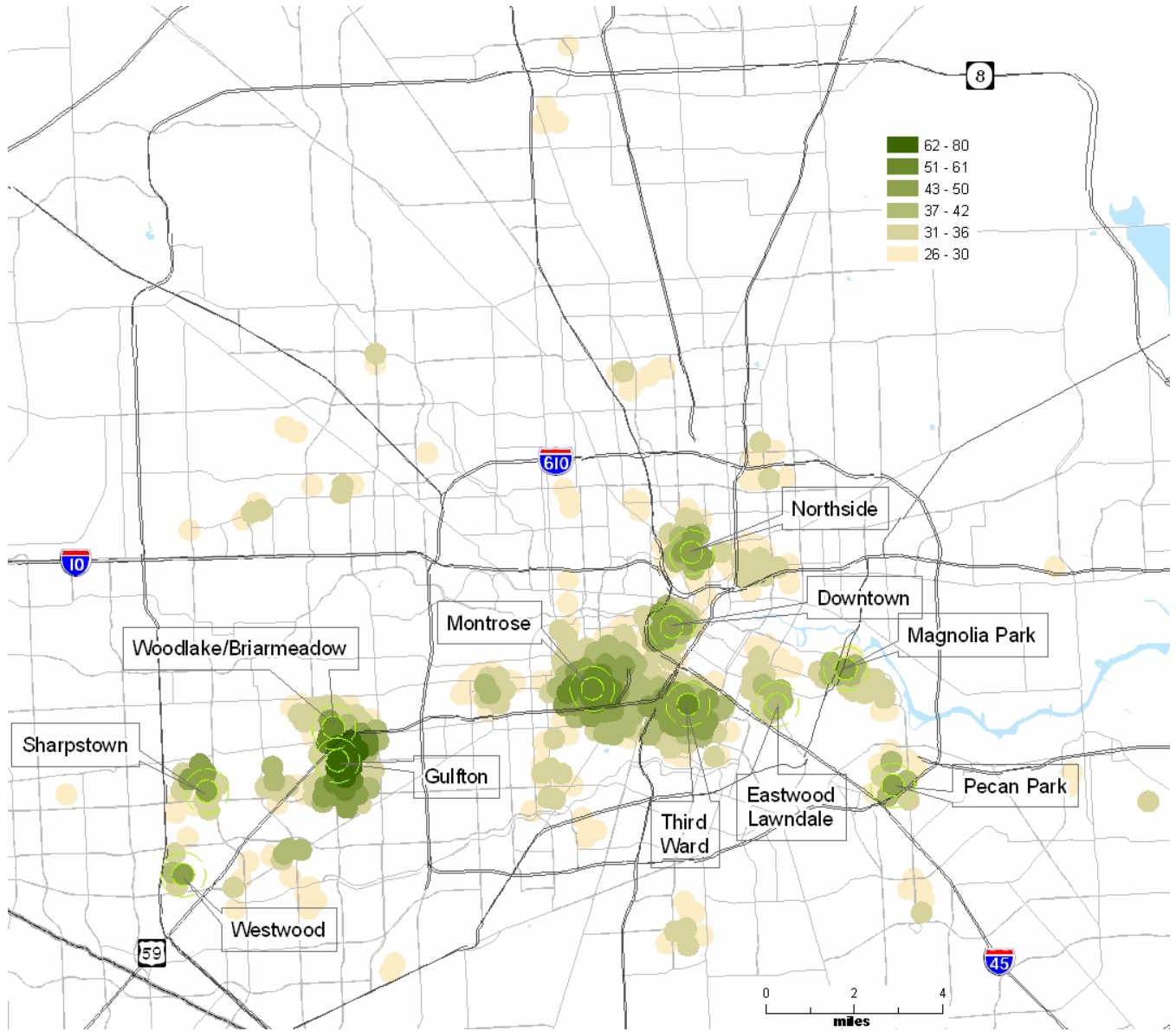
The scoring and ranking of districts are intended to be a tool in the selection of districts in which improvements in bicycling and walking appear most promising. Other factors will also come in to play in the selection of areas for investment, including community interest and support. These additional factors will have as much bearing on the likelihood of success in phase II as the objective factors used in scoring. It bears repeating that all areas in Houston should be improved with respect to bicycling and walking; this report only proposes one way of choosing where to start.

Figure 2. Map of Top 500 Districts by Score (Entire Study Area)



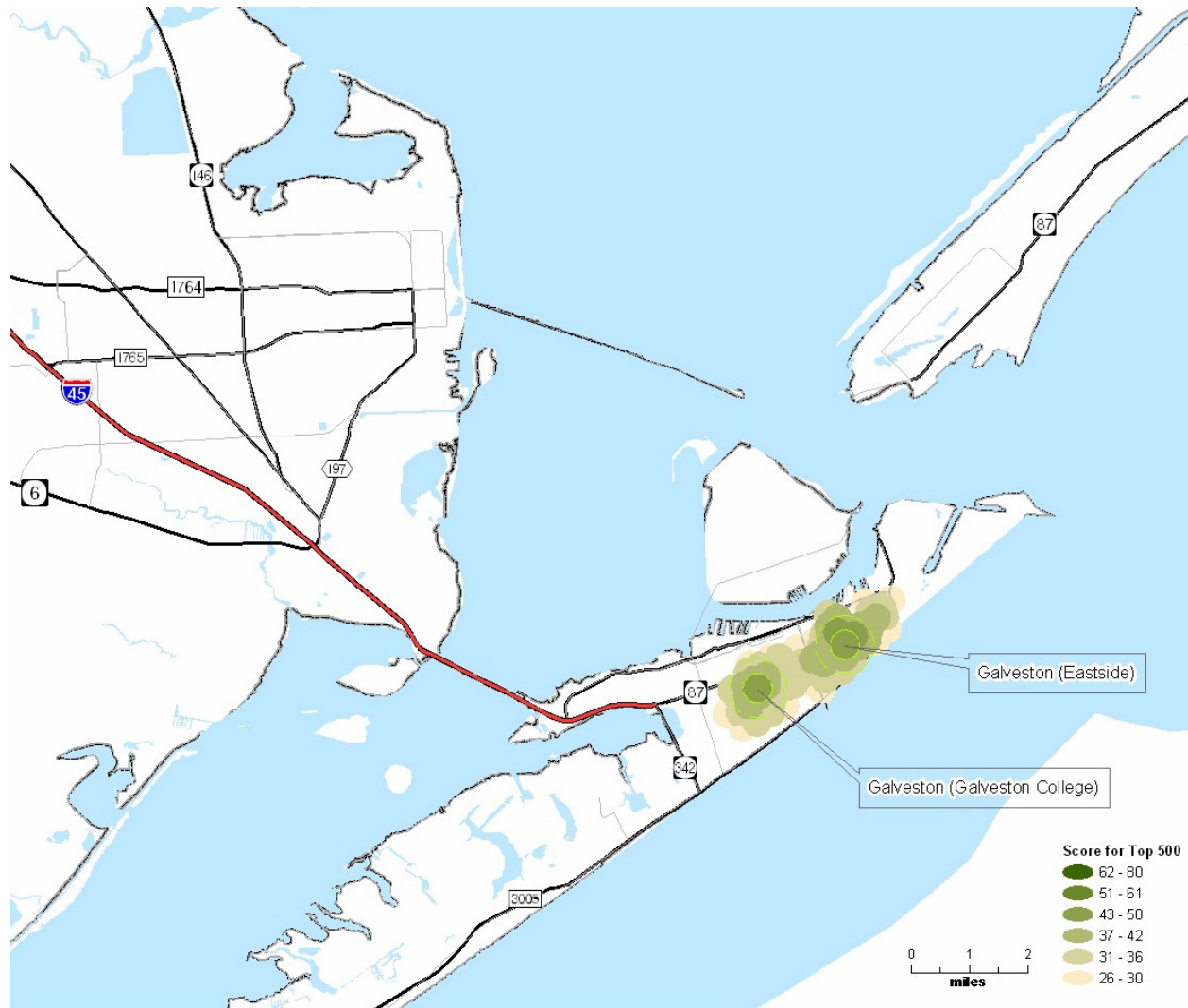
Note: A higher resolution version of this map (11x17" format) can be found in the maps section (M-1)

Figure 3. Map of Top 500 Districts by Score (Harris county portion)



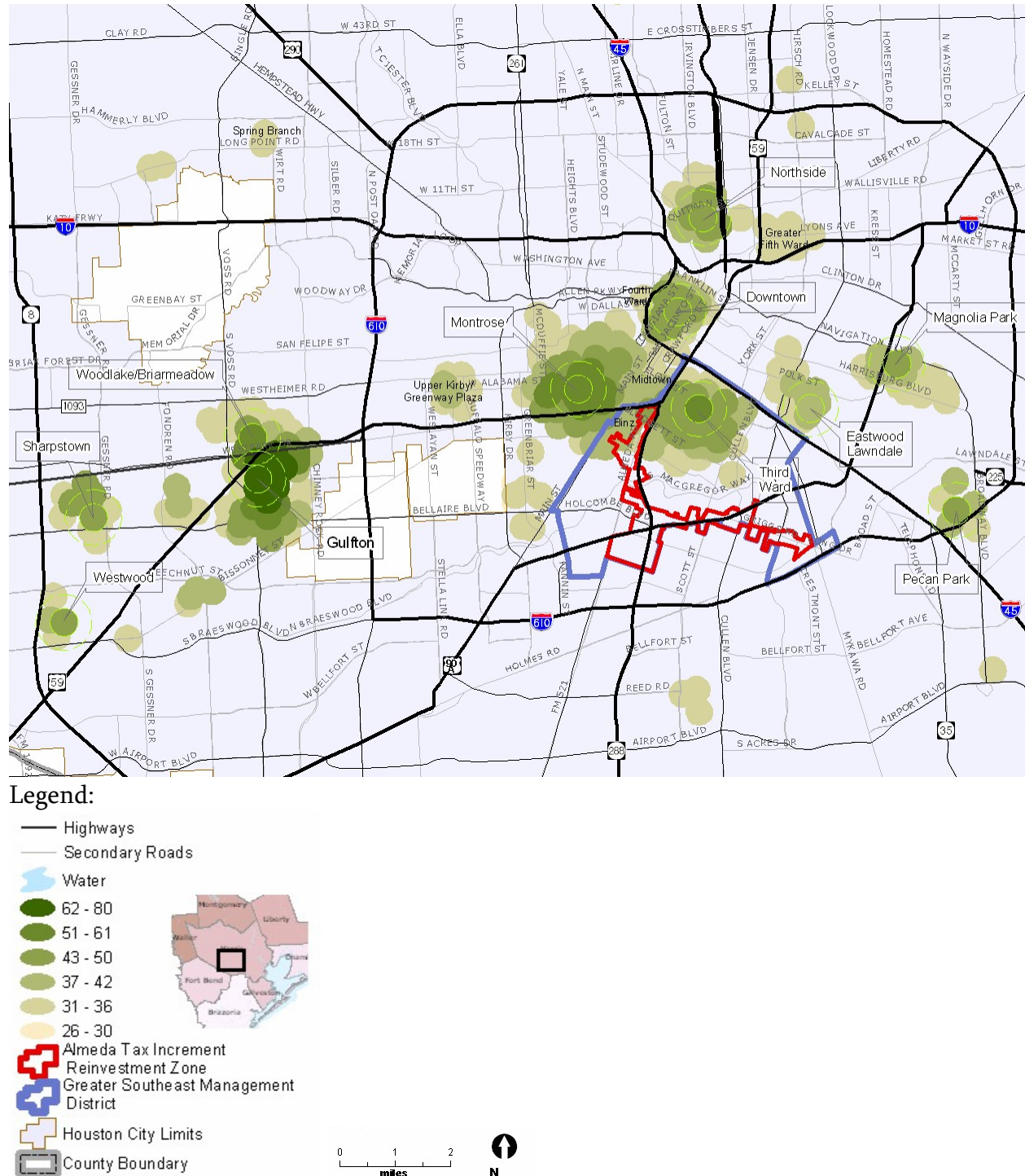
Note: A higher resolution version of this map (11x17" format) can be found in the maps section (M-2)

Figure 4. Map of Top 500 Districts by Score (Galveston portion)



Note: A higher resolution version of this map (11x17" format) can be found in the maps section (M-3)

Figure 5. Top Scoring Districts of Central Houston



Note: A higher resolution version of this map (11x17" format) can be found in the maps section (M-4)

Figure 6. Top Scoring Districts of Galveston



Note: A higher resolution version of this map (11x17" format) can be found in the maps section (M-5)

Methodology

District Identification – First Pass

The purpose of the first pass district scoring is to objectively evaluate all possible districts in the 8-county study area on their potential for increasing pedestrian and bicycle trips and safety.

Definition of Districts

Early in the study, a decision was made to consider districts to be circular areas of a size suitable for walking or bicycling. According to data from the National Household Travel Survey (2001) the median pedestrian trip distance is half a mile and 90 percent of all trips are less than 1.3 miles. For bicycling, the median is nine tenths of a mile, with 90 percent of bicycle trips falling under 4 miles.

Since a comfortable distance for bicycling is considerably longer than that for walking, we defined the districts by their centers, and allowed for different radii for different purposes. These concentric areas may also be used in phase II of the project. For example, pedestrian improvements may be intensely focused on an area of ¼-mile radius, while obstacles to bicycling will be examined for a larger area. Although districts are all of identical size, different-sized areas are examined for different purposes (bicycling and walking). When that scale was changed, it was changed for all districts. In other words, when comparing the population in district 1 with that in district 2, the same radius is always used. For most purposes a half-mile radius district is assumed, however both ¼-mile and one-mile radii were also used for some purposes. For reference, a ½-mile radius district is 0.79 square miles or 502 acres, while a ¼-mile district is 0.2 square miles or 126 acres.

To identify centers of candidate districts, we looked at a number of attractors important to bicycling and walking, such as schools, employers, retail services, public buildings and landmarks. Multiple sources for similar data were used for some types of centers to ensure complete coverage. In particular, schools were felt to be a very important center for bicycling and pedestrian trips and effort was made to ensure that every school in the study area was found. The centroids (geographic centers) of census block groups and traffic analysis zones were used to “fill-in” areas that might have been missed due to faulty data. The centers identified are shown in **Table 2**.

With the large number of points identified, and redundant data sources, many districts were on top of each other or nearly so. Therefore, a number of aggregation steps were performed to combine points if they were close (generally 600 feet or less) to each other. This process is described in more detail in **Appendix B**.



