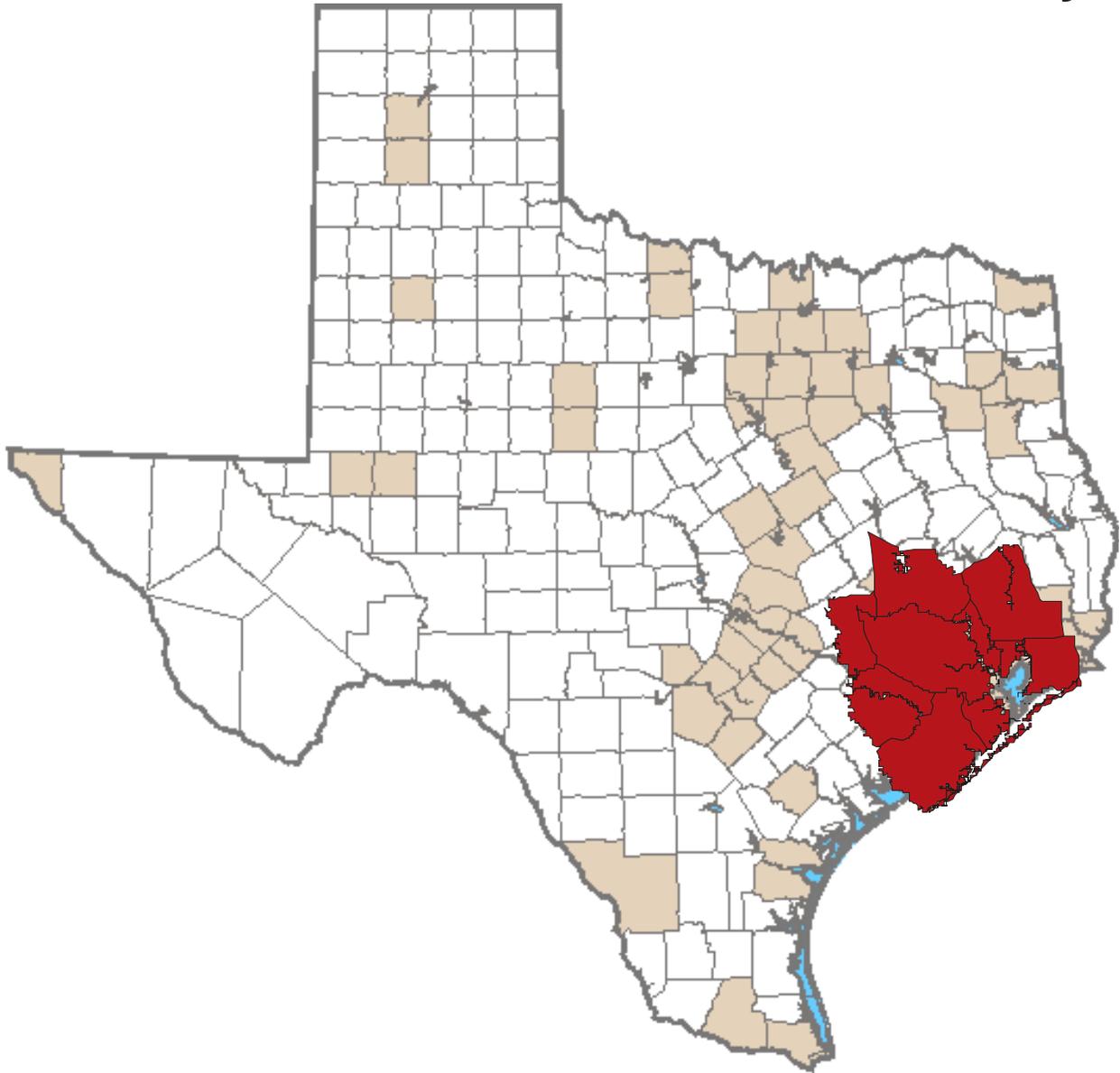


2010/2011 H-GAC Work Place Travel Survey Technical Summary



Prepared by the
Texas A&M Transportation Institute
May 2013

**2010/2011
Houston-Galveston Area Council (H-GAC)
Work Place and Special Generator Travel Survey**

TECHNICAL SUMMARY

Texas Department of Transportation Travel Survey Program

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INTRODUCTION

In 2010, the Transportation Planning and Programming (TPP) Division of the Texas Department of Transportation (TxDOT) sponsored a comprehensive set of travel surveys in the Houston-Galveston Area. The Houston-Galveston Area Council (H-GAC) serves as the Metropolitan Planning Organization (MPO) for transportation planning in eight counties, which include Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. The purpose of the surveys was to collect data and information needed as input to the H-GAC travel demand model to forecast traffic levels on area roadways, evaluate the region's transportation plan, and aid in the region's air quality conformity analyses. Most urbanized areas in Texas (as well as in the U.S. and abroad) rely on travel forecasting models as a tool in their transportation planning and air quality analysis efforts. Since modeling results may be used in determining the conformity or non-conformity status of transportation plans to federal clean air regulations, the use of accurate and up-to-date data from the regional travel surveys is important to TxDOT and MPOs across the state.

This report summarizes the results of the work place and special generator surveys for the H-GAC study area. A variety of work place and special generator summary information is presented in this report. The summary information is subject to modification as the survey data are further evaluated and analyzed within the context of all the travel surveys conducted. The purpose of the survey was to collect data on the travel characteristics of employees and non-employees at industrial, retail, medical, office, government, and education establishments. These data are used for forecasting travel demand within the H-GAC study area.

The study area, shown in Figure 1, is located in southeast Texas. The eight-county Houston-Galveston Area has a combined total population of 5,891,999, a total land area of approximately 7,612 square miles, and a population density of 774 persons per square mile based on the 2010 Census. The city of Houston is the study area's urban center, with an estimated population of 2,099,451, and population density of approximately 3,501 persons per square mile. The city of Galveston, located south of Houston, has an estimated population of 47,743, and population density of 1,158 persons per square mile.

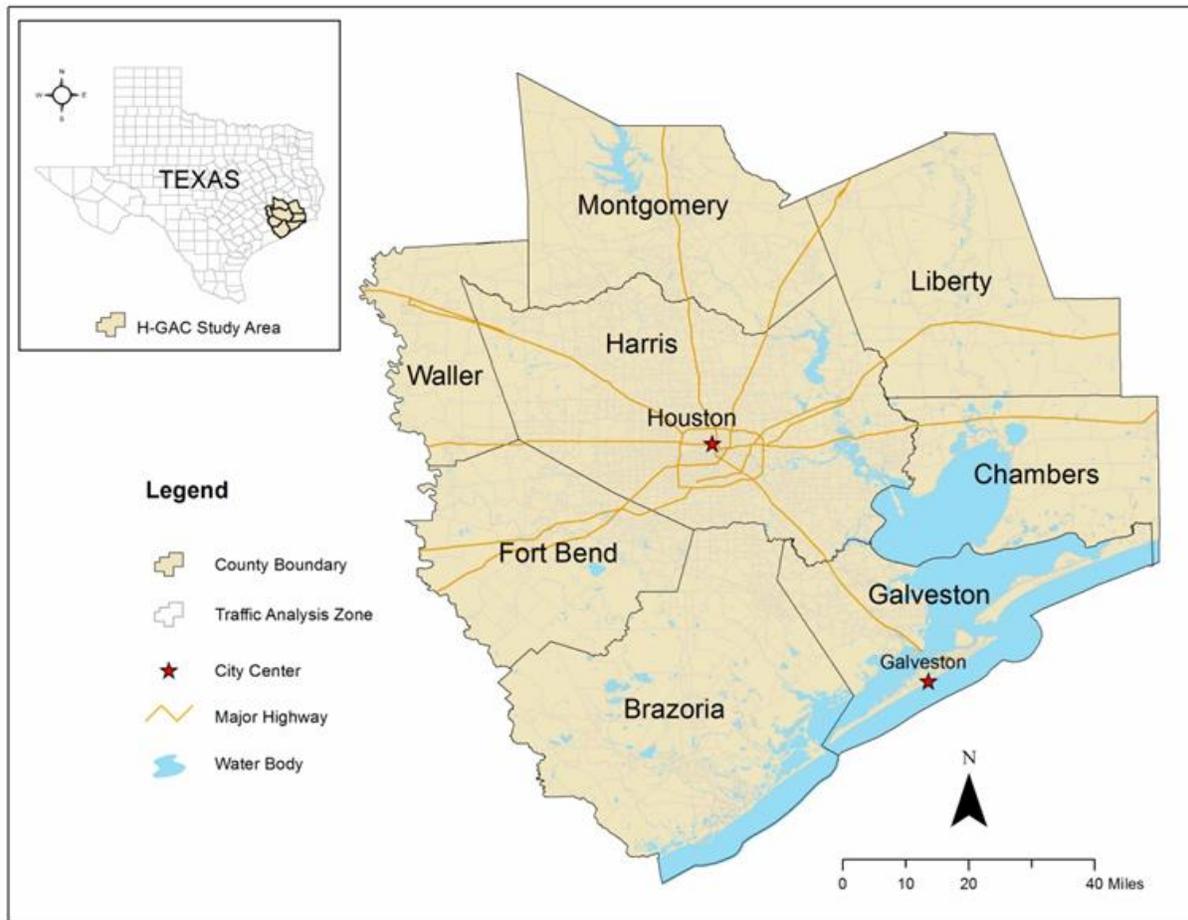


Figure 1. H-GAC Eight-County Study Area.

SURVEY METHODOLOGY

The work place and special generator travel surveys were conducted during the period from January 2010 through April 2011. TxDOT contracted with ETC Institute to conduct the H-GAC Work Place Survey. The Texas A&M Transportation Institute (TTI) provided technical assistance to both TxDOT and ETC in the effort.

The H-GAC Work Place Survey consisted of the following four data collection efforts.

- *Establishment Survey.* This survey determined whether the work place was free standing (e.g., points of vehicle access and parking were clearly established and were designed to serve that work place only), or non-free standing (e.g., vehicle access points and parking were designed to serve more than one establishment). Data on total employment, number of employees at work during the travel survey day, amount of parking, number of daily deliveries, hours of operation, and other general information were collected in this survey.

- Intercept Interview Survey. This survey involved an intercept interview of persons as they entered and/or exited the establishments. All survey participants were randomly selected, and included both employees and non-employees.
- Person or Vehicle Count. This task involved counting all vehicles entering and exiting surveyed establishments during their normal operating hours using Accumulative Count Recorders (ACRs) or video cameras. For those sites not suitable for vehicle counts, manual counts of persons and/or vehicles were conducted. The counts were performed at each entrance and exit beginning a minimum of one hour prior to the location's normal operating hours and ending no later than one hour after normal operating hours.
- Commercial Vehicle Count. This task involved counting the number of commercial vehicles accessing the establishment (i.e., making deliveries or pick-ups or other purposes) using ACRs, video cameras, or manual counts.

The surveyed establishments were classified as either full survey sites or partial survey sites, and distinguished according to their free standing or non-free standing status. Full survey sites included all the previously mentioned data collection activities, while partial survey sites only collected general information (e.g., establishment survey) and did not include intercept interview surveys. Counts were conducted at all surveyed sites.

SAMPLING PLAN AND RECRUITMENT

The sampling plan was developed based on the data inputs and framework of the H-GAC travel demand model and establishment data available from the Texas Workforce Commission (TWC). Each TWC listing is assigned a North American Industry Classification System (NAICS) code. The sampling plan for this survey aggregated establishments to one of six employment categories, and sought to obtain a total of 200 full surveys and 300 partial surveys, as shown in Table 1.

Table 1. Sampling Targets by Employment Category and Survey Type.

Employment Type	Type of Survey	
	Full	Partial
Industrial	30	45
Retail	40	60
Medical	30	45
Office	30	45
Education	40	60
Government	30	45
Total	200	300

The current H-GAC travel model has expanded these six employment categories to 10, which added Entertainment and Restaurant, sub-categories for Medical (Medical 1 and Medical 2 - for large medical complexes), and subcategories for Education (Education 1 - Kindergarten to 12th grade, and Education 2 - all other secondary education employment). Accordingly, the establishments in the TWC listings were converted into the H-GAC employment categories to properly classify the establishments and ensure that the sampling targets by employment type were met. The H-GAC conversion procedure was based on land use type and the NAICS code of the establishment at that particular location.

Table 2 provides a summary of the H-GAC employment categories by land use type and NAICS code. The conversion rules are described in Appendix A of this report.

The survey sample was drawn from a listing of establishments generated from the TWC database that consisted of 128,811 establishments. The establishments were sorted by employment type and then placed in random order for sampling. Each listing included the name, address, and NAICS code of the work place, and the establishment's employment type was reclassified and renamed according to the H-GAC employment categories. The Entertainment and Restaurant categories were classified under the Retail employment type. The analysis and trip rate development process attempted to keep the numbers within the subcategories should these become needed as inputs in the current H-GAC travel model. However, the sample under these subcategories was too small to provide reliable results.

Table 2. H-GAC Employment Categories, Land Use, and NAICS Code.

Employment Type	Land Use	4-Digit NAICS Code
Industrial	Industrial	1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1132, 1141, 1151, 1152, 1153 2111, 2121, 2122, 2123, 2131, 2211, 2212, 2213, 2361, 2362, 2371, 2372, 2373, 2379, 2381, 2382, 2383, 2389 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169, 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279, 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4851, 4852, 4853, 4854, 4855, 4859, 4861, 4862, 4869, 4871, 4872, 4879, 4881, 4882, 4883, 4884, 4889, 4921, 4922, 4931 5171, 5172, 5174, 5179, 5311, 5312, 5321, 5322, 5323, 5324, 5612, 5616, 5617, 5619, 5621, 5622, 5629, 8111, 8112, 8113
	Warehouse	1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1132, 1141, 1151, 1152, 1153 2111, 2121, 2122, 2123, 2131 2361, 2362, 2371, 2372, 2373, 2379, 2381, 2382, 2383, 2389 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169, 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279, 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399, 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4851, 4852, 4853, 4854, 4855, 4859, 4861, 4862, 4869, 4871, 4872, 4879, 4881, 4882, 4883, 4884, 4889, 4921, 4922, 4931, 5311, 5312, 5321, 5322, 5323, 5324, 5612, 5616, 5617, 5619, 5621, 5622, 5629,
	Commercial/Retail	5612, 5617, 6242, 7223
	Other	4811, 4812, 4851 6242
	Undevelopable	4811

Table 2 (Continued).

Employment Type	Land Use	4-Digit NAICS Code
Retail	Commercial/ Retail	1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1131, 1132, 1133, 1141, 1142, 1151, 1152, 1153 2211, 2212, 2361, 2381, 2382, 2383 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249 4411, 4412, 4413, 4421, 4422, 4431, 4441, 4442, 4451, 4452, 4453, 4461, 4471, 4481, 4482, 4483, 4511, 4512, 4521, 4529, 4531, 4532, 4533, 4539, 4541, 4542, 4543 4851, 4852, 4853, 4859, 4871, 4872, 4879, 4889, 4921, 4922
		2211, 2212, 2361, 2381, 2382, 2383 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249 5221, 5242 5311, 5312, 5321, 5322, 5323, 5324 5616, 5617 6114, 6115, 6116, 6117 7211, 7212, 7213 8111, 8112, 8114, 8121, 8122, 8123, 8129 8131
	Warehouse	4481
	Other	5191, 8131
	Education	6114, 6115, 6116, 6117
	Single Family, Mobile Houses, Multi-family, Condo, Group quarters	6116, 6244
	Office	6114, 6115, 6116 6244 8131
	Hospital	7222
	Hotel	7211, 7213
	Recreation	7131, 7139
Restaurant	Commercial/Retail	7221, 7222, 7224
Entertainment	Commercial/Retail	7111, 7112 7132, 7139
	Parks/Open Space	7121
	Recreational	7139
	Other	7121, 7131
Medical 1	Office	6211, 6212, 6213, 6214, 6215, 6216, 6231, 6232, 6233, 6239, 6241, 6243
Medical 2	Commercial/Retail	6219

Table 2 (Continued).

Employment Type	Land Use	4-Digit NAICS Code
Office	Office	1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1131, 1132, 1133, 1141, 1142, 1151, 1152, 1153 2111, 2121, 2122, 2123, 2131 2211, 2212, 2213 2361, 2362 2371, 2372, 2373, 2379 2381, 2382, 2383, 2389 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249, 4251, 4541, 4542, 4543 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4851, 4852, 4853, 4854, 4855, 4859, 4861, 4862, 4869, 4871, 4872, 4879, 4881, 4882, 4883, 4884, 4885, 4889 4921, 4922, 4931 5111, 5112, 5121, 5122, 5151, 5152, 5171, 5172, 5174, 5179, 5182, 5191 5221, 5222, 5223, 5231, 5232, 5239, 5241, 5242, 5251, 5259 5311, 5312, 5313, 5321, 5322, 5323, 5324, 5331 5411, 5412, 5413, 5414, 5415, 5416, 5417, 5418, 5419 5511 5611, 5613, 5614, 5615, 5616, 5619, 5621, 5622, 5629 6117, 6242 8132, 8133, 8134, 8139
	Commercial/Retail	4251, 4885 5111, 5112, 5122, 5151, 5152, 5182, 5191 5223, 5231, 5232, 5239, 5241, 5251, 5259 5313, 5331 5411, 5412, 5413, 5414, 5415, 5416, 5417, 5418, 5419 5611, 5613, 5614, 5615, 5619
Education 1	Education	6111
Education 2	Education	6112, 6113
Government	Government	4911 5211 9211, 9221, 9231, 9241, 9251, 9261, 9271, 9281
	Office	9231, 9241, 9251, 9261, 9271, 9281

Source: H-GAC, 2012.

The recruitment process involved contacting the businesses from each employment type in the randomized order that they appeared on the list. Businesses were verified and tracked based on the following categories:

- Willing to Participate. The establishment is located within the study area and indicated willingness to participate as a full or partial survey.
- Refused with Data. The establishment refused to participate in the survey but provided general data.
- Refused without Data. The establishment refused to participate in the survey and did not provide general data.

Table 3 shows a summary of the H-GAC work place survey recruitment participation by employment type and business location. A total of 5,126 establishments were successfully contacted, out of which 1,371 businesses indicated a willingness to participate in the work place survey. However, many of these companies were not able to get permission to authorize a survey to take place at their establishments, and were dropped later or determined as no longer needed to fulfill the survey sample requirements.

Table 3. Work Place Survey Recruitment Participation.

Employment Type	Recruitment Category			Total
	Willing to Participate	Refused	Refused with Data	
Industrial	261	576	199	1,036
Retail	400	684	85	1,169
Medical	244	666	228	1,138
Office	212	487	278	977
Education	147	393	4	544
Government	107	141	14	262
Total	1,371	2,947	808	5,126
Business Location				
Brazoria	113	139	19	271
Chambers	12	15	0	27
Fort Bend	115	199	34	348
Galveston	102	151	22	275
Harris	894	2,166	696	3,756
Liberty	8	29	2	39
Montgomery	122	230	34	386
Waller	4	16	1	21
Other	1	2	0	3
Total	1,371	2,947	808	5,126

Table 4 shows the distribution of establishments that agreed to participate and were recruited for a full or partial survey by employment type and business location. Note that these numbers have slightly changed during the actual establishment surveys as a result of employment type re-classification (Table 5).

Table 4. Work Place Survey Full and Partial Survey Recruitment Participation.

Employment Type	Recruitment Participation		Total
	Full Survey	Partial Survey	
Industrial	34	41	75
Retail	44	57	101
Medical	33	42	75
Office	34	40	74
Education	42	58	100
Government	34	41	75
Total	221	279	500
Business Location			
Brazoria	17	13	30
Chambers	2	0	2
Fort Bend	19	21	40
Galveston	9	18	27
Harris	153	209	362
Liberty	2	0	2
Montgomery	18	18	36
Waller	1	0	1
Total	221	279	500

The longitude and latitude coordinates, zone, and area types of the establishments were not collected during the survey recruitment. Hence, a geocoding tool was used to generate the longitude and latitude coordinates for each site to determine the zone where it was located, and its area type.

Area type is generally determined by land use activity within a Traffic Analysis Zone (TAZ). It is measured based on a combination of population and employment density in the zone. The density factors are classified into ranges of values that define each area type depending on the urban area. Typically, the area types consist of a Central Business District (CBD), a CBD Fringe and/or Urban area, a Suburban and/or a Suburban Fringe area, and a Rural area. As Figure 2 shows, the H-GAC study area had five area types — CBD, Urban, Suburban, Suburban Fringe, and Rural.

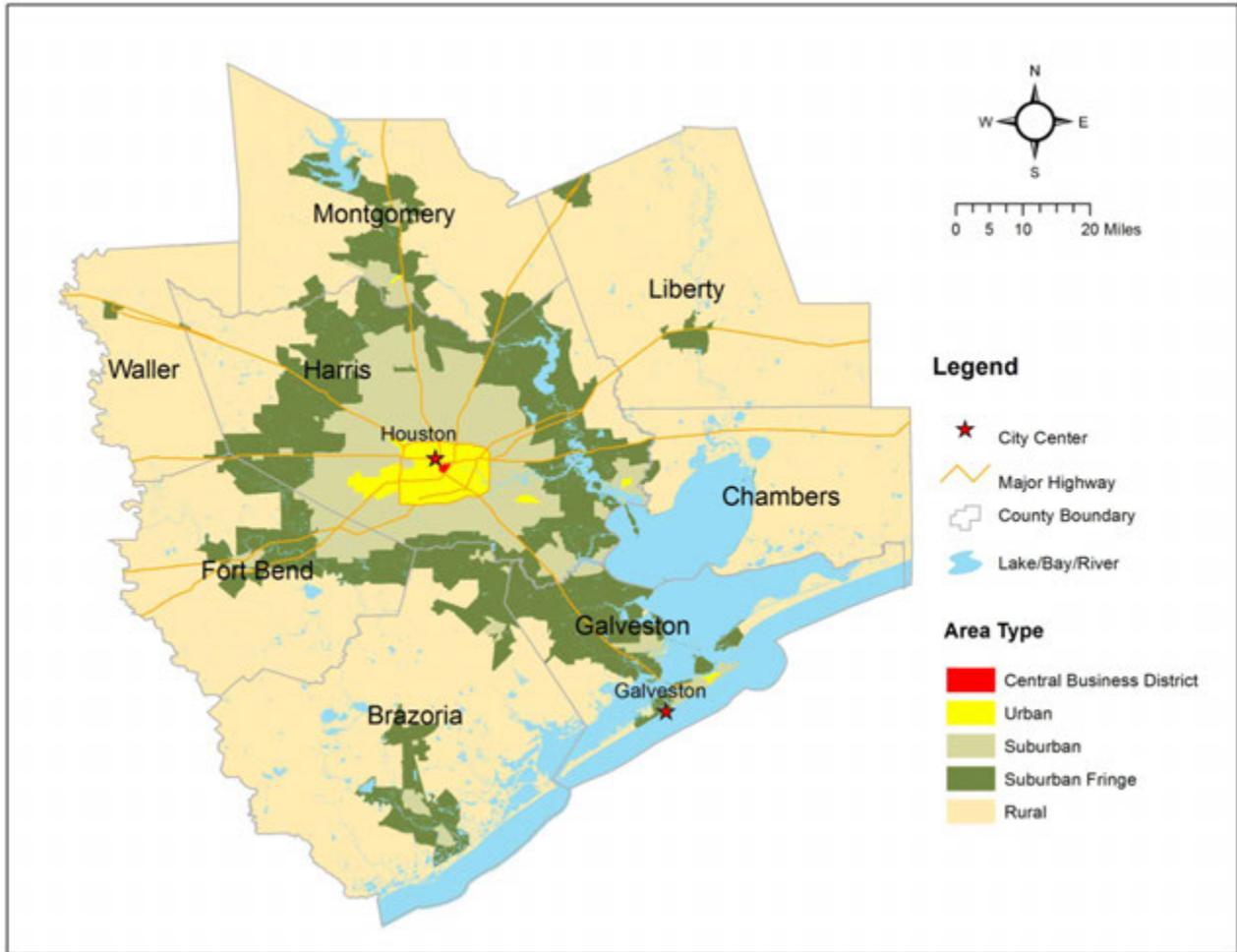


Figure 2. H-GAC Eight-County Area Types.

SURVEY RESULTS

The H-GAC work place survey covered 500 establishments and five special generators. It is important to note that the employment types that were assigned to some establishments during recruitment were found to be inconsistent with the reported NAICS code for the work place, as well as the H-GAC conversion equivalencies. As a result, the distribution of full and partial survey sites by employment and establishment types, provided in Table 5, were not quite the same as the recruitment sample shown in Table 4. One partial survey site was converted to a full survey site under the retail category. The NAICS codes for 10 establishments under the medical category had to be re-classified, nine of which were education, and one was retail. Additionally, three retail establishments had to be re-classified as office.

The full survey sites consisted of 222 sites (126 free standing and 96 non-free standing) that reported a total employment of 6,173. A total of 1,797 employees and 2,959 non-employees (referred to in this report as visitors) participated in the intercept survey. The surveyed employees represented approximately 35 percent of the total 5,144 employees reported to be at work during the travel survey day.

The partial survey sites consisted of 278 sites (148 free standing and 130 non-free standing) that reported a total employment of 8,752, of which 7,928 employees were reported to be at work during the travel survey day. No intercept surveys were conducted at these sites, but general information about the establishments were collected.

Table 5 shows the distribution of full and partial surveys by employment type and establishment type, after re-classifying the surveyed establishments based on the H-GAC NAICS code conversion. Table 6 shows the distribution of full and partial surveys by area type and employment type.

Table 5. Full and Partial Surveys by Employment Type and Establishment Type.