Table 2. Types of District Centers Identified

Type of Center	Approximate Number of Points Identified
Landmarks (educational institutions, amusement centers, stadium / performing centers)	895
Institutions (mixed hospitals, educational institutions)	519
Museums	27
“Locales” (camps, shopping centers, ranches, clubs)	181
Churches	342
Buildings	24
Hospitals/Medical Centers	43
Parks (two sources)	745+375
Schools (two sources)	1,055+512
Selected Employers (Medical, Government, Libraries, Museums, etc)	19,716
METRO Transit centers	15
METRO park & ride stations	25
METRO CBD-to-dome LRT stops	19
Transportation Terminals (Intercity bus, train & marine terminals)	18
Centroids of Traffic analysis zones (generally, population or employment areas)	2,634
Centroids of Census block groups (generally, populated areas)	2,706

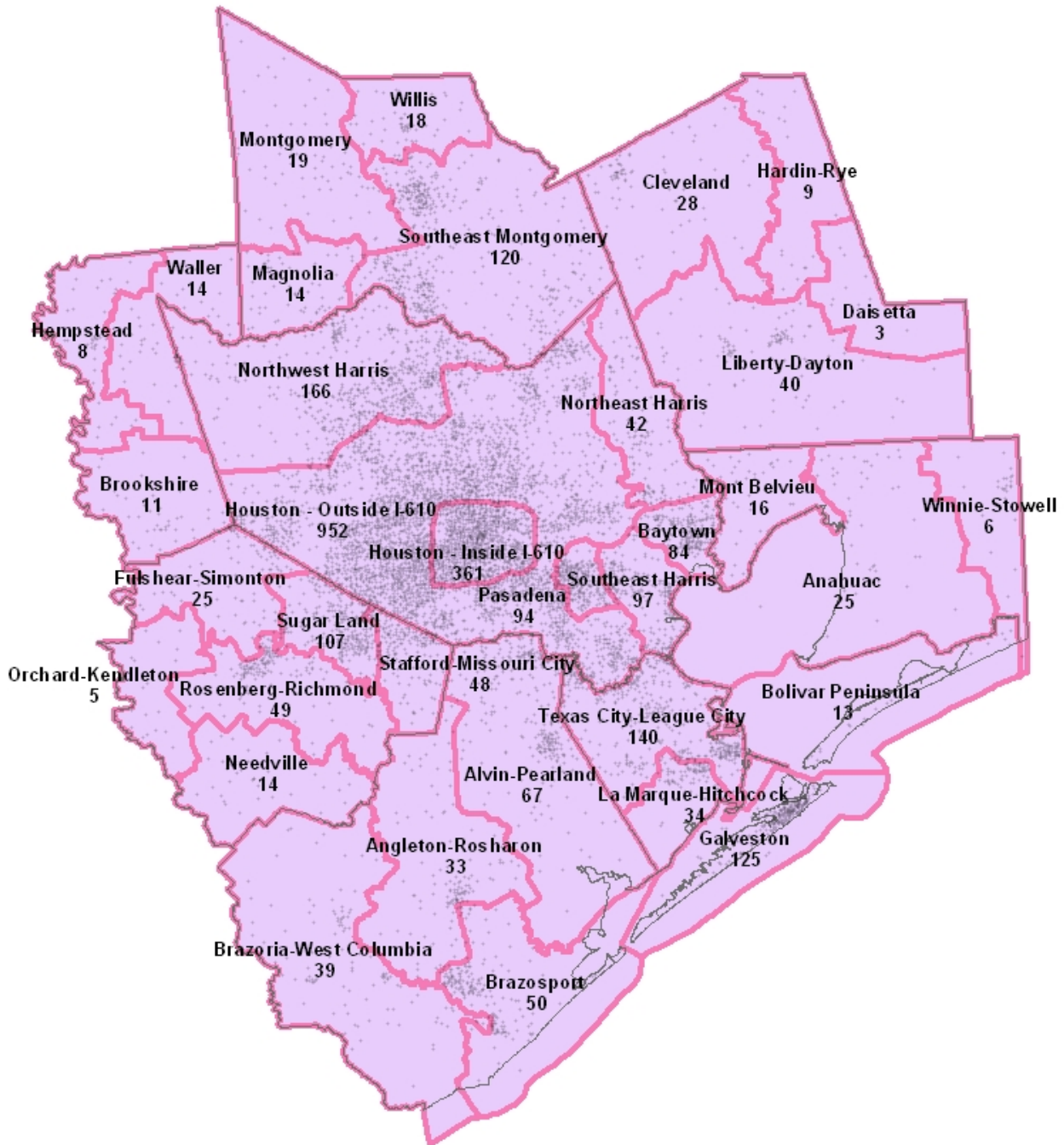
The center may contain a civic amenity that provides a central focal point for activity, or there may be several smaller focal points within the district. It is important to note that while the district is identified by its center, there may not be any particular significance to that location, particularly if the center is a TAZ or block group centroid – an average of information not necessarily an active center.

After cleaning, a total of 9,219 district centers were identified. While this seems a very large number, we chose to err on the side of thoroughness and completeness rather than risk missing a potentially interesting area, or have to go back and revisit the process because a group felt left out of the analysis.

For the purpose of tabular presentation, districts were given names and assigned to larger geographic areas, again based on their center (the district itself may straddle more than one area). Districts were assigned to 35 county/county subdivision areas, as shown in **Figure 7**, and also to 259 neighborhoods. Neighborhoods were defined using the City of Houston Super Neighborhood boundaries where applicable, the boundaries of other cities, towns and census designated places, with the remainder assigned to the rural portion of the county subdivision shown in **Figure 7**.

A full list of districts can be found in **Appendix C**.

Figure 7. Distribution of Districts by County and County Subdivision





Strengths and Weaknesses of Defining Districts as Circles

The use of circular and overlapping districts in a regional planning study is a practice that, to our knowledge, is not commonly employed. This section describes alternative approaches and compares them to that chosen, with the benefit of hindsight.

The two primary advantages of using circular districts are:

1. They allow for one district to be defined with multiple “layers” of concentric circles using different radii from the center. These different radii represent the distances from the center that a person would be likely to walk or bicycle, and therefore the types of characteristics
2. Assuming that the center is a meaningful place (attractor), a circular district is a good representation of the walking and bicycling catchment areas for that center. Note that not all the centers used are physical focal points; some are artificial centers of traffic analysis zones, for example. Districts with both types of centers (real and arbitrary) may provide opportunities for many different trips, not just trips to the center.

The two primary disadvantages of using circular districts are:

1. Using circular districts makes it impossible to cover a region are completely without having either gaps or overlapping areas. Having overlapping districts makes correlation analysis less statistically valid unless the spatial autocorrelation is taken into account. Overlap also makes display of results on a map more difficult and the resulting maps can be harder to interpret.
2. Data are not available in such shapes and consistent sizes. Some data are available at the TAZ level, some at the Census block group level, some at other levels, including individual points. If we had chosen to use one of those predefined zone systems at least some of the data would have been “ready to use.” But since we created an unusual system, we had to allocate all the data from those other areas into our areas.

To avoid overlap, either gaps in the districts would have to be acceptable or non circular districts could be used. Typically predefined zones are used. Two predefined zone systems were considered. Traffic Analysis Zones (TAZs) are defined by H-GAC and have the advantage that many of the data we wished to use are collected at this level. There are 2,634 zones, ranging in size from 5.1 acres in downtown Houston to over 67,000 acres in Liberty County. This wide range in size was the primary reason for not using TAZs. Census Block Groups have similar properties to TAZs, including the fact that many of the data used were only available at this level. There are 2,706 census block groups in the study area ranging from 5.9 acres to over 149,000 acres. Another possibility would be to use a custom-made grid of squares. To cover the study area would require approximately 10,000 districts using squares equivalent in size to a half-mile radius circle. None of these options have the opportunity to look at different data for concentric areas.

On the positive side, the overlap provides for a much higher degree of accuracy, and confidence that a promising district is not omitted because it is surrounded by less promising areas. If all the data were only available at one level of geography, the advantage of consistently sized, overlapping districts would be lost. However, the data were collected from several sources including point sources and census block level (for population and age distribution) which allow

for accurate estimation of the actual data value for any district. The distribution of population at the census block level was also used to allocate block group level data more accurately.

Finally, the distribution of our centers was neither random nor even, but rather was deliberately denser in areas with more attractors. [However any districts less than 600 feet apart were always combined into one district.] This also increased the accuracy and reduced the likelihood that a promising district was missed. Even if they could be perfectly packed (which circular districts cannot), it would take 39,000 quarter-mile districts to completely cover the entire region. Using ½ mile radius districts, complete coverage could be achieved – again assuming perfect packing – with 9,810 districts.

Development of Composite Indicator (Score)

The potential for success in converting automobile trips to bicycle and pedestrian trips, and improving pedestrian and bicyclist safety, is based upon many interrelated factors and cannot be directly measured. In order to facilitate comparison of districts, a composite indicator, or score, was developed that would best represent the combined effect of all the most important factors. A composite indicator is a mathematical combination (or aggregation as it is termed) of indicators that have no common meaningful unit of measurement. Indicators are pieces of information that summarize the characteristics of a system or highlight what is happening in a system. They are often a compromise between scientific accuracy and the information available at a reasonable cost.

Indicators were identified on the basis of a review of the literature (see **Appendix E**), expert advice, statistical analysis as well as comments from the project steering committee. Each indicator has associated with it one or more variables that are empirically measured. The choice of variables was driven by a consideration of a number of factors including: coverage (only variables that are measured in all 8 counties were used), the recentness of the data, direct relevance to the phenomenon that the indicators are intended to measure, and quality. Wherever possible we sought to use direct measures of the phenomena we wanted to capture. But in some cases, “proxies” had to be employed.

Once indicators and variables were chosen, the data were collected and further analyzed. In order to better understand the data and look for ways of reducing the number of indicators and variables required, correlations between variables were examined, and a principal component analysis was performed.

The steps in the development of the final score are described in further detail in this section; the final scoring method itself is described in the section, Final Composite Indicator on page 26.

Selection and Evaluation of Indicators and Variables

The study team determined that the best method for measuring the potential for success in increasing bicycling and pedestrian activity and safety in the scope of this project was to create a composite indicator score. In doing so, the team borrowed heavily from many of the previously published efforts to measure bicycle and pedestrian activity or demand.

As the literature review (**Appendix E**) shows, there are a multitude of indicators ‘associated’ with bicycling and pedestrian activity. These indicators are usually stand-ins for the underlying true factors, which are complex, inter-related and often immeasurable things such as ‘social



acceptability.’ When it comes to measuring the unmet (or latent) demand, or potential, for bicycling and walking the challenge is even greater. For the purposes of this study we are interested primarily in this *potential* for walking and bicycling which is currently being met by automobile trips. However, measuring the factors associated with bicycling and pedestrian *activity* is highly relevant for several reasons:

1. Even in districts where walking and bicycling are relatively common, they still represent a fraction of the total number of trips being taken, and so there is still room for additional trip conversion. While up to 44 percent of work trips are made by walking or bicycling in a few districts¹, on average, only about 2 percent of work trips are made by non-motorized modes.
2. Areas where there is already bicycling and walking activity may have a better chance of succeeding in converting additional automobile trips to non-motorized modes, due to peer acceptance and safety improvements. A recent study shows that the likelihood that a given person walking or bicycling will be struck by a motorist varies inversely with the amount of walking or bicycling in the area (Jacobsen 2003).
3. Frequently, bicycling and walking are “chosen” as means of transportation when other options are not available. As additional options become available to individuals and communities, investments that encourage bicycling and walking may partially offset the tendency to abandon non-motorized travel. For low-income households, having mobility without financing an automobile can result in increased financial flexibility that can be used for other necessities.

In choosing the indicators to use in the final composite indicator, the following were considered:

- Indicators with little or no variability among districts in the region would not be useful. Indicators such as climate and topology fall in this category
- Data for each indicator chosen had to be available and consistently collected throughout the 8-county study area. This eliminated a number of otherwise valid and desirable measures.
- Data for each indicator also had to be relatively up-to-date to accurately reflect existing conditions in rapidly growing areas.

In developing the composite indicator, there was discussion about whether indicators of success for bicycling and walking should give a district a higher or lower score. One could make the argument that the district that is the *most unfriendly* to bicyclists and pedestrians is the one with the highest potential. However, the cost of making changes in such an area would likely be restrictively high. Ideally, a high scoring district would be one that already has indications of success in areas that are very difficult to influence through available transportation management techniques, but are lacking in areas that can be changed relatively easily. As an example, a district with high potential for success might be one that has a *good* network of roads but *poor* sidewalk connectivity, since changing an existing road network is a monumental task, whereas improving sidewalk connectivity is feasible.

After selecting indicators using all the above criteria, a long list of viable indicators remained, and in many cases several different ways of measuring the indicator were available. **Table 3**

¹ The highest areas for bicycling and walking work trips (expressed as percentage) are in Galveston north of Water Street, and on or adjacent to the university campuses of Rice University (and the Texas Medical Center), the University of Houston and Prairie View A&M University.

shows the indicators and measures that were initially collected for consideration in the final composite indicator (score). This collection can be thought of as the “draft” composite indicator.



Table 3. Indicators and Measures Initially Collected (“Draft” List)

Indicator	Measures Considered	Notes on decision
<i>Demographic factors</i>		
Population density	<ul style="list-style-type: none"> ✗Persons per square mile ½-mi ✓Persons per square mile ¼-mi 	<ul style="list-style-type: none"> • Since census block data are good for ¼ mi radius, this was used to produce a greater variation between neighboring districts
Children	<ul style="list-style-type: none"> ✗Number of persons age 5–17 ✓Percent of persons age 5–17 	<ul style="list-style-type: none"> • Use of percent removes correlation with population
Youth	<ul style="list-style-type: none"> ✗Number of persons age 5–30 ✗Percent of persons age 5 – 30 	<ul style="list-style-type: none"> • Removed because of overlap with children
Elderly	<ul style="list-style-type: none"> ✗Number of persons age 65 and over ✓Percent of persons age 65 and over 	<ul style="list-style-type: none"> • Use of percent removes correlation with population
Low Income	<ul style="list-style-type: none"> ✗Number of households in lowest income quintile ✓Percent of households in lowest income quintile ✗Median Income 	<ul style="list-style-type: none"> • Use of percent removes correlation with population • Median income can not be apportioned accurately from one polygon (Block group) to another (district)
Low Auto availability	<ul style="list-style-type: none"> ✗Percent of housing units with 0 or 1 auto available 	<ul style="list-style-type: none"> • Correlated with low income
<i>Attractions</i>		
Schools – K through 12	<ul style="list-style-type: none"> ✗School enrollment from TEA ✗Number of schools in district ✓Education jobs from H-GAC 	<ul style="list-style-type: none"> • TEA data complete but many large schools did not geocode (location not identified) • The number of schools not deemed as relevant to trip generation as the number of students, and concerns about consist data source • Education jobs a surrogate for students assuming
Schools - higher education	<ul style="list-style-type: none"> ✓Higher-education enrollment 	<ul style="list-style-type: none"> • Non-normal distribution, so took log
Employment	<ul style="list-style-type: none"> ✗Number of jobs 	<ul style="list-style-type: none"> • This was highly correlated with trip attractions
Employment	<ul style="list-style-type: none"> ✓Diversity of jobs (no single job category dominates) 	
Public facilities	<ul style="list-style-type: none"> ✗Number of parks, churches, museums, transit centers (incl rail stations), hospitals 	<ul style="list-style-type: none"> • Data not consistently collected in all parts of the study area
Trip attractions	<ul style="list-style-type: none"> ✓Trip attractions 	<ul style="list-style-type: none"> • Highly correlated with total employment from modeling output (allocate from TAZ level)
Home-Work distance	<ul style="list-style-type: none"> ✓Number of trips less than 10 minutes ✗Percent of trips less than 10 minutes 	

Indicator	Measures Considered	Notes on decision
Land Use Characteristics		
Residential density	✗ Dwelling units per acre	• Highly correlated with population
Mixed use	✓ Diversity of land uses (no single land use dominates)	
Mixed use	✓ Ratio of jobs to households	
Travel conditions/Other		
Mode for work trip	✓ Number that walk to work ✓ Number that bicycle to work	
Safety	✓ Number of bicycle crashes (1999)	• Additional years would add more credibility to this variable but not available
Safety	✓ Number of pedestrian crashes (1999)	• Additional years would add more credibility to this variable but not available
Transit Access	✓ Number of bus stops (Houston METRO and Island Transit)	• Does not take into account quality of service but other measures much more time consuming to calculate

At this stage, several statistical analyses were performed to aid in simplifying the final composite indicator. These included correlation analysis and factor analysis (principal component analysis), as described below. Additionally, indicators or variables were eliminated based on problems that became apparent only after the data were collected and examined graphically (by mapping) or statistically.

The first method employed was to look for variables that were highly correlated with each other. **Table 4** shows a matrix with the correlation coefficient for all variables compared pair wise with each other. A higher value indicates more correlation, with a maximum of 1 if the two factors are identical. This information was primarily used to identify “redundant” variables. Specifically, this showed that “trip attractions” (TOTATT2007) correlates very strongly to total employment, (EMP_TOTAL) and confirmed that housing units (HSE_UNITS) and population (POPNOCORR) are highly correlated. This analysis also informed us that the number of children is strongly correlated with the total population, and suggested to us dividing the number of children by the population, producing a variable essentially independent of the population.

A factor analysis (principal components) was performed in order to detect structure in the relationships between variables, that is, to classify variables, and also to further examine variables that might be redundant, and thus simplify the final formula. With 20 variables, five principal components (or factors) were identified. Together they “explained” 74 percent of the total variance. Looking for patterns of similarity between items that load on a factor suggested that these five factors could be named as follows:

- Population Size
- Employment
- Proximity to Work
- Diversity
- Income



Table 4 Matrix of Correlations among Indicators in “Draft” List

	POPNOCORR	AGE_5_17	PERCAGE5_1	AGE_5_30	AGE_65_UP	PERCELD	PERCLOWINC	PERCORR1CA	HSE_UNITS	STUDENTS_T	EDUCEMPLO	SCHOOLEMPA	EMP_TOTAL	TOTATT2007	WORKCYCLIS	WORKWALKER	PERCWORKBI	WORKTRIPLT	PERCSHORTT	BIKECRASHE	PEDCRASHES	LANDU_DIV	EMPDIVERSI	HHS_EMP_RA	BUSSTOPS
POPNOCORR	1																								
AGE_5_17	0.93	1																							
PERCAGE5_1	-0.03	-0.02	1																						
AGE_5_30	0.89	0.84	-0.03	1																					
AGE_65_UP	0.64	0.52	-0.03	0.52	1																				
PERCELD	-0.05	-0.06	0.00	-0.05	0.02	1																			
PERCLOWINC	0.12	0.12	0.00	0.18	0.20	-0.01	1																		
PERCORR1CA	0.39	0.27	0.00	0.47	0.41	0.01	0.60	1																	
HSE_UNITS	0.86	0.68	-0.03	0.87	0.65	-0.04	0.11	0.51	1																
STUDENTS_T	0.03	0.00	0.00	0.14	0.03	0.00	0.10	0.17	0.05	1															
EDUCEMPLO	0.40	0.31	0.00	0.45	0.42	-0.02	0.17	0.43	0.50	0.23	1														
SCHOOLEMPA	0.14	0.16	-0.01	0.17	0.15	-0.03	0.01	0.08	0.16	0.02	0.32	1													
EMP_TOTAL	0.08	0.00	0.05	0.16	0.08	0.01	0.03	0.28	0.19	0.33	0.48	0.02	1												
TOTATT2007	0.21	0.10	0.03	0.30	0.21	0.01	0.07	0.40	0.35	0.40	0.60	0.06	0.96	1											
WORKCYCLIS	0.43	0.27	-0.01	0.46	0.31	-0.01	0.19	0.39	0.56	0.10	0.34	0.07	0.15	0.27	1										
WORKWALKER	0.55	0.39	-0.01	0.63	0.38	-0.01	0.22	0.53	0.68	0.26	0.48	0.10	0.32	0.47	0.70	1									
PERCWORKBI	0.14	0.06	0.02	0.19	0.16	0.00	0.37	0.47	0.20	0.38	0.33	0.03	0.37	0.45	0.63	1									
WORKTRIPLT	0.59	0.40	-0.02	0.60	0.50	-0.03	-0.05	0.40	0.80	0.06	0.47	0.13	0.22	0.38	0.60	0.69	0.27	1							
PERCSHORTT	-0.03	-0.10	0.01	-0.05	0.10	0.02	0.14	0.26	0.05	0.08	0.17	0.00	0.16	0.20	0.20	0.22	0.47	0.38	1						
BIKECRASHE	0.41	0.31	0.00	0.48	0.40	-0.01	0.41	0.57	0.50	0.25	0.54	0.11	0.41	0.50	0.36	0.47	0.37	0.35	0.03	1					
PEDCRASHES	0.27	0.21	0.04	0.36	0.18	0.00	0.21	0.38	0.33	0.24	0.51	0.07	0.80	0.78	0.26	0.42	0.36	0.22	0.05	0.56	1				
LANDU_DIV	0.18	0.11	-0.02	0.22	0.13	-0.02	0.18	0.42	0.24	0.08	0.26	0.08	0.14	0.22	0.23	0.31	0.24	0.28	0.21	0.27	0.16	1			
EMPDIVERSI	0.29	0.31	-0.04	0.29	0.26	-0.04	0.02	0.16	0.26	-0.07	0.22	0.15	-0.10	-0.04	0.07	0.09	-0.03	0.20	0.03	0.15	0.02	0.23	1		
HHS_EMP_RA	0.30	0.27	-0.02	0.30	0.28	-0.06	0.06	0.21	0.31	-0.07	0.19	0.15	-0.14	-0.08	0.15	0.16	-0.03	0.28	0.08	0.13	-0.01	0.28	0.44	1	
BUSSTOPS	0.35	0.24	0.01	0.41	0.38	-0.01	0.39	0.56	0.46	0.31	0.58	0.10	0.66	0.72	0.36	0.48	0.44	0.29	0.03	0.79	0.75	0.21	0.07	0.04	1

Variable Modification

There were several ways in which raw variables were modified for inclusion in the composite indicator.

Several variables were divided by a denominator to remove the influence of a highly dependent variable. For example, the number of children was divided by the total number of people, and this value was expressed as a percent.

Highly skewed variables (generally those with a Skewness rating of 4 or more) were modified by taking their log (base 10). By taking the log of highly skewed variables, extreme values are less likely to disproportionately affect the final score.

Some variables were inverted, so that a higher value always indicated a “better” state. “Better” in this context means having a greater potential for bicycle and pedestrian trip conversion and safety improvements. For example, the balance of households to jobs was modified so that a lower score indicated a poor balance (100 percent jobs, or 100 percent households) while higher scores indicated a 50/50 balance.

Aggregation and Weighting Schemes

To combine all the factors into a single score, the value for each variable has to be converted to a unitless dimension.

One method considered was to divide the variable by the maximum value for that variable. In that case, the maximum value each factor can contribute to the final score is equal to the weight on that factor. The disadvantage is that this puts too much emphasis on the maximum, which is often an outlier.

Another method that was discussed involves using the results of principal component analysis to weight (factor analysis) and combine the variables. In principal component analysis, a statistical software package attempts to find the “components” that “explain” the variance found in the data. Each component consists of all the variables with a weighting coefficient for each. Each component is statistically independent of the other components. One way to use the component analysis to generate a final score is to rank each district on each of the components separately, and then add the ranks together. High scoring districts are those that perform relatively well in each component. The downside to this method, aside from its non-intuitiveness, is that weights are assigned to indicators based on correlations which do not necessarily correspond to the underlying relationships between the indicators and the phenomena being measured.

The method finally chosen is that most often employed, which is to normalize the variables and then add the normalized values. Normalized variables have a mean of zero and a standard deviation of one. In other words, positive values indicate an above-average value, while negative values indicate below-average values.

Sensitivity

In this context, sensitivity refers to the ability of a change (or error) in a variable value or weight to produce a large change in the results. Although a formal sensitivity analysis was not performed, a variety of weighting schemes were tried to observe what the impact on the final results might be. These included:



- Using the number of children and elderly rather than percent
- Using the original values rather than the log for employment, bus stops and higher education employment
- Giving population a weight of 5 or 7, and giving the children and elderly variables a weight of 0.
- Giving all variables an equal weight of 1
- Standardizing variables by dividing by the maximum versus subtracting the mean and dividing by the standard deviation.

Although there were, of course, differences in the results, they were not as dramatic as might be expected. Although the order changed, the same district areas tended to score high with most of the different schemes tested. Given that one could easily argue that the weights for variables could equally validly be different, this provides some reassurance that such changes would not call the entire process into question. In other words, the model is robust enough that modest changes in the weights of variables (including dropping one more out entirely) will not dramatically change the overall results.

Final Composite Indicator

The final selection of indicators, variables and weights chosen for the composite indicator score is shown in **Table 5**.

Variable Aggregation

To combine all the factors into a single score, the value for each variable in each district was normalized using $[x - \text{average}(x)] / [\text{standard deviation}(x)]$. The average score for each variable is therefore 0.

Variable Weighting

The initial assumption for combining variables was that all of them would be weighted equally. However, in the process of putting together the final list, several factors came in to play to suggest increased or decreased emphasis on some variables. As described in the preceding section, “Selection and Evaluation of Indicators and Variables” some variables initially considered were eliminated in favor of other, closely correlated variables to simplify the final scheme. The population, low-income and trip attractions variables each became surrogates for one or more variables that were eliminated from the score, and so their weight was increased. The land use diversity variable was reduced in weight as the underlying data were less robust, and there were two other “diversity” indicators. Finally, two pairs of variables were reduced in weight as they measure related properties: the number of the bicycling and walking crashes and the bicycling and walking to work variables.

As previously discussed under the heading “Sensitivity”, various weights were tried and the net effect on the final scoring, while noticeable, was not dramatic.

Assessment of Scoring System

Two commonly asked questions are “what does a high score mean?” and “why did this neighborhood score high but not that other one?” Because the score is a composite indicator composed of many different variables (shown in **Table 5**), the answer is not always intuitive or

obvious. Indeed, this is one of the advantages and disadvantages of using this method: the results are not always what one expects.

First of all, high scores result from *above average* values in *multiple* indicators. Below average values in some indicators may offset above average values in others. Likewise, if a district is remarkably above average in one or a few indicators, this can partially offset average or below average scores in others. That being said, no district scored in the top 150 (and very few in the top 500) without being above average in at least 10 of the 16 indicators listed in **Table 5**.

The final indicators were chosen in part to be independent of each other, although certainly some correlation between them remains (see **Table 4**). Further information on the rationale for each of the variables used is also provided in Appendix A, and in the literature review (Appendix E). As a result, one can't single out any one or two indicators and pin the success of all the high-scoring districts to them. Indeed, when looking at the top-scoring districts by neighborhood (see next sections), we find that the variable with the most influence on the score varies from neighborhood to neighborhood. For example, for Gulfton, the high population density was a significant factor in the high final score, whereas for Montrose districts, the number of work trips less than ten minutes was significantly above average, and Downtown Houston scored high in part due to the large number of pedestrian crashes recorded there. One characteristic observed of many of the high scoring districts was that they have a lot going on in them, and usually many different types of activity (not all residential or retail, for example).

The scoring system is not perfect, and it is certainly not the only one that could have been chosen, as previously discussed. However, in addition to offering a reasonable way to choose the districts in the eight-county area with the highest potential for converting trips to bicycling and walking and increasing bicycle and pedestrian safety, it can also be modified to serve other purposes.

This method can be used to look at the relative ranking of districts in a subset of the eight county area. A specific example of this is to look at the top-scoring districts for each county separately, or to look at districts in cities other than Houston. With the data collected for the study and provided in the appendices, it is also possible to look at a subset of the indicators, or create an alternate weighting system for a specific purpose.

Once again it is worth reiterating that this scoring system should not be the only means to determine where bicycle and pedestrian investment is warranted. Many districts that did not score high still have high need for improvement.



Table 5. Indicators and Variables Chosen for Final Composite Indicator

Indicator	Variable [and district size used, in miles]	Weight
<i>Population Indicators</i>		
Population	Total population (not including prison population). All districts are equal size so this is equivalent to population density. [$\frac{1}{4}$]	3
Children	Number of persons age 5-17 of center divided by total number of persons in the district [$\frac{1}{4}$]	2
Elderly	Number of persons age 65 and over, divided by total number of persons in the district [$\frac{1}{4}$]	2
Low-income households	Number of households in lowest 20 percent of all households in region, divided by total number of households in the district [$\frac{1}{2}$]	3
<i>Employment and Activity Indicators</i>		
K-12 Education employment	Number of jobs classified as Lower Education (corrected for HISD headquarters) [$\frac{1}{2}$]	2
Total trip attractions	Log of Total Trip Attractions (from transportation modeling) [$\frac{1}{2}$]	3
Higher education enrollment	Log of number of higher education students enrolled (full and part time) [$\frac{1}{2}$]	2
<i>Land Use Indicators</i>		
Land-use diversity	Measure of number of different land use types and the proportional area distribution of land use types [$\frac{1}{2}$]	1
Employment diversity	Measure of the number of different employment job categories and their numerical distribution (lack of dominance of any one category) [$\frac{1}{2}$]	2
Balance of households and employment	Measure of how close the ratio of households-to-jobs is to 50:50 [$\frac{1}{2}$]	2
<i>Travel Indicators</i>		
Existing bicycling	Number of persons reporting bicycle as mode of transportation to work [$\frac{1}{2}$]	1
Existing walking	Number of persons reporting walk as mode of transportation to work [$\frac{1}{2}$]	1
Short (work) trips	Number of workers reporting a trip to work of 10 minutes or less, divided by the total number of workers not including work-at-home [$\frac{1}{2}$]	2
<i>Other Indicators</i>		
Transit access	Log of number of bus stops [$\frac{1}{2}$]	2
Bicycle crashes	Number of bicycle crashes reported in 1999 [2]	1
Pedestrian crashes	Number of pedestrian crashes reported in 1999 [$\frac{1}{2}$]	1

Proceeding with Results of First Pass

The normalized values were multiplied by a weight (see **Table 5**) and then added together. The final score has an average of 0 and a standard deviation of 15. The range is from -51 to 80.