Employment Type	Full Survey			Partial Survey			All Surveys		
	FS ¹	NFS ¹	Total	FS ¹	NFS ¹	Total	FS ¹	NFS ¹	Total
Industrial	22	12	34	21	19	40	43	31	74
Retail	20	24	44	12	44	56	32	68	100
Medical	4	25	29	11	23	34	15	48	63
Office	16	19	35	21	21	42	37	40	77
Education	42	4	46	58	6	64	100	10	110
Government	22	12	34	25	17	42	47	29	76
Total	126	96	222	148	130	278	274	226	500

¹ FS - Free Standing, NFS – Non-Free Standing.

Table 6. Full and Partial Surveys by Area Type and Employment Type.

Area Type	Industrial		Retail		Medical		Office		Education		Government		Total	
	Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial
CBD	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Urban	4	9	12	15	9	11	7	10	3	3	0	1	35	49
Suburban	19	19	20	27	11	19	18	24	22	31	11	11	101	131
Suburban Fringe	8	11	11	11	8	3	6	8	14	28	12	20	59	81
Rural	3	1	1	3	1	0	4	0	7	2	11	10	27	16
Total	34	40	44	56	29	34	35	42	46	64	34	42	222	278

Figure 3 shows the general locations of the surveyed establishments in the H-GAC study area, color-coded by employment type and corresponding area type. Table 7 and Table 8 provide further detail of key outcomes, respectively, of full and partial survey sites.

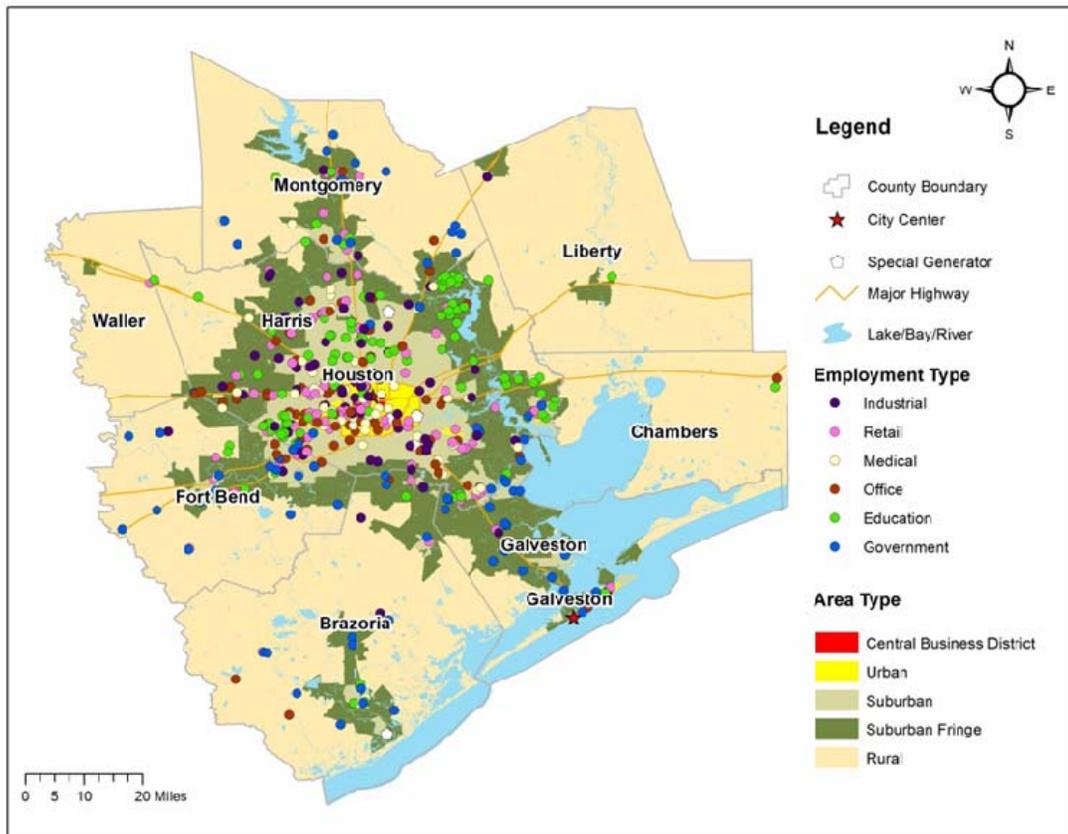


Figure 3. H-GAC Study Area Surveyed Work Place Locations.

Table 7. Full Surveys Data Summary.

Area Type	Item	Industrial	Retail	Medical	Office	Education	Government	Total
CBD	Number of sites	0	0	0	0	0	0	0
	Surveyed employees	0	0	0	0	0	0	0
	Surveyed visitors	0	0	0	0	0	0	0
	Total employment	0	0	0	0	0	0	0
	Employees at work	0	0	0	0	0	0	0
Urban	Number of sites	4	12	9	7	3	0	35
	Surveyed employees	15	89	37	27	29	0	197
	Surveyed visitors	18	457	91	28	59	0	653
	Total employment	41	196	75	100	164	0	576
	Employees at work	41	146	59	80	75	0	401
Suburban	Number of sites	19	20	11	18	22	11	101
	Surveyed employees	125	127	40	110	428	132	962
	Surveyed visitors	67	702	124	52	242	105	1,292
	Total employment	407	305	83	268	1,785	538	3,386
	Employees at work	319	200	80	190	1,710	346	2,845
Suburban Fringe	Number of sites	8	11	8	6	14	12	59
	Surveyed employees	37	60	33	17	218	101	466
	Surveyed visitors	49	353	54	36	155	123	770
	Total employment	97	147	127	45	924	298	1,638
	Employees at work	78	103	75	28	855	241	1,380
Rural	Number of sites	3	1	1	4	7	11	27
	Surveyed employees	17	5	2	14	83	51	172
	Surveyed visitors	14	41	19	35	87	48	244
	Total employment	35	9	12	31	410	76	573
	Employees at work	23	6	10	20	403	56	518
Total	Number of sites	34	44	29	35	46	34	222
	Surveyed employees	194	281	112	168	758	284	1,797
	Surveyed visitors	148	1,553	288	151	543	276	2,959
	Total employment	580	657	297	444	3,283	912	6,173
	Employees at work	461	455	224	318	3,043	643	5,144

Table 8. Partial Surveys Data Summary.

Area Type	Item	Industrial	Retail	Medical	Office	Education	Government	Total
CBD	Number of sites	0	0	1	0	0	0	1
	Total employment	0	0	8	0	0	0	8
	Employees at work	0	0	8	0	0	0	8
Urban	Number of sites	9	15	11	10	3	1	49
	Total employment	147	153	111	93	235	17	756
	Employees at work	71	119	84	76	232	17	599
Suburban	Number of sites	19	27	19	24	31	11	131
	Total employment	294	165	238	280	2,949	417	4,343
	Employees at work	277	137	193	196	2,678	404	3,885
Suburban Fringe	Number of sites	11	11	3	8	28	20	81
	Total employment	113	113	40	65	2,504	414	3,249
	Employees at work	107	94	30	47	2,422	388	3,088
Rural	Number of sites	1	3	0	0	2	10	16
	Total employment	7	21	0	0	280	88	396
	Employees at work	7	16	0	0	266	59	348
Total	Number of sites	40	56	34	42	64	42	278
	Total employment	561	452	397	438	5,968	936	8,752
	Employees at work	462	366	315	319	5,598	868	7,928

Trip Characteristics

This section presents the trip characteristics of persons entering or exiting the surveyed work places. Information on residency, trip purpose, mode of travel and occupancy, trip origins, and trip destinations were analyzed to measure the amount of trip attractions to the sites.

Residence

As Table 9 shows, approximately 99 percent of the surveyed employees and nearly 98 percent of the surveyed visitors were residents of the H-GAC study area. Survey participants were considered residents if their home addresses were located within the H-GAC eight-county region, which included Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller. Those who did not live within these counties were considered non-residents.

Table 9. Employee and Visitor Surveys by Residency.

Survey Participant	Resident	Percent of Total	Non-Resident	Percent of Total	Total	Percent of Total
Employee	1,780	99.05	17	0.95	1,797	37.78
Visitor	2,895	97.84	64	2.16	2,959	62.22
Total	4,675	98.30	81	1.70	4,756	100.00

Close to two-thirds of the surveyed employees were from Harris County (56 percent were residents of Houston). The remaining one-third were from Fort Bend (17 percent), Montgomery (8 percent), Brazoria (6 percent), and Galveston (3 percent) counties.

For surveyed visitors, approximately 74 percent were from Harris County, out of which 62 percent were residents of Houston. Approximately 7 percent came from Fort Bend, 6 percent from Montgomery, 5 percent from Brazoria, and close to 4 percent were from Galveston counties.

The surveyed non-resident employees were largely from Jefferson (24 percent), and 12 percent were either from Austin, Grimes, or Matagorda counties. The surveyed non-resident visitors came from Jefferson (11 percent), Austin (9 percent), Walker (5 percent), and Bexar, Grimes, Hidalgo and Matagorda (3 percent each) counties. Approximately 24 percent were out-of-state visitors, with 4 percent from New York or California, 3 percent from Florida, Louisiana, or Alabama, and the remaining 11 percent came from Georgia, Michigan, Missouri, Mississippi, Nevada, and Virginia.

Figure 4 shows the residence locations of surveyed employees and visitors within the H-GAC study area and state of Texas.

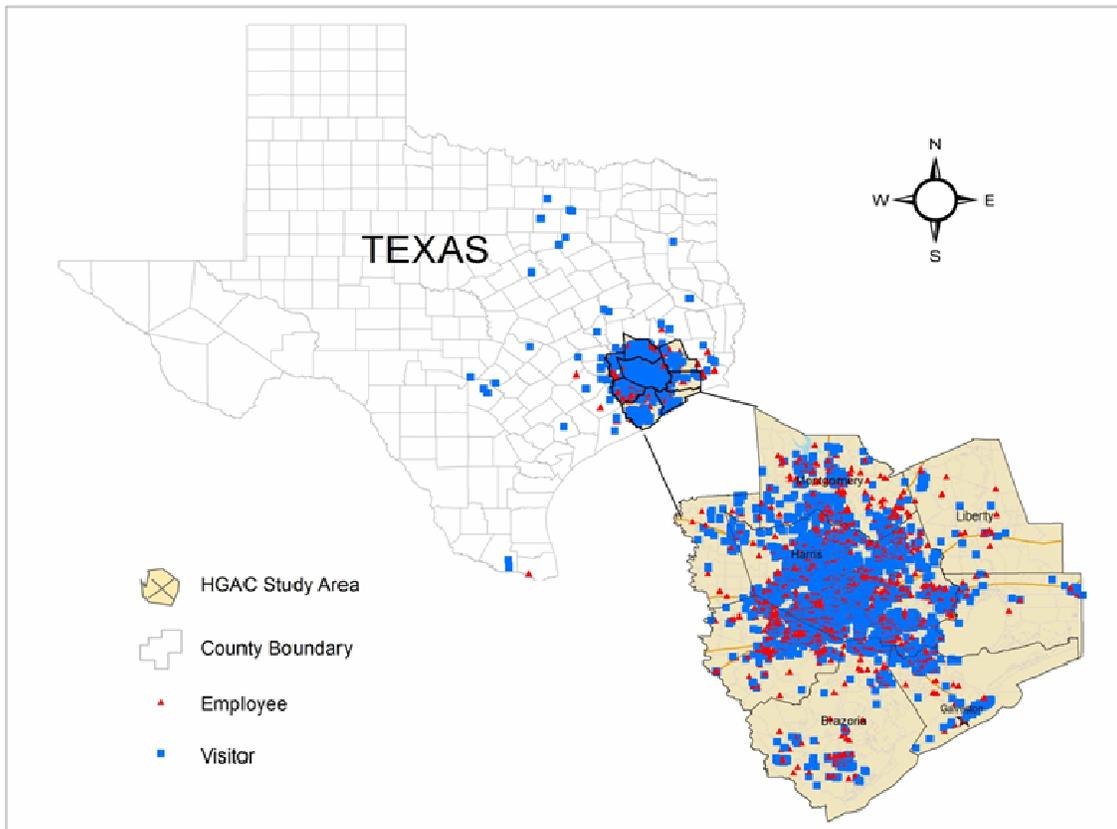


Figure 4. Residence Locations of Surveyed Employees and Visitors within the H-GAC Area and Texas.

Trip Purpose

Table 10 summarizes the trip purposes of surveyed resident and non-resident employees and visitors at the establishments.

Table 10. Trip Purposes of Surveyed Residents and Non-Residents.

Trip Purpose	Resident		Non-Resident		Total		Grand Total
	Employee	Visitor	Employee	Visitor	Employee	Visitor	
Return Home	2	4	0	0	2	4	6
Work Related	1,744	133	16	6	1,760	139	1,899
School Related	9	115	1	2	10	117	127
Social/Recreational/Visit	1	99	0	7	1	106	107
Shop	8	1,050	0	30	8	1,080	1,088
Eat Out	0	312	0	4	0	316	316
Personal Business	11	684	0	10	11	694	705
Pick Up/Drop Off Passenger	4	365	0	0	4	365	369
Change Travel Mode	0	7	0	2	0	9	9
Delivery – Pick Up/Drop Off	1	24	0	0	1	24	25
Other	0	102	0	3	0	105	105
Total	1,780	2,895	17	64	1,797	2,959	4,756

In the analysis, the surveyed trip purposes were classified according to the following trip categories and were distinguished between those made by residents and non-residents of the H-GAC study area.

- 1) Home-based work (HBW) – when the purpose was work-related, the origin or destination was the home, and the origin or destination was located within the study area.
- 2) Home-based non-work (HBNW) – when the purpose was not work-related, the origin or destination was the home, and the origin or destination was located within the study area.
- 3) Non home-based destination (NHB-D) – when the origin was not the home, the destination was the establishment being surveyed, and the origin was located within the study area.
- 4) Non home-based origin (NHB-O) – when the reported destination when leaving the establishment being surveyed was not the home, and the destination was located within the study area.
- 5) External trip origin (EXT-O) – when the origin was outside the study area.
- 6) External trip destination (EXT-D) – when the destination was outside the study area when leaving the establishment.
- 7) Non-resident (NON-RES) – when the person making the trip to and from the establishment lived outside the study area and the origin or destination of the trip was inside the study area.

In the same manner as the resident trips, non-resident trips were also classified based on the previously mentioned trip purpose categories (1 through 6). Table 11 shows the breakdown of these trips. However, in the analysis and expansion of survey non-resident trip data, such trips are presented as one trip purpose category (NON-RES).

Table 11 shows the distribution of employee and visitor resident and non-resident trips travelling to and from the surveyed establishments by trip purpose. Table 12 provides the breakdown of all trips by trip purpose and by area and employment types. Thirty-eight (32) trips surveyed at non free standing establishments were not counted because they were reported as “not the first establishment visited” and therefore were not attractions to the work place.

Table 11. Survey Trips by Purpose to and from the Workplace.

Trip Purpose	Resident			Non-Resident			All Trips		
	Employee	Visitor	Total	Employee	Visitor	Total	Employee	Visitor	Total
HBW	3,088	181	3,269	0	0	0	3,088	181	3,269
HBNW	58	4,461	4,519	0	0	0	58	4,461	4,519
NHB-D	127	457	584	1	16	17	128	473	601
NHB -O	277	640	917	4	21	25	281	661	942
EXT-O	4	7	11	16	48	64	20	55	75
EXT-D	6	12	18	13	43	56	19	55	74
Total	3,560	5,758	9,318	34	128	162	3,594	5,886	9,480

Table 12. Survey Trips by Purpose, Area Type and Employment Type.

Area Type	Employment Type	Trip Purpose							Total
		HBW	HBNW	NHB-D	NHB-O	EXT-O	EXT-D	NON-RES	
CBD	Industrial	0	0	0	0	0	0	0	0
	Retail	0	0	0	0	0	0	0	0
	Medical	0	0	0	0	0	0	0	0
	Office	0	0	0	0	0	0	0	0
	Education	0	0	0	0	0	0	0	0
	Government	0	0	0	0	0	0	0	0
Urban	Industrial	33	22	6	5	0	0	0	66
	Retail	162	711	76	106	0	0	28	1,083
	Medical	90	136	11	12	0	0	4	253
	Office	52	39	11	8	0	0	0	110
	Education	57	106	5	8	0	0	0	176
	Government	0	0	0	0	0	0	0	0
Suburban	Industrial	233	77	31	38	0	0	4	383
	Retail	216	1,004	162	225	3	4	42	1,656
	Medical	65	188	29	44	0	0	2	328
	Office	218	57	19	24	0	1	2	321
	Education	766	417	45	102	0	2	8	1,340
	Government	267	136	22	43	1	1	4	474
Suburban Fringe	Industrial	61	77	14	18	0	0	0	170
	Retail	110	597	42	44	0	1	20	814
	Medical	59	93	6	12	0	0	4	174
	Office	42	34	10	12	0	0	8	106
	Education	363	272	31	77	1	0	2	746
	Government	176	199	22	45	0	0	6	448
Rural	Industrial	30	20	4	6	0	0	2	62
	Retail	19	43	8	15	1	0	6	92
	Medical	3	31	3	5	0	0	0	42
	Office	20	52	4	8	1	3	10	98
	Education	144	127	10	48	2	3	6	340
	Government	83	81	13	12	2	3	4	198
Total	Industrial	357	196	55	67	0	0	6	681
	Retail	507	2,355	288	390	4	5	96	3,645
	Medical	217	448	49	73	0	0	10	797
	Office	332	182	44	52	1	4	20	635
	Education	1,330	922	91	235	3	5	16	2,602
	Government	526	416	57	100	3	4	14	1,120
Total Trips		3,269	4,519	584	917	11	18	162	9,480

Mode of Travel and Vehicle Occupancy

Table 13 shows the mode of travel used by the survey participants to the work place. Approximately 90 percent of the trips to the work places were made by drivers of cars, trucks, or vans. More than 7 percent were passengers of a vehicle. The average occupancy was estimated at 1.3 persons per vehicle.

Table 13. Survey Mode of Travel to the Work Place.

Mode	Resident		Non-Resident		All Surveys		
	Employee	Visitor	Employee	Visitor	Total	Percent of Total	Average Vehicle Occupancy
Driver (car/truck/van)	1,674	2,551	15	50	4,290	90.20	1.28
Passenger (car/truck/van)	66	263	2	13	344	7.23	2.33
Walk	18	40	0	0	58	1.22	0.00
Bicycle	5	12	0	0	17	0.36	0.00
Transit Bus	10	10	0	0	20	0.42	0.00
Metro Rail	0	0	0	0	0	0.00	0.00
School Bus	0	0	0	0	0	0.00	0.00
Taxi/Limo	0	3	0	1	4	0.08	2.00
Commercial Cargo Transport Vehicle	0	3	0	0	3	0.06	3.67
Commercial Service Vehicle	4	8	0	0	12	0.25	1.08
Motorcycle	2	5	0	0	7	0.15	1.14
Other	1	0	0	0	1	0.02	0.00
Total	1,780	2,895	17	64	4,756	100.00¹	1.34

¹ Percentage total may not be exact due to rounding.

Trip Length

Each trip in the survey, based on its reported origin location and destination location, was geocoded either to a TAZ system for the H-GAC study area, or to the statewide TAZ system when the location was outside the study area (but within the state of Texas). After the trips were geocoded, the travel distance and travel time for each trip to the surveyed work place was estimated using the transportation network available for the H-GAC study area that provides the zone-to-zone trip lengths and travel times based on network speeds. The H-GAC network matrix only provides distances and travel time between zones (inter-zonal) and not within zones (intra-zonal).

The analyses of trip length and travel time to and from the surveyed work place pertain only to inter-zonal trips by person and motorized mode of travel. Motorized trips included all trips by drivers and passengers of automobiles, transit bus, taxi/limo, commercial cargo and service vehicles, and motorcycle. Person trips included all travel modes, including walking and bicycle trips.

Table 14 and Table 15 show the survey inter-zonal trip lengths and travel times to and from the work place by trip purpose, respectively. HBW trips had an average travel distance of approximately 11 miles per trip and an average travel time close to 17 minutes. For HBNW trips, the average trip length was nearly 10 miles per trip while the average travel time was approximately 15 minutes per trip. The estimates for NHB trips reflected the average of NHB-D and NHB-O trips, which showed an average trip length and travel time of approximately 9 miles and 14 minutes per trip, respectively. NON-RES trips had an average trip length of 14 miles per trip, and an average travel time of 19 minutes per trip.

Table 14. Survey Inter-Zonal Trip Lengths to and from the Work Place.

Trip Purpose	Total Person Trips	Total Person Miles	Average Person Miles	Total Motorized Trips	Total Motorized Miles	Average Motorized Miles
HBW	3,446.00	37,882.93	10.99	3,037.00	34,050.09	11.21
HBNW	6,218.00	61,823.54	9.94	4,098.00	39,832.77	9.72
NHB	946.50	8,600.60	9.09	668.50	5,947.55	8.90
NON-RES	62.00	892.97	14.40	39.00	547.00	14.03
Total	10,672.50	109,200.04	10.23	7,842.50	80,377.41	10.25

Table 15. Survey Inter-Zonal Trip Travel Times to and from the Work Place.

Trip Purpose	Total Person Trips	Total Person Minutes	Average Person Minutes	Total Motorized Trips	Total Motorized Minutes	Average Motorized Minutes
HBW	3,446.00	57,345.61	16.64	3,037.00	51,424.99	16.93
HBNW	6,218.00	94,122.13	15.14	4,098.00	60,809.93	14.84
NHB	946.50	13,196.52	13.94	668.50	9,141.32	13.67
NON-RES	62.00	1,215.33	19.60	39.00	750.42	19.24
Total	10,672.50	165,879.59	15.54	7,842.50	122,126.66	15.57

Table 16 and Table 17 provide the survey trip length frequency distributions (TLFDs) and travel times by trip purpose, grouped at five-mile intervals, respectively. Table 18 and Table 19 show the ungrouped TLFDs and travel times, respectively for all survey person and motorized trips.

Table 16. Survey Person and Motorized Trip TLFDs (Grouped).

Trip Length	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
≤ 5 miles	1,233.00	2,979.00	485.00	31.00	1,053.00	2,031.00	355.00	19.00
6 to 10 miles	901.00	1,224.00	181.50	7.00	796.00	773.00	127.00	6.00
11 to 15 miles	548.00	800.00	111.50	7.00	506.00	508.00	73.50	3.00
16 to 20 miles	355.00	470.00	69.50	4.00	313.00	307.00	44.00	2.00
21 to 25 miles	171.00	310.00	41.00	2.00	147.00	204.00	28.50	2.00
26 to 30 miles	87.00	143.00	26.50	1.00	79.00	103.00	17.00	1.00
31 to 35 miles	63.00	129.00	18.00	2.00	58.00	66.00	12.50	2.00
36 to 40 miles	40.00	68.00	7.00	0.00	38.00	47.00	5.50	0.00
41 to 45 miles	20.00	23.00	2.00	5.00	20.00	19.00	2.00	2.00
46 to 50 miles	13.00	22.00	2.00	1.00	13.00	14.00	1.50	1.00
51 to 55 miles	9.00	33.00	0.50	0.00	8.00	16.00	0.50	0.00
56 to 60 miles	3.00	14.00	1.00	0.00	3.00	7.00	1.00	0.00
> 60 miles	3.00	3.00	1.00	2.00	3.00	3.00	0.50	1.00
Total	3,446.00	6,218.00	946.50	62.00	3,037.00	4,098.00	668.50	39.00

Table 17. Survey Person and Motorized Trip Travel Times (Grouped).

Travel Time	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
≤ 5 minutes	489.00	1,431.00	271.00	22.00	409.00	981.00	198.50	13.00
6 to 10 minutes	837.00	1,684.00	244.00	10.00	729.00	1,141.00	175.50	7.00
11 to 15 minutes	663.00	873.00	130.00	5.00	586.00	554.00	93.50	4.00
16 to 20 minutes	506.00	671.00	93.50	8.00	457.00	420.00	59.00	4.00
21 to 25 minutes	334.00	591.00	75.50	0.00	303.00	370.00	52.50	0.00
26 to 30 minutes	260.00	327.00	44.00	5.00	224.00	219.00	28.00	3.00
31 to 35 minutes	123.00	189.00	28.50	1.00	113.00	130.00	19.50	1.00
36 to 40 minutes	93.00	163.00	27.00	0.00	81.00	106.00	17.50	0.00
41 to 45 minutes	40.00	94.00	16.00	3.00	39.00	54.00	11.50	3.00
46 to 50 minutes	43.00	83.00	8.50	0.00	39.00	53.00	6.00	0.00
51 to 55 minutes	20.00	23.00	2.00	5.00	20.00	19.00	1.50	2.00
56 to 60 minutes	14.00	31.00	2.50	0.00	14.00	19.00	2.50	0.00
> 60 minutes	24.00	58.00	4.00	3.00	23.00	32.00	3.00	2.00
Total	3,446.00	6,218.00	946.50	62.00	3,037.00	4,098.00	668.50	39.00

Table 18. Survey Person and Motorized Trip TLFDs (Ungrouped).