The top 500 districts by score are shown in **Figure 2**. All of the top 500 districts were found in Harris or Galveston counties. Most, but not all, of the top 500 districts are in the city of Houston or the city of Galveston. Note that the 500th district has a score of 26, which is nearly two standard deviations above the mean value. Although by necessity the remainder of the report concentrates on the top-ranked districts, there is a need for bicycle and pedestrian improvements in many of the lower-ranked areas.

Combining Districts by Neighborhood

When viewed on a map, it is clear that high scoring districts tend to cluster together, and are often surrounded in ‘rings’ by progressively lower scoring areas. This is partly a result of the overlapping districts and the fact that many of the data were allocated from larger units (such as TAZs).

For discussion purposes, districts were assigned to “neighborhoods” using Super Neighborhoods, for City of Houston, and incorporated place names outside the City of Houston. The top 20 neighborhoods represented are shown in order in **Table 1**.

Because districts are assigned based on their center, districts may actually overlap two or more neighborhoods. Because of the overlap in districts, around any highly ranked district there are usually other districts that are also highly ranked, that might be considered “fringe” districts. For example, the highest scoring districts in the University Place & Binz Super Neighborhoods overlapped with the Montrose neighborhoods. For this reason, these two neighborhoods weren’t included in the top twelve profiled in the next section. This pattern is particularly evident when scores are visualized on a map. Conversely, many “neighborhoods” had more than one distinct cluster of districts; for example, Galveston appears to have to separate clusters with distinct characteristics.

Field Work

Field visits for twelve top district areas were conducted on foot and on bicycle by John Ciccarelli, Lorin Gaertner and Clark Martinson on October 31, November 1 and November 3, 2004. These visits were necessarily brief and were intended only to obtain a “flavor” for the challenges and opportunities each area possesses. The following general observations were noted in the districts visited by the WPM Planning Team.

General Infrastructure Observations

- The street grid in older neighborhoods evenly distributes traffic providing places to walk and bicycle
- Utility corridors and drainage-ways may be opportunities for walking and cycling trails
- Many older streets have less traffic than originally designed for and could be put on a “road diet” by restriping - reducing the number of vehicle lanes and adding bicycle lanes
- High pedestrian crossings such as school zones would be safer by relocating driveways



General Walking Observations

- Slow streets with low traffic volume can be safe for walking
- Narrow sidewalks prohibit groups of two or more from walking side by side
- Sidewalks throughout the region are typically 4-foot; recommend changing standard to 5-foot for 2 adults to comfortably walk together or pass in same or opposite directions. 5-foot standard is recognized by pedestrian experts and is used in many cities throughout the country.
- Wide and continuous sidewalks are needed along busy streets. The sidewalk networks of districts we visited throughout the Houston-Galveston area are frequently discontinuous, notably more so than in other areas of the country.
- Gateways and openings from private property to public sidewalks dictate the desire lines for walking between two points
- Obstructions in sidewalks such as utility poles and bus shelters conflict with walking
- Pedestrian bulb outs at intersections in curb side parking dimension can reduce the distance crossing street
- Median refuge is needed in busy streets to provide pedestrian protection and refuge
- Control measures such as crossing guards at school zones and pedestrian actuated traffic lights are needed at crossings with high traffic volume
- Corner ramps are needed where missing to meet ADA guidelines
- Drainage ditches and frequently deep gutters along curbing are barriers to meeting ADA guidelines at street corners
- Planting strip width between sidewalk and curb allows green space for trees to mature without roots breaking sidewalk
- On streets where people walk in the street because sidewalks are discontinuous and/or corners are difficult to step onto or off of, and where achieving continuous sidewalks on each block appears politically difficult due to private encroachment, consider calming the intersections to reduce vehicle speeds along those blocks.
- Mid block crossings are needed where blocks are longer than 500'

General Cycling Observations

- Bottlenecks at curbside parking force cyclists into situations where it is more difficult to control their lane
- Conditions of curb lane and storm sewer grates impact safety for cyclists
- Cyclists must always be aware of their position on roadway and the position of traffic so that they can maintain control of their lane and have a safety zone for avoiding crashes with vehicles
- Many roads offer the opportunity to reduce number of vehicle lanes by restriping lanes to provide bike lanes (subject to traffic study)
- The bicycling environment would be improved with bike racks on public buses

- Bicyclists entering an intersection must schedule their move with cross traffic so that everybody communicates their intended movement
- Intersections need safe stop points for cyclists when crossing
- Visibility, bottlenecks, construction sites, curbside parking, driveways, left turns and intersections pose safety concerns for cyclists
- Bicycle detection is needed at all signalized intersections for the cyclist's through and left turn movements. The rightmost through lane should have a bicycle detector with a marking. Where there is no right turn only lane, consider also providing a curbside "Bike Crossing" pushbutton on the approach.

Specific observations as well as photographs from the visits are included in the following section.



Profiles of Top 12 District Areas

In this section, each of 12 high-ranked district areas is briefly profiled. Each profile includes the following:

- A brief description of the area, especially with regard to the characteristics that made it a high scoring area.
- The data on all indicators used in determination of the score, for the top scoring district in the area. These include the rank of this district (out of 9,219 districts) for each indicator.
- Any Tax Increment Reinvestment Zone (TIRZ) or Neighborhood-to-Standard areas that overlap with the area, where applicable (also shown in **Table 6**)
- Highways that intersect one or more potential districts in the neighborhood
- The Houston or Galveston City Council district, as applicable (also shown in **Table 6**)
- Major employers identified in the area (per ABI 2002 employment data, employers with more than 100 employees).

Additionally, maps of each district area containing all local streets with names, and separate maps with aerial photographs of the highest scoring district in the area are included with this report.

The district areas are presented in alphabetical order, to deemphasize relative scores among these districts. All twelve have excellent probabilities of success for improving bicycling and walking, based on our observations.

Table 6 TIRZ, Neighborhoods to Standard and Council Districts for Top 12 Areas

AREA	TIRZ	Neighborhoods to Standard	Council Districts
DOWNTOWN	Market Square	None	I
EASTWOOD	none	Eastwood/Broadmoor, (Sunnyland)	I
LAWNDALE			
GALVESTON	none	n/a	1,2,3,4
GREATER THIRD WARD	none	Third Ward Completion, (Tierwester/TSU)	I,D
GULFTON	Southwest Houston	Gulfton, (Sharpstown Completion)	F
MAGNOLIA PARK	none	Magnolia Park, Oakland/Fuller	I
MONTROSE	none	Castle Court, Westmoreland/Audubon Place	D
NEAR NORTHSIDE	none	Near Northside, North Central	H
PECAN PARK	(Gulfgate)	Pecan Park, (Park Place)	I
SHARPSTOWN	Southwest Houston	Sharpstown, Sharpstown II	F
WESTWOOD	Southwest Houston	Sharpstown	F, (C)
WOODLAKE/ BRIARMEADOW	Southwest Houston	(Gulfton)	C, (F)

Source: City of Houston GIS Layers Apr 2002

Zones/Districts in parentheses are on the periphery of the high-scoring area

Downtown



The Houston central business district scored high for its excellent transit access, as well as for its safety improvement potential in light of large numbers of pedestrian and bicycle crashes. University enrollment (University of Houston Downtown campus) and K-12 education employment (indicating student population) also contribute to the scores, but the single largest factor is certainly the total trip attractions, which results from the large concentration of employment.

Table 7 Indicator Results for Top Downtown District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	331	5,303	-1.3
Children	21%	1%	8,816	-5.0
Elderly	8%	10%	3,413	0.1
Low-income households	20%	15%	6,066	-1.6
K-12 education employment	46	917	1	17.9
Total trip attractions	6,107	383,067	2	7.7
Higher education enrollment	0	1,217	270	6.8
Land-use diversity	42%	49%	3,185	0.5
Employment diversity	60%	31%	8,602	-3.3
Balance of households and employment	81%	51%	8,824	-4.1
Existing bicycling	0	5	2,698	-0.1
Existing walking	14	209	275	2.6
Short (work) trips	138	201	3,325	0.1
Transit access	0	221	1	5.9
Bicycle crashes	2	38	14	5.0
Pedestrian crashes	0	43	2	18.5
Total Score			34 th Overall	49.7

Downtown



Relevant City Council District: I

Relevant TIRZ: Market Square

Highways: Interstate 45

Major Employers for Top Downtown District (1/2 mile radius) are (greater than 1,000 employees): Reliant Energy Entex, Houston City Public Works, Enron Corp, Arthur Andersen LLP, Bank One Texas, Beavers Walker Webster, Coastal Oil & Gas Corp., Dynegy, PriceWaterhouse Coopers, Sutherland Lewis Cooper, Vinson & Elkins, Chevron, Centerpoint Energy, Conoco, Continental Airlines, Express Jet Holdings, Houston Chronicle, Chevron Texaco, Foley's, Bank of America, Chase Manhattan Bank, El Paso Corp., Equistar Chemicals, Shell, Tennessee Gas Pipeline Co, and Wells Fargo Bank Texas.

Observations

- ADA ramps and traffic signals at corners provide basic infrastructure making downtown the most pedestrian oriented place in Houston
- Cotswold and Main Street LRT pedestrian environment improvements by the downtown District and METRO are the largest investments in pedestrian facilities in Houston
- Streets are designed for high volumes of bus traffic and generally unfriendly for cycling
- New resident population, restaurants and nightclubs create need for safe pedestrian environment day and night
- Underground tunnels and overhead sky bridges create a weather-protected environment for walking between employment centers, restaurants and shopping but may limit access
- Sports and convention visitors to the Toyota Center, Minute Maid Park and the George Brown Convention Center walk long distances from parking, transit and other places of origination to the their destination - often lacking shade and weather protection



Eastwood Lawndale



Eastwood/Lawndale is a middle class community south-east of Downtown. The Gulf Freeway created a commercial edge on its south. This district has a high population and excellent transit access.

Table 8 Indicator Results for Top Eastwood Lawndale District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	2,558	128	8.7
Children	21%	21%	4,360	0.4
Elderly	8%	7%	5,451	-0.7
Low-income households	20%	40%	729	4.5
K-12 education employment	46	304	291	4.9
Total trip attractions	6,107	20,768	874	2.9
Higher education enrollment	0	332	523	5.4
Land-use diversity	42%	56%	1,750	0.9
Employment diversity	60%	69%	1,444	1.7
Balance of households and employment	81%	94%	1,483	2.1
Existing bicycling	0	37	480	1.6
Existing walking	14	84	1,297	0.7
Short (work) trips	138	210	3,159	0.2
Transit access	0	54	163	4.0
Bicycle crashes	2	19	398	2.1
Pedestrian crashes	0	3	640	1.0
Total Score			118 th Overall	40.4

Eastwood Lawndale



Relevant City Council District: I

Relevant Neighborhoods-to-Standard Areas: Eastwood/Broadmoor, (Sunnyland on southeast corner)

Highways: None

Major Employers for Top Eastwood Lawndale District (1/2 mile radius) are: Austin High School, Chamfer International, Grant Prideco Inc and Jackson Middle School.

Observations

- Slow streets – low volume traffic allows walking safely in streets
- Narrow sidewalks work for individuals but not for groups of two or more to walk side by side
- Wide and continuous sidewalks are needed along busy streets
- Obstructions in sidewalks such as utility poles, parked vehicles and METRO bus shelters conflict with walking
- Corner Ramps are needed where missing to meet ADA guidelines
- Drainage ditches and gutters along curbing are hurdles to meeting ADA guidelines at street corners
- Planting strip width between sidewalk and curb allows green space for trees to mature without roots breaking sidewalk
- Lawndale near Telephone, east of RR tracks: 52' wide, currently striped as 16' outside lane, 10' inside lane. 4-lane capacity does not appear to be needed; check ADT and peak-hour usage. If 4-lane configuration is not needed, consider restriping to: 7' bike lanes, one 12' travel lane each direction, and a 14' center lane that could have 10' to 12' turn pockets interspersed with planted median.

Galveston



The only one of the top 15 district areas outside of the City of Houston, there are two distinct, high scoring areas in the City of Galveston. The first is centered in the east end historical district, while the second is centered near 37th avenue and includes Galveston College, one of three institutes of higher learning on Galveston Island. With a long history and development constrained by the boundaries of the island, Galveston features compact and mixed use development and a high level of existing walking and bicycling.

Table 9 Indicator Results for Top Galveston District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	1,701	531	4.8
Children	21%	17%	6,532	-0.6
Elderly	8%	15%	1,579	1.3
Low-income households	20%	43%	560	5.1
K-12 education employment	46	338	213	5.6
Total trip attractions	6,107	34,158	348	3.7
Higher education enrollment	0	47	797	3.4
Land-use diversity	42%	49%	3,246	0.5
Employment diversity	60%	68%	1,765	1.5
Balance of households and employment	81%	93%	1,927	1.9
Existing bicycling	0	113	61	5.7
Existing walking	14	442	31	6.2
Short (work) trips	138	944	66	8.1
Transit access	0	22	1,438	2.8
Bicycle crashes	2	0	7,806	-0.7
Pedestrian crashes	0	0	5,955	-0.3
Total Score			39 th Overall	49

Galveston



Highways: SH 87 (Broadway)

Major Employers for Top Galveston District (1/2 mile radius) are: DITV, Galveston County Jail, Galveston County Sheriff, Transitional Learning Ctr and Texas Ferry-Galveston Landing.

General Galveston Observations (two districts)

- Fine street grid and block pattern provide wide sidewalks and slow traffic
- Pedestrians choose to walk in the street where safe, and most grid streets except for some collectors are low-volume enough to enable this
- Many discontinuous sidewalks where home owner stops sidewalk at their property line
- Active community street life with impromptu card games and gatherings in front yards
- Home owners take control of ROW with shade structures and yard furniture where sidewalks are missing
- Meet with neighborhood and let them tell us what can be improved
- Improve pedestrian crossing Broadway at significant pedestrian corridors like 15th street.
- Curb parking on 15th and Broadway
- Protect pedestrians by extending sidewalk and pedestrian bulbs beyond curb
- Extend crosswalk across intersection in line with sidewalk and create pedestrian refuge in Broadway
- Plant signature palm tree in extended nose of Broadway median between refuge and turning traffic
- 3 or more cars sometimes wait in the wide (30') median in preparation for left and U turns, blocking space and sightlines for crossing pedestrians. The added nose island will narrow the intersection's very wide median vehicle refuge area (currently about 75' wide) to 50' or less, retaining 1 car of storage each way
- Provide left turn queue in Broadway for cars queuing to make left turn or U turn rather than stacking in intersection as they do today
- The parking lane on Broadway is steeply sloped toward the curb starting at the outside edge of the #3 travel lane. Pedestrian bulbs will need to maintain curb drainage with raised island sidewalk bridge extensions to make the transition from lower elevation sidewalk to higher elevation roadway at St. Paul's UMC and other corners



Greater Third Ward



The Greater Third Ward districts are the home of two of Houston's institutions of higher learning, Texas Southern University and the University of Houston. This area has a high proportion of low-income households, as well as significantly high numbers of bicycle crashes.