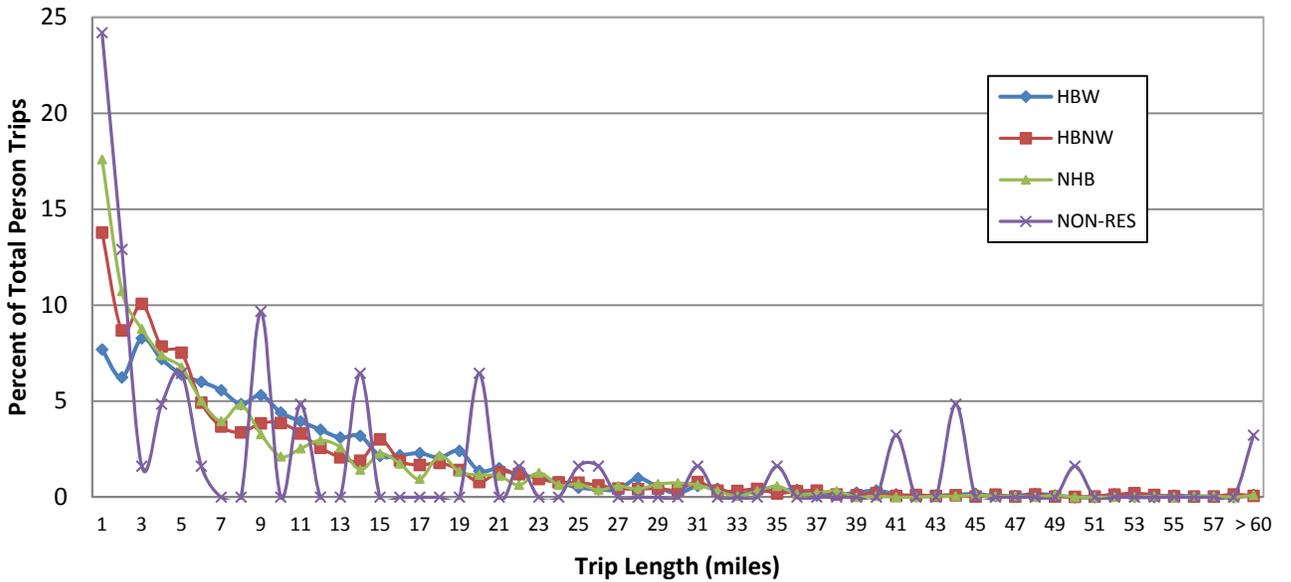
Miles	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
1	265.00	857.00	166.50	15.00	220.00	574.00	120.50	9.00
2	215.00	540.00	101.50	8.00	178.00	389.00	74.50	5.00
3	285.00	626.00	83.00	1.00	242.00	431.00	64.00	1.00
4	248.00	488.00	70.00	3.00	209.00	327.00	53.00	1.00
5	220.00	468.00	64.00	4.00	204.00	310.00	43.00	3.00
6	207.00	306.00	47.50	1.00	190.00	203.00	31.00	1.00
7	192.00	229.00	37.50	0.00	159.00	141.00	24.50	0.00
8	167.00	210.00	45.50	0.00	152.00	142.00	33.00	0.00
9	183.00	239.00	31.00	6.00	159.00	146.00	24.00	5.00
10	152.00	240.00	20.00	0.00	136.00	141.00	14.50	0.00
11	136.00	206.00	24.00	3.00	123.00	126.00	14.00	1.00
12	121.00	160.00	28.00	0.00	110.00	102.00	15.00	0.00
13	107.00	129.00	24.50	0.00	103.00	83.00	17.50	0.00
14	110.00	118.00	13.50	4.00	98.00	79.00	11.00	2.00
15	74.00	187.00	21.50	0.00	72.00	118.00	16.00	0.00
16	75.00	118.00	16.50	0.00	64.00	76.00	11.50	0.00
17	79.00	104.00	9.00	0.00	71.00	66.00	5.50	0.00
18	71.00	111.00	20.50	0.00	61.00	69.00	12.50	0.00
19	83.00	88.00	12.50	0.00	75.00	58.00	8.50	0.00
20	47.00	49.00	11.00	4.00	42.00	38.00	6.00	2.00
21	52.00	81.00	10.50	0.00	44.00	48.00	6.00	0.00
22	39.00	75.00	6.00	1.00	35.00	46.00	5.50	1.00
23	36.00	59.00	12.00	0.00	30.00	45.00	9.00	0.00
24	27.00	48.00	6.00	0.00	22.00	34.00	4.50	0.00
25	17.00	47.00	6.50	1.00	16.00	31.00	3.50	1.00
26	14.00	38.00	3.50	1.00	14.00	29.00	2.00	1.00
27	14.00	28.00	5.50	0.00	14.00	20.00	4.00	0.00
28	34.00	26.00	4.00	0.00	27.00	18.00	3.00	0.00
29	18.00	28.00	6.50	0.00	17.00	20.00	3.00	0.00
30	7.00	23.00	7.00	0.00	7.00	16.00	5.00	0.00

Table 18 (Continued).

Miles	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
31	20.00	49.00	6.00	1.00	17.00	19.00	4.50	1.00
32	15.00	21.00	3.00	0.00	15.00	12.00	1.50	0.00
33	6.00	20.00	0.50	0.00	6.00	11.00	0.50	0.00
34	10.00	27.00	3.00	0.00	10.00	18.00	2.50	0.00
35	12.00	12.00	5.50	1.00	10.00	6.00	3.50	1.00
36	13.00	19.00	1.50	0.00	11.00	12.00	1.50	0.00
37	3.00	21.00	2.00	0.00	3.00	13.00	1.00	0.00
38	4.00	9.00	3.00	0.00	4.00	7.00	2.50	0.00
39	8.00	6.00	0.00	0.00	8.00	4.00	0.00	0.00
40	12.00	13.00	0.50	0.00	12.00	11.00	0.50	0.00
41	5.00	4.00	0.00	2.00	5.00	4.00	0.00	1.00
42	2.00	7.00	0.00	0.00	2.00	7.00	0.00	0.00
43	3.00	4.00	0.50	0.00	3.00	3.00	0.50	0.00
44	4.00	6.00	0.50	3.00	4.00	4.00	0.50	1.00
45	6.00	2.00	1.00	0.00	6.00	1.00	1.00	0.00
46	2.00	8.00	0.50	0.00	2.00	6.00	0.50	0.00
47	2.00	2.00	0.50	0.00	2.00	1.00	0.50	0.00
48	6.00	9.00	0.00	0.00	6.00	4.00	0.00	0.00
49	3.00	2.00	1.00	0.00	3.00	2.00	0.50	0.00
50	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
51	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00
52	5.00	8.00	0.00	0.00	4.00	3.00	0.00	0.00
53	1.00	13.00	0.00	0.00	1.00	5.00	0.00	0.00
54	0.00	7.00	0.50	0.00	0.00	3.00	0.50	0.00
55	3.00	3.00	0.00	0.00	3.00	3.00	0.00	0.00
56	1.00	2.00	0.50	0.00	1.00	1.00	0.50	0.00
57	1.00	2.00	0.50	0.00	1.00	1.00	0.50	0.00
59	0.00	9.00	0.00	0.00	0.00	4.00	0.00	0.00
60	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00
61	3.00	0.00	1.00	0.00	3.00	0.00	0.50	0.00
70	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
75	0.00	2.00	0.00	0.00	0.00	2.00	0.00	0.00
82	0.00	0.00	0.00	2.00	0.00	0.00	0.00	1.00
TOTAL	3,446.00	6,218.00	946.50	62.00	3,037.00	4,098.00	668.50	39.00

Figure 5 (a and b) show the ungrouped trip lengths in percentage values of total person and motorized trips by trip purpose, respectively.

(a) Person Trips



(b) Motorized Trips

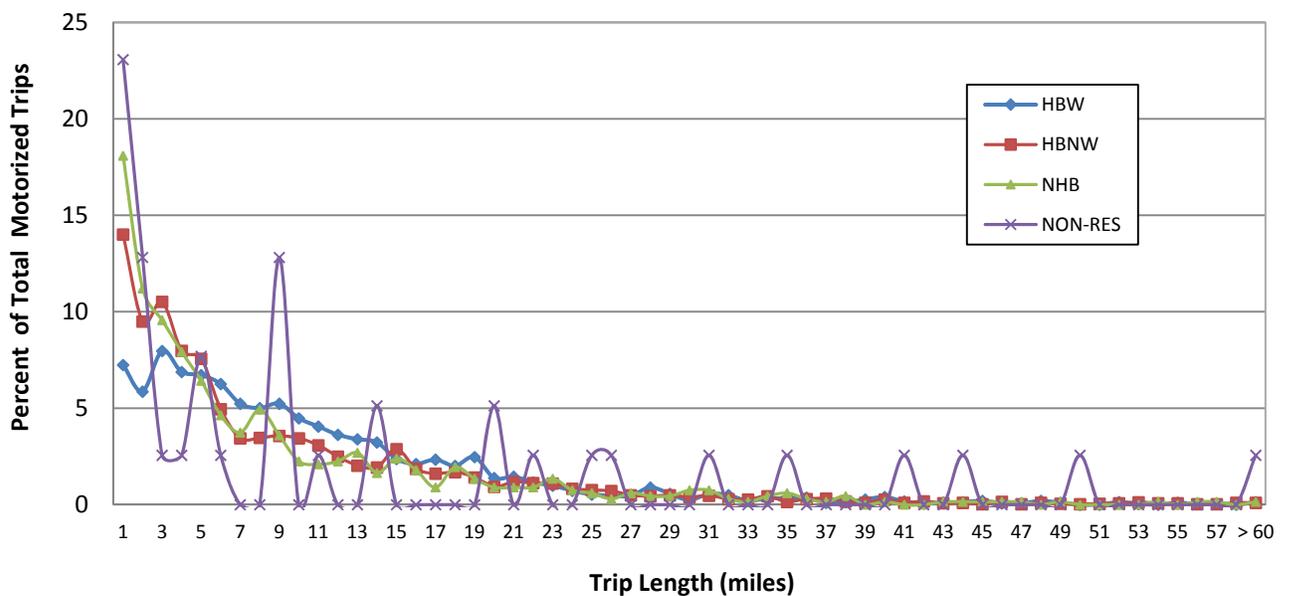


Figure 5. TLFDs of Person and Motorized Trips to and from the Work Place.

Table 19. Survey Person and Motorized Trip Travel Times (Ungrouped).

Minutes	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
1	11.00	54.00	8.00	0.00	6.00	41.00	6.00	0.00
2	65.00	267.00	31.50	7.00	53.00	180.00	23.50	5.00
3	150.00	399.00	96.50	7.00	125.00	256.00	67.50	3.00
4	159.00	411.00	71.00	5.00	130.00	299.00	55.00	3.00
5	104.00	300.00	64.00	3.00	95.00	205.00	46.50	2.00
6	207.00	426.00	59.00	1.00	169.00	295.00	45.00	1.00
7	160.00	368.00	49.50	1.00	139.00	246.00	38.00	1.00
8	148.00	297.00	42.00	3.00	127.00	210.00	30.50	1.00
9	142.00	349.00	52.00	5.00	131.00	225.00	35.00	4.00
10	180.00	244.00	41.50	0.00	163.00	165.00	27.00	0.00
11	119.00	176.00	25.00	0.00	109.00	116.00	18.50	0.00
12	156.00	136.00	30.00	0.00	133.00	94.00	18.50	0.00
13	139.00	204.00	31.00	0.00	119.00	129.00	24.00	0.00
14	110.00	167.00	21.00	5.00	101.00	103.00	14.50	4.00
15	139.00	190.00	23.00	0.00	124.00	112.00	18.00	0.00
16	89.00	143.00	18.50	1.00	83.00	94.00	12.50	1.00
17	124.00	152.00	20.00	0.00	98.00	98.00	10.50	0.00
18	111.00	160.00	20.50	0.00	103.00	94.00	14.00	0.00
19	99.00	103.00	19.00	0.00	97.00	63.00	12.00	0.00
20	83.00	113.00	15.50	7.00	76.00	71.00	10.00	3.00
21	94.00	187.00	26.00	0.00	84.00	112.00	17.50	0.00
22	58.00	104.00	13.00	0.00	54.00	68.00	8.00	0.00
23	56.00	118.00	13.50	0.00	50.00	78.00	11.00	0.00
24	63.00	118.00	9.00	0.00	58.00	66.00	7.00	0.00
25	63.00	64.00	14.00	0.00	57.00	46.00	9.00	0.00
26	76.00	69.00	9.50	0.00	67.00	50.00	6.00	0.00
27	46.00	67.00	6.00	0.00	42.00	44.00	5.00	0.00
28	61.00	52.00	13.50	5.00	50.00	35.00	6.00	3.00
29	43.00	85.00	11.00	0.00	36.00	53.00	7.50	0.00
30	34.00	54.00	4.00	0.00	29.00	37.00	3.50	0.00

Table 19 (Continued).

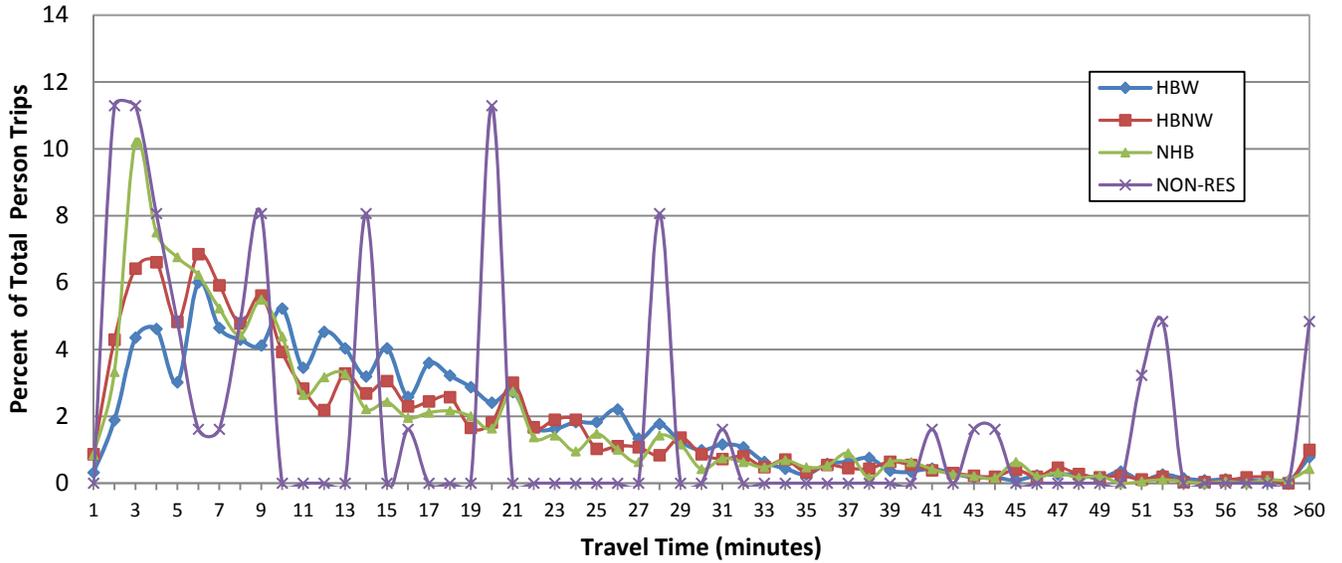
Minutes	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
31	40.00	45.00	7.00	1.00	37.00	32.00	4.50	1.00
32	37.00	50.00	6.00	0.00	33.00	31.00	3.50	0.00
33	22.00	30.00	4.50	0.00	20.00	22.00	3.50	0.00
34	15.00	44.00	6.50	0.00	14.00	29.00	6.00	0.00
35	9.00	20.00	4.50	0.00	9.00	16.00	2.00	0.00
36	20.00	34.00	5.00	0.00	18.00	24.00	4.50	0.00
37	22.00	28.00	8.50	0.00	20.00	19.00	5.00	0.00
38	26.00	27.00	1.50	0.00	19.00	18.00	1.50	0.00
39	13.00	40.00	6.00	0.00	13.00	18.00	3.00	0.00
40	12.00	34.00	6.00	0.00	11.00	27.00	3.50	0.00
41	15.00	24.00	4.00	1.00	14.00	15.00	2.50	1.00
42	10.00	19.00	2.50	0.00	10.00	11.00	2.50	0.00
43	6.00	14.00	2.00	1.00	6.00	6.00	1.50	1.00
44	6.00	12.00	1.50	1.00	6.00	7.00	1.50	1.00
45	3.00	25.00	6.00	0.00	3.00	15.00	3.50	0.00
46	8.00	12.00	2.00	0.00	8.00	9.00	1.00	0.00
47	9.00	29.00	3.00	0.00	8.00	13.00	2.00	0.00
48	9.00	17.00	1.50	0.00	8.00	12.00	1.50	0.00
49	5.00	11.00	2.00	0.00	5.00	9.00	1.50	0.00
50	12.00	14.00	0.00	0.00	10.00	10.00	0.00	0.00
51	3.00	7.00	0.50	2.00	3.00	5.00	0.50	1.00
52	9.00	12.00	1.00	3.00	9.00	10.00	0.50	1.00
53	5.00	2.00	0.50	0.00	5.00	2.00	0.50	0.00
55	3.00	2.00	0.00	0.00	3.00	2.00	0.00	0.00
56	4.00	5.00	0.50	0.00	4.00	3.00	0.50	0.00
57	3.00	11.00	0.00	0.00	3.00	7.00	0.00	0.00
58	2.00	11.00	1.00	0.00	2.00	7.00	1.00	0.00
59	2.00	0.00	1.00	0.00	2.00	0.00	1.00	0.00
60	3.00	4.00	0.00	0.00	3.00	2.00	0.00	0.00

Table 19 (Continued).

Minutes	Person Trips				Motorized Trips			
	HBW	HBNW	NHB	NON-RES	HBW	HBNW	NHB	NON-RES
61	1.00	5.00	1.50	1.00	1.00	4.00	1.00	1.00
62	2.00	16.00	0.00	0.00	2.00	6.00	0.00	0.00
63	2.00	1.00	0.50	0.00	2.00	1.00	0.50	0.00
64	4.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
65	2.00	8.00	0.50	0.00	2.00	4.00	0.50	0.00
66	0.00	7.00	0.00	0.00	0.00	3.00	0.00	0.00
67	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
68	3.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
69	1.00	6.00	0.00	0.00	1.00	4.00	0.00	0.00
70	0.00	1.00	0.50	0.00	0.00	1.00	0.50	0.00
71	3.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
72	0.00	9.00	0.00	0.00	0.00	4.00	0.00	0.00
74	1.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00
75	1.00	0.00	1.00	0.00	1.00	0.00	0.50	0.00
76	2.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00
81	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
82	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
86	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
94	0.00	1.00	0.00	2.00	0.00	1.00	0.00	1.00
95	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
TOTAL	3,446.00	6,218.00	946.50	62.00	3,037.00	4,098.00	668.50	39.00

Figure 6 (a and b) show the ungrouped travel times in percentage values of total person and motorized trips by trip purpose, respectively.

(a) Person Trips



(b) Motorized Trips

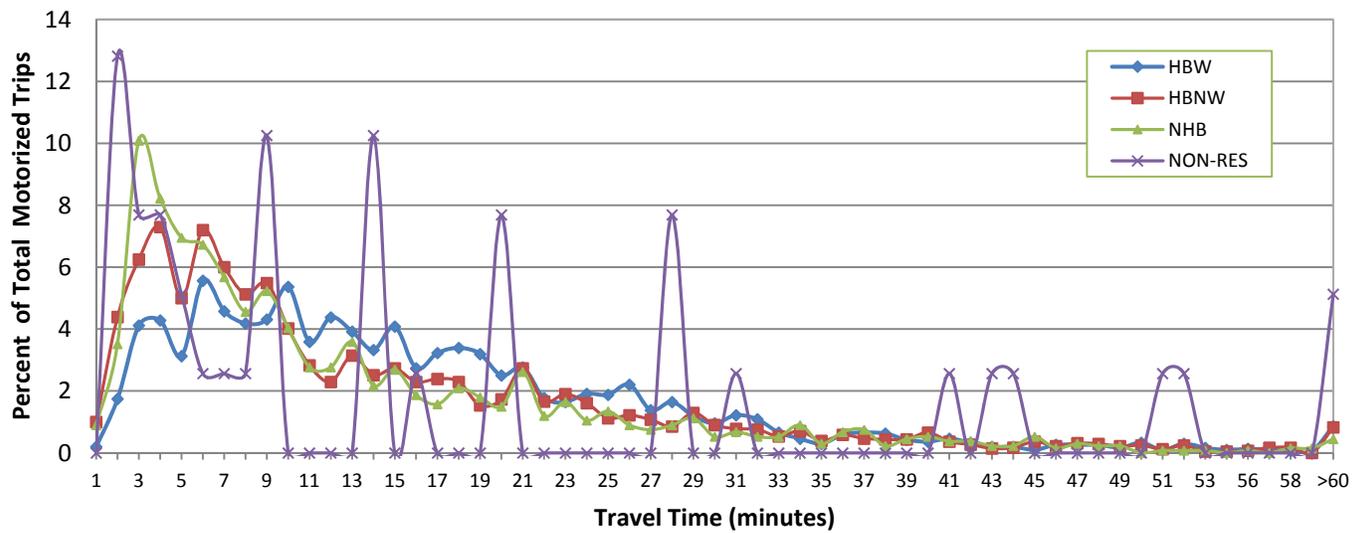


Figure 6. Travel Times of Person and Motorized Trips to and from the Work Place.

COMMERCIAL VEHICLE COUNTS

The commercial vehicle (CV) counts involved counting the number of cargo and service vehicles traveling to and from the surveyed establishments during the work place travel survey day. The counts were conducted using ACRs, video cameras, or manual counts. The counts were conducted for a 24-hour period beginning at 6:00 a.m. and ending at 6:00 a.m. on the following day of the survey. A total of 8,140 commercial vehicles were counted at 394 out of the 500 surveyed establishments. It was not certain whether the remaining 106 establishments did or did not have commercial vehicles traveling to and from the sites. Based on the total CV counts, approximately 70 percent were at education establishments, which probably included school buses that should not have been classified as commercial vehicles.

Figure 7 shows the distribution of commercial vehicle counts by employment type while Table 20 shows the distribution by area and employment types for the H-GAC study area.

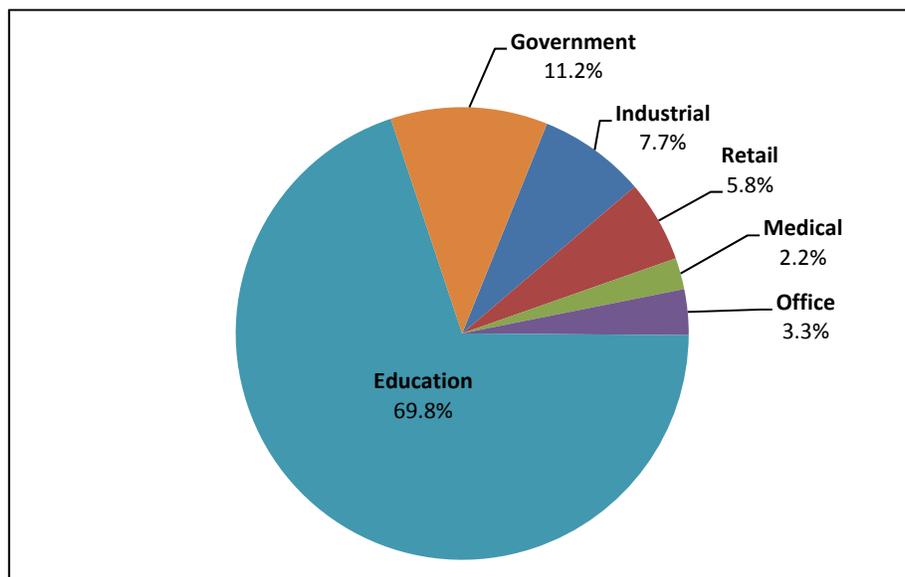


Figure 7. Commercial Vehicle Counts by Employment Type.

Table 20. Commercial Vehicle Counts by Area Type and Employment Type.

Area Type	Industrial	Retail	Medical	Office	Education 1	Government	Total
CBD	0	0	2	0	0	0	2
Urban	38	48	46	47	127	4	310
Suburban	453	266	103	160	2,982	195	4,159
Suburban Fringe	104	108	31	53	2,228	628	3,152
Rural	29	53	0	6	343	86	517
Total	624	475	182	266	5,680	913	8,140

COMMERCIAL VEHICLE SURVEYS

Commercial vehicle (CV) intercept interviews were conducted as part of the H-GAC work place survey. A total of 338 drivers of commercial vehicles making deliveries or pick-ups at 111 sites agreed to participate in the CV survey. The commercial vehicles were distinguished based on nine classification types listed in Table 21 and Table 22, and categorized as cargo transport or service vehicle types. The CV analysis included the trip purpose, the type of place where the trips occurred, and the type and average weight of cargo being transported at pick-up and drop-off locations.

Table 21 and Table 22 show the vehicle classification types of the surveyed cargo transport and service vehicles for each category of employment. Approximately 79 percent of the total was cargo transport vehicles and 21 percent were service vehicles. Approximately 43 percent of the cargo transport vehicles were classified as single-unit 2-axle (6-wheelers), 21 percent were semi all tractor-trailer combinations, and 17 percent were cargo or mini vans. For surveyed service vehicles, approximately 19 percent were classified as cargo or mini vans, 18 percent were passenger cars, and 10 percent were either pick-up trucks or 10-wheelers.

Table 21. Survey Commercial Cargo Transport Vehicle Classification Types.

Vehicle Classification	Industrial	Retail	Medical	Office	Education	Government	Total	Percent of Total
Passenger Car	2	0	0	1	0	1	4	1.50
Pick-Up Truck	0	0	0	0	1	0	1	0.38
Van (cargo or mini)	3	11	4	6	11	10	45	16.92
Sport Utility Vehicle	0	1	1	0	1	0	3	1.13
Single Unit 2-axle (6-wheels)	10	22	1	15	57	9	114	42.86
Single Unit 3-axle (10-wheels)	6	7	1	0	0	0	14	5.26
Single Unit 4-axle (14-wheels)	1	1	0	0	0	0	2	0.75
Semi (all tractor-trailer combination)	12	39	2	0	3	0	56	21.05
Other	5	4	7	6	3	2	27	10.15
Total	39	85	16	28	76	22	266	100.00

Table 22. Survey Commercial Service Vehicle Classification Types.

Vehicle Classification	Industrial	Retail	Medical	Office	Education	Government	Total	Percent of Total
Passenger Car	4	8	0	0	0	1	13	18.06
Pick-Up Truck	4	0	0	2	0	1	7	9.72
Van (cargo or mini)	2	6	0	2	4	0	14	19.44
Sport Utility Vehicle	0	0	0	0	0	1	1	1.39
Single Unit 2-axle (6-wheels)	4	2	0	2	8	1	17	23.61
Single Unit 3-axle (10-wheels)	1	0	0	0	6	0	7	9.72
Single Unit 4-axle (14-wheels)	0	0	0	0	0	0	0	0.00
Semi (all tractor-trailer combinations)	0	2	0	0	1	0	3	4.17
Other	1	0	0	1	8	0	10	13.89
Total	16	18	0	7	27	4	72	100.00

Table 23 and Table 24 show the trip purposes and types of place at the origin and destination of all surveyed commercial vehicles, respectively.

Table 23. Survey Commercial Vehicle Travel Purposes at Trip Origins and Destinations.

Trip Purpose	Origin	Percent of Total	Destination	Percent of Total
Base Location/Return to Base Location	16	4.73	31	9.17
Delivery	118	34.91	155	45.86
Pick Up	60	17.75	30	8.88
Delivery and Pick Up	69	20.41	79	23.37
Maintenance	14	4.14	10	2.96
Driver needs (lunch, etc.)	24	7.10	3	0.89
To Home	1	0.30	12	3.55
Buy Gas/Fuel	24	7.10	2	0.59
Other	11	3.25	13	3.85
Refused/Unknown	1	0.30	3	0.89
Total	338	100.00¹	338	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 24. Survey Commercial Vehicle Types of Place at Trip Origins and Destinations.

Type of Place	Origin	Percent of Total	Destination	Percent of Total
Office Building	76	22.49	76	22.49
Retail/Shopping	37	10.95	43	12.72
Industrial/Manufacturing	21	6.21	21	6.21
Medical/Hospital	3	0.89	8	2.37
Education 1 (12th grade or less)	33	9.76	34	10.06
Education 2 (College, Trade, etc.)	1	0.30	4	1.18
Government Office/Building	2	0.59	2	0.59
Residential	66	19.53	65	19.23
Airport	3	0.89	3	0.89
Intermodal Facility	1	0.30	1	0.30
Warehouse	35	10.36	22	6.51
Distribution Center	11	3.25	6	1.78
Other	49	14.50	38	11.24
Refused/Unknown	0	0.00	15	4.44
Total	338	100.00¹	338	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 25 shows the types of commodities being transported at the work place by 266 out of the total 388 surveyed commercial vehicles.

Table 25. Survey Cargo Types.

Cargo Type	Number of Deliveries	Percent of Total	Average Cargo Delivery Weight (lbs.)	Number of Pick-Ups	Percent of Total	Average Cargo Pick-Up Weight (lbs.)
Marine Products	1	0.38	215.00	0	0.00	0.00
Food, Health, and Beauty Products	12	4.51	498.45	5	1.88	358.75
Textiles	1	0.38	32,000.00	1	0.38	26,000.00
Wood Products	2	0.75	2,230.00	0	0.00	0.00
Chemical Products	5	1.88	2,256.50	4	1.50	1,178.00
Printed Matter	1	0.38	500.00	1	0.38	x
Rubber, Plastic, and Styrofoam Products	3	1.13	10,266.67	0	0.00	0.00
Clay, Concrete, Glass, or Stone	2	0.75	469.50	0	0.00	0.00
Manufactured Goods/Equipment	5	1.88	26.50	0	0.00	0.00
Miscellaneous Shipments	90	33.83	174.81	56	21.05	6.00
Hazardous Materials	1	0.38	12,000.00	1	0.38	73,000.00
Transportation	1	0.38	40.00	2	0.75	155.00
Unclassified Cargo	24	9.02	4,669.00	17	6.39	15,480.00
Driver Refused to Answer	5	1.88	2,160.00	2	0.75	26.00
Unknown to Driver	4	1.50	28.67	1	0.38	x
Empty	0	0.00	NA	16	6.02	NA
No Cargo Delivery/Pick Up	109	40.98	NA	160	60.15	NA
Total	266	100.00¹	1,421.28	266	100.00¹	4,327.05

¹ Percentage total may not be exact due to rounding.

x - Not reported, NA - Not applicable.

SPECIAL GENERATOR SURVEYS

Special generators are those establishments that are considered unique trip attractors. These may include major shopping centers, hospitals, colleges/universities, recreational facilities, military bases, airports, and other land use developments that have unique trip generation characteristics and therefore require modeling outside the typical travel demand modeling framework.

Five special generators were surveyed in the Houston-Galveston study area. These included one university (University of Houston), two airports (George Bush Intercontinental Airport and William P. Hobby Airport), and two ports (Port of Freeport and Port of Houston). Figure 8 shows their locations and corresponding area types.

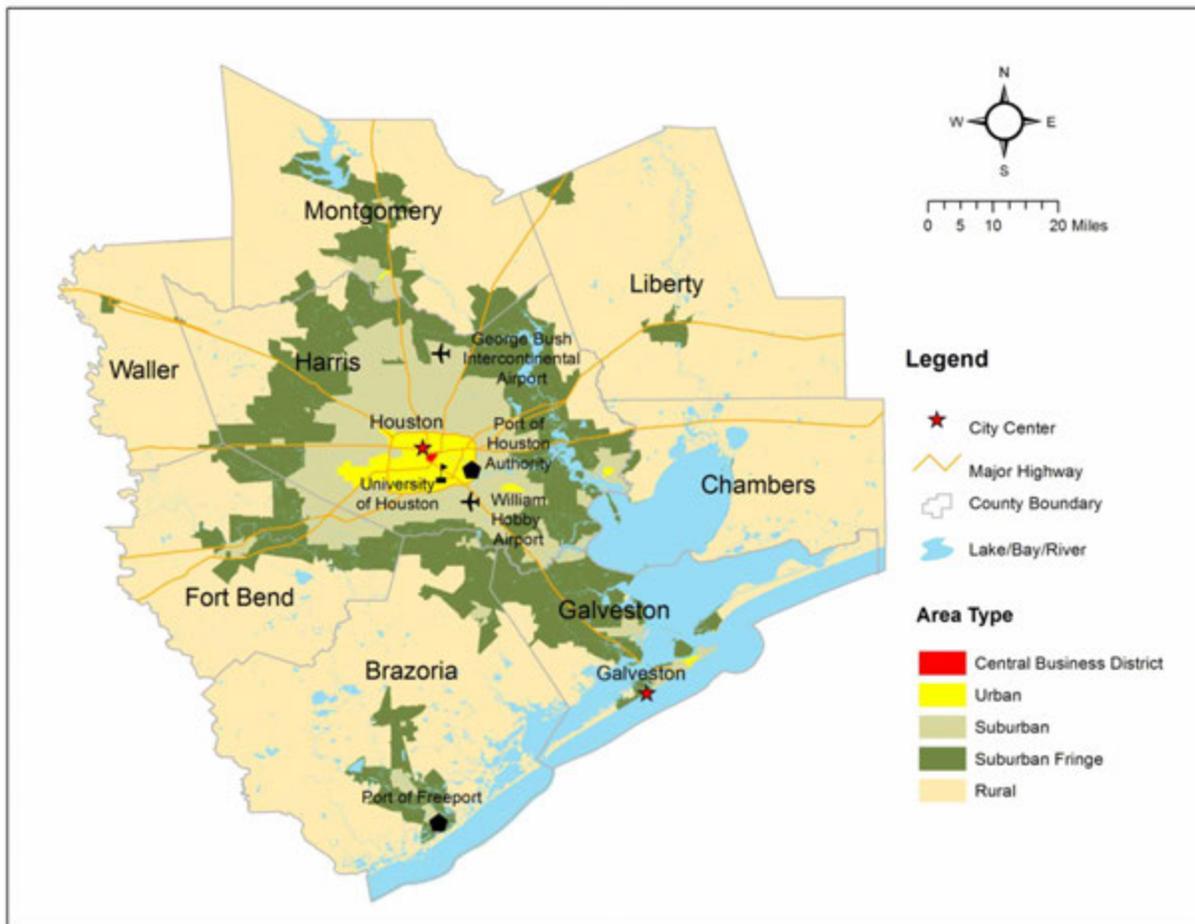


Figure 8. H-GAC Special Generators.

The methodology used to survey special generators was the same as that used for full work place surveys (see page 2 of this report). It included a general survey, an intercept survey, non-commercial vehicle counts and/or person counts, and commercial vehicle counts. Table 26 provides a summary of the general data collected from the special generator surveys. The Port of Houston was converted into a partial survey site, and was later dropped given the incomplete data for analysis and expansion. The vendor was denied permission to conduct interviews with the business entities at the Port, and employment data were not available.

Table 26. H-GAC Special Generators Data Summary.

Data Elements	Bush Intercontinental Airport	Hobby Airport	University of Houston	Port of Freeport	Port of Houston¹
Total Employment	18,500	7,172	5,500	137 ²	NA
Employees at Work	9,250	3,586	4,785	38	NA
Commercial Vehicle Counts	18,791	7,502	5,233	1,057	13,973
Non-Commercial Vehicle Counts	79,095	23,027	64,426	1,274	9,118
Person Counts ³	101,961	28,860	76,846	4,256 ⁴	NA
Employee Surveys	423	341	115	38 ⁵	NA
Visitor Surveys	536	474	929	123 ⁵	NA
Commercial Vehicle Surveys	85	41	53	47	NA

¹ Converted into partial survey site. No intercept surveys were conducted and employment data were not made available. NA - Not available.

² Based on total zonal employment. Actual total employment reported at the Port of Freeport was 38.

³ Estimates were derived by multiplying the non-commercial vehicle count by the average auto driver vehicle occupancy.

⁴ Including 2,615 persons counted at the site.

⁵ Values adjusted to equal actual total employees at work. 113 employee surveys were added to the 10 visitor surveys. It was deemed reasonable to assume that those surveys were actually visitors with work-related purposes at the facility.

The trip characteristics observed from each special generator are described by mode of travel, trip purpose, and trip length. The analyses of trip length pertain to inter-zonal trips since the Houston-Galveston network matrix provides only distances between zones and not within zones, and for the auto driver mode only. It is important to note that the results presented throughout this section were based on survey trip data. These results significantly change after weighting is applied to the trip data during the survey expansion.

Commercial vehicle (CV) intercept surveys were also conducted at each special generator. The vehicles were distinguished based on nine classification types and categorized as cargo transport or service vehicle types. The CV analysis included the trip purpose, the type of place where the trips occurred, and the type and average weight of cargo being transported at pick-up and drop off locations.

George Bush Intercontinental Airport

Bush Intercontinental Airport had a reported total employment of 18,500, with 9,250 of these employees estimated to be at work during the travel survey day. A total of 423 employees and 536 visitors participated in the survey. The surveyed employees represented approximately 5 percent of the total employees at work. Vehicle counts were conducted at 12 locations for a 24-hour period (6:00 a.m. to 6:00 a.m.), with a total count of 79,095 non-commercial vehicles and 18,791 commercial vehicles.

Table 27 shows the mode of travel used by survey participants traveling to and from Bush Intercontinental Airport. Approximately 62 percent of the total trips were made by drivers of cars, trucks, or vans, 9 percent were passengers of cars, trucks, or vans, and 23 percent traveled by airplane. The remaining 6 percent used other modes of travel, with 2 percent by transit bus and more than 1 percent by taxi/limo. The average occupancy rates for the auto driver mode of travel by surveyed residents were 1.1 persons for employee trips and 1.5 persons for visitor trips. For surveyed non-residents, the average occupancy rates were 3.5 persons per employee trip and 1.8 persons per visitor trip.

Table 27. Survey Mode of Travel to and from Bush Intercontinental Airport.

Mode	To Workplace	From Workplace	Total Trips	Percent of Total
Driver (car/truck/van)	624	567	1,191	62.10
Passenger (car/truck/van)	77	103	180	9.38
Walk	1	1	2	0.10
Bicycle	1	1	2	0.10
Transit Bus	20	17	37	1.93
Metro Rail	2	1	3	0.16
Taxi/Limo	13	12	25	1.30
Commercial Cargo Transport Vehicle	1	1	2	0.10
Commercial Service Vehicle	2	3	5	0.26
Motorcycle	3	2	5	0.26
Airplane	210	232	442	23.04
Hotel/Motel Shuttle Bus/Van	2	10	12	0.63
Other Parking Shuttle	2	8	10	0.52
Other	1	1	2	0.10
Total	959	959	1,918	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 28 shows the number and percentage of surveyed trips to and from Bush Intercontinental Airport by purpose.

Table 28. Survey Trips by Purposes to and from Bush Intercontinental Airport.

Trip Purpose	To Airport	From Airport	Total Trips	Percent of Total
HBW	440	426	866	45.15
HBNW	202	154	356	18.56
NHB-D	48	0	48	2.50
NHB-O	0	50	50	2.61
EXT-D	73	0	73	3.81
EXT -O	0	133	133	6.93
NON RES	196	196	392	20.44
Total	959	959	1,918	100.00

Table 29 and Table 30 show the trip lengths and travel times by trip purpose for person and motorized trips, respectively. The number of trips slightly differed from the number of trips shown in Table 28 since these represented inter-zonal trips only. The estimates for NHB trips reflected the average of NHB-D and NHB-O trips. The average trip length per person trip was 21 miles and 20 miles per motorized trip. The average travel time per person trip was approximately 30 minutes and close to 29 minutes per motorized trip.

Table 29. Survey Inter-Zonal Trip Lengths to and from Bush Intercontinental Airport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Miles	Average Person Miles	Total Motorized Trips	Total Motorized Miles	Average Motorized Miles
HBW	878.00	15,166.68	17.27	742.00	13,012.20	17.54
HBNW	541.00	15,314.10	28.31	311.00	8,653.94	27.83
NHB	53.50	704.28	13.16	43.00	598.89	13.93
NON-RES	94.00	1,781.02	18.95	61.00	1,100.47	18.04
Total	1,566.50	32,966.08	21.04	1,157.00	23,365.50	20.19

Table 30. Survey Inter-Zonal Travel Times to and from Bush Intercontinental Airport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Minutes	Average Person Minutes	Total Motorized Trips	Total Motorized Minutes	Average Motorized Minutes
HBW	878.00	22,358.69	25.47	742.00	19,129.39	25.78
HBNW	541.00	20,689.92	38.24	311.00	11,694.85	37.60
NHB	53.50	1,082.86	20.24	43.00	906.54	21.08
NON-RES	94.00	2,507.86	26.68	61.00	1,533.26	25.14
Total	1,566.50	46,639.33	29.77	1,157.00	33,264.04	28.75

Table 31 shows the vehicle classification types of the cargo transport and service vehicles surveyed at the Bush Intercontinental Airport, including the average occupancy for each vehicle. More than 96 percent of the total was cargo transport vehicles and the remaining 4 percent were service vehicles. Approximately 28 percent were classified as single unit 2-axle (6-wheelers), nearly 25 percent were cargo or mini vans, 18 percent were pick-up trucks, and more than 16 percent were semi tractor-trailer combinations. The average occupancy was 1.1 persons per commercial vehicle.

Table 31. Survey Commercial Vehicle Classification Types and Average Occupancy.

Vehicle Classification	CV Type		Total	Percent of Total	Average Occupancy
	Cargo Transport	Service			
Passenger Car	5	0	5	5.88	1.20
Pick-Up Truck	14	1	15	17.65	1.00
Van (cargo or mini)	19	2	21	24.71	1.24
Sport Utility Vehicle (SUV)	2	0	2	2.35	1.00
Single Unit 2-axle (6 wheels)	24	0	24	28.23	1.04
Single Unit 3-axle (10 wheels)	3	0	3	3.53	1.00
Single Unit 4-axle (14 wheels)	0	0	0	0.00	0.00
Semi (tractor-trailer combination)	14	0	14	16.47	1.07
Other	1	0	1	1.18	1.00
Total	82	3	85	100.00	1.09

Table 32 shows the trip purposes at the origin and destination of the CV trips. Table 33 shows the types of place at the origin and destination of the CV trips.

Table 32. Survey Commercial Vehicle Travel Purposes at Trip Origins and Destinations.

Trip Purpose	Origin	Percent of Total	Destination	Percent of Total
Base Location/Return to Base Location	1	1.18	15	17.65
Delivery	36	42.35	33	38.82
Pick Up	33	38.82	7	8.24
Delivery and Pick Up	13	15.29	11	12.94
Maintenance	1	1.18	1	1.18
Driver Needs (lunch, etc.)	0	0.00	0	0.00
To Home	0	0.00	14	16.47
Buy Gas/Fuel	0	0.00	0	0.00
Other	1	1.18	0	0.00
Refused/Unknown	0	0.00	4	4.70
Total	85	100.00	85	100.00

Table 33. Survey Commercial Vehicle Types of Place at Trip Origins and Destinations.

Type of Place	Origin	Percent of Total	Destination	Percent of Total
Office Building	13	15.29	8	9.41
Retail/Shopping	1	1.18	1	1.18
Industrial/Manufacturing	3	3.53	5	5.88
Medical/Hospital	6	7.06	2	2.35
Education (College, Trade)	1	1.18	0	0.00
Government Office/Building	0	0.00	1	1.18
Residential	4	4.71	6	7.06
Airport	7	8.23	3	3.53
Warehouse	28	32.94	31	36.47
Distribution Center	16	18.82	12	14.12
Other	6	7.06	5	5.88
Refused/Unknown		0.00	11	12.94
Total	85	100.00	85	100.00

Table 34 shows the types of commodities being transported at Bush Intercontinental Airport by 82 out of the total 85 surveyed commercial vehicles.

Table 34. Survey Cargo Types at Bush Intercontinental Airport.

Cargo Type	Number of Deliveries	Percent of Total	Average Cargo Weight (lbs.)	Number of Pick-Ups	Percent of Total	Average Cargo Weight (lbs.)
Forest Products	1	1.22	50.00	1	1.22	675.00
Marine Products	1	1.22	680.00	1	1.22	200.00
Metals and Minerals	3	3.66	923.67	1	1.22	2,000.00
Food, Health, and Beauty Products	1	1.22	1,000.00	2	2.44	2,650.00
Textiles	0	0.00	0.00	1	1.22	70.00
Wood Products	2	2.44	1,500.00	0	0.00	0.00
Printed Matter	0	0.00	0.00	1	1.22	130.00
Chemical Products	2	2.44	1,565.00	0	0.00	0.00
Refined Petroleum or Coal Products	2	2.44	7,770.00	1	1.22	1,065.00
Clay, Concrete, Glass, or Stone	2	2.44	500.00	1	1.22	750.00
Manufactured Goods/Equipment	6	7.32	2,804.17	9	10.98	7,359.11
Wastes	0	0.00	0.00	1	1.22	100.00
Miscellaneous Shipments	6	7.32	8,835.00	8	9.76	2,973.14
Hazardous Materials	2	2.44	984.00	0	0.00	0.00
Transportation	0	0.00	0.00	1	1.22	41,000.00
Unclassified Cargo ¹	13	15.85	2,645.08	10	12.20	3,195.00
Driver Refused to Answer	1	1.22	2,500.00	1	1.22	1,080.00
Unknown to Driver	9	10.98	1,719.44	10	12.20	888.40
No Cargo Delivery/Pick Up	31	37.80	NA	33	40.24	NA
Total	82	100.00²	2,854.18	82	100.00²	3,755.13

¹ Two cargo vehicles reported a cargo weight of 11,300 lbs. for containers and 20,000 lbs. for container transfers.

Other unclassified cargo items included blood, medical goods, computer parts, dogs, flowers, and documents.

² Percentage total may not be exact due to rounding.

NA – Not applicable.

William P. Hobby Airport

William P. Hobby Airport had a reported total employment of 7,172 and 3,586 of its employees were estimated to be at work during the travel survey day. A total of 341 employees and 474 non-employees participated in the survey. The surveyed employees represented around 9 percent of the total employees at work. Vehicle counts were conducted at 24 locations for a 24-hour period (6:00 a.m. to 6:00 a.m.), with a total count of 23,027 non-commercial vehicles and 7,502 commercial vehicles.

Table 35 shows the mode of travel used by survey participants traveling to and from Hobby Airport. Approximately 62 percent of the total trips were made by drivers of cars, trucks, or vans, 11 percent were passengers of cars, trucks, or vans, and 21 percent traveled by airplane. The remaining 6 percent used other modes of travel, with more than 1 percent by transit bus and taxi/limo. The average occupancy rates for the auto driver mode of travel by surveyed residents were 1.1 persons for employee trips and 1.4 persons for visitor trips. All surveyed non-residents were visitors, with average occupancy rates of 1.7 persons per trip.

Table 35. Survey Mode of Travel to and from Hobby Airport.

Mode	To Workplace	From Workplace	Total Trips	Percent of Total
Driver (car/truck/van)	514	501	1,015	62.27
Passenger (car/truck/van)	80	95	175	10.74
Walk	4	3	7	0.43
Bicycle	1	1	2	0.12
Transit Bus	10	7	17	1.04
School Bus	1	0	1	0.06
Metro Rail	1	0	1	0.06
Taxi/Limo	10	14	24	1.47
Commercial Cargo Transport Vehicle	2	2	4	0.25
Commercial Service Vehicle	4	7	11	0.67
Motorcycle	2	2	4	0.25
Airplane	180	167	347	21.29
Hotel/Motel Shuttle Bus/Van	3	9	12	0.74
Other Parking Shuttle	2	6	8	0.49
Other	1	1	2	0.12
Total	815	815	1,630	100.00

Table 36 shows the number and percentage of surveyed trips to and from Hobby Airport by purpose.

Table 36. Survey Trips by Purposes to and from Hobby Airport.

Trip Purpose	To Workplace	From Workplace	Total Trips	Percent of Total
HBW	334	368	702	43.07
HBNW	159	126	285	17.48
NHB-D	78	0	78	4.79
NHB-O	0	65	65	3.99
EXT-D	76	0	76	4.66
EXT -O	0	88	88	5.40
NON RES	168	168	336	20.61
Total	815	815	1,630	100.00

Table 37 and Table 38 show the trip lengths and travel times by trip purpose for person and motorized trips, respectively. The number of trips slightly differed from the number of trips shown in Table 36 since these represented inter-zonal trips only. The estimates for NHB trips reflected the average of NHB-D and NHB-O trips. The average trip length was approximately 18 miles per trip. The average travel time was approximately 26 minutes per trip.

Table 37. Survey Inter-Zonal Trip Lengths to and from Hobby Airport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Miles	Average Person Miles	Total Motorized Trips	Total Motorized Miles	Average Motorized Miles
HBW	715.00	11,996.78	16.78	618.00	10,362.58	16.77
HBNW	389.00	8,632.23	22.19	231.00	5,079.34	21.99
NHB	72.50	1,015.42	14.01	67.50	974.79	14.44
NON-RES	81.00	1,123.80	13.87	53.00	772.04	14.57
Total	1,257.50	22,768.23	18.11	969.50	17,188.75	17.73

Table 38. Survey Inter-Zonal Travel Times to and from Hobby Airport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Minutes	Average Person Minutes	Total Motorized Trips	Total Motorized Minutes	Average Motorized Minutes
HBW	715.00	17,520.44	24.50	618.00	15,117.87	24.46
HBNW	389.00	12,052.33	30.98	231.00	7,084.33	30.67
NHB	72.50	1,497.98	20.66	67.50	1,430.68	21.20
NON-RES	81.00	1,631.41	20.14	53.00	1,117.57	21.09
Total	1,257.50	32,702.16	26.01	969.50	24,750.45	25.53

Table 39 shows the vehicle classification types of the cargo transport and service vehicles surveyed at Hobby Airport, including the average occupancy for each vehicle. Approximately 95 percent of the total was cargo transport vehicles and the remaining 5 percent were service vehicles. Approximately 29 percent were classified as either single unit 2-axle (6-wheelers) or cargo or mini vans, 17 percent were pick-up trucks, 12 percent were passenger cars, 10 percent were sport utility vehicles, and more than 2 percent were 14-wheelers. The average occupancy was 1.2 persons per commercial vehicle.

Table 39. Survey Commercial Vehicle Classification Types and Average Occupancy.

Vehicle Classification	CV Type		Total	Percent of Total	Average Occupancy
	Cargo Transport	Service			
Passenger Car	5	0	5	12.20	1.00
Pick-Up Truck	6	1	7	17.07	1.29
Van (cargo or mini)	12	0	12	29.27	1.17
Sport Utility Vehicle (SUV)	4	0	4	9.76	1.00
Single Unit 2-axle (6 wheels)	11	1	12	29.27	1.17
Single Unit 3-axle (10 wheels)	0	0	0	0.00	0.00
Single Unit 4-axle (14 wheels)	1	0	1	2.44	1.00
Semi (tractor-trailer combination)	0	0	0	0.00	0.00
Total	39	2	41	100.00¹	1.15

¹ Percentage total may not be exact due to rounding.

Table 40 shows the trip purposes at the origin and destination of the CV trips. Table 41 shows the types of place at the origin and destination of the CV trips.

Table 40. Survey Commercial Vehicle Travel Purposes at Trip Origins and Destinations.

Trip Purpose	Origin	Percent of Total	Destination	Percent of Total
Base Location/Return to Base Location	6	14.63	6	14.63
Delivery	7	17.07	21	51.22
Pick Up	22	53.66	6	14.63
Delivery and Pick Up	4	9.76	3	7.32
Maintenance	1	2.44	1	2.44
Driver Needs (lunch, etc.)	0	0.00	0	0.00
To Home	0	0.00	4	9.76
Buy Gas/Fuel	0	0.00	0	0.00
Other	1	2.44	0	0.00
Refused/Unknown	0	0.00	0	0.00
Total	41	100.00	41	100.00

Table 41. Survey Commercial Vehicle Types of Place at Trip Origins and Destinations.