Table 10 Indicator Results for Top Greater Third Ward District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	1,244	1,372	2.8
Children	21%	23%	3,182	0.9
Elderly	8%	15%	1,432	1.5
Low-income households	20%	67%	33	11.0
K-12 education employment	46	256	457	3.8
Total trip attractions	6,107	19,044	1,022	2.7
Higher education enrollment	0	2,944	115	7.7
Land-use diversity	42%	49%	3,160	0.5
Employment diversity	60%	80%	1	3.1
Balance of households and employment	81%	96%	1,015	2.4
Existing bicycling	0	53	313	2.5
Existing walking	14	167	448	2.0
Short (work) trips	138	168	3,942	-0.2
Transit access	0	48	262	3.8
Bicycle crashes	2	30	144	3.8
Pedestrian crashes	0	6	194	2.3
Total Score			30 th Overall	50.6

Greater Third Ward



Relevant City Council Districts: I, D

Relevant Neighborhoods-to-Standard Areas: Third Ward Completion, Tierwester/TSU on southern border)

Highways: I-45, US 59, SH 288

Major Employers for Top Greater Third Ward District (1/2 mile radius) are: Riverside General Hospital and Ryan Middle School.

Observations

- Project Row Houses is a fine example of community empowerment and involvement
- The Third Ward Community Bike Shop is an outreach of Row Houses that will let kids earn a bike and will organize programs to encourage more cycling
- Lack of sidewalks and ditch drainage-ways force walking in streets
- Active community street life spills over from front yards into streets
- There is a sense that the neighborhoods have been forgotten by the City and that the universities will inevitably take control along their edges
- Meet with neighborhood and let them tell us what is wrong
- Pedestrians choose to walk in the street where safe, and this is mostly safe except for some un-civil driving by motorists cutting through the neighborhood
- Active community street life with impromptu card games and gatherings in front yards. Good “eyes on the street”, Example: Tuam near Scott
- Home owners take control of public ROW with shade structures and yard furniture where sidewalks are missing. We spoke with one elderly homeowner who said there would probably be some willingness to give back the sidewalk right of way if the city were to offer to install sidewalks that were continuous along the blocks



Gulfton



The top-scoring Gulfton districts form a tight cluster, with the highest-scoring district centered on Benavidez Elementary School. This is an area of dense populated residential apartments and features a relatively high volume of existing walking and bicycling activity.

Table 11 Indicator Results for Top Gulfton District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	6,653	4	27.2
Children	21%	20%	5,080	0.2
Elderly	8%	1%	8,747	-2.1
Low-income households	20%	41%	684	4.7
K-12 education employment	46	247	496	3.7
Total trip attractions	6,107	37,521	286	3.8
Higher education enrollment	0	23	893	2.7
Land-use diversity	42%	68%	214	1.6
Employment diversity	60%	55%	5,953	-0.1
Balance of households and employment	81%	99%	293	2.8
Existing bicycling	0	148	22	7.5
Existing walking	14	555	7	8.0
Short (work) trips	138	1,088	23	9.7
Transit access	0	27	1,012	3.1
Bicycle crashes	2	14	835	1.4
Pedestrian crashes	0	14	33	5.8
Total Score			1 st Overall	79.8

Gulfton



Relevant City Council District: F

Relevant TIRZ: Southwest Houston

Relevant Neighborhoods-to-Standard Areas: Gulfton, (Sharpstown Completion edge)

Highways: US 59

Major Employers for Top Gulfton District (1/2 mile radius) are: Benavidez Elementary School, Cotton Surveying Co, GC Svc Ltd Partnership, Hospitality Food Svc, Houston Tuberculosis Control, I-Sector Corp, Jack Roach Ford, Jones & Carter Inc Engineers, Michael's International, Ridgways Ltd and Smith Protective Svc Inc.

Observations

- Long blocks and vast apartment complexes with controlled access limit safe crossings
- Wide public rights of way with ditches could be reconstructed with wide sidewalks
- Wide and continuous sidewalks are needed along busy streets
- Gateways and openings from private property to public sidewalks dictate the desire lines
- Obstructions in sidewalks such as METRO bus shelters conflict with walking
- Pedestrian bulb-outs at intersections can reduce the distance crossing street
- Median refuge is needed in busy streets to provide pedestrian protection and refuge, especially for strong crossing "desire lines" near markets
- Control measures such as crossing guards at school zones and pedestrian actuated pedestrian signals are needed at crossings with high traffic volume
- Corner Ramps are needed where missing to meet ADA guidelines
- Drainage ditches and gutters along curbing are barriers to meeting ADA guidelines at street corners
- Mid block crossings are needed where blocks are longer than 500'

Magnolia Park



Magnolia Park borders the Houston Ship Channel near some of the first wharves built when Houston became a deep-water port in 1913, and for a time was an incorporated municipality. Magnolia Park is a center of Houston's Hispanic community, especially around recently revived commercial areas near Harrisburg and Wayside.

Table 12 Indicator Results for Top Magnolia Park District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	2,513	138	8.5
Children	21%	23%	3,031	1.0
Elderly	8%	10%	3,346	0.1
Low-income households	20%	41%	705	4.6
K-12 education employment	46	307	283	4.9
Total trip attractions	6,107	20,257	918	2.8
Higher education enrollment	0	61	755	3.7
Land-use diversity	42%	68%	209	1.6
Employment diversity	60%	74%	293	2.3
Balance of households and employment	81%	99%	267	2.8
Existing bicycling	0	20	971	0.6
Existing walking	14	140	584	1.6
Short (work) trips	138	216	3,051	0.3
Transit access	0	49	248	3.8
Bicycle crashes	2	12	1,098	1.1
Pedestrian crashes	0	8	100	3.2
Total Score			85 th Overall	42.9

Magnolia Park



Relevant City Council District: I

Relevant Neighborhoods-to-Standard Areas: Magnolia Park, Oakland/Fuller

Highways: US 90 Alt (Wayside Dr.)

Major Employer for Top Magnolia Park District (1/2 mile radius) is: Edison Middle School

Observations

- Slow streets – low volume traffic allows walking safely in streets
- Narrow sidewalks work for individuals but not for groups of two or more to walk side by side
- Old sidewalks are broken and in need of repair for smooth surface to accommodate strollers and grocery carts for walking to store
- Wide and continuous sidewalks are needed along busy streets
- Obstructions in sidewalks such as utility poles and METRO bus shelters conflict with walking
- Corner Ramps are needed where missing to meet ADA guidelines
- Drainage ditches and gutters along curbing are barriers to meeting ADA guidelines at street corners
- Planting strip width between sidewalk and curb allows green space for trees to mature without roots breaking sidewalk

Montrose



The Montrose area districts feature a large number of short work trips susceptible to conversion to bicycling and walking, as well as a relatively high level of existing walking and bicycling. The University of St. Thomas is in this area, and the study area is at the edge of the Museum District, including the Menil Collection, the Houston Center for Photography, the Rothko Chapel, and other attractions.

Table 13 Indicator Results for Top Montrose District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	1,980	311	6.1
Children	21%	5%	8,614	-3.9
Elderly	8%	4%	7,132	-1.4
Low-income households	20%	27%	2,682	1.4
K-12 education employment	46	388	126	6.7
Total trip attractions	6,107	36,150	311	3.8
Higher education enrollment	0	2,880	120	7.7
Land-use diversity	42%	54%	2,142	0.8
Employment diversity	60%	68%	1,650	1.6
Balance of households and employment	81%	97%	778	2.5
Existing bicycling	0	174	7	8.9
Existing walking	14	337	89	4.6
Short (work) trips	138	1,149	10	10.3
Transit access	0	50	230	3.9
Bicycle crashes	2	26	195	3.2
Pedestrian crashes	0	6	194	2.3
Total Score			11 th Overall	58.5

Montrose



Relevant City Council District: D

Relevant Neighborhoods-to-Standard Areas: Castle Court, Westmoreland/Audubon Place

Highways: US 59, Spur 527

Major Employers for Top Montrose District (1/2 mile radius) are: Annunciation Orthodox School, Central College, Covenant House-Texas, Kroger Food Store, Red Sky and University of St. Thomas.

Observations

- Slow streets, fine grid and mature shade trees provide excellent environment for walking
- Sidewalks need repair and are too narrow for two people to walk side by side
- Joggers run in street alongside parked cars
- Bottlenecks at parked cars
- Need wider sidewalks along busy streets
- OK to walk in street where traffic volumes are low speeds slow
- Sidewalks fit one person
- Good mix of residential and commercial uses encourage biking and walking trips
- St. Thomas University and Menil Collection create cultural center that attracts pedestrian and cycling activity
- Gate at end of Lovett Boulevard to exclusive Courtland Place discourages strolling

Near Northside



The Near Northside neighborhood (also known as Northside Village), is largely single-family residential with large apartment complexes. The Davis High School-Marshall Middle School-Carnegie Library complex in the southern part of the community is an important gathering place and is the center of the top-scoring district.

Table 14 Indicator Results for Top Near Northside District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	2,143	242	6.8
Children	21%	21%	4,237	0.5
Elderly	8%	9%	4,120	-0.2
Low-income households	20%	51%	234	7.2
K-12 education employment	46	647	20	12.2
Total trip attractions	6,107	21,749	798	2.9
Higher education enrollment	0	0	5,156	-0.7
Land-use diversity	42%	60%	1,124	1.1
Employment diversity	60%	71%	706	2.0
Balance of households and employment	81%	99%	218	2.8
Existing bicycling	0	22	866	0.8
Existing walking	14	152	518	1.7
Short (work) trips	138	304	1,859	1.3
Transit access	0	84	49	4.6
Bicycle crashes	2	29	158	3.6
Pedestrian crashes	0	9	81	3.6
Total Score			32 nd Overall	50.2

Near Northside



Relevant City Council District: H

Relevant Neighborhoods-to-Standard Areas: Near Northside, North Central

Highways: None

Major Employers for Top Near Northside District (1/2 mile radius) are: Fiesta Mart Inc, Jefferson Davis High School and Marshall Middle School.

Observations

- North Main is six lanes 60' wide with 8'-6" flush sidewalk / buffer area.
- Railroad underpass creates a bottleneck on North Main reducing it to two lanes – bicycle safety could be improved with a bicyclist-activate flashing light “bicycle in tunnel when flashing”
- While waiting for the implementation of the METRO LRT plan for North Main, implement an interim plan to restripe North Main to four 12' lanes with two 6' bike lanes. Alternatively, 5-lane non-bike-lane configuration with 15' outside lanes, 10' inside lanes, and a 10' center turn lane. Choice depends on priority of curbside parking vs. left turn storage needs. 15-foot outside lane would let cars and bikes pass buses in the curb lane.
- North Main has been widened at the expense of the pedestrian zone - Only 8' exists between curb and property line for sidewalk
- Quitman is a 36' wide roadway that could be converted to two 6' bike lanes and two 12' main lanes (with 2-foot grass strip and 4' sidewalk on each side)
- Slow streets – low volume traffic allows walking safely in streets
- Narrow sidewalks work for individuals but not for groups of two or more to walk side by side. 5-foot (comfortable for 2 adults) should be standard throughout the region, with 7.5 feet where 2 persons frequently walk together and are passed by others (as in school areas).
- Drainage ditches and gutters along curbing are barriers to meeting ADA guidelines at street corners
- On “ditch drainage” streets where driveways bridge the ditch, vehicles parked on the driveway bridges can block the sidewalk. This depends on the width of the ditch; at 13' (example: McKee Street has 13' driveway bridges, and vehicles (about 16' long) often block the 4.5-foot sidewalk beyond.

Pecan Park



Pecan Park is a pre-World War II single-family residential community located just south of Harrisburg. Its close proximity to the Port of Houston made it a popular location for workers in the ship channel industries. Commercial development is located on the edges of the neighborhood along the freeways. A large apartment complex in the south, originally built for adults only, is now the home of hundreds of families with school-age children. The influx of young families has prompted the construction of two new schools for the community. Pecan Park scores high as a result of this high population density, with significant numbers of children and K-12 education employment.

Table 15 Indicator Results for Top Pecan Park District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	5,216	10	20.7
Children	21%	25%	1,845	1.4
Elderly	8%	2%	8,424	-1.9
Low-income households	20%	37%	1,065	3.7
K-12 education employment	46	335	218	5.5
Total trip attractions	6,107	19,275	995	2.7
Higher education enrollment	0	223	574	5.0
Land-use diversity	42%	38%	5,359	-0.1
Employment diversity	60%	70%	1,178	1.8
Balance of households and employment	81%	77%	5,499	-0.3
Existing bicycling	0	13	1,486	0.3
Existing walking	14	137	605	1.5
Short (work) trips	138	393	1,123	2.2
Transit access	0	17	1,902	2.5
Bicycle crashes	2	14	835	1.4
Pedestrian crashes	0	5	262	1.9
Total Score			47 th Overall	48.3

Pecan Park



Relevant City Council District: I

Relevant TIRZ: (Gulfgate, just a sliver along I-45)

Highways: I-610, I-45

Relevant Neighborhoods-to-Standard Areas: Pecan Park, (Park Place south of I-610)

Major Employers for Top Pecan Park District (1/2 mile radius) are: Deady Middle School, Raul Yzagura School-Success and Sellers Brothers Food Market.

Observations

- Office City Boulevard needs street trees to provide shade for sidewalks
- Office City Boulevard entrance to apartments creates a four way stop that should be modified to improve safety for pedestrian crossing, especially children crossing from apartments to elementary school and stores (suggestion include reconstructing as a roundabout and/or relocating the driveway to the apartment away from the intersection). Because of the 2-lane approaches, 2-lane departures, and fairly high right and left turn volumes at this intersection, we observed several pedestrians – including children – having difficulty deciding when to safely cross the street from the apartment side to the retail on the far side.
- A single-lane roundabout may be more than adequate to replace the multilane 4-way stop control because it appears that the 2-lane approaches are only needed for a few car lengths of storage, not for mid-block capacity. Single lane modern roundabouts can dramatically improve pedestrian safety and reduce vehicle collisions compared to multilane 4-way stops. Because of the level terrain, existing street widths (44' and 60') and because there are no buildings anywhere near the corners, it appears that a roundabout retrofit would be fairly straightforward
- Depending on east-west volume, consider a 4-to-3 “Road Diet” for Office City Boulevard that would replace the 2-lane each way configuration with 1 lane each way plus bike lanes plus wide planted median
- Mid block crossings are needed where blocks are longer than 500', for example on the block just east of the above-mentioned intersection where the crossing would still be along the north-side apartment complex frontage, and still along the south-side retail frontage.
- Evergreen near Dahlia: 4 lane arterial with raised median. Currently all 4 lanes are 12' wide. Suggest shifting the lane line to widen outside lane at expense of inside lane, perhaps to 14'/10' or 13.5'/10.5'. This would make the outside lane much more comfortable for the cyclists we saw using the street.
- Heminger at Claremont: Major defects in corner sidewalks

Sharpstown



The top Sharpstown districts are adjacent or overlapping with the Gulfton area and share many of the same characteristics as those districts. A separate cluster of districts is located just west of Gessner road, between Bellaire and Alief roads, and it is this cluster that is highlighted in **Table 16**.