Type of Place	Origin	Percent of Total	Destination	Percent of Total
Office Building	3	7.32	7	17.07
Retail/Shopping	0	0.00	2	4.88
Industrial/Manufacturing	8	19.51	5	12.20
Medical/Hospital	5	12.20	5	12.20
Government Office/Building	1	2.44	0	0.00
Residential	2	4.88	4	9.76
Airport	1	2.44	1	2.44
Warehouse	9	21.95	7	17.07
Distribution Center	2	4.88	0	0.00
Other	10	24.39	5	12.20
Refused/Unknown	0	0.00	5	12.20
Total	41	100.00	41	100.00

Table 42 shows the types of commodities being transported at Hobby Airport by 39 out of the total 41 surveyed commercial vehicles.

Table 42. Survey Cargo Types at Hobby Airport.

Cargo Type	Number of Deliveries	Percent of Total	Average Cargo Weight (lbs.)	Number of Pick-Ups	Percent of Total	Average Cargo Weight (lbs.)
Forest Products	0	0.00	0.00	2	5.13	375.00
Food, Health, and Beauty Products	3	7.69	10,233.33	4	10.26	7,680.00
Refined Petroleum or Coal Products	1	2.56	80.00	0	0.00	0.00
Manufactured Goods/Equipment	10	25.64	109.30	4	10.26	158.75
Miscellaneous Shipments	1	2.56	37.00	1	2.56	51.00
Unclassified Cargo	4	10.26	12.25	6	15.38	106.67
Driver Refused to Answer	1	2.56	0.00	1	2.56	0.00
Unknown to Driver	1	2.56	10.00	4	10.26	35.33
No Cargo Delivery/Pick Up	18	46.15	NA	17	43.59	NA
Total	39	100.00¹	1,598.45	39	100.00	1,645.10

¹ Percentage total may not be exact due to rounding.
NA – Not applicable.

University of Houston

The University of Houston had a reported total employment of 5,500 and 4,785 of its employees were estimated to be at work during the travel survey day. A total of 115 employees and 929 non-employees participated in the survey. The surveyed employees represented 2 percent of the total employees at work. Vehicle counts were conducted for a 24-hour period (6:00 a.m. to 6:00 a.m.), with a total count of 64,426 non-commercial vehicles and 5,233 commercial vehicles.

Table 43 shows the mode of travel used by survey participants traveling to and from the University of Houston. Approximately 87 percent were drivers of cars, trucks, or vans, more than 4 percent were passengers of cars, trucks, or vans, 5 percent used transit bus, and less than 4 percent used other modes of travel. The average occupancy rates for the auto driver mode of travel by surveyed residents were 1.1 persons per employee trip and 1.3 persons per visitor trip. For surveyed non-residents, the average occupancy rate was 1.0 persons per employee trip and per visitor trip.

Table 43. Survey Mode of Travel to and from the University of Houston.

Mode	To Workplace	From Workplace	Total Trips	Percent of Total
Driver (car/truck/van)	906	912	1,818	87.07
Passenger (car/truck/van)	49	45	94	4.50
Walk	13	12	25	1.20
Bicycle	11	10	21	1.01
Transit Bus	54	52	106	5.08
Metro Rail	4	6	10	0.48
School Bus	4	4	8	0.38
Motorcycle	3	3	6	0.29
Total	1,044	1,044	2,088	100.01

¹ Percentage total may not be exact due to rounding.

Table 44 shows the number and percentage of surveyed trips to and from the University of Houston by trip purpose.

Table 44. Survey Trips by Purposes to and from the University of Houston.

Trip Purpose	To Workplace	From Workplace	Total Trips	Percent of Total
HBW	117	112	229	10.97
HBNW	862	820	1,682	80.56
NHB-D	57	0	57	2.73
NHB-O	0	104	104	4.98
EXT-D	1	0	1	0.05
EXT -O	0	1	1	0.05
NON RES	7	7	14	0.67
Total	1,044	1,044	2,088	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 45 and Table 46 show the trip lengths and travel times by trip purpose for person and motorized trips, respectively. The number of trips slightly differed from the number of trips shown in Table 46 since these represented inter-zonal trips and for the auto driver mode of travel only. The estimates for NHB trips reflected the average of NHB-D and NHB-O trips. The average trip length was approximately 15 miles per trip. The average travel time was approximately 22 minutes per trip.

Table 45. Survey Inter-Zonal Trip Lengths to and from the University of Houston by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Miles	Average Person Miles	Total Motorized Trips	Total Motorized Miles	Average Motorized Miles
HBW	247.00	3,191.59	12.92	217.00	2,776.51	12.79
HBNW	1,920.00	29,494.36	15.36	1,557.00	24,198.93	15.54
NHB	93.00	1,109.71	11.93	77.00	918.20	11.92
NON-RES	1.00	5.28	5.28	1.00	5.28	5.28
Total	2,261.00	33,800.94	14.95	1,852.00	27,898.92	15.06

Table 46. Survey Inter-Zonal Travel Times to and from the University of Houston by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Minutes	Average Person Minutes	Total Motorized Trips	Total Motorized Minutes	Average Motorized Minutes
HBW	247.00	4,734.77	19.17	217.00	4,117.84	18.98
HBNW	1,920.00	42,853.66	22.32	1,557.00	35,146.46	22.57
NHB	93.00	1,649.87	17.74	77.00	1,364.88	17.73
NON-RES	1.00	10.56	10.56	1.00	10.56	10.56
Total	2,261.00	49,248.86	21.78	1,852.00	40,639.74	21.94

Table 47 shows the vehicle classification types of the cargo transport and service vehicles surveyed at the University of Houston, including the average occupancy for each vehicle. Approximately 51 percent of the total was cargo transport vehicles and 49 percent were service vehicles. Approximately 38 percent were classified as single unit 2-axle (6-wheelers) or 23 percent were cargo or mini vans, 19 percent were pick-up trucks, more than 9 percent were 10-wheelers, another 9 percent were “other” vehicles which consisted of mail/UPS trucks, a cement truck, and a bus. Less than 2 percent were passenger cars. The average occupancy was 1.9 persons per commercial vehicle.

Table 47. Survey Commercial Vehicle Classification Types and Average Occupancy.

Vehicle Classification	CV Type		Total	Percent of Total	Average Occupancy
	Cargo Transport	Service			
Passenger Car	0	1	1	1.89	1.00
Pick-Up Truck	1	9	10	18.87	1.30
Van (cargo or mini)	4	8	12	22.64	1.83
Sport Utility Vehicle (SUV)	0	0	0	0.00	0.00
Single Unit 2-axle (6 wheels)	15	5	20	37.74	1.25
Single Unit 3-axle (10 wheels)	4	1	5	9.43	1.20
Single Unit 4-axle (14 wheels)	0	0	0	0.00	0.00
Semi (tractor-trailer combination)	0	0	0	0.00	0.00
Other	3	2	5	9.43	6.80
Total	27	26	53	100.00	1.91

Table 48 shows the trip purposes at the origin and destination of the CV trips. Table 49 shows the types of place at the origin and destination of the CV trips.

Table 48. Survey Commercial Vehicle Travel Purposes at Trip Origins and Destinations.

Trip Purpose	Origin	Percent of Total	Destination	Percent of Total
Base Location/Return to Base Location	25	47.17	30	56.60
Delivery	13	24.53	10	18.87
Pick Up	3	5.66	3	5.66
Delivery and Pick Up	2	3.77	4	7.55
Maintenance	6	11.32	4	7.55
Driver Needs (lunch, etc.)	2	3.77	0	0.00
To Home	0	0.00	2	3.77
Buy Gas/Fuel	2	3.77	0	0.00
Total	53	100.00¹	53	100.00

¹ Percentage total may not be exact due to rounding.

Table 49. Survey Commercial Vehicle Types of Place at Trip Origins and Destinations.

Type of Place	Origin	Percent of Total	Destination	Percent of Total
Office Building	12	22.64	18	33.96
Retail/Shopping	6	11.32	7	13.21
Industrial/Manufacturing	4	7.55	3	5.66
Medical/Hospital	0	0.00	1	1.89
Education (College, Trade)	11	20.75	14	26.42
Residential	5	9.43	2	3.77
Warehouse	8	15.09	6	11.32
Distribution Center	3	5.66	1	1.89
Construction Site	0	0.00	1	1.89
Other	4	7.55	0	0.00
Total	53	100.00¹	53	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 50 shows the types of commodities being transported at the University of Houston by 27 out of the total 53 surveyed commercial vehicles.

Table 50. Survey Cargo Types at the University of Houston.

Cargo Type	Number of Deliveries	Percent of Total	Average Cargo Weight (lbs.)	Number of Pick-Ups	Percent of Total	Average Cargo Weight (lbs.)
Metals and Minerals	1	3.70	25.00	0	0.00	0.00
Food, Health, and Beauty Products	3	11.11	201.67	0	0.00	0.00
Textiles	1	3.70	25.00	1	3.70	25.00
Printed Matter	2	7.41	100.00	1	3.70	50.00
Chemical Products	2	7.41	20.00	0	0.00	0.00
Clay, Concrete, Glass, or Stone	2	7.41	75.00	0	0.00	0.00
Manufactured Goods/Equipment	6	22.22	45.83	0	0.00	0.00
Miscellaneous Shipments	4	14.81	22.00	2	7.41	11.00
Unknown to Driver	5	18.52	8.20	2	7.41	5.50
No Cargo Delivery/Pick Up	1	3.70	NA	21	77.78	NA
Total	27	100.00¹	55.73	27	100.00	18.00

¹ Percentage total may not be exact due to rounding.

NA – Not applicable.

Port of Freeport

The Port of Freeport had a reported total employment of 38 and all of its employees were estimated to be at work during the travel survey day. A total of 38 employees and 123 non-employees participated in the survey. Vehicle counts were conducted for a 24-hour period (6:00 a.m. to 6:00 a.m.), with a total count of 1,274 non-commercial vehicles and 1,057 commercial vehicles. A total of 2,615 persons were counted at the site. It is important to note that there were some adjustments made in the survey data. The number of employee surveys exceeded the reported employment at this special generator. Given the business nature of the facility, it was reasonable to assume that some of the employee surveys were actually visitors with work-related purposes at the facility, and were therefore treated as visitor surveys in the analysis. It was also deemed reasonable to use the total zonal employment estimate of 137 in developing the trip rates.

Table 51 shows the mode of travel used by survey participants traveling to and from Port of Freeport. Approximately 87 percent were drivers of cars, trucks, or vans, 9 percent were passengers of cars, trucks, or vans, and the remaining 4 percent either walked or were drivers of a commercial cargo transport or

service vehicle. The average occupancy rates for the auto driver mode of travel by surveyed residents were 1.1 persons per employee trip and 1.4 persons per visitor trips. For surveyed non-residents, the average occupancy rate was 1.0 person per trip.

Table 51. Survey Mode of Travel to and from the Port of Freeport.

Mode	To Work Place	From Work Place¹	Total Trips	Percent of Total
Driver (car/truck/van)	140	140	280	86.96
Passenger (car/truck/van)	15	15	30	9.32
Walk	2	2	4	1.24
Commercial Cargo Transport Vehicle	2	2	4	1.24
Commercial Service Vehicle	2	2	4	1.24
Total	161	161	322	100.00

¹ The survey provided the mode of arrival only. The departure mode was therefore assumed to be the same as the arrival mode.

Table 52 shows the number and percentage of surveyed trips to and from the Port of Freeport by trip purpose. Table 53 and Table 54 show the trip lengths and travel times by trip purpose for person and vehicle trips, respectively. The number of trips slightly differed from the number of trips shown in Table 52 since these represented inter-zonal trips and for the auto driver mode of travel only. The estimates for NHB trips reflected the average of NHB-D and NHB-O trips. The average trip length was approximately 18 miles per trip. The average travel time was 25 minutes per trip.

Table 52. Survey Trips by Purposes to and from the Port of Freeport.

Trip Purpose	To Work Place	From Work Place	Total Trips	Percent of Total
HBW	135	124	259	80.43
HBNW	5	5	10	3.11
NHB-D	17	0	17	5.28
NHB-O	0	28	28	8.70
EXT-D	0	0	0	0.0
EXT -O	0	0	0	0.0
NON RES	4	4	8	2.48
Total	161	161	322	100.00

Table 53. Survey Inter-Zonal Trip Lengths to and from the Port of Freeport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Miles	Average Person Miles	Total Motorized Trips	Total Motorized Miles	Average Motorized Miles
HBW	295.00	5,571.19	18.89	226.00	4,169.61	18.45
HBNW	13.00	231.60	17.82	10.00	182.42	18.24
NHB	22.50	417.33	18.55	18.50	296.48	16.03
NON-RES	2.00	17.80	8.90	2.00	17.80	8.90
Total	332.50	6,237.92	18.76	256.50	4,666.31	18.19

Table 54. Survey Inter-Zonal Travel Times to and from the Port of Freeport by Trip Purpose.

Trip Purpose	Total Person Trips	Total Person Minutes	Average Person Minutes	Total Motorized Trips	Total Motorized Minutes	Average Motorized Minutes
HBW	295.00	7,650.99	25.94	226.00	5,759.05	25.48
HBNW	13.00	332.87	25.61	10.00	261.30	26.13
NHB	22.50	578.50	25.71	18.50	418.60	22.63
NON-RES	2.00	30.28	15.14	2.00	30.28	15.14
Total	332.50	8,592.64	25.84	256.50	6,469.23	25.22

Table 55 shows the vehicle classification types of the cargo transport and service vehicles surveyed at the Port of Freeport, including the average occupancy for each vehicle. Approximately 49 percent were semi tractor-trailer combinations, 23 percent were pick-up trucks, 13 percent were single unit 2-axle (6-wheelers), 6 percent were 10-wheelers, 2 percent were 14-wheelers, 2 percent were cargo or mini vans, and 4 percent were passenger cars. The average occupancy rate was 1.04 persons per commercial vehicle.

Table 55. Survey Commercial Vehicle Classification Types and Average Occupancy.

Vehicle Classification	CV Type		Total	Percent of Total	Average Occupancy
	Cargo Transport	Service			
Passenger Car	2	0	2	4.26	1.00
Pick-Up Truck	11	0	11	23.40	1.09
Van (cargo or mini)	1	0	1	2.13	1.00
Single Unit 2-axle (6 wheels)	4	2	6	12.77	1.17
Single Unit 3-axle (10 wheels)	3	0	3	6.38	1.00
Single Unit 4-axle (14 wheels)	1	0	1	2.13	1.00
Semi (tractor-trailer combination)	23	0	23	48.94	1.00
Total	45	2	47	100.00¹	1.04

¹ Percentage total may not be exact due to rounding.

Table 56 shows the trip purposes at the origin and destination of the CV trips. Table 57 shows the types of place at the origin and destination of the CV trips.

Table 56. Survey Commercial Vehicle Travel Purposes at Trip Origins and Destinations.

Trip Purpose	Origin	Percent of Total	Destination	Percent of Total
Base Location/Return to Base Location	4	8.51	11	23.40
Delivery	11	23.40	19	40.43
Pick Up	25	53.19	2	4.26
Delivery and Pick Up	7	14.89	5	10.64
To Home	0	0.00	5	10.64
Refused/Unknown	0	0.00	5	10.64
Total	47	100.00¹	47	100.00¹

¹ Percentage total may not be exact due to rounding.

Table 57. Survey Commercial Vehicle Types of Place at Trip Origins and Destinations.

Type of Place	Origin	Percent of Total	Destination	Percent of Total
Office Building	3	6.38	1	2.13
Retail/Shopping	3	6.38	4	8.51
Industrial/Manufacturing	12	25.53	10	21.28
Medical/Hospital	1	2.13	0	0.00
Residential	0	0.00	1	2.13
Warehouse	2	4.26	7	14.89
Distribution Center	8	17.02	7	14.89
Other	18	38.30	9	19.15
Refused/Unknown	0	0.00	8	17.02
Total	47	100.00	47	100.00

Table 58 shows the types of commodities being transported at the Port of Freeport by 45 out of the total 47 surveyed commercial vehicles.

Table 58. Survey Cargo Types at the Port of Freeport.

Cargo Type	Number of Deliveries	Percent of Total	Average Cargo Weight (lbs.)	Number of Pick-Ups	Percent of Total	Average Cargo Weight (lbs.)
Farm Products	2	4.44	35,000.00	0	0.00	0.00
Forest Products	1	2.22	44,000.00	1	2.22	44,000.00
Food, Health, and Beauty Products	19	42.22	56,971.58	19	42.22	40,144.00
Textiles	1	2.22	3,750.00	0	0.00	0.00
Rubber, Plastic, and Styrofoam Products	2	4.44	41,500.00	1	2.22	32,000.00
Manufactured Goods/Equipment	1	2.22	40,000.00	1	2.22	46,400.00
Wastes	1	2.22	44,000.00	1	2.22	25,000.00
Miscellaneous Shipments	1	2.22	9,000.00	0	0.00	0.00
Hazardous Materials	1	2.22	2,000.00	0	0.00	0.00
Transportation	1	2.22	22,086.00	0	0.00	0.00
Unclassified Cargo	3	6.67	7,333.33	0	0.00	0.00
Driver Refused to Answer	1	2.22	28,000.00	1	2.22	30,000.00
Unknown to Driver	1	2.22	45,000.00	2	4.44	x
No Cargo Delivery/Pick Up	10	22.22	NA	19	42.22	NA
Total	45	100.00¹	42,722.74	45	100.00¹	39,172.33

¹ Percentage total may not be exact due to rounding.

x- Not reported, NA - Not applicable.

DATA EXPANSION

The expansion of work place and special generator survey data involved a series of procedures. This section provides a general description of the expansion process.

The full survey trip data were aggregated by site and then linked with the employment and count data collected from the establishment survey. The person and vehicle counts at each site were used to expand the survey trip data. The total trips were counted separately for employees and visitors at free-standing and non-freestanding establishments, and distinguished between residents and non-residents of the H-GAC study area. The total trips were classified by purpose, both from the origin to the work place and from the work place to the next destination, and summed as person trips (all travel modes, including walking and bicycle trips) and motorized trips (all trips by drivers and passengers of automobiles, transit bus, taxi/limo, commercial cargo, and service vehicles), for each category of trip purpose.

The survey employee trips were expanded first to estimate the total employee person trips and employee motorized trips by purpose. The process involved dividing the survey employee trips for each category of purpose by the number of employee surveys and then multiplying this number by the total number of employees reported to be at work during the survey day. The expanded employee person/motorized trips were subtracted from the total person/vehicle count at the site to yield the total visitor person/motorized trips to the site.

The survey visitor person/motorized trips were used to establish the proportion of visitor trips for each category of trip purpose. These percentages were applied to the total estimated visitor trips to yield the visitor person/motorized trips by purpose. The average visitor vehicle occupancy rates were based on the auto driver mode of travel, and were calculated for each trip purpose. These occupancy rates were used to convert the expanded visitor person trips to motorized trips, or visitor motorized trips to person trips, depending on whether a vehicle count or a person count was conducted at the site.

After the data were expanded for each site, the results were aggregated by employment type and area type. These results were then used to estimate the number of employee and visitor trips by purpose and employment type at the partial survey sites. The person and vehicle counts at each partial survey site were used to expand the trip estimates. Table 59 provides the work place survey data summary by area and employment types.

Table 59. Work Place Survey Data Summary by Area Type and Employment Type.

Area Type	Item	Industrial	Retail	Medical	Office	Education ¹	Government	Total
CBD	Number of sites	-	-	1	-	-	-	1
	Total employment	-	-	8	-	-	-	8
	Employees at work	-	-	8	-	-	-	8
	Total person count	-	-	126	-	-	-	126
	Total vehicle count	-	-	101	-	-	-	101
	Total CV count	-	-	2	-	-	-	2
Urban	Number of sites	13	27	20	17	6	1	84
	Total employment	188	349	186	193	399	17	1,332
	Employees at work	112	265	143	156	307	17	1,000
	Total person count	806	7,898	1,455	1,631	9,740	102	21,632
	Total vehicle count	770	6,233	1,206	1,456	4,245	89	13,999
	Total CV count	38	48	46	47	127	4	310
Suburban	Number of sites	38	47	30	42	53	22	232
	Total employment	701	470	321	548	4,734	955	7,729
	Employees at work	593	337	273	385	4,388	737	6,713
	Total person count	2,491	17,429	5,768	3,894	70,513	4,410	104,505
	Total vehicle count	2,383	13,578	3,638	3,509	48,120	3,800	75,028
	Total CV count	453	266	103	160	2,986	195	4,163
Suburban Fringe	Number of sites	19	22	11	14	42	32	140
	Total employment	210	260	167	110	3,428	712	4,887
	Employees at work	185	191	105	75	3,277	629	4,462
	Total person count	1,283	5,454	1,852	1,018	72,613	7,667	89,887
	Total vehicle count	1,238	3,632	1,613	872	47,424	6,673	61,452
	Total CV count	104	108	31	53	2,230	628	3,154
Rural	Number of sites	4	4	1	4	9	21	43
	Total employment	42	30	12	31	690	164	969
	Employees at work	30	22	10	20	669	115	866
	Total person count	249	994	152	361	9,383	2,557	13,696
	Total vehicle count	193	809	134	279	6,582	2,039	10,036
	Total CV count	29	53	-	6	337	86	511
Total	Number of sites	74	100	63	77	110	76	500
	Total employment	1,141	1,109	694	882	9,251	1,848	14,925
	Employees at work	920	815	539	636	8,641	1,498	13,049
	Total person count	4,829	31,775	9,353	6,904	162,249	14,736	229,846
	Total vehicle count	4,584	24,252	6,692	6,116	106,371	12,601	160,616
	Total CV count	624	475	182	266	5,680	913	8,140

¹ Data shown for Education 1 category only. To represent the Education 2, it was deemed appropriate to use estimates developed from the special generator survey (University of Houston) in the model rate development for this employment category.

The expanded trips by purpose, shown in Table 60 and Table 61 for each category of employment and area type, were divided by the total employment (in Table 59) to develop the attraction rates (in Table 62 and Table 63). The total expanded person and vehicle trips do not include the external trips and “not first store” trips to the surveyed work places.

Table 60. Survey Person Trips by Trip Purpose, Area Type, and Employment Type.

Area Type	Industrial					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	-----NO OBSERVATIONS-----					
Urban	343.19	294.71	82.74	85.69	0.00	806.33
Suburban	1,141.68	709.10	294.77	296.44	42.22	2,484.21
Suburban Fringe	314.70	702.48	98.35	151.04	0.00	1,266.57
Rural	58.87	123.59	26.21	33.52	7.02	249.21
Total	1,858.44	1,829.88	502.07	566.69	49.24	4,806.32
Area Type	Retail					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	-----NO OBSERVATIONS-----					
Urban	484.58	5,656.52	630.69	711.06	293.01	7,775.86
Suburban	688.57	11,134.07	2,348.83	2,579.53	568.77	17,319.77
Suburban Fringe	353.18	4,175.47	300.85	280.85	175.93	5,286.28
Rural	166.24	498.15	96.15	154.23	67.72	982.49
Total	1,692.57	21,464.21	3,376.52	3,725.67	1,105.43	31,364.40
Area Type	Medical					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	30.35	78.97	6.88	6.27	1.41	123.88
Urban	386.91	881.78	67.20	64.25	34.63	1,434.77
Suburban	451.60	4,714.46	249.85	336.91	15.18	5,768.00
Suburban Fringe	210.67	1,416.78	113.97	101.91	8.67	1,852.00
Rural	15.00	107.68	10.42	18.89	0.00	151.99
Total	1,094.53	7,199.67	448.32	528.23	59.89	9,330.64

Table 60 (Continued).

Area Type	Office					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	-----NO OBSERVATIONS-----					
Urban	315.13	932.21	258.73	124.44	0.00	1,630.51
Suburban	1,314.20	1,856.09	240.49	380.04	33.39	3,824.21
Suburban Fringe	228.89	477.31	101.60	110.65	81.56	1,000.01
Rural	28.93	252.27	14.99	26.38	24.67	347.24
Total	1,887.15	3,517.88	615.81	641.51	139.62	6,801.97
Area Type	Education 1					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	-----NO OBSERVATIONS-----					
Urban	1,532.82	7,386.87	382.78	437.73	0.00	9,740.20
Suburban	10,287.78	49,619.08	3,072.66	5,603.11	434.28	69,016.91
Suburban Fringe	7,001.71	57,281.63	2,687.00	6,487.28	28.39	73,486.01
Rural	1,412.59	6,443.48	3,06.37	1,384.15	125.81	9,672.40
Total	20,234.90	120,731.06	6,448.81	13,912.27	588.48	161,915.52
Area Type	Government					
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	Total Person Trips
CBD	-----NO OBSERVATIONS-----					
Urban	47.22	40.01	4.98	8.48	0.00	100.69
Suburban	1,715.58	1,993.14	210.32	441.76	26.15	4,386.95
Suburban Fringe	1,225.47	5,171.10	399.52	724.86	146.41	7,667.36
Rural	295.66	1,995.44	65.48	102.61	34.62	2,493.81
Total	3,283.93	9,199.69	680.30	1,277.71	207.18	14,648.81

Table 61. Survey Motorized Trips by Trip Purpose, Area Type, and Employment Type.

Area Type	Industrial					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	-----NO OBSERVATIONS-----					
Urban	340.50	276.63	79.79	72.74	0.00	769.66
Suburban	1,100.28	713.38	267.76	268.56	27.05	2,377.03
Suburban Fringe	311.68	673.29	95.86	141.15	0.00	1,221.98
Rural	40.63	103.18	17.49	25.22	6.48	193.00
Total	1,793.09	1,766.48	460.90	507.67	33.53	4,561.67
Area Type	Retail					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	-----NO OBSERVATIONS-----					
Urban	476.09	4,389.88	499.61	558.08	204.60	6,128.26
Suburban	640.58	8,496.58	1,903.38	2,045.39	399.61	13,485.54
Suburban Fringe	340.49	2,609.66	244.32	214.30	78.36	3,487.13
Rural	142.75	401.16	74.63	125.15	55.98	799.67
Total	1,599.91	15,897.28	2,721.94	2,942.92	738.55	23,900.60
Area Type	Medical					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	26.66	60.99	5.43	5.15	1.09	99.32
Urban	360.67	691.86	56.17	56.77	24.09	1,189.56
Suburban	431.01	2,737.07	196.45	263.48	10.02	3,638.03
Suburban Fringe	171.38	1,247.42	103.71	82.00	8.67	1,613.18
Rural	15.00	95.38	7.82	16.12	0.00	134.32
Total	1,004.72	4,832.72	369.58	423.52	43.87	6,674.41

Table 61 (Continued).

Area Type	Office					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	-----NO OBSERVATIONS-----					
Urban	292.74	809.14	232.20	122.22	0.00	1,456.30
Suburban	1,216.17	1,631.87	220.44	344.97	29.90	3,443.35
Suburban Fringe	201.04	428.03	84.34	96.07	50.24	859.72
Rural	17.47	198.51	11.30	16.66	21.05	264.99
Total	1,727.42	3,067.55	548.28	579.92	101.19	6,024.36
Area Type	Education 1					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	-----NO OBSERVATIONS-----					
Urban	863.03	2,995.91	170.39	216.13	0.00	4,245.46
Suburban	9,526.11	31,698.41	1,961.89	3,665.73	335.22	47,187.36
Suburban Fringe	6,382.18	35,511.93	1,858.82	4,234.09	28.39	48,015.41
Rural	1,365.45	4,127.56	230.12	836.79	104.96	6,664.88
Total	18,136.77	74,333.81	4,221.22	8,952.74	468.57	106,113.11
Area Type	Government					Total Motorized Trips
	HBW Attractions	HBNW Attractions	NHB-D	NHB-O	NON-RES	
CBD	-----NO OBSERVATIONS-----					
Urban	44.02	32.51	4.09	7.53	0.00	88.15
Suburban	1,483.82	1,723.47	192.49	359.28	20.15	3,779.21
Suburban Fringe	1,091.64	4461.78	360.01	632.03	127.28	6,672.74
Rural	222.10	1,601.18	52.15	89.06	23.12	1,987.61
Total	2,841.58	7,818.94	608.74	1087.90	170.55	12,527.71

Table 62 and Table 63 show the survey person and motorized trip attraction rates by purpose for each employment category and area type, respectively. The NHB trips represented the average of NHB origin and destination trips. The NON-RES trips were divided by two to develop a rate for non-resident trip

attractions. The external trips were removed from the analysis because these trips were estimated using the external survey and input to the travel demand model directly.

Table 62. Survey Person Trip Attraction Rates.

Trip Purpose	Area Type	Person Trips Per Employee					
		Industrial	Retail	Medical	Office	Education 1	Government
HBW	CBD	0.000	0.000	3.794	0.000	0.000	0.000
	Urban	1.825	1.388	2.080	1.633	3.842	2.778
	Suburban	1.629	1.465	1.407	2.398	2.173	1.796
	Suburban Fringe	1.499	1.358	1.262	2.081	2.043	1.721
	Rural	1.402	5.541	1.250	0.933	2.047	1.803
HBNW Retail	CBD		0.000				
	Urban		16.208				
	Suburban		23.690				
	Suburban Fringe		16.059				
	Rural		16.605				
HBNW Other	CBD	0.000		9.872	0.000		0.000
	Urban	1.568		4.741	4.830		2.353
	Suburban	1.012		14.687	3.387		2.087
	Suburban Fringe	3.345		8.484	4.339		7.263
	Rural	2.943		8.974	8.138		12.167
HBNW School	CBD					0.000	
	Urban					18.513	
	Suburban					10.481	
	Suburban Fringe					16.710	
	Rural					9.338	
NHB	CBD	0.000	0.000	0.822	0.000	0.000	0.000
	Urban	0.448	1.922	0.353	0.993	1.028	0.396
	Suburban	0.422	5.243	0.914	0.566	0.916	0.341
	Suburban Fringe	0.594	1.119	0.646	0.907	1.338	0.790
	Rural	0.711	4.173	1.221	0.667	1.225	0.512
NON-RES	CBD	0.000	0.000	0.088	0.000	0.000	0.000
	Urban	0.000	0.420	0.093	0.000	0.000	0.000
	Suburban	0.030	0.605	0.024	0.030	0.046	0.014
	Suburban Fringe	0.000	0.338	0.026	0.371	0.004	0.103
	Rural	0.084	1.129	0.000	0.398	0.091	0.106

Note: Attraction rates represent observed rates, with zero CBD rates in most employment categories except for Medical. No surveys represented Education 2 establishments.

Table 63. Survey Motorized Trip Attraction Rates.

Trip Purpose	Area Type	Motorized Trips Per Employee					
		Industrial	Retail	Medical	Office	Education 1	Government
HBW	CBD	0.000	0.000	3.332	0.000	0.000	0.000
	Urban	1.811	1.364	1.939	1.517	2.163	2.589
	Suburban	1.570	1.363	1.343	2.219	2.012	1.554
	Suburban Fringe	1.484	1.310	1.026	1.828	1.862	1.533
	Rural	0.967	4.758	1.250	0.563	1.979	1.354
HBNW Retail	CBD		0.000				
	Urban		12.578				
	Suburban		18.078				
	Suburban Fringe		10.037				
	Rural		13.372				
HBNW Other	CBD	0.000		7.623	0.000		0.000
	Urban	1.471		3.720	4.192		1.912
	Suburban	1.018		8.527	2.978		1.805
	Suburban Fringe	3.206		7.470	3.891		6.267
	Rural	2.457		7.948	6.403		9.763
HBNW School	CBD					0.000	
	Urban					7.509	
	Suburban					6.696	
	Suburban Fringe					10.359	
	Rural					5.982	
NHB	CBD	0.000	0.000	0.661	0.000	0.000	0.000
	Urban	0.406	1.515	0.304	0.918	0.484	0.342
	Suburban	0.383	4.201	0.716	0.516	0.594	0.289
	Suburban Fringe	0.564	0.882	0.556	0.820	0.889	0.697
	Rural	0.508	3.330	0.997	0.451	0.773	0.431
NON-RES	CBD	0.000	0.000	0.068	0.000	0.000	0.000
	Urban	0.000	0.293	0.065	0.000	0.000	0.000
	Suburban	0.019	0.425	0.016	0.027	0.035	0.011
	Suburban Fringe	0.000	0.151	0.026	0.228	0.004	0.089
	Rural	0.077	0.933	0.000	0.340	0.076	0.070

Note: Attraction rates represent observed rates, with zero CBD rates in most employment categories except for Medical. No surveys represented Education 2 establishments.

The commercial vehicle counts taken at each site were aggregated by area type and employment type, and then divided by the total employment, and then divided by two to develop a trip attraction rate for commercial vehicle travel. Table 64 shows the survey commercial vehicle trip attraction rates.

Table 64. Survey Commercial Vehicle Trip Attraction Rates.

Area Type	Commercial Vehicle Trips Per Employee					
	Industrial	Retail	Medical	Office	Education	Government
CBD	0.000	0.000	0.125	0.000	0.000	0.000
Urban	0.101	0.069	0.124	0.122	0.159	0.118
Suburban	0.323	0.283	0.160	0.146	0.315	0.102
Suburban Fringe	0.248	0.208	0.093	0.241	0.325	0.441
Rural	0.345	0.883	0.000	0.097	0.244	0.262

Note: Attraction rates represent observed rates, with zero CBD rates in most employment categories except for Medical. No surveys represented Education 2 establishments.

Table 65 shows the expanded survey trip attractions and attraction rates by purpose for each H-GAC special generator. The expansion procedures used were similar to the full work place survey sites. The attraction rates were developed by dividing the expanded trips by purpose by the total employment at the special generator. The external trips were removed from the analysis. The NHB trips represented the average of the NHB origin and destination trips. The NON-RES trips were divided by two to develop a rate for non-resident trip attractions. The commercial vehicle count at the special generator was divided by two to develop a rate for commercial vehicle trip attractions. It is important to note that totals may not be exact due to rounding.

Table 65. H-GAC Special Generator Survey Person and Motorized Trip Attractions and Rates.

Trip Purpose	Bush Intercontinental Airport			
	Total Person Trips	Person Trips Per Employee	Total Motorized Trips	Motorized Trips Per Employee
HBW	26,047.78	1.408	23,335.61	1.261
HBNW	26,260.77	1.420	19,156.88	1.036
NHB	2,191.26	0.118	1,756.66	0.095
NON-RES	14,811.72	0.801	10,829.22	0.585
Commercial Vehicle Trips	9,395.50	0.508	9,395.50	0.508
Total	78,707.03	4.255	64,473.87	3.485

Table 65 (Continued).

Trip Purpose	Hobby Airport			
	Total Person Trips	Person Trips Per Employee	Total Motorized Trips	Motorized Trips Per Employee
HBW	9,035.23	1.260	8,144.96	1.136
HBNW	6,365.06	0.887	4,679.62	0.652
NHB	1,056.39	0.147	904.01	0.126
NON-RES	3,854.60	0.537	2,809.75	0.392
Commercial Vehicle Trips	3,751.00	0.523	3,751.00	0.523
Total	24,062.28	3.354	20,289.34	2.829
Trip Purpose	University of Houston			
	Total Person Trips	Person Trips Per Employee	Total Motorized Trips	Motorized Trips Per Employee
HBW	9,300.04	1.691	8,928.28	1.623
HBNW	61,212.79	11.130	49,748.40	9.045
NHB	2,959.17	0.538	2,554.74	0.464
NON-RES	254.09	0.046	207.12	0.038
Commercial Vehicle Trips	2,616.50	0.476	2,616.50	0.476
Total	76,342.59	13.881	64,055.04	11.646
Trip Purpose	Port of Freeport			
	Total Person Trips	Person Trips Per Employee	Total Motorized Trips	Motorized Trips Per Employee
HBW	3,402.69	24.837	1,016.33	7.418
HBNW	141.74	1.035	41.81	0.305
NHB	303.83	2.218	90.39	0.660
NON-RES	51.87	0.379	15.54	0.113
Commercial Vehicle Trips	528.50	3.858	528.50	3.858
Total	4,428.63	32.327	1,692.57	12.354

Note: The attraction rates for Port of Freeport were developed using the total zonal employment as divisor.

Model Rate Development

The work place survey data must be converted into recommended attraction rates to be used as inputs to the travel demand model. Attraction rates, defined as the estimated number of attractions per employee, were developed for each trip purpose, area type, and employment type. The NHB origin and destination trips were combined and divided by two to develop an attraction rate for NHB trips. The NON-RES trips were divided by two to develop an attraction rate for non-resident travel.

Table 66 and Table 67 show the total person and motorized vehicle trip attraction rates by purpose and employment type for all area types, as calculated from the survey trip data, respectively. The next step in model rate development involved applying the survey attraction rates to the total MPO employment estimates, shown in Table 68, to calculate the total trip attractions to the H-GAC study area. It is important to note that the total estimates may not match exactly due to rounding. The trip attraction rates used in the calculation of total trip attractions were in full significant digits.

Table 66. Survey Total Person Trip Attraction Rates.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	1.629	1.604	0.468	0.022
Retail	1.526	19.355	3.202	0.498
Medical	1.577	10.374	0.704	0.043
Office	2.140	3.989	0.713	0.079
Education 1	2.187	13.051	1.100	0.032
Education 2 ¹	1.691	11.130	0.538	0.046
Government	1.777	4.978	0.530	0.056

¹ Trip rates for this category were adapted from the University of Houston special generator survey.

Table 67. Survey Total Motorized Trip Attraction Rates.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	1.572	1.548	0.424	0.015
Retail	1.443	14.335	2.554	0.333
Medical	1.448	6.964	0.571	0.032
Office	1.959	3.478	0.640	0.057
Education 1	1.961	8.035	0.712	0.025
Education 2 ¹	1.623	9.045	0.464	0.038
Government	1.538	4.231	0.459	0.046

¹ Trip rates for this category were adapted from the University of Houston special generator survey.

Table 68. Total Employment in the H-GAC Study Area by Employment Type and Area Type.

Area Type	Total Employment							
	Industrial	Retail	Medical	Office	Education 1	Education 2	Government	Total
CBD	384	11,592	3,017	114,189	282	961	18,227	148,652
Urban	82,449	186,210	122,190	315,034	11,182	31,805	31,678	780,548
Suburban	237,379	407,711	116,902	449,435	45,692	10,048	37,691	1,304,858
Suburban Fringe	76,921	170,192	34,731	111,993	27,124	6,603	11,326	438,890
Rural	12,869	22,567	3,239	16,657	6,318	1,127	3,755	66,532
Total	410,002	798,272	280,079	1,007,308	90,598	50,544	102,677	2,739,480

Source: H-GAC, 2010 Employment Estimates.

Table 69 and Table 70 show the estimated total person and motorized trip attractions to the H-GAC study area by employment type and trip purpose, respectively.

Table 69. Total Person Trip Attractions by Employment Type and Trip Purpose.

Employment Type	HBW	HBNW	NHB	NON-RES	Total
Industrial	667,803.59	657,544.83	192,023.33	8,846.69	1,526,218.44
Retail	1,218,336.20	15,450,202.29	2,556,124.13	397,851.29	19,622,513.91
Medical	441,723.47	2,905,588.27	197,054.74	12,085.61	3,556,452.09
Office	2,155,275.67	4,017,688.78	717,970.59	79,727.18	6,970,662.22
Education 1	198,166.93	1,182,357.81	99,701.29	2,881.58	1,483,107.61
Education 2	85,465.65	562,534.41	27,194.27	2,335.01	677,529.34
Government	182,459.03	511,145.07	54,394.79	5,755.48	753,754.37
Total	4,949,230.54	25,287,061.46	3,844,463.14	509,482.84	34,590,237.98

Table 70. Total Vehicle Trip Attractions by Employment Type and Trip Purpose.

Employment Type	HBW	HBNW	NHB	NON-RES	Total
Industrial	644,323.04	634,761.13	174,021.42	6,024.24	1,459,129.83
Retail	1,151,634.75	11,443,061.28	2,038,821.67	265,806.76	14,899,324.46
Medical	405,474.64	1,950,349.09	160,033.01	8,852.11	2,524,708.85
Office	1,972,839.97	3,503,362.29	644,241.92	57,781.64	6,178,225.82
Education 1	177,619.09	727,974.71	64,508.42	2,294.43	970,218.65
Education 2	82,049.27	457,178.80	23,477.56	1,903.35	564,608.98
Government	157,881.34	434,430.06	47,133.52	4,737.90	644,182.82
Total	4,591,822.10	19,151,117.36	3,152,237.52	345,222.43	27,240,399.41

Table 71 shows the commercial vehicle trip attraction rates and total commercial vehicle attractions by employment type. It is important to note that the estimates may not be representative of the actual commercial vehicle movement in the study area given the incomplete count data from the work place surveys.

Table 71. Survey Commercial Vehicle Trip Attraction Rates and Total Trip Attractions by Employment Type.

Employment Type	Total Commercial Vehicle Trips Per Employee	Total Commercial Vehicle Trip Attractions
Industrial	0.273	112,112.73
Retail	0.214	170,955.46
Medical	0.131	36,725.06
Office	0.151	151,895.65
Education 1	0.307	27,813.03
Education 2	0.476	24,045.16
Government	0.247	25,363.66
All Employment Types	0.200	548,910.75

The total trip attractions estimated from the work place survey were then compared with the estimated total trip productions from the household survey and commercial vehicle survey. Table 72 provides a summary of the trip estimates from the travel surveys conducted in the H-GAC study area. The results show significant differences between the number of trips from the work place survey and the household survey. Estimates of household internal trips were based on a straight weighting of the survey data with no adjustments for proxy bias or person age/gender bias, which resulted in lower number of trips. The estimates of commercial vehicle trips from the work place survey were approximately 65 percent of the trip estimates from the commercial vehicle survey.

Table 72. Travel Estimates from the H-GAC Travel Surveys.

Trip Purpose	Work Place Survey		Household Survey		Commercial Vehicle Survey
	Person Trips	Motorized Trips	Person Trips	Motorized Trips	Vehicle Trips
HBW	4,949,231	4,591,822	2,995,195	2,977,290	
HBNW Retail	15,450,202	11,443,061	3,223,530	3,196,916	
HBNW Other	8,091,967	6,522,903	3,225,559	2,999,404	
HBNW Education 1 (K to 12)	1,182,358	727,975	3,867,001	3,665,028	
HBNW Education 2 (Post Secondary)	562,534	457,179	209,998	208,352	
NHB	3,844,463	3,152,238	4,361,888	4,270,930	
NON-RES	509,483	347,400	-	-	
Commercial Vehicle Trips	-	548,911	-	-	840,717

The attraction rates by trip purpose from the workplace survey required further adjustments to balance the aggregate estimates of trip attractions with the aggregate estimates of trip productions from the household survey and commercial vehicle survey. Correction factors for HBW and HBNW person trips were calculated by dividing the number of person trips from the household survey with the number of person trips from the workplace survey for HBW and HBNW trips, respectively.

The NHB destination and origin trips from the workplace survey were summed and averaged to reflect the adjustment when calculating the correction factor for the total NHB trips from the household survey. However, for motorized trips, the correction factors for HBW, HBNW, and NHB trips were calculated by taking the ratio of motorized trip productions to person trip productions for each trip purpose, and were then applied to the person trip attractions by employment type and area type for each trip purpose. This procedure was used to resolve the issue of motorized attraction rates being higher than person trip attraction rates in some area types of employment.

The NON-RES trips from the workplace survey were calculated, summed, and divided by the total employment. The resulting rates were applied to the employment data to develop an estimate of the total internal trips made by persons that did not live in the study area. The total non-resident trips from the H-GAC workplace survey when converted to trip productions and attractions yield an estimate of 509,483 person trips and 347,400 motorized trips. These estimates are recommended for use in the travel demand model for non-resident travel.

Table 73 and Table 74 show the survey person and motorized trip attraction rates, with cell adjustments, by area type for each category of trip purpose and employment type, respectively. Most of the employment categories showed zero trip rates in the CBDs. This resulted from the survey design that only sampled by employment type with no strata for area type. Therefore, the average attraction rates developed for each category of employment were used as the CBD trip rate for that particular category. In the case of the Medical employment category where the CBD trip rate was not zero, the attraction rate represented the average of the CBD survey trip rate and the average trip rate for this category. Since no surveys represented the Education 2 employment category, attraction rates developed from the University of Houston special generator survey were used, and were held constant across area types for this category.

Table 75 and Table 76 show the adjusted and balanced person and motorized trip production/attraction rates, by area type for each category of trip purpose and employment type. Table 77 and Table 78 show the balanced total trip production/attraction rates by employment category and trip purpose. Table 79 and Table 80 show the balanced total trip productions/attractions by employment category and trip purpose. It is important to note that totals may not be exact due to rounding. The attraction rates used in the estimation of the balanced total trip productions/attractions were in full significant digits.

Table 73. Survey Person Trip Attraction Rates (With Cell Adjustments).

Trip Purpose	Area Type	Person Trips						
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee
HBW	CBD	1.621	1.526	2.499	2.226	2.168	1.691	1.758
	Urban	1.817	1.388	1.936	1.699	2.283	1.691	1.794
	Suburban	1.621	1.464	1.309	2.495	2.283	1.691	1.794
	Suburban Fringe	1.476	1.790	1.173	1.902	2.025	1.691	1.702
	Rural	1.476	1.790	1.173	1.902	2.025	1.691	1.783
HBNW Retail	CBD	18.681						
	Urban	15.644						
	Suburban	22.865						
	Suburban Fringe	15.555						
	Rural	15.555						
HBNW Other	CBD	1.587		11.099	3.847			6.995
	Urban	1.552		5.198	4.659			2.939
	Suburban	1.001		16.103	3.267			2.939
	Suburban Fringe	3.245		9.338	4.991			10.205
	Rural	3.245		9.338	4.991			17.096
HBNW School	CBD					13.385	11.130	
	Urban					11.390	11.130	
	Suburban					11.390	11.130	
	Suburban Fringe					15.871	11.130	
	Rural					15.871	11.130	
NHB	CBD	0.468	2.914	0.843	0.670	1.131	0.538	0.651
	Urban	0.447	1.749	0.390	0.933	0.950	0.538	0.421
	Suburban	0.421	4.771	1.010	0.532	0.950	0.538	0.421
	Suburban Fringe	0.613	1.305	0.757	0.845	1.355	0.538	0.970
	Rural	0.613	1.305	0.757	0.845	1.355	0.538	0.630
NON-RES	CBD	0.019	0.482	0.052	0.066	0.030	0.046	0.092
	Urban	0.019	0.406	0.074	0.066	0.040	0.046	0.022
	Suburban	0.026	0.585	0.019	0.025	0.040	0.046	0.022
	Suburban Fringe	0.012	0.406	0.019	0.312	0.018	0.046	0.168
	Rural	0.012	0.406	0.019	0.312	0.018	0.046	0.173

Note: Attraction rates represent observed rates with cell adjustments and after correction factors were applied. CBD rates were developed based on the average attraction rates for each employment category. In the case of Medical employment, the CBD rates represent the average of the observed CBD rate and the average attraction rate for this category. Education 2 trip rates were developed using the rates from the University of Houston special generator survey and were held constant across area types.

Table 74. Survey Motorized Trip Attraction Rates (With Cell Adjustments).

Trip Purpose	Area Type	Motorized Trips						
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee
HBW	CBD	1.562	1.448	2.199	2.035	1.950	1.623	1.522
	Urban	1.801	1.369	1.784	1.576	2.013	1.623	1.556
	Suburban	1.561	1.368	1.236	2.306	2.013	1.623	1.556
	Suburban Fringe	1.390	1.672	0.958	1.611	1.871	1.623	1.517
	Rural	1.390	1.672	0.958	1.611	1.871	1.623	1.340
HBNW Retail	CBD	13.807						
	Urban	12.116						
	Suburban	17.413						
	Suburban Fringe	10.000						
	Rural	10.000						
HBNW Other	CBD	1.535		8.091	3.359			5.928
	Urban	1.459		4.126	4.048			2.531
	Suburban	1.009		9.459	2.876			2.531
	Suburban Fringe	3.055		8.322	4.291			8.780
	Rural	3.055		8.322	4.291			13.679
HBNW School	CBD					8.255	9.045	
	Urban					6.944	9.045	
	Suburban					6.944	9.045	
	Suburban Fringe					9.889	9.045	
	Rural					9.889	9.045	
NHB	CBD	0.424	2.321	0.680	0.598	0.734	0.464	0.570
	Urban	0.405	1.377	0.335	0.858	0.604	0.464	0.360
	Suburban	0.382	3.818	0.791	0.482	0.604	0.464	0.360
	Suburban Fringe	0.554	1.032	0.647	0.691	0.896	0.464	0.865
	Rural	0.554	1.032	0.647	0.691	0.896	0.464	0.534
NON-RES	CBD	0.013	0.320	0.041	0.041	0.024	0.038	0.077
	Urban	0.013	0.282	0.053	0.066	0.031	0.038	0.017
	Suburban	0.017	0.409	0.013	0.020	0.031	0.038	0.017
	Suburban Fringe	0.011	0.223	0.020	0.182	0.015	0.038	0.149
	Rural	0.011	0.223	0.020	0.182	0.015	0.038	0.118

Note: Attraction rates represent observed rates with cell adjustments and after correction factors were applied. CBD rates were developed based on the average attraction rates for each employment category. In the case of Medical employment, the CBD rates represent the average of the observed CBD rate and the average attraction rate for all area types by purpose. Education 2 trip rates were developed using the rates from the University of Houston special generator survey and were held constant across area types.

Table 75. Adjusted and Balanced Person Trip Production/Attraction Rates.

Trip Purpose	Area Type	Person Trips						
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee
HBW	CBD	0.981	0.923	1.513	1.347	1.312	1.023	1.064
	Urban	1.100	0.840	1.172	1.028	1.381	1.023	1.217
	Suburban	0.981	0.886	0.792	1.510	1.381	1.023	1.217
	Suburban Fringe	0.893	1.084	0.710	1.151	1.226	1.023	1.155
	Rural	0.893	1.084	0.710	1.151	1.226	1.023	1.209
HBNW Retail	CBD	3.898						
	Urban	3.264						
	Suburban	4.771						
	Suburban Fringe	3.245						
	Rural	3.245						
HBNW Other	CBD	0.633		4.424	1.534			2.788
	Urban	0.618		2.072	1.857			1.172
	Suburban	0.399		6.419	1.302			1.172
	Suburban Fringe	1.293		3.722	1.990			4.068
	Rural	1.293		3.722	1.990			6.815
HBNW School	CBD					43.777	4.155	
	Urban					37.253	4.155	
	Suburban					37.253	4.155	
	Suburban Fringe					51.908	4.155	
	Rural					51.908	4.155	
NHB	CBD	0.531	3.306	0.956	0.760	1.283	0.610	0.738
	Urban	0.508	1.985	0.443	1.058	1.078	0.610	0.477
	Suburban	0.478	5.413	1.146	0.603	1.078	0.610	0.477
	Suburban Fringe	0.695	1.481	0.859	0.959	1.538	0.610	1.101
	Rural	0.695	1.481	0.859	0.959	1.538	0.610	0.714
NON-RES	CBD	0.019	0.482	0.052	0.066	0.030	0.046	0.092
	Urban	0.019	0.406	0.074	0.066	0.040	0.046	0.022
	Suburban	0.026	0.585	0.019	0.025	0.040	0.046	0.022
	Suburban Fringe	0.012	0.406	0.019	0.312	0.018	0.046	0.168
	Rural	0.012	0.406	0.019	0.312	0.018	0.046	0.173

Note: Attraction rates represent balanced and adjusted rates to match trip production estimates from the 2008 H-GAC Household Travel Survey.