Table 16 Indicator Results for Top Non-Fringe Sharpstown District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	3,646	44	13.6
Children	21%	16%	6,934	-0.9
Elderly	8%	3%	7,742	-1.6
Low-income households	20%	33%	1,556	2.7
K-12 education employment	46	115	2,088	0.9
Total trip attractions	6,107	20,226	922	2.8
Higher education enrollment	0	33	852	3.0
Land-use diversity	42%	58%	1,383	1.0
Employment diversity	60%	58%	5,262	0.2
Balance of households and employment	81%	100%	32	2.9
Existing bicycling	0	92	117	4.5
Existing walking	14	324	98	4.4
Short (work) trips	138	669	237	5.2
Transit access	0	26	1,087	3.0
Bicycle crashes	2	11	1,253	0.9
Pedestrian crashes	0	5	262	1.9
Total Score			69 th Overall	44.5

Sharpstown



Relevant City Council District: F

Relevant TIRZ: Southwest Houston

Relevant Neighborhoods-to-Standard Areas: Sharpstown, Sharpstown II

Highways: None

Major Employers for Top non-fringe Sharpstown District (1/2 mile radius) are: Bank United, Fiesta Mart Inc, Mariner Health-Southwest and Texas First National Bank

Observations

- Utility corridors and drainage-ways should be retrofitted with all-weather trails to encourage *safe* walking and cycling from homes to schools, commercial areas and METRO bus routes
- The levee greenways are already used as informal north-south travel corridors by walkers and cyclists to reach destinations on east-west streets that would otherwise require a long detour around the ends of neighborhoods. With relatively simple median refuge and/or curb bulb improvements where the levee greenways are bridged by east-west streets, off-street north-south continuity could be provided. Coordination with community, property owners, flood control and police would be essential.
- The south end of the district's major north-south levee greenway corridor is fairly close to the proposed future location of a major transit hub that will serve this district. A levee trail could safely and directly convey transit users to the heart of their neighborhoods.
- METRO Bellaire bus service needs to provide gracious safe bus stations with secure bike storage at shelters
- Properties around Sharpstown Mall should be repositioned as pedestrian oriented village with housing, shopping and employment opportunities
- Ethnic shopping centers along north side of Bellaire need to be interconnected with pathways to provide safe walking and cycling access between shopping centers
- Fences along apartment complexes prevent access to logical walkway connections between properties and along public streets
- High density apartments and open space between golf courses, schools and parks create great potential for interconnected system of trails to encourage walking and cycling trips

Westwood



Westwood is located just inside Beltway 8 at the Southwest Freeway. Westwood Mall, a former shopping center that has been converted into a business center, is located on Bissonnet at the southern portion of the high-scoring districts. The area is primarily commercial and multi-family residential. Population density was a major factor in the high score for this area.

Table 17 Indicator Results for Top Westwood District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	5,874	7	23.7
Children	21%	21%	4,263	0.5
Elderly	8%	1%	8,616	-2.0
Low-income households	20%	33%	1,520	2.8
K-12 education employment	46	87	2,952	0.3
Total trip attractions	6,107	29,500	457	3.4
Higher education enrollment	0	0	5,156	-0.7
Land-use diversity	42%	62%	864	1.2
Employment diversity	60%	62%	3,730	0.8
Balance of households and employment	81%	98%	507	2.7
Existing bicycling	0	51	330	2.3
Existing walking	14	227	226	2.9
Short (work) trips	138	355	1,396	1.8
Transit access	0	23	1,344	2.8
Bicycle crashes	2	10	1,429	0.8
Pedestrian crashes	0	3	640	1.0
Total Score			71 st Overall	44.3

Relevant City Council District: F, (C)

Relevant TIRZ: Southwest Houston

Relevant Neighborhoods-to-Standard Areas: Sharpstown

Highways: Beltway 8

Westwood



Major Employers for Top Westwood District (1/2 mile radius) are: Auto Management Inc, Message Pro, Thermo Flow Automation and Thermo Polysonics.

Observations

- Utility corridors and drainage-ways should be retrofitted with all weather trails to encourage walking and cycling from homes to schools, commercial areas and METRO bus routes
- Brays Bayou flood detention areas need to be connected to apartment complexes and single family homes with pathways to encourage purposeful and recreational use from ones home
- Old Westwood Country Club and greenways into neighborhood can be improved as additional recreational trails and park facilities
- Fences along apartment complexes prevent access to logical walkway connections between properties
- High density apartments and open space between golf courses, schools and parks create great potential for interconnected system of trails to encourage walking and cycling trips
- At 2 apartment complexes on Club Creek Drive, high iron fences apparently added to create a security perimeter span the public sidewalk, forcing through pedestrians walking along the collector street to walk in the street. Examine legality of this fence alignment, and move the fence line to back of public sidewalk if current alignment is illegal.
- Opportunities to reduce crossing distance across apartment complex entrance streets and major driveways through use of corner bulbs and small median refuges
- Examine traffic volume on Club Creek Drive to determine whether 4-lane segments can be changed to 3-lane plus bike lanes. Observed volume does not appear to warrant 4-lane configuration Bellwood at Rancheater.
- Busy wide driveway serving large apartment complex driveway, right turn in/out configuration. Could improve pedestrian safety for walkers along major street by (a) adding median islands on the apartment driveway axis, (b) adding a thin island on the street side of the crosswalk to define the right turn in/out movements and provide refuge for crossing walkers



Woodlake/Briar Meadow



The top scoring districts of this Super Neighborhood are those closest to the Gulfton area, but although population and existing bicycling and walking are the major contributors to this district's score, higher education enrollment is also significant. The district shown in **Table 18** is the second highest scoring district in this district area, since it is more distinct from the Gulfton area districts.

Table 18 Indicator Results for Top Non-Fringe Woodlake/Briar Meadow District

Indicator	Median for all districts	Value for this district	Rank	Contribution to Score
Population	471	3,564	47	13.2
Children	21%	14%	7,383	-1.3
Elderly	8%	1%	8,625	-2.0
Low-income households	20%	29%	2,363	1.7
K-12 education employment	46	150	1,411	1.6
Total trip attractions	6,107	33,878	358	3.7
Higher education enrollment	0	1,160	284	6.8
Land-use diversity	42%	59%	1,176	1.1
Employment diversity	60%	59%	5,009	0.3
Balance of households and employment	81%	94%	1,422	2.1
Existing bicycling	0	146	25	7.4
Existing walking	14	325	96	4.4
Short (work) trips	138	953	59	8.2
Transit access	0	16	2,005	2.4
Bicycle crashes	2	16	608	1.7
Pedestrian crashes	0	11	57	4.5
Total Score			19 th Overall	55.8

Woodlake/Briar Meadow



Relevant City Council District: C, (F)

Relevant TIRZ: Southwest Houston

Relevant Neighborhoods-to-Standard Areas: Gulfton (South Edge)

Highways: US 59, Urban Road 1093 (Westheimer Rd)

Major Employers for second Woodlake/Briar Meadow District (1/2 mile radius) are: Hospitality Food Svc, Houston Indoor Flea Market, Houston Tuberculosis Control, Lee Senior High School, Maxim's Catering, Pappasito's Cantina, Richmond Room, Seafood Wholesale, Smith Protective Svc Inc, T Town 2000, Whelan Security Co. Inc. and Zindler Service Co.

Observations

- Long blocks and vast apartment complexes with controlled access limit safe crossings
- Narrow sidewalks prohibit groups of two or more from walking side by side
- Wide and continuous sidewalks are needed along busy streets
- Sidewalks are missing in areas where it is unsafe to walk in the street
- Obstructions in sidewalks such as utility poles and METRO bus shelters conflict with walking
- Pedestrian bulb-outs at intersections in curb side parking dimension can reduce the distance crossing street
- Median refuge is needed in busy streets to provide pedestrian protection and refuge
- Control measures such as crossing guards at school zones and pedestrian actuated pedestrian signals are needed at crossings with high traffic volume
- Corner Ramps are needed where missing to meet ADA guidelines
- Drainage ditches and gutters along curbing are barriers to meeting ADA guidelines at street corners
- Mid block crossings are needed where blocks are longer than 500'



Top Districts by County

While the first aim of the methodology was to identify districts throughout the 8-county transportation planning area, it can also be adapted to look at sub-areas within the study area. One example is to look at the high-ranking districts in each county separately. This allows the most promising districts or neighborhoods in the suburban counties to be identified without undue comparison to their neighbors. This could be a useful tool to prioritize bicycle and pedestrian improvements at the county level.

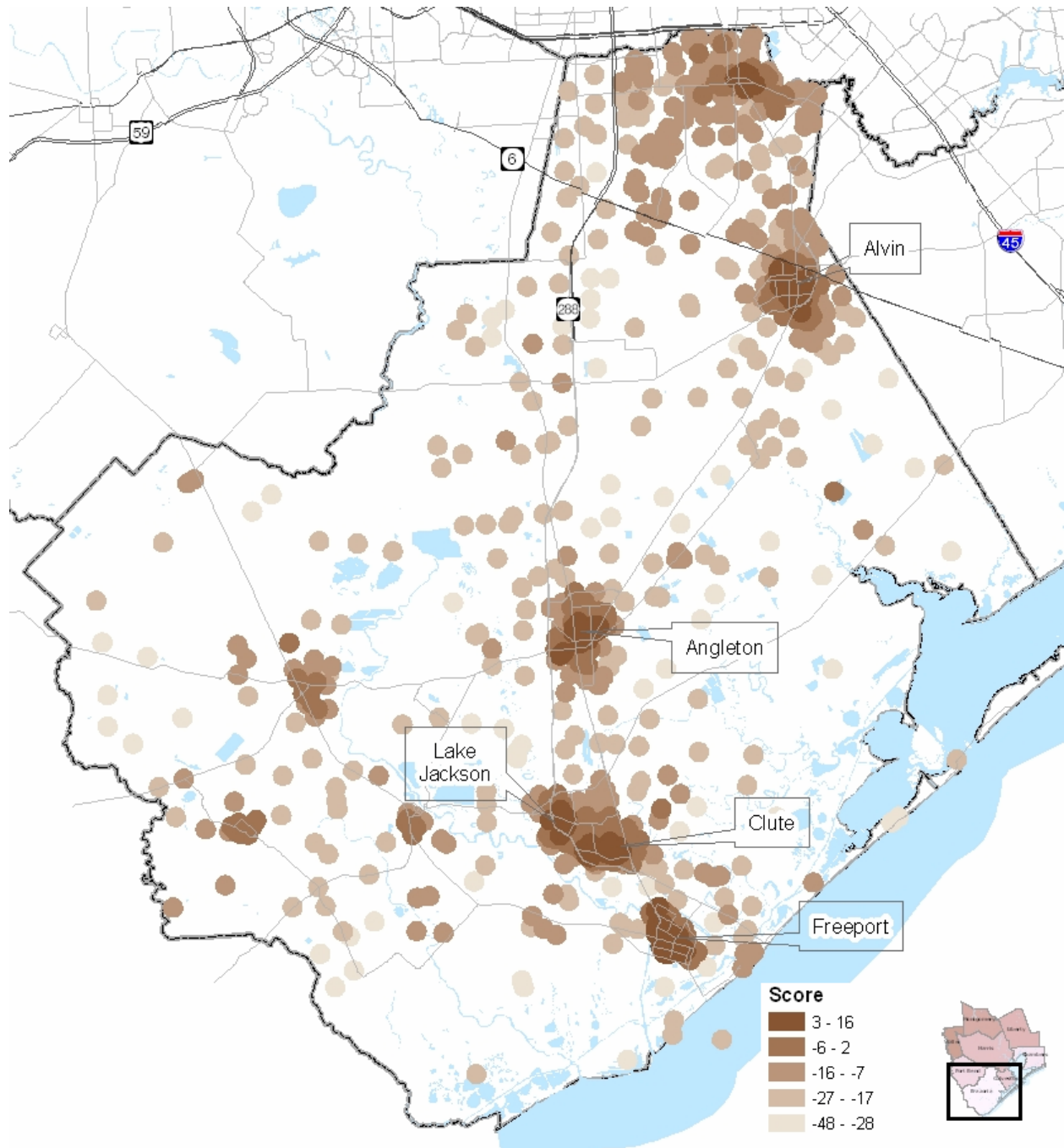
In this section we present the top districts and places (cities) within each of the 8 counties. The same indicators and scoring system is used for each county as was used for the 8-county region. Essentially what we did was take the 8-county analysis and remove the other seven counties from the results. As a result, the scores still reflect the 8-county population from which they were derived, where a score below zero means it falls below the mean of all 9,219 districts. However, the rank within the county is also shown. An alternative way would be to take the data for each county separately and rerun the analysis for each county separately. If a more detailed study of the bicycling and pedestrian potential was being conducted in each county, one could certainly revisit the weights to reflect local concerns and realities. For example, using transit access as an indicator is less useful in a county that has demand-response transit only throughout the county.

For each county, a table is provided showing the top 5 neighborhoods (district areas, usually defined as incorporated places), the rank of the top district in that neighborhood among all the districts in the county and the score. Since the score was determined for all 8 counties, negative scores represent scores below the average for all the districts in the 8-county region.

Higher resolution maps showing all districts for each county, with their scores and the clusters of high-scoring districts labeled, can be found as a supplement to this report in Maps M-30 to M-37.

Brazoria County

Brazoria County has a Census 2000 population of 242,000. Pearland and the surrounding area make up about 35 percent of the county's population, followed by Lake Jackson and Alvin. The top ranked areas for bicycle and pedestrian trip conversion and safety improvements are in Alvin, Freeport, Angleton, Clute and Lake Jackson.

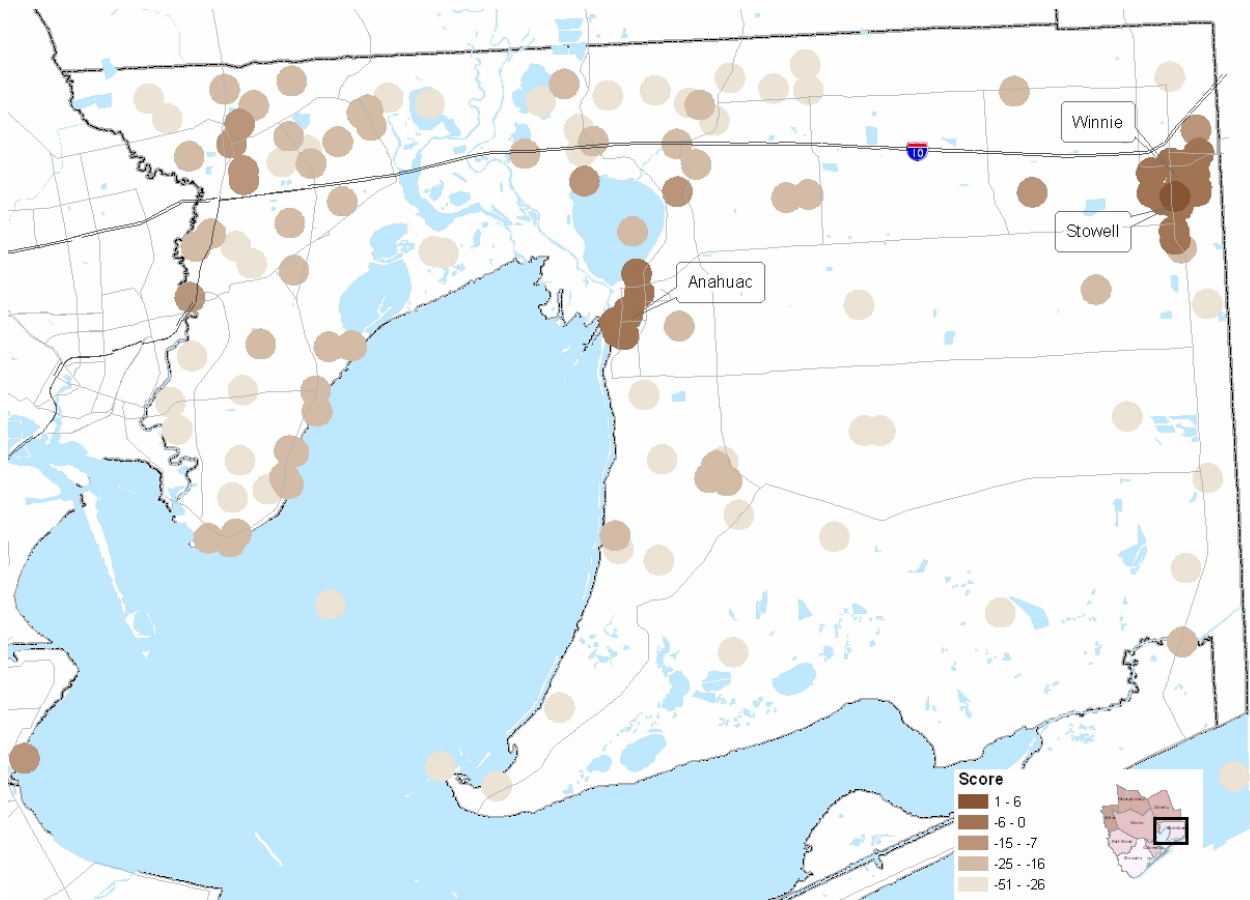


Rank in 728 Brazoria Districts	District Name	Location	Score
1	TAZ 1614	Alvin	16
4	Arrington Park	Freeport	13
11	Block Group 396623003	Angleton	11
23	TAZ 1776	Clute	9
38	DISTINCTIVE DENTAL SVC +	Lake Jackson	7



Chambers County

Chambers County has a Census 2000 population of 26,000 making it the least populated county in the 8-county study area. It is a largely rural county with several important wildlife areas. The highest scoring areas for potential for bicycle and pedestrian trip conversion and safety improvements (at the district level) are in communities of Winnie-Stowell and Anahuac. Because of the small size of this county, only the top 3 districts are shown.

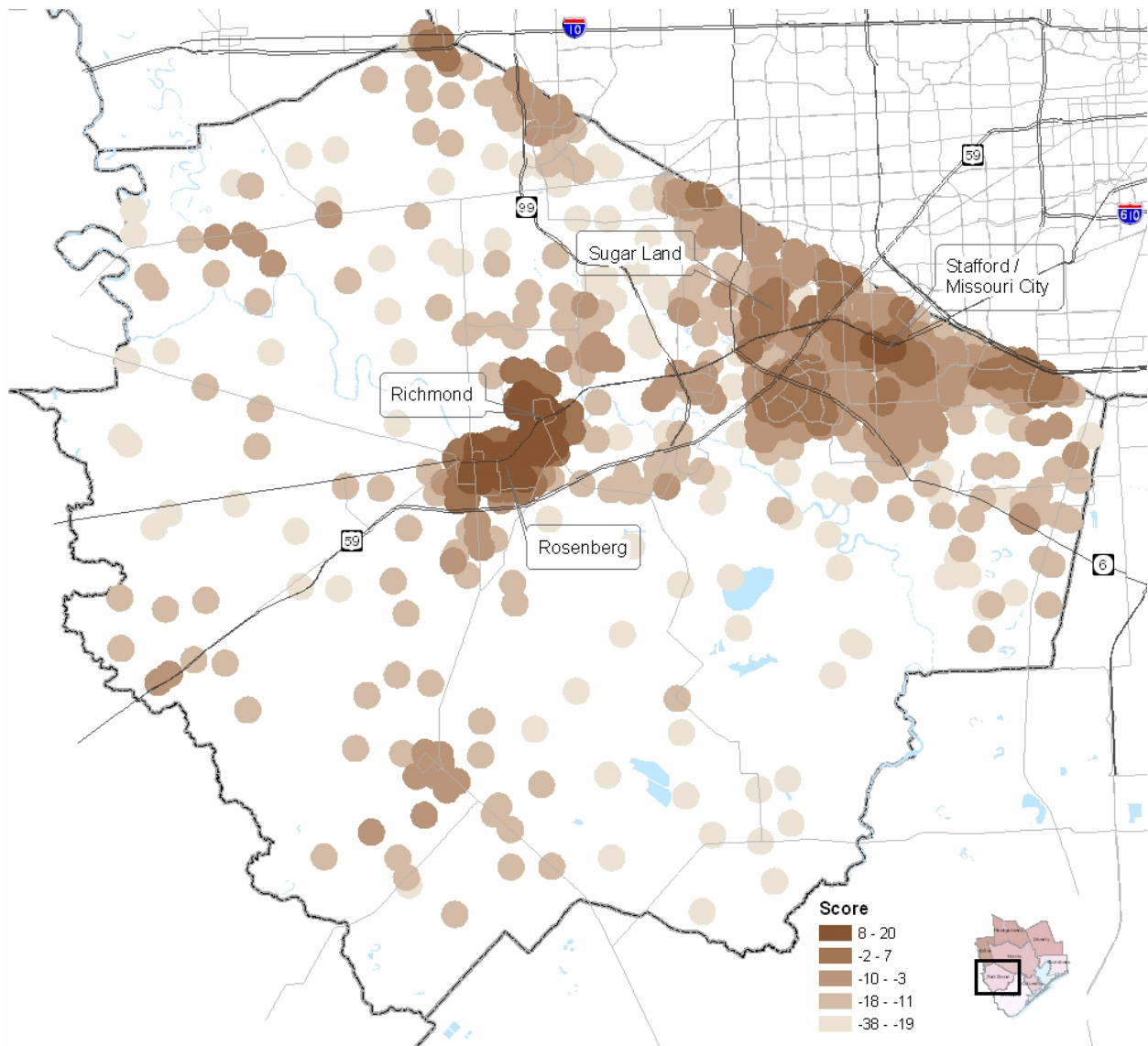


Rank in 128 Chambers Districts	District Name	Location	Score
1	EAST CHAMBERS HIGH SCHOOL	Winnie	6
2	Chambers Memorial Hospital	Anahuac	0
3	Winnie Stowell Park	Winnie	-2

Fort Bend County

Fort Bend County has a Census 2000 population of 354,000, making it the 10th largest county in the state of Texas. The most populated places are on the periphery of Houston, including Sugar Land with 63,000 people in the incorporated area, followed by Missouri City and the portion of

the City of Houston in Fort Bend County. However the highest scoring areas for potential for bicycle and pedestrian trip conversion and safety improvements are in the center of the county, in the Richmond/Rosenberg area. An unincorporated portion of the Stafford-Missouri City area (at



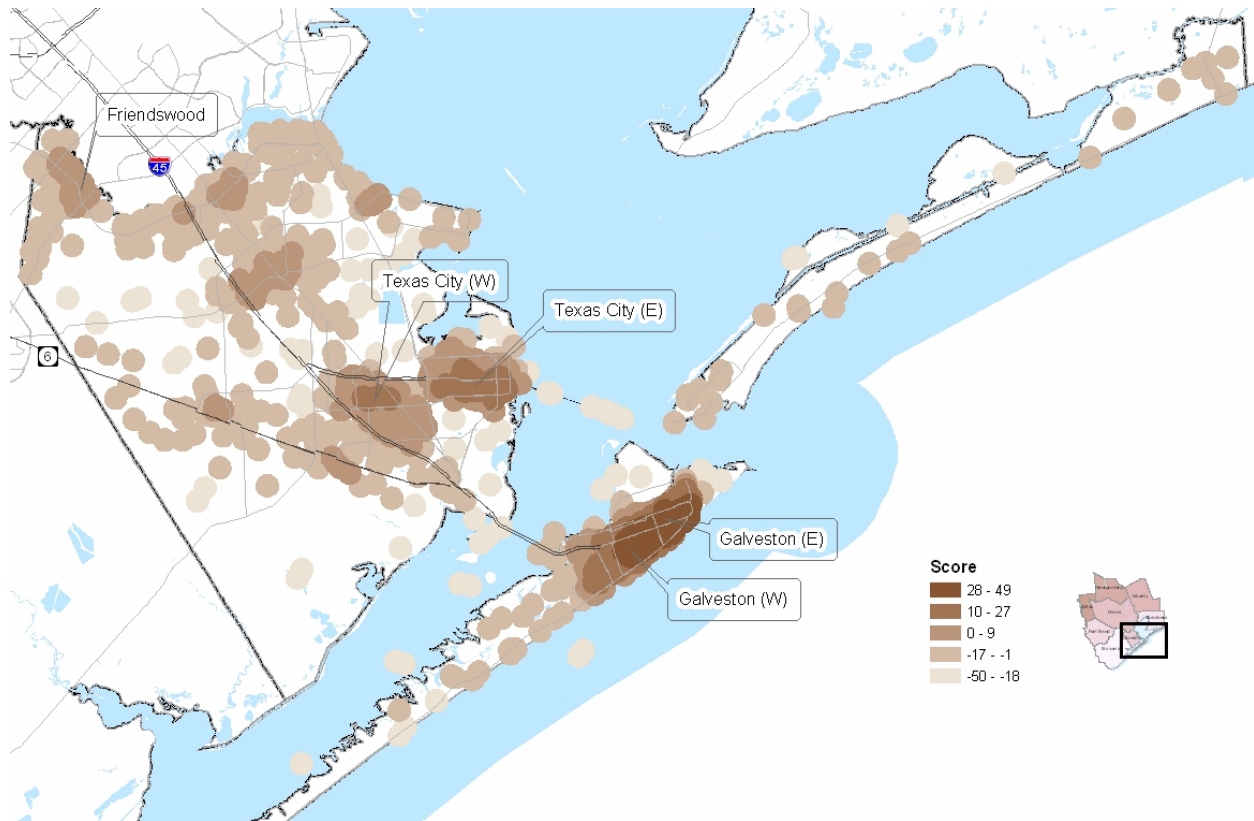
FM-1092 & US-90-Alt) is the location of another cluster of high-scoring districts.

Rank in 730 Fort Bend Districts	District Name	Location	Score
1	Block Group 1576749005	Richmond	20
3	TAZ 1964	Rosenberg	18
14	RICHMOND STATE SCHOOL	Rural Rosenberg-Richmond	14
43	Block Group 1576713001	Rural Stafford-Missouri City	9
49	TAZ 1820	Stafford	8



Galveston County

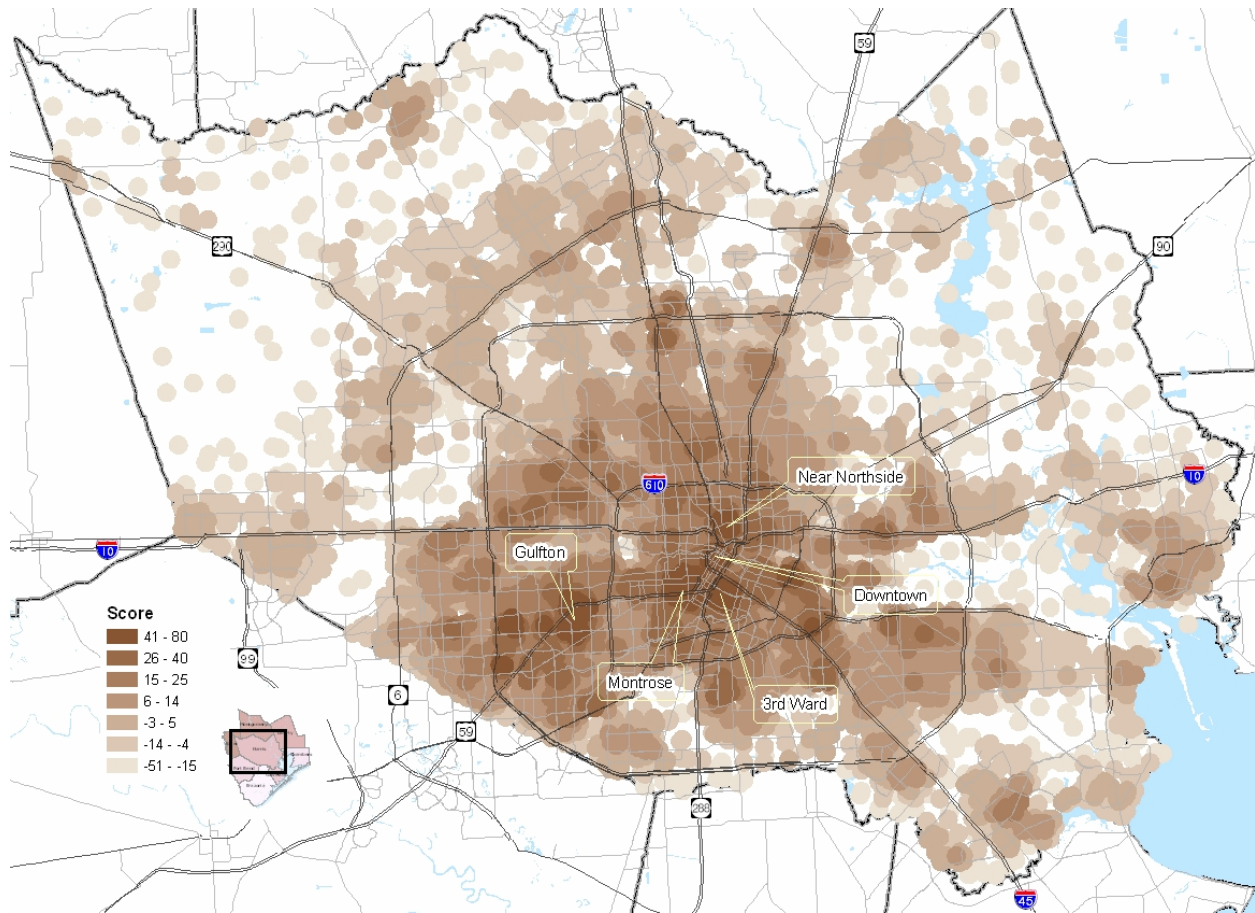
Galveston County has a 2000 Census population of 250,000, approximately one-quarter of which resides in the City of Galveston on Galveston Island. The next most populated places are League City, Texas City and Friendswood. High scoring districts, representing potential for bicycle and pedestrian trip conversion and safety improvements, were clustered in two separate areas of Galveston and two separate areas of Texas City. The districts in the city of Galveston were among the top 12 for the entire region and are described in more detail elsewhere in this report.