Table 76. Adjusted and Balanced Motorized Trip Production/Attraction Rates.

Trip Purpose	Area Type	Motorized Trips						
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee
HBW	CBD	0.975	0.918	1.504	1.339	1.304	1.017	1.057
	Urban	1.093	0.835	1.165	1.022	1.373	1.017	1.079
	Suburban	0.975	0.881	0.788	1.501	1.373	1.017	1.079
	Suburban Fringe	0.888	1.077	0.706	1.144	1.218	1.017	1.024
	Rural	0.888	1.077	0.706	1.144	1.218	1.017	1.073
HBNW Retail	CBD	3.865						
	Urban	3.237						
	Suburban	4.731						
	Suburban Fringe	3.219						
	Rural	3.219						
HBNW Other	CBD	0.588		4.114	1.426			2.593
	Urban	0.575		1.927	1.727			1.089
	Suburban	0.371		5.969	1.211			1.089
	Suburban Fringe	1.203		3.461	1.850			3.783
	Rural	1.203		3.461	1.850			6.337
HBNW School	CBD					41.490	4.122	
	Urban					35.307	4.122	
	Suburban					35.307	4.122	
	Suburban Fringe					49.197	4.122	
	Rural					49.197	4.122	
NHB	CBD	0.520	3.237	0.936	0.744	1.256	0.598	0.723
	Urban	0.497	1.943	0.434	1.036	1.056	0.598	0.467
	Suburban	0.468	5.300	1.122	0.591	1.056	0.598	0.467
	Suburban Fringe	0.680	1.450	0.841	0.939	1.506	0.598	1.078
	Rural	0.680	1.450	0.841	0.939	1.506	0.598	0.700
NON-RES	CBD	0.013	0.320	0.041	0.041	0.024	0.038	0.077
	Urban	0.013	0.282	0.053	0.066	0.031	0.038	0.017
	Suburban	0.017	0.409	0.013	0.020	0.031	0.038	0.017
	Suburban Fringe	0.011	0.223	0.020	0.182	0.015	0.038	0.149
	Rural	0.011	0.223	0.020	0.182	0.015	0.038	0.118

Note: Attraction rates represent balanced and adjusted rates to match trip production estimates from the 2008 H-GAC Household Travel Survey.

Table 77. Balanced Total Person Trip Production/Attraction Rates.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	0.986	0.639	0.531	0.022
Retail	0.924	4.038	3.633	0.498
Medical	0.954	4.135	0.798	0.043
Office	1.295	1.590	0.809	0.079
Education 1	1.324	42.683	1.249	0.032
Education 2	1.075	1.984	0.601	0.056
Government	0.986	0.639	0.531	0.022

Table 78. Balanced Total Motorized Trip Production/Attraction Rates.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	0.980	0.594	0.520	0.015
Retail	0.918	4.005	3.557	0.333
Medical	0.949	3.845	0.782	0.032
Office	1.287	1.478	0.792	0.057
Education 1	1.316	40.454	1.223	0.025
Education 2	1.069	1.845	0.589	0.046
Government	0.980	0.594	0.520	0.015

Table 79. Balanced Total Person Trip Productions/Attractions by Employment Type and Trip Purpose.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	404,144.03	262,105.57	217,867.68	8,846.69
Retail	737,317.54	3,223,530.00	2,900,151.91	397,851.29
Medical	267,323.96	1,158,203.74	223,576.26	12,085.61
Office	1,304,338.29	1,601,500.88	814,601.98	79,727.18
Education 1	119,927.45	3,867,001.00	113,120.05	2,881.58
Education 2	51,722.44	209,998.00	30,854.34	2,335.01
Government	110,421.28	203,748.80	61,715.76	5,755.48
Total	2,995,194.99	10,526,087.99	4,361,887.98	509,482.84

Table 80. Balanced Total Motorized Trip Productions/Attractions by Employment Type and Trip Purpose.

Employment Type	HBW	HBNW	NHB	NON-RES
Industrial	401,728.09	243,728.45	213,324.51	6,024.24
Retail	732,909.93	3,196,916.00	2,839,675.35	265,806.76
Medical	265,725.93	1,076,998.11	218,914.05	8,852.11
Office	1,296,541.08	1,489,214.17	797,615.17	57,781.64
Education 1	119,210.53	3,665,028.00	110,761.17	2,294.43
Education 2	51,413.25	208,352.00	30,210.94	1,903.35
Government	109,761.19	189,463.28	60,428.81	4,737.90
Total	2,977,290.00	10,069,700.01	4,270,930.00	347,400.43

Table 81 shows the survey commercial vehicle (CV) attraction rates, with cell adjustments, by area type for each category of employment and trip purpose.

Table 81. Survey Commercial Vehicle Trip Attraction Rates (With Cell Adjustments).

Area Type	Commercial Vehicle Trips						
	Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee
CBD	0.282	0.199	0.125	0.155	0.308	0.476	0.356
Urban	0.104	0.064	0.121	0.125	0.304	0.476	0.148
Suburban	0.333	0.263	0.157	0.150	0.304	0.476	0.148
Suburban Fringe	0.272	0.258	0.085	0.215	0.312	0.476	0.636
Rural	0.272	0.258	0.085	0.215	0.312	0.476	0.378
All Area Types	0.273	0.214	0.131	0.151	0.307	0.476	0.247

Note: Attraction rates represent observed rates with cell adjustments and after correction factors were applied. Education 2 trip rates were developed using the CV rates from the University of Houston Special Generator Survey, and were held constant across area types.

Table 82 shows the adjusted and balanced total CV trip attractions in the H-GAC study area. Correction factors were applied and trip balancing was performed based on the estimated CV trips from the 2010 H-GAC Commercial Vehicle Survey. It is important to note that the total estimates may not match exactly due to rounding.

Table 82. Adjusted and Balanced Total Commercial Vehicle Trip Attractions.

Area Type	Commercial Vehicle Trips							
	Industrial	Retail	Medical	Office	Education 1	Education 2	Government	Total
CBD	165.67	3,529.44	578.92	27,047.72	132.87	700.21	9,947.67	42102.50
Urban	13,147.06	18,205.57	22,640.05	60,254.76	5,204.01	23,174.03	7,164.44	149789.92
Suburban	121,015.26	164,029.44	28,102.89	103,062.26	21,264.68	7,321.26	8,524.36	453320.15
Suburban Fringe	32,026.81	67,166.48	4,506.33	36,805.87	12,974.90	4,811.13	11,035.54	169327.06
Rural	5,358.13	8,906.09	420.26	5,474.23	3,022.25	821.16	2,175.21	26177.33
Total	171,712.93	261,837.02	56,248.45	232,644.84	42,598.71	36,827.79	38,847.22	840,716.96

Table 83 shows the adjusted and balanced CV trip attraction rates by area type and employment type, including household. The CV rates per household were held constant across area types.

Table 83. Adjusted and Balanced Commercial Vehicle Trip Attraction Rates.

Area Type	Commercial Vehicle Trips							
	Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee	Per Household
CBD	0.431	0.304	0.192	0.237	0.471	0.729	0.546	0.077
Urban	0.159	0.098	0.185	0.191	0.465	0.729	0.226	0.077
Suburban	0.510	0.402	0.240	0.229	0.465	0.729	0.226	0.077
Suburban Fringe	0.416	0.395	0.130	0.329	0.478	0.729	0.974	0.077
Rural	0.416	0.395	0.130	0.329	0.478	0.729	0.579	0.077
All Area Types	0.419	0.328	0.201	0.231	0.470	0.729	0.378	0.077

Note: Attraction rates represent balanced and adjusted rates to match total CV trip estimates from the 2010 H-GAC Commercial Vehicle Survey.

Table 84 and Table 85 show the recommended person and motorized trip attraction rates to be used as data inputs to the H-GAC travel demand model. These rates represent adjusted, balanced, and smoothed data.

Table 84. Recommended Person Trip Attraction Rates.

Trip Purpose	Area Type	Person Trips							
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee	Per Household
HBW	CBD	0.985	0.899	1.511	1.350	1.359	1.023	1.065	0.063
	Urban	1.099	0.818	1.170	1.030	1.431	1.023	1.082	0.063
	Suburban	0.980	0.863	0.792	1.513	1.326	1.023	1.087	0.063
	Suburban Fringe	0.899	1.169	0.709	1.153	1.270	1.023	1.032	0.063
	Rural	0.892	1.055	0.799	1.002	1.347	1.023	1.081	0.063
HBNW Retail	CBD		3.896						0.000
	Urban		3.263						0.000
	Suburban		4.769						0.000
	Suburban Fringe		3.244						0.000
	Rural		3.299						0.000
HBNW Other	CBD	0.525		4.423	1.533			2.789	0.467
	Urban	0.549		2.071	1.857			1.170	0.467
	Suburban	0.478		6.417	1.302			1.172	0.467
	Suburban Fringe	1.232		3.721	1.900			4.069	0.467
	Rural	0.657		3.799	1.999			6.816	0.467
HBNW School	CBD					43.869	4.155		0.000
	Urban					37.332	4.155		0.000
	Suburban					37.279	4.155		0.000
	Suburban Fringe					52.018	4.155		0.000
	Rural					51.108	4.155		0.000
NHB	CBD	0.503	3.299	0.956	0.761	1.263	0.610	0.741	0.296
	Urban	0.540	1.980	0.443	1.060	0.893	0.610	0.472	0.296
	Suburban	0.407	5.401	1.145	0.605	0.911	0.610	0.479	0.296
	Suburban Fringe	0.848	1.478	0.858	0.961	1.815	0.610	1.105	0.296
	Rural	0.876	1.746	0.899	0.852	1.889	0.610	0.717	0.296
NON-RES	CBD	0.013	0.462	0.052	0.019	0.022	0.046	0.093	0.000
	Urban	0.015	0.317	0.074	0.200	0.039	0.046	0.020	0.000
	Suburban	0.025	0.659	0.019	0.007	0.049	0.046	0.022	0.000
	Suburban Fringe	0.016	0.318	0.021	0.089	0.008	0.046	0.170	0.000
	Rural	0.031	0.469	0.007	0.086	0.001	0.046	0.175	0.000

Note: Recommended attraction rates represent adjusted, balanced, and smoothed rates to match the trip production estimates from the 2008 H-GAC Household Travel Survey.

Table 85. Recommended Motorized Trip Attraction Rates.

Trip Purpose	Area Type	Motorized Trips							
		Per Industrial Employee	Per Retail Employee	Per Medical Employee	Per Office Employee	Per Education 1 Employee	Per Education 2 Employee	Per Government Employee	Per Household
HBW	CBD	0.980	0.858	1.234	1.341	1.301	1.017	1.057	0.062
	Urban	1.096	0.815	1.143	1.024	1.377	1.017	1.079	0.062
	Suburban	0.980	0.860	0.802	1.504	1.370	1.017	1.079	0.062
	Suburban Fringe	0.893	1.159	0.741	1.146	1.216	1.017	1.024	0.062
	Rural	0.754	1.030	0.864	1.002	1.247	1.017	1.073	0.062
HBNW Retail	CBD	3.866							0.000
	Urban	3.237							0.000
	Suburban	4.732							0.000
	Suburban Fringe	3.219							0.000
	Rural	3.200							0.000
HBNW Other	CBD	0.506		3.956	1.432			2.593	0.444
	Urban	0.477		2.977	1.734			1.089	0.444
	Suburban	0.442		4.935	1.216			1.089	0.444
	Suburban Fringe	1.191		3.264	1.807			3.783	0.444
	Rural	0.596		3.412	1.857			6.337	0.444
HBNW School	CBD					41.560	4.122		0.000
	Urban					35.367	4.122		0.000
	Suburban					35.259	4.122		0.000
	Suburban Fringe					49.280	4.122		0.000
	Rural					49.082	4.122		0.000
NHB	CBD	0.483	3.276	0.936	0.787	1.256	0.598	0.723	0.289
	Urban	0.537	1.967	0.434	0.971	1.056	0.598	0.467	0.289
	Suburban	0.403	5.364	1.122	0.625	1.050	0.598	0.467	0.289
	Suburban Fringe	0.806	1.265	0.841	0.952	1.506	0.598	1.078	0.289
	Rural	0.873	1.468	0.850	0.846	1.550	0.598	0.700	0.289
NON-RES	CBD	0.008	0.359	0.041	0.001	0.021	0.038	0.077	0.000
	Urban	0.010	0.306	0.053	0.137	0.027	0.038	0.017	0.000
	Suburban	0.020	0.380	0.013	0.007	0.035	0.038	0.017	0.000
	Suburban Fringe	0.005	0.242	0.020	0.089	0.014	0.038	0.149	0.000
	Rural	0.007	0.544	0.010	0.082	0.001	0.038	0.118	0.000

Note: Recommended attraction rates represent adjusted, balanced, and smoothed rates to match the trip production estimates from the 2008 H-GAC Household Travel Survey.

SURVEY SUMMARY

In 2010/2011, the TPP Division of TxDOT funded a work place and special generator survey in the eight-county Houston-Galveston study area. The purpose of the survey was to collect data on the travel characteristics of employees and non-employees at industrial, retail, service, and education establishments. These data are used for forecasting travel demand within the H-GAC area.

The work place survey consisted of four data collection efforts, which involved a general establishment survey, an intercept interview survey, a person or vehicle count, and a commercial vehicle count. The surveyed establishments were classified as either full survey sites or partial survey sites. The full survey sites consisted of 222 establishments with total reported employment of 6,173. A total of 1,797 employees and 2,959 non-employees/visitors participated in the intercept interviews. The partial survey sites consisted of 278 establishments with total reported employment of 8,752. The partial sites did not include intercept interview surveys. The survey findings indicated that approximately 229,846 persons and 160,616 non-commercial vehicles were traveling to and from the surveyed establishments during the travel survey period. There were 8,140 commercial vehicles counted at the surveyed establishments during their normal operating hours.

The special generator survey consisted of two airports (George Bush Intercontinental Airport and William P. Hobby Airport), one university (University of Houston), and one port (Port of Freeport). The data collection efforts for the special generator survey were similar to the work place survey.

The expansion of workplace and special generator survey data involved a series of procedures to develop the trip rate estimates for each category of trip purpose based on employment and count data. In the final analysis, the aggregate estimates of trip attractions from the H-GAC Work Place Survey were compared with the aggregate estimates of trip productions from the 2008 H-GAC Household Travel Survey. Adjustments and correction factors were applied to match the total trip attractions with the total trip productions. The recommended trip attraction rates represent adjusted, balanced, and smoothed data.

The total non-resident trip attractions amounted to 509,483 person trips and 347,400 motorized trips. The commercial vehicle trip attraction rates were developed using data from the 2010 H-GAC Commercial Vehicle Survey and the H-GAC Work Place Survey.

Adjustments made to the observed trip rates are highly sensitive to the amount of employment and distribution of employment. Therefore, the recommended attraction rates presented in this report may require further adjustments during the calibration phase of the travel demand model for the H-GAC study area to achieve results that are more acceptable.

**APPENDIX A:
H-GAC NAICS TO EMPLOYMENT CATEGORY CONVERSION RULES**

2010 Employment Forecast Base Year NAICS to Travel Model Category Conversion Rules Based on Land Use Type

The forecast group provides 21 land use types that include:

1. Single-Family Residential;
2. Mobile Homes;
3. Multi-family Residential;
4. Condo Residential;
5. Group Quarters;
6. Commercial/Retail;
7. Government;
8. Educational;
9. Hotel/Motel;
10. Hospital/Convalescent Center;
11. Office;
12. Industrial;
13. Storage/Warehouse;
14. Recreational;
15. Other;
16. Agriculture;
17. Unknown;
18. Mixed Use;
19. Vacant Developable;
20. Parks/Open Space; and
21. Undevelopable.

The revised travel model employment categories are:

1. Retail;
2. Office;
3. Industrial;
4. Medical 1;
5. Medical 2 (large medical complex, such as hospitals);
6. Education 1 (Kindergarten to 12th grade);
7. Education 2 (all other secondary education employment);
8. Government;
9. Entertainment; and
10. Restaurant.

In this guide, only 12 types of land use are discussed that are relevant to NAICS employment. There are five types of land use that are residential bound. The five types are grouped together and treated as one type. Finally, four types of land use — agriculture, unknown, vacant developable, and undevelopable — are not discussed here, due to their nature of uncertainty.

The general procedures for the conversion are:

1. Examine the location's land use type first;
2. Check the NAICS code of the establishment residing on the land partial; and
3. Assign the establishment to one of the travel model employment categories as discussed in the following.

Recommended NAICS to travel model employment category conversion rules based on land use types:

- A) If the land use type is Commercial/Retail, and if the NAICS code is among:
- 1) 1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1131, 1132, 1133, 1141, 1142, 1151, 1152, 1153, the establishment is assigned to Retail;
 - 2) 2211, 2212, the establishment is assigned to Retail;
 - 3) 2361, 2381, 2382, 2383, the establishment is assigned to Retail;
 - 4) 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249, the establishment is assigned to Retail;
 - 5) 4251, the establishment is assigned to Office;
 - 6) 4411, 4412, 4413, 4421, 4422, 4431, 4441, 4442, 4451, 4452, 4453, 4461, 4471, 4481, 4482, 4483, the establishment is assigned to Retail;
 - 7) 4511, 4512, 4521, 4529, 4531, 4532, 4533, 4539, 4541, 4542, 4543, the establishment is assigned to Retail;
 - 8) 4851, 4852, 4853, 4859, 4871, 4872, 4879, 4889, the establishment is assigned to Retail;
 - 9) 4885, the establishment is assigned to Office;
 - 10) 4921, 4922, the establishment is assigned to Retail;
 - 11) 5111, 5112, 5122, 5151, 5152, 5182, 5191, the establishment is assigned to Office;
 - 12) 5221, 5242, the establishment is assigned to Retail;
 - 13) 5223, 5231, 5232, 5239, 5241, 5251, 5259, the establishment is assigned to Office;
 - 14) 5311, 5312, 5321, 5322, 5323, 5324, the establishment is assigned to Retail;
 - 15) 5313, 5331, the establishment is assigned to Office;
 - 16) 5411, 5412, 5413, 5414, 5415, 5416, 5417, 5418, 5419, the establishment is assigned to Office;
 - 17) 5611, the establishment is assigned to Office;
 - 18) 5612, the establishment is assigned to Industrial;
 - 19) 5613, 5614, 5615, the establishment is assigned to Office;
 - 20) 5616, 5617, the establishment is assigned to Retail;
 - 21) 5619, the establishment is assigned to Office;
 - 22) 6114, 6115, 6116, 6117, the establishment is assigned to Retail;
 - 23) 6211, 6212, 6213, 6214, 6215, 6216, 6231, 6232, 6233, 6239, 6241, 6243, the establishment is assigned to Medical 1;
 - 24) 6219, the establishment is assigned to Medical 2;
 - 25) 6242, the establishment is assigned to Industrial;
 - 26) 6244, the establishment is assigned to Education 1;
 - 27) 7111, 7112, the establishment is assigned to Entertainment;
 - 28) 7113, 7114, 7115, the establishment is assigned to Office;
 - 29) 7132, 7139, the establishment is assigned to Entertainment;
 - 30) 7211, 7212, 7213, the establishment is assigned to Retail;

- 31) 7221, 7222, 7224, the establishment is assigned to Restaurant;
- 32) 7223, the establishment is assigned to Industrial;
- 33) 8111, 8112, 8114, 8121, 8122, 8123, 8129, the establishment is assigned to Retail;
- 34) 8131, the establishment is assigned to Retail;
- 35) 8132, 8133, 8134, 8139, the establishment is assigned to Office; and
- 36) 9231, 9241, 9251, 9261, 9271, 9281, the establishment is assigned to Government.

B) If the land use type is Hotel, and if the NAICS code is among 7211, 7213, the establishment is assigned to Retail.

C) If the land use type is Recreation, and if the NAICS code is among 7131, 7139, the establishment is assigned to Retail.

D) If the land use type is Office, and if the NAICS code is among:

- 1) 1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1131, 1132, 1133, 1141, 1142, 1151, 1152, 1153, the establishment is assigned to Office;
- 2) 2111, 2121, 2122, 2123, 2131, the establishment is assigned to Office;
- 3) 2211, 2212, 2213, the establishment is assigned to Office;
- 4) 2361, 2362, the establishment is assigned to Office;
- 5) 2371, 2372, 2373, 2379, the establishment is assigned to Office;
- 6) 2381, 2382, 2383, 2389, the establishment is assigned to Office;
- 7) 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169, the establishment is assigned to Office;
- 8) 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279, the establishment is assigned to Office;
- 9) 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399, the establishment is assigned to Office;
- 10) 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249, 4251, the establishment is assigned to Office;
- 11) 4541, 4542, 4543, the establishment is assigned to Office;
- 12) 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4851, 4852, 4853, 4854, 4855, 4859, 4861, 4862, 4869, 4871, 4872, 4879, 4881, 4882, 4883, 4884, 4885, 4889, the establishment is assigned to office;
- 13) 4921, 4922, 4931, the establishment is assigned to Office;
- 14) 5111, 5112, 5121, 5122, 5151, 5152, 5171, 5172, 5174, 5179, 5182, 5191, the establishment is assigned to Office;
- 15) 5221, 5222, 5223, 5231, 5232, 5239, 5241, 5242, 5251, 5259, the establishment is assigned to Office;
- 16) 5311, 5312, 5313, 5321, 5322, 5323, 5324, 5331, the establishment is assigned to Office;
- 17) 5411, 5412, 5413, 5414, 5415, 5416, 5417, 5418, 5419, the establishment is assigned to Office;
- 18) 5511, the establishment is assigned to Office;

- 19) 5611, 5613, 5614, 5615, 5616, 5619, 5621, 5622, 5629, the establishment is assigned to Office;
- 20) 5612, 5617, the establishment is assigned to Industrial;
- 21) 6114, 6115, 6116, the establishment is assigned to Retail;
- 22) 6117, the establishment is assigned to Office;
- 23) 6211, 6212, 6213, 6214, 6215, 6216, 6219, 6231, 6232, 6233, 6239, 6241, the establishment is assigned to Medical 1;
- 24) 6242, the establishment is assigned to Office;
- 25) 6243, the establishment is assigned to Medical 1;
- 26) 6244, the establishment is assigned to Retail;
- 27) 8131, the establishment is assigned to Retail;
- 28) 8132, 8133, 8134, 8139, the establishment is assigned to Office; and
- 29) 9231, 9241, 9251, 9261, 9271, 9281, the establishment is assigned to Government;

E) If the land use type is Industrial, and if the NAICS code is or among:

- 1) 1151, 1152, 1153, the establishment is assigned to Industrial;
- 2) 2111, 2121, 2122, 2123, 2131, the establishment is assigned to Industrial;
- 3) 2211, 2212, 2213, the establishment is assigned to Industrial;
- 4) 2361, 2362, 2371, 2372, 2373, 2379, 2381, 2382, 2383, 2389, the establishment is assigned to Industrial;
- 5) 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169, the establishment is assigned to Industrial;
- 6) 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279, the establishment is assigned to Industrial;
- 7) 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399, the establishment is assigned to Industrial;
- 8) 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4851, 4852, 4853, 4854, 4855, 4859, 4861, 4862, 4869, 4871, 4872, 4879, 4881, 4882, 4883, 4884, 4889, the establishment is assigned to Industrial;
- 9) 4921, 4922, 4931, the establishment is assigned to Industrial;
- 10) 5171, 5172, 5174, 5179, the establishment is assigned to Industrial;
- 11) 5311, 5321, 5324, the establishment is assigned to Industrial;
- 12) 5612, 5616, 5617, 5619, 5621, 5622, 5629, the establishment is assigned to Industrial; and
- 13) 8111, 8112, 8113, the establishment is assigned to Industrial.

F) If the land use type is Warehouse, and if the NAICS code is or among:

- 1) 1111, 1112, 1113, 1114, 1119, 1121, 1122, 1123, 1124, 1125, 1129, 1132, 1141, 1151, the establishment is assigned to Industrial;
- 2) 2111, 2121, 2122, 2123, the establishment is assigned to Industrial;
- 3) 2361, 2362, 2371, 2373, 2379, 2381, 2382, 2383, 2389, the establishment is assigned to Industrial;

- 4) 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3121, 3122, 3131, 3132, 3133, 3141, 3149, 3151, 3152, 3159, 3161, 3162, 3169, the establishment is assigned to Industrial;
- 5) 3211, 3212, 3219, 3221, 3222, 3231, 3241, 3251, 3252, 3253, 3254, 3255, 3256, 3259, 3261, 3262, 3271, 3272, 3273, 3274, 3279, the establishment is assigned to Industrial;
- 6) 3311, 3312, 3313, 3314, 3315, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3331, 3332, 3333, 3334, 3335, 3336, 3339, 3341, 3342, 3343, 3344, 3345, 3346, 3351, 3352, 3353, 3359, 3361, 3362, 3363, 3364, 3365, 3366, 3369, 3371, 3372, 3379, 3391, 3399, the establishment is assigned to Industrial;
- 7) 4231, 4232, 4233, 4234, 4235, 4236, 4237, 4238, 4239, 4241, 4242, 4243, 4244, 4245, 4246, 4247, 4248, 4249, the establishment is assigned to Industrial;
- 8) 4481, the establishment is assigned to Retail;
- 9) 4811, 4812, 4821, 4831, 4832, 4841, 4842, 4861, 4862, 4869, 4889, the establishment is assigned to Industrial;
- 10) 4911, the establishment is assigned to Government;
- 11) 4921, 4922, 4931, the establishment is assigned to Industrial;
- 12) 5311, 5321, 5322, 5323, 5324, the establishment is assigned to Industrial; and
- 13) 5617, 5619, 5621, 5622, 5629, the establishment is assigned to Industrial.