Rank in 756 Galveston Districts	District Name	Location	Score
1	Broadway Church +	Galveston (East)	49
4	TAZ 2568	Galveston (West)	43
101	TRAVIS CITY HIGH SCHOOL +	Texas City (East)	16
112	TAZ 2489	Texas City (West)	14
194	BIOELECTRONICS	Friendswood	6

Harris County

Harris County has a 2000 Census population of 3,401,000. It is the most populous county in the state, and has the vast majority of the population and employment for the 8-county region. The majority (56 percent) of the population resides in Houston. Most of the highest scoring districts in the region with respect to potential for bicycle and pedestrian trip conversion and safety improvements are found in Harris county and in the City of Houston, and are described in detail elsewhere in this report.

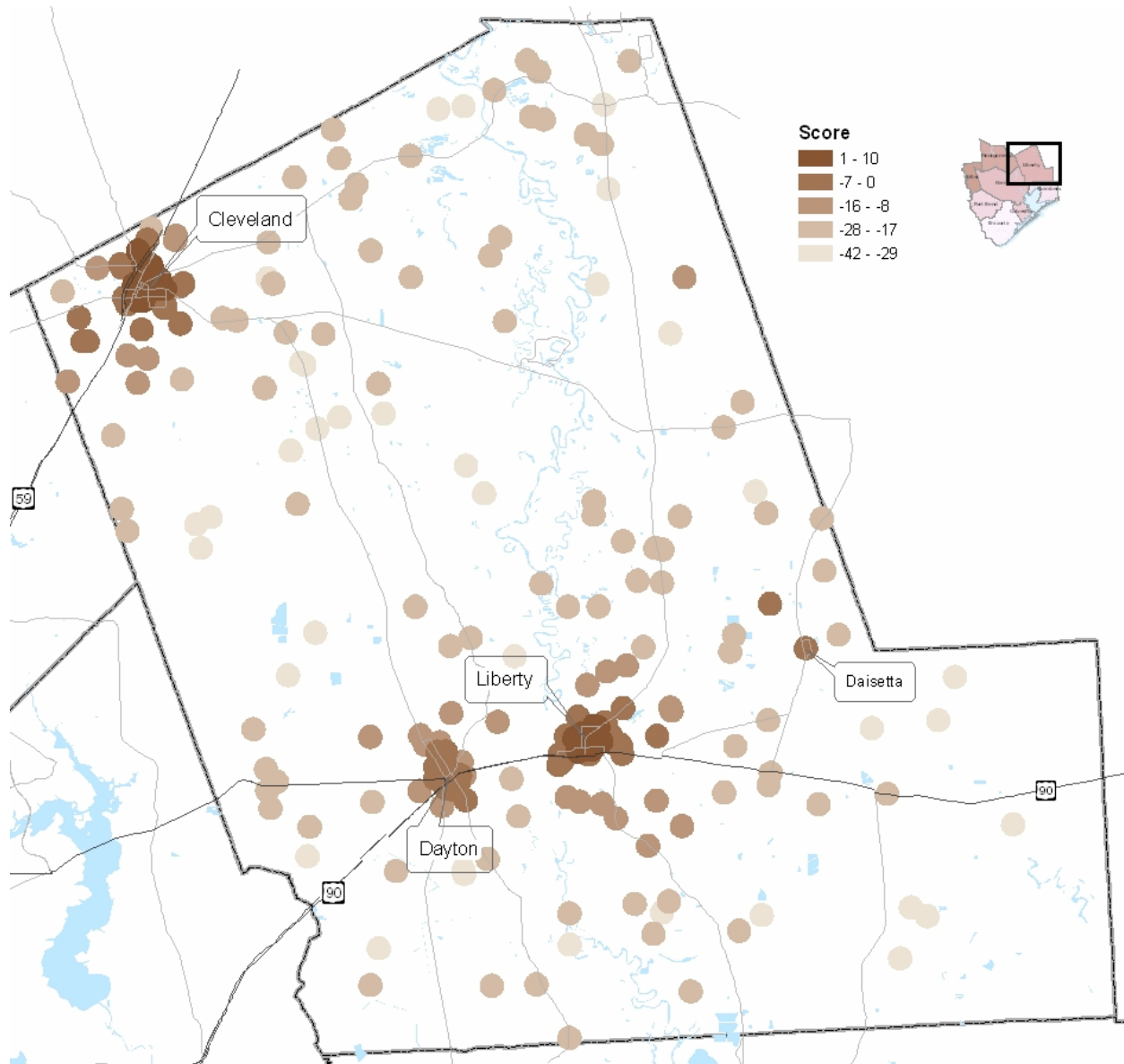


Rank in 5,783 Harris Districts	District Name	Location	Score
1	Benavidez Elementary School +	Gulfton	80
10	Christus Southwest Comm Health +	Sharpstown	61
11	Rothko Chapel	Montrose	58
17	Block Group 2014327005	Woodlake/Briarmeadow	56
30	Riverside General Hospital +	Greater Third Ward	51



Liberty County

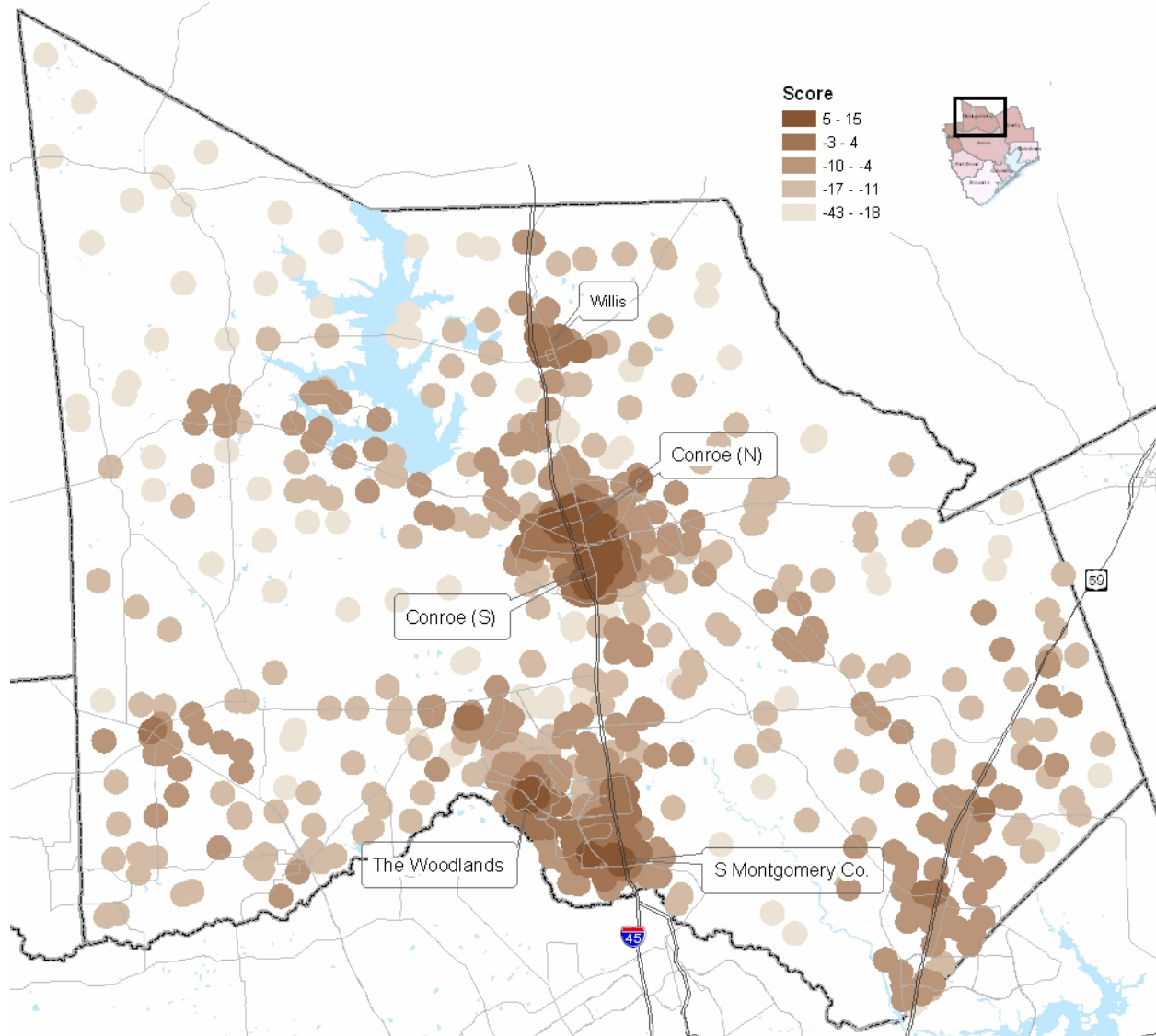
Liberty County has a 2000 Census population of 70,000. The county seat and largest city is Liberty, but the majority of the population lives in the unincorporated areas of the county. With respect to potential for bicycle and pedestrian trip conversion and safety improvements, the highest scoring district, with numerous districts surrounding it, is located in Cleveland in the north part of the county.



Rank in 229 Liberty Districts	District Name	Location	Score
1	TAZ 2283	Cleveland	10
2	BAPTIST HOSPITAL LIBERTY +	Liberty	9
37	FREDDA NOTTINGHAM EL	Dayton	0
46	TAZ 2286	Uninc. Cleveland	-2
55	DAISETTA WATER & GAS DEPT +	Daisetta	-5

Montgomery County

Montgomery County has a 2000 Census population of 294,000. Interstate 45 runs through the county and much of the population growth in the county is occurring in this corridor. The districts with the highest scoring, representing the greatest potential for bicycle and pedestrian trip conversion and safety improvements were in Conroe (two areas), the Woodlands and in the area near I-45 at the southern portion of the county.

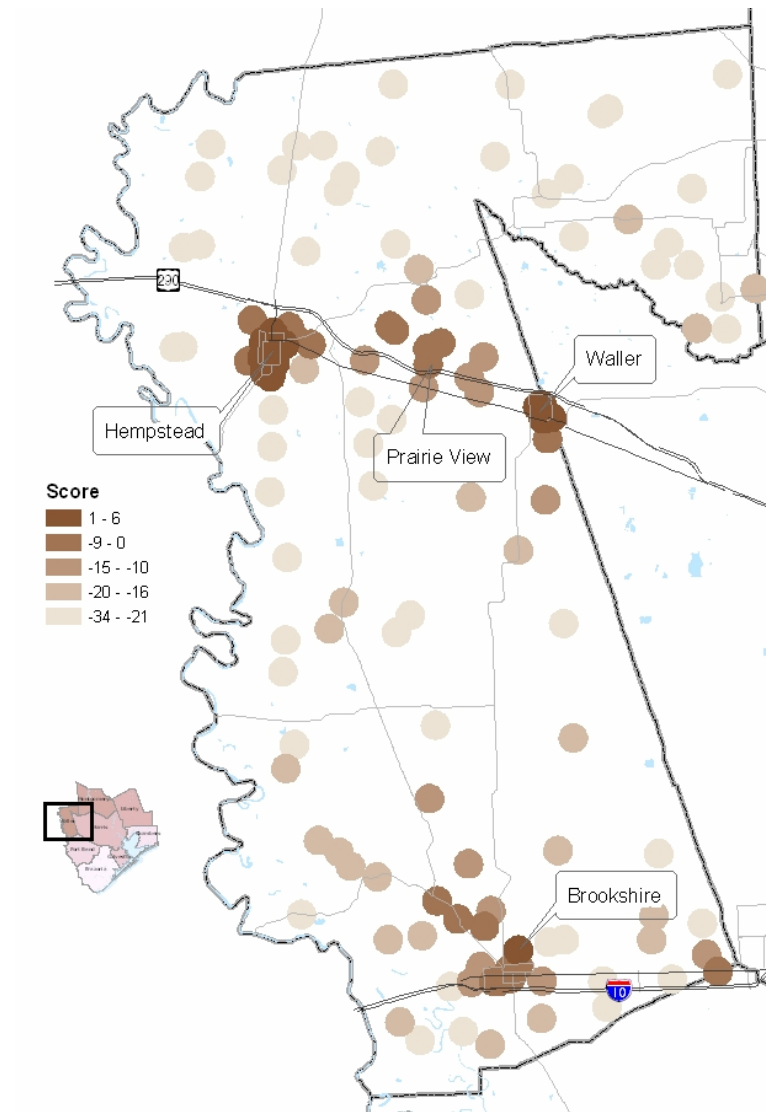


Rank in 708 Montgomery Districts	District Name	Location	Score
1	Block Group 3396934002	Conroe (S)	15
7	US POST OFFICE	The Woodlands	10
12	TAZ 2152	Conroe (N)	9
13	25329 INTERSTATE 45 +	S Montgomery County	9
68	TODD'S SCHOOL OF MERIT	Willis	3



Waller County

Waller County has a 2000 Census population of 33,000, the second least populated county in the 8-county region after Chambers County. Hempstead and Prairie View are the two largest communities by population. The districts with the highest scores, representing the greatest potential for bicycle and pedestrian trip conversion and safety improvements were in Waller, Brookshire, Hempstead and Prairie View.



Rank in 130 Waller Districts	District Name	Location	Score
1	WALLER JUNIOR HIGH SCHOOL +	Waller	6
4	HIGHWAYS & PUBLIC TRANS DEPT +	Brookshire	3
6	HEMPSTEAD SPECIAL EDUCATION	Hempstead	3
18	JONES ELEMENTARY	Prairie View	-3



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