G) If the land use type is Hospital, and if the NAICS code is or among:

- 1) 6221, 6222, 6223, the establishments are assigned to Medical 2; and
- 2) 7222, the establishment is assigned to Retail.

H) If the land use type is Education, and if the NAICS code is or among:

- 1) 6111, the establishment is assigned to Education 1;
- 2) 6112, 6113, the establishment is assigned to Education 2;
- 3) 6114, 6115, 6116, and 6117, the establishment is assigned to Retail; and
- 4) 6243, the establishment is assigned to Medical 1.

I) If the land use type is Government, and if the NAICS code is or among:

- 1) 4911, the establishment is assigned to Government;
- 2) 5211, the establishment is assigned to Government; and
- 3) 9211, 9221, 9231, 9241, 9251, 9261, 9271, 9281, the establishment is assigned to Government.

J) If the land use type is Mixed Use, and if the mix is Residential/Retail, then go to A).

K) If the land use type is Mixed Use, and if the mix is Retail/Office, first estimate the proportion of retail to office in square feet, then allocate proportionately by following A) and D).

L) If the land use type is Mixed Use, and if the mix is Office/Warehouse, first estimate the proportion of office to warehouse in square feet, then allocate proportionately to Office and Warehouse by following D) and F).

M) If the land use type is Other, and if the NAICS is or among:

- 1) 4811, 4812, 4851, the establishment is assigned to Industrial;
 - 2) 5191, the establishment is assigned to Retail;
 - 3) 6242, the establishment is assigned to Industrial;
 - 4) 7121, the establishment is assigned to Entertainment;
 - 5) 7131, the establishment is assigned to Entertainment;
 - 6) 8131, the establishment is assigned to Retail; and
 - 7) 9221, the establishment is assigned to Government;
- N) If the land use type is Recreational, and if the NAICS code is or among 7139, the establishment is assigned to Entertainment.
- O) If the land use type is Parks/Open Space, and if the NAICS is or among 7121, the establishment is assigned to Entertainment
- P) If the land use type is Single Family, Mobile Houses, Multi-family, Condo, Group quarters, and if the NAICS code is or among:
- 1) 6116, the establishment is assigned to Retail;
 - 2) 6244, the establishment is assigned to Retail; and
 - 3) 7222, the establishment is assigned to Restaurant.
- Q) If the land use type is Undevelopable, and if the NAICS is or among 4811, the establishment is assigned to Industrial.

Assignment examples:

1. If the land use type is Office, and the NAICS description is MINING, QUARRYING, AND OIL AND GAS EXTRACTION, the establishment is assigned to Office.
2. If the land use type is Office, and the NAICS description is OFFICE OF PHYSICIANS, the establishment is assigned to Medical 1.
3. If the land use type is Office, and the NAICS description is EDUCATION SERVICES, the establishment is assigned to Retail.
4. If the land use type is Office, and the NAICS description is PUBLIC ADMINISTRATION, the establishment is assigned to Government.
5. If the land use type is Office, and the NAICS description is FOOD SERVICES AND DRINKING PLACES, the establishment is assigned to Restaurant.
6. If the land use type is Retail, and the NAICS description is CHILD DAY CARE SERVICES, the establishment is assigned to Retail.
7. If the land use type is Retail or Office, and the NAICS description is OFFICES OF DENTISTS, the establishment is assigned to MEDICAL 1.

Source: H-GAC, 2012.

**APPENDIX B:
H-GAC WORK PLACE SURVEY FORMS**

Survey Forms

Record Type 9: Work Place General Survey Form A	1 Page
Record Type H10: Houston-Galveston Work Place Intercept Survey Form B	2 Pages
Record Type H11: Houston-Galveston Work Place Intercept Survey Form C	2 Pages
Record Type SHA: Houston-Galveston Airport Intercept Survey Form B	2 Pages
Record Type SUH: University of Houston Intercept Survey Form B	2 Pages
Record Type SPF: Houston-Galveston Port of Freeport Survey Form B	2 Pages
Record Type WCV: Commercial Vehicle Survey Form D	2 Pages

Survey Date: _____
Record Type 9

Site # _____
NAICS Code: _____
TAZ No. _____

**WORK PLACE GENERAL SURVEY
Form A**

Employment Type: _____
 Free Standing
 Non-Free Standing

Work Place Information

Name

Street Address

City State Zip Code Telephone

Management Information

CEO/Administrator

Name: _____ Telephone: _____

Title: _____

Personnel Manager

Name: _____ Telephone: _____

or Other Contact

Title: _____

Security Director

Name : _____ Telephone: _____

Title: _____

Traffic Counts/Hours of Operation

Weekday Hours of Operation: _____

Commercial Vehicle Count _____ Non-Commercial Vehicle Count _____ Person Count _____

Employment Information

Total Employees (Full and part time): _____ Number at Work on Survey Day: _____

Delivery Information

Delivery Hours _____ No. of Deliveries _____
(If Restricted) _____ on Day of Survey _____

Number/Type of Vehicles owned/Leased for Commercial/Business Purposes

_____ Commercial Cargo Transport Vehicles _____ Commercial Service Vehicles
_____ Cars/SUVs _____ Cargo Vans _____ Service Vans _____ Pickup Trucks

Record Type H10

**INTERCEPT TRAVEL SURVEY
Form B**

Free Standing Work Place
TAZ _____ Survey Area _____
Site # _____
Date: ____/____/____
Interviewer _____
Employment Type _____

Address: _____

Date: _____ Location: _____

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
Time interview began		
Time interview ended		
1. Do you work in this building or at this location?	1) Yes 2) No	1) Yes 2) No
2. In what city or county do you live?		
3a. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties? (If NO go to question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)
3b. If YES – Which roadway did you use to enter the area? (airport is an option)	b. _____	b. _____
4. What is your home address or the names of the nearest two intersecting streets?		
5a. Did you travel here directly from your home with no stops? (if YES go to Question 7)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 7)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 7)
5b. If NO where did you start your trip that brought you to _____?	b. _____ (Address or nearest intersection)	b. _____ (Address or nearest intersection)
6a. Is that location:	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County
6b. If outside of those counties, what street or highway were you on when you entered the area?	b. _____	b. _____
7. What approximate time did you arrive at this location today?	_____ a.m. / _____ p. m.	_____ a.m. / _____ p. m.
8. How did you arrive here at the _____ today? (Choose from arrival options)		
9a. If car/truck/van ask: How many people, including yourself, were in the vehicle?	a) # people _____	a) # people _____
9b. If bus/rail, ask: What fare did you pay?	b) Fare \$ _____.	b) Fare \$ _____.
10. What is the reason for coming here today? (Choose from trip purpose options)	Number _____ Other _____	Number _____ Other _____
11. When you leave here are you going straight home with no stops?	<input type="checkbox"/> Yes <input type="checkbox"/> No (Go to 12)	<input type="checkbox"/> Yes <input type="checkbox"/> No (Go to 12)

Houston-Galveston Work Place Intercept Survey, Form B Continued

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
12. What is the address of the place you will be going?	<p>_____</p> <p>_____</p> <p>(Address or nearest intersection)</p>	<p>_____</p> <p>_____</p> <p>(Address or nearest intersection)</p>
13a. Is that location: 13b. If outside of those counties what street or highway will you be on when you leave this area.?	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. _____ _____	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. _____ _____
14. Thank them for their time and participating		

<u>Arrival Option</u>	<u>Trip Purpose Options</u>	
1) Driver (car/truck/van) 2) Passenger (car/truck/van) 3) Walk 4) Bicycle 5) Transit Bus 6) Transit Rail 7) School Bus 8) Taxi/Paid Limousine 9) Commercial Cargo Transport Vehicle 10) Commercial Service Vehicle 11) Motorcycle 12) Other – specify in block 99) Non-Response	1) Work related 2) School 3) Social/recreational/visit 4) Shop 5) Eat out 6) Pick up/drop off passenger 7) Change travel mode 8) Delivery – pick up/drop off 9) Other – specify in block 99) Non-response	

**HOUSTON-GALVESTON WORK PLACE
INTERCEPT TRAVEL SURVEY
Form C**

Record Type H11

Non Free Standing Work Place

TAZ _____ Survey Area _____

Site # _____

Date: ____/____/____

Interviewer _____

Employment Type _____

Address: _____

Date: _____ Location: _____

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
Time Interview Began		
Time Interview Ended		
1. Do you work in this building or at this location?	1) Yes 2) No	1) Yes 2) No
2. In what city or county do you live?		
3a. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties? (If NO go to question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)
3b. If YES – Which roadway did you use to enter the area? (airport is an option)	b. _____ _____	b. _____ _____
4. What is your home address or the names of the nearest two intersecting streets?		
5a. Did you travel here directly from your home with no stops? (if YES go to Question 7)	a. <input type="checkbox"/> Yes (Go to 7) <input type="checkbox"/> No	a. <input type="checkbox"/> Yes (Go to 7) <input type="checkbox"/> No
5b. If NO where did you start your trip that brought you to _____?	b. _____ (Address or nearest intersection)	b. _____ (Address or nearest intersection)
6a. Is that location ?	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County
6b. If outside of those counties, what street or highway were you on when you entered the area?	b. _____	b. _____
7. What approximate time did you arrive at this location today?	_____ a.m. / _____ p. m.	_____ a.m. / _____ p. m.
8. How did you arrive at the _____ today? (Choose from arrival options)		
9a. If car/truck/van ask: How many people, including yourself, were in the vehicle? 9b. If bus/rail, ask: What fare did you pay?	a) # people _____ b) Fare \$ _____.	a) # people _____ b) Fare \$ _____.
10. What is the reason for coming here today? (Choose from trip purpose options)	Number _____ Other _____	Number _____ Other _____

Houston-Galveston Work Place Intercept Survey, Form C Continued

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
11. Is this the 1 st store / establishment you have visited since arriving at this location?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
12. How many stores /establishments have you visited in this center during this trip?		
13. How many more stores or businesses do you plan to visit in this center / building?		
14. When you leave here are you going straight home with no stops?	<input type="checkbox"/> Yes (Go to 17) <input type="checkbox"/> No (Go to 15)	<input type="checkbox"/> Yes (Go to 17) <input type="checkbox"/> No (Go to 15)
15. What is the address of the place you will be going?	_____ _____ (Address or nearest intersection)	_____ _____ (Address or nearest intersection)
16a. Is that location in: 16b. If outside these counties, what street or highway will you be on when you leave the area.?	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. _____	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. _____
17. Thank them for their time and participating.		

<u>Arrival Option</u>	<u>Trip Purpose Options</u>	
13) Driver (car/truck/van) 14) Passenger (car/truck/van) 15) Walk 16) Bicycle 17) Transit Bus 18) Transit Rail 19) School Bus 20) Taxi/Paid Limousine 21) Commercial Cargo Transport Vehicle 22) Commercial Service Vehicle 23) Motorcycle 24) Other – specify in block 99) Non-Response	10) Work related 11) School 12) Social/recreational/visit 13) Shop 14) Eat out 15) Pick up/drop off passenger 16) Change travel mode 17) Delivery – pick up/drop off 18) Other – specify in block 99) Non-response	

Record Type SHA

**Houston-Galveston Airport
SPECIAL GENERATOR INTERCEPT SURVEY
Form B**

Date: ____/____/____

Interviewer: _____ Airport: _____ Approximate Location in Airport: _____

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
Time interview began		
Time interview ended		
1. Do you work here at the airport?	1) Yes 2) No	1) Yes 2) No
2. In what city or county do you live?		
3. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties?	<input type="checkbox"/> Yes (Go to 4) <input type="checkbox"/> No (Go to 5)	<input type="checkbox"/> Yes (Go to 4) <input type="checkbox"/> No (Go to 5)
If they live outside the counties listed, ask:	_____	_____
4. Which roadway did you use to enter the Houston area?	_____	_____
If they live in one of the counties listed, ask:	_____	_____
5. What is your home address or nearest two intersecting streets?	_____	_____
6. How did you arrive here at the airport today? (Choose from arrival options below) If by airplane, go to 10	Arrival Option # _____ Other _____ If by airplane, go to 10	Arrival Option # _____ Other _____ If by airplane, go to 10
Arrival Options: 1) Driver (car/truck/van) 2) Passenger (car/truck/van) 99) Refused	3) Walk 4) Bicycle 5) Metro Bus	6) School bus 7) Taxi/Paid Limousine 8) Commercial Cargo Vehicle 9) Commercial Service Vehicle 10) Motorcycle 11) Airplane
		12) Hotel/Motel Shuttle Bus 13) Other Parking Shuttle 14) Other – Specify in box
7. If arrival was by car/truck/van, How many people, including yourself were in the vehicle when you arrived at the airport? If arrival was by bus or taxi, what fare did you pay?	# of People _____ Fare \$ _____	# of People _____ Fare \$ _____
8. Did you travel here directly from your home to the airport with no stops? If NO where did you start your trip that brought you to the airport?	a. <input type="checkbox"/> Yes (Go to 10) <input type="checkbox"/> No _____ _____ (Address or nearest intersection)	a. <input type="checkbox"/> Yes (Go to 10) <input type="checkbox"/> No _____ _____ (Address or nearest intersection)
9. Is that location in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, or Waller Counties? If No, what street or highway were you on when you entered the Houston area?	<input type="checkbox"/> Yes <input type="checkbox"/> No _____	<input type="checkbox"/> Yes <input type="checkbox"/> No _____

Houston-Galveston Airport Intercept Survey Form B - Continued

10. What approximate time did you arrive at the airport today?	_____ a.m. / _____ p. m.	_____ a.m. / _____ p. m.
11. What is the reason for coming here today? (Choose from trip purpose options below)	Number _____ Other _____	Number _____ Other _____
Trip Purpose Options: 1) Return Home 4) Social Recreation/Visit 7) Personal Business 10) Delivery – pick up or drop off 2) Work Related 5) Shop 8) Pick Up/Drop Off Passenger 11) Other – specify in block 3) School 6) Eat Out 9) Change Travel Mode 99) Refused		
12. When you leave the airport, what mode will you use? (Choose from options below)	Option # _____ Other _____	Option # _____ Other _____
Departure Options: 1) Driver (car/truck/van) 3) Walk 6) School bus 9) Commercial Service Vehicle 12) Hotel/Motel Shuttle Bus 2) Passenger (car/truck/van) 4) Bicycle 7) Taxi/Paid Limousine 10) Motorcycle 13) Other Parking Shuttle 99) Refused 5) Metro Bus 8) Commercial Cargo Vehicle 11) Airplane 14) Other – Specify in box		
13. When you leave the airport are you going straight home with no stops?	<input type="checkbox"/> Yes (Go to 16) <input type="checkbox"/> No (Go to 14)	<input type="checkbox"/> Yes (Go to 16) <input type="checkbox"/> No (Go to 14)
14. What is the name and address of the place you will be going?	_____ _____ (Address or nearest intersection)	_____ _____ (Address or nearest intersection)
15. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties? If no, what street or highway will you be on when you leave the Houston area.?	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____
16. Thank them for their time and participating.		

Record Type SUH

**UNIVERSITY OF HOUSTON
SPECIAL GENERATOR INTERCEPT SURVEY
Form B**

Date: _____/_____/_____

Interviewer _____ Location on Campus: _____

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
Time interview began		
Time interview ended		
1 Are you a student here at the university?	1) Yes (Go to Question 2) 2) No (Go to Question 3)	1) Yes (Go to Question 2) 2) No (Go to Question 3)
2 Do you live on campus?	1) Yes (Terminate Interview) 2) No (Go to Question 3)	1) Yes (Terminate Interview) 2) No (Go to Question 3)
3. Do you work here at the university or are you visiting the university?	1) Employee 2) Visitor	1) Employee 2) Visitor
4. In what city or county do you live?		
5. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties?	<input type="checkbox"/> Yes (go to 6) <input type="checkbox"/> No (go to 7)	<input type="checkbox"/> Yes <input type="checkbox"/> No
If they live outside the counties listed, ask:	_____	_____
6. Which roadway did you use to enter the Houston area?	_____	_____
If they live in one of the counties listed, ask:	_____	_____
7. What is your home address or nearest two intersecting streets?	_____	_____
8. How did you arrive here at the university today? (Choose from arrival options below)	Arrival Option # _____ Other _____	Arrival Option # _____ Other _____
Arrival Options:	3) Walk 6) School bus 9) Commercial Service Vehicle 99) Refused	
	1) Driver (car/truck/van) 4) Bicycle 7) Taxi/Paid Limousine 10) Motorcycle	
	2) Passenger (car/truck/van) 5) Metro Bus 8) Commercial Cargo Vehicle 11) Other – Specify in box	
9. If arrival was by car/truck/van, How many people, including yourself were in the vehicle when you arrived at the university? Where did you park?	# of People _____ 1) On-Campus 2) Off Campus Parking Lot 3) Off Campus in Street Designated Parking Spot 4) Other (specify) _____	# of People _____ 1) On-Campus 2) Off Campus Parking Lot 3) Off Campus in Street Designated Parking Spot 4) Other (specify) _____
10. Did you travel here directly from your home to the university with no stops? If NO where did you start your trip that brought you to the university?	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 12) _____ (Address or nearest intersection)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 12) _____ (Address or nearest intersection)
11. Is that location in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, or Waller Counties? If No, what street or highway were you on when you entered the Houston area?	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____

University of Houston Intercept Survey Form B – Continued

12. What approximate time did you arrive at the university today?	_____ a.m. / _____ p. m.	_____ a.m. / _____ p. m.
13. What is the reason for coming here today? (Choose from trip purpose options below)	Number _____ Other _____	Number _____ Other _____
Trip Purpose Options: 1) Return Home 4) Social Recreation/Visit 7) Personal Business 10) Delivery – pick up or drop off 2) Work Related 5) Shop 8) Pick Up/Drop Off Passenger 11) Other – specify in block 3) School 6) Eat Out 9) Change Travel Mode 99) Refused		
14. When you leave the university, what mode will you use? (Choose from options below)	Option # _____ Other _____	Option # _____ Other _____
Departure Options: 1) Driver (car/truck/van) 3) Walk 6) School bus 9) Commercial Service Vehicle 99) Refused 2) Passenger (car/truck/van) 4) Bicycle 7) Taxi/Paid Limousine 10) Motorcycle 5) Metro Bus 8) Commercial Cargo Vehicle 11) Other – Specify in box		
15. When you leave the university are you going straight home with no stops?	<input type="checkbox"/> Yes (Go to 18) <input type="checkbox"/> No (If NO go to Question 16)	<input type="checkbox"/> Yes(Go to 18) <input type="checkbox"/> No (If NO go to Question 16)
16. What is the name and address of the place you will be going?	_____ _____ (Address or nearest intersection)	_____ _____ (Address or nearest intersection)
17. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties? If yes, what street or highway will you be on when you leave the Houston area.?	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____	<input type="checkbox"/> Yes <input type="checkbox"/> No _____ _____
18. Thank them for their time and participating.		

Record Type SPF

**HOUSTON-GALVESTON PORT OF FREEPORT
SPECIAL GENERATOR INTERCEPT TRAVEL SURVEY
Form B**

TAZ _____ Survey Area _____

Date: _____/_____/_____
Interviewer _____

Address: _____

Date: _____ Location: _____

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
Time interview began		
Time interview ended		
1. Do you work in this building or at this location?	1) Yes 2) No	1) Yes 2) No
2. In what city or county do you live?		
3a. Is that outside Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties? (If NO go to question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If NO go to Question 4)
3b. If YES – Which roadway did you use to enter the area? (airport is an option)	b. _____	b. _____
4. What is your home address or the names of the nearest two intersecting streets?		
5a. Did you travel here directly from your home with no stops? (if YES go to Question 7)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 7)	a. <input type="checkbox"/> Yes <input type="checkbox"/> No (If YES go to Question 7)
5b. If NO where did you start your trip that brought you to _____?	b. _____ (Address or nearest intersection)	b. _____ (Address or nearest intersection)
6a. Is that location:	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County
6b. If outside of those counties, what street or highway were you on when you entered the area?	b. _____	b. _____
7. What approximate time did you arrive at this location today?	_____ a.m. / _____ p. m.	_____ a.m. / _____ p. m.
8. How did you arrive here at the _____ today? (Choose from arrival options)		
9a. If car/truck/van ask: How many people, including yourself, were in the vehicle?	a) # people _____	a) # people _____
9b. If bus/rail, ask: What fare did you pay?	b) Fare \$ _____.	b) Fare \$ _____.
10. What is the reason for coming here today? (Choose from trip purpose options)	Number _____ Other _____	Number _____ Other _____
11. When you leave here are you going straight home with no stops?	<input type="checkbox"/> Yes <input type="checkbox"/> No (Go to 12)	<input type="checkbox"/> Yes <input type="checkbox"/> No (Go to 12)

Houston-Galveston Port of Freeport Intercept Survey, Form B Continued

<u>Questions</u>	<u>Person 1</u>	<u>Person 2</u>
12. What is the address of the place you will be going?	<p>_____</p> <p>_____</p> <p>(Address or nearest intersection)</p>	<p>_____</p> <p>_____</p> <p>(Address or nearest intersection)</p>
13a. Is that location: 13b. If outside of those counties what street or highway will you be on when you leave this area.?	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. <p>_____</p>	a. In <input type="checkbox"/> Brazoria <input type="checkbox"/> Chambers <input type="checkbox"/> Fort Bend <input type="checkbox"/> Galveston <input type="checkbox"/> Harris <input type="checkbox"/> Liberty <input type="checkbox"/> Montgomery <input type="checkbox"/> Waller <input type="checkbox"/> Other County b. <p>_____</p>
14. Thank them for their time and participating		

<u>Arrival Option</u>	<u>Trip Purpose Options</u>	
25) Driver (car/truck/van) 26) Passenger (car/truck/van) 27) Walk 28) Bicycle 29) Transit Bus 30) Transit Rail 31) School Bus 32) Taxi/Paid Limousine 33) Commercial Cargo Transport Vehicle 34) Commercial Service Vehicle 35) Motorcycle 36) Other – specify in block 99) Non-Response	19) Work related 20) School 21) Social/recreational/visit 22) Shop 23) Eat out 24) Pick-up/drop-off passenger 25) Change travel mode 26) Delivery – pick up/drop off 27) Other – specify in block 99) Non-response	

WORK PLACE COMMERCIAL VEHICLE SURVEY

Form D

Workplace Site #: _____

Survey Date: _____

Zone #: _____

Interviewer: _____

<u>Questions</u>	<u>Vehicle 1</u>	<u>Vehicle 2</u>
1. Time of Arrival	_____ a.m. / _____ p.m.	_____ a.m. / _____ p.m.
2. Number of People in Vehicle		
3. Standard Vehicle Class (choose from vehicle class codes)		
4. Vehicle Type	<input type="checkbox"/> 1 – Cargo Transport <input type="checkbox"/> 2 Service	<input type="checkbox"/> 1 – Cargo Transport <input type="checkbox"/> 2 Service
5. What is the cargo being delivered? (Choose from cargo codes.)	Code _____ (If coded as 19, enter name of cargo) _____	Code _____ (If coded as 19, enter name of cargo) _____
6. What is the weight of the cargo being delivered in pounds?	Weight _____ <input type="checkbox"/> No cargo delivered	Weight _____ <input type="checkbox"/> No cargo delivered
7. What is the cargo being picked up? (Choose from cargo codes.)	Code _____ (If coded as 19, enter name of cargo) _____	Code _____ (If coded as 19, enter name of cargo) _____
8. What is the weight of the cargo being picked up in pounds?	Weight _____ <input type="checkbox"/> No cargo picked up	Weight _____ <input type="checkbox"/> No cargo picked up.
9. What is your reason for coming here today?	_____ (Choose from trip purpose options)	_____ (Choose from trip purpose options)
10a. What is the address of the last place you got into your vehicle? (Address or nearest two intersecting streets)	_____ _____ _____	_____ _____ _____
10b. What type of place was that location? (See type of place codes below)	Type of Place Code _____	Type of Place Code _____
11a. Is that location:	a. <input type="checkbox"/> Brazoria <input type="checkbox"/> Harris <input type="checkbox"/> Chambers <input type="checkbox"/> Liberty <input type="checkbox"/> Fort Bend <input type="checkbox"/> Montgomery <input type="checkbox"/> Galveston <input type="checkbox"/> Waller <input type="checkbox"/> Hardin County <input type="checkbox"/> Jefferson County <input type="checkbox"/> Orange County <input type="checkbox"/> Outside of those counties	a. <input type="checkbox"/> Brazoria <input type="checkbox"/> Harris <input type="checkbox"/> Chambers <input type="checkbox"/> Liberty <input type="checkbox"/> Fort Bend <input type="checkbox"/> Montgomery <input type="checkbox"/> Galveston <input type="checkbox"/> Waller <input type="checkbox"/> Hardin County <input type="checkbox"/> Jefferson County <input type="checkbox"/> Orange County <input type="checkbox"/> Outside of those counties
11b. If outside of the counties shown, what street or highway were you on when you entered the area?	b. _____ _____	b. _____ _____
12. What was your purpose for being at that location?	_____ (Choose from trip purpose options)	_____ (Choose from trip purpose options)
13. What approximate time did you leave that location?	_____ a.m. / _____ p.m.	_____ a.m. / _____ p.m.
14a. What is the address of the place you will be going when you leave? (place/address or nearest intersection/city)	_____ _____ _____	_____ _____ _____
14b. What type of place is that location? (See type of place codes below)	Type of Place Code _____	Type of Place Code _____

