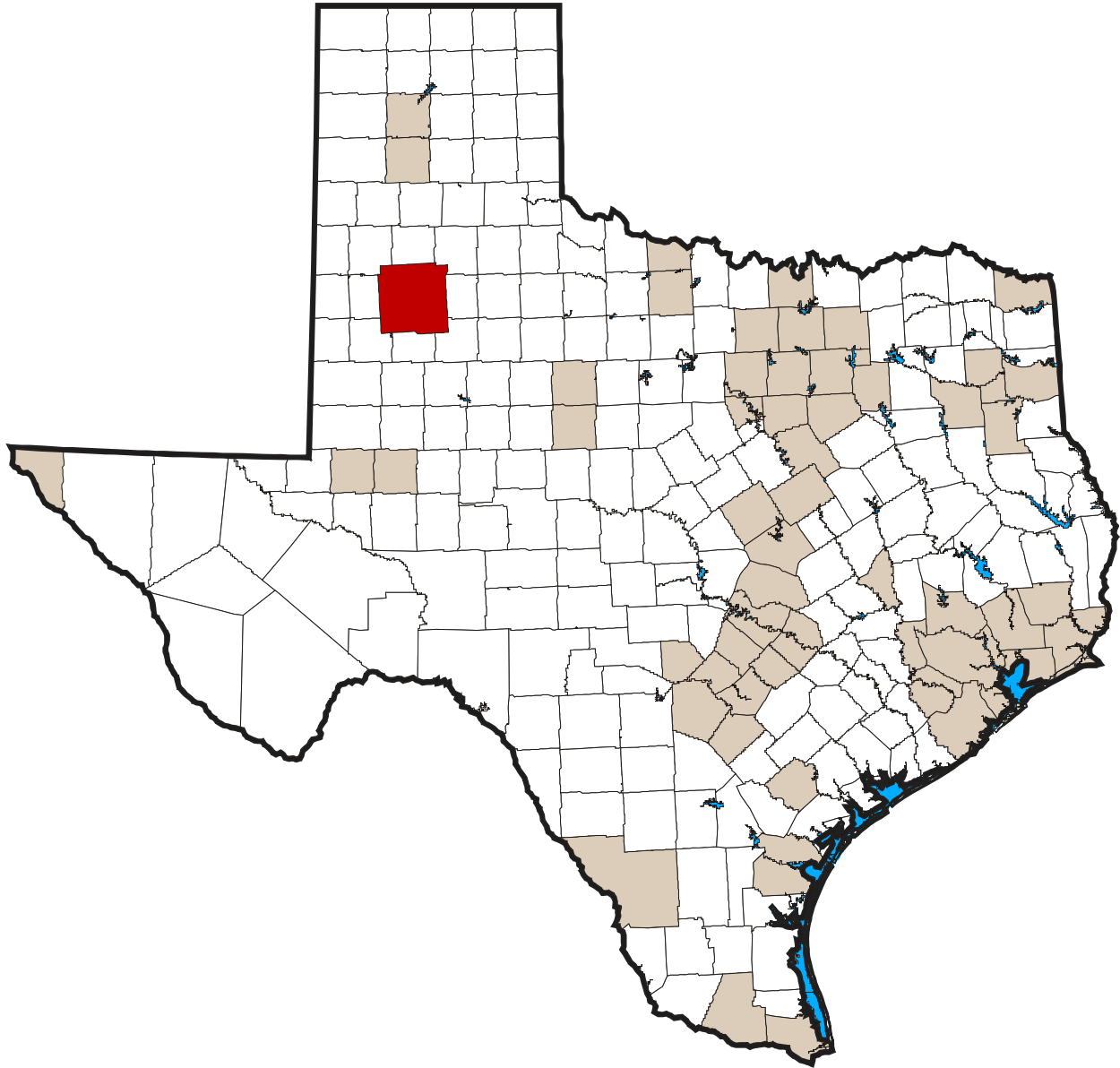


# 2010-2011 Abilene Commercial Vehicle Survey Technical Summary



Prepared by the  
Texas A&M Transportation Institute  
November 2013



# **2010-2011 Abilene Commercial Vehicle Survey**

## **TECHNICAL SUMMARY**

**Texas Department of Transportation Travel Survey Program**

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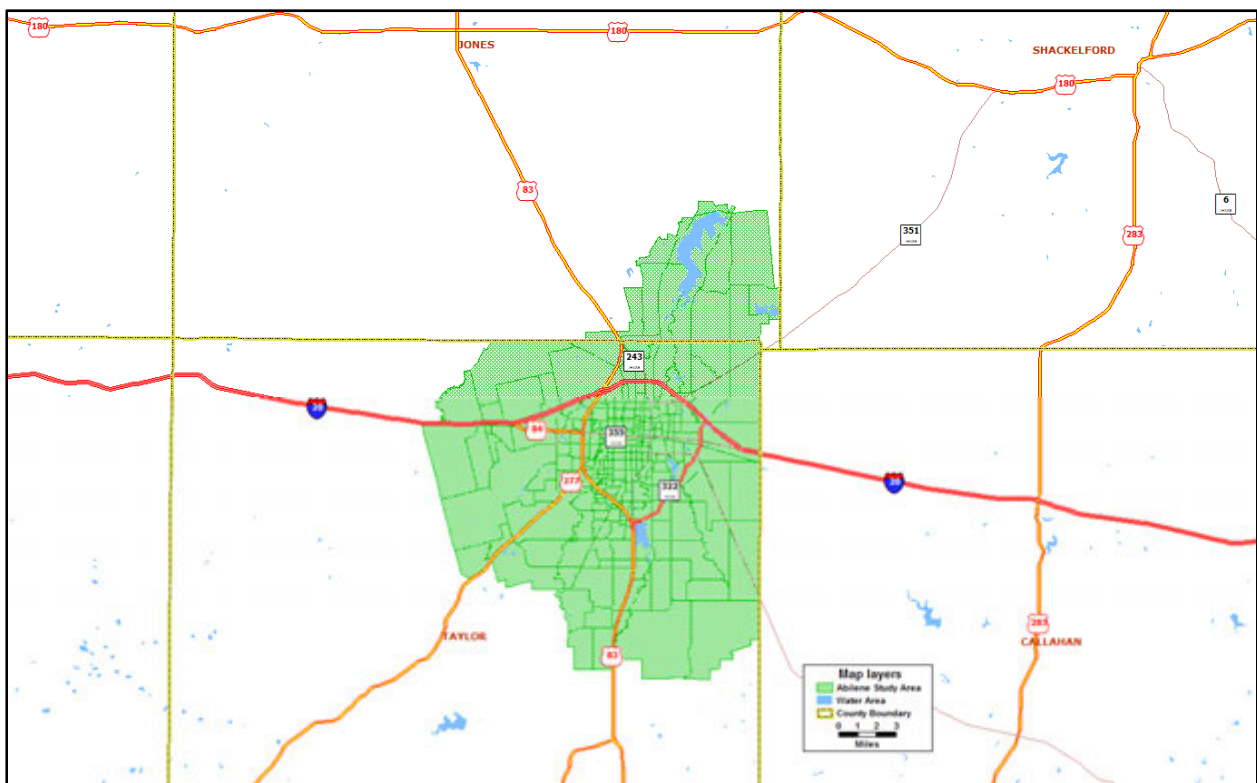
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## INTRODUCTION

In 2010 and 2011, the Texas Department of Transportation (TxDOT) funded a commercial vehicle survey in the Abilene area. The purpose of this survey was to provide data that would enable TxDOT to forecast total commercial vehicle travel demand within the Abilene urban area. The study area is located in west central Texas, as shown in Figure 1, and includes portions of Jones and Taylor counties. The study area has a total population of approximately 151,700 people in 2010 (American Fact Finder).



**Figure 1. Abilene Study Area.**

This report presents a technical summary of the commercial vehicle travel survey conducted from 2010-2011 in the Abilene region and documents the data collected and the analysis of results for the study area. The forms used in the survey are included in the Appendix of this report.

## **SURVEY METHODOLOGY**

The commercial vehicle surveys for the Abilene study area were conducted during the period between November 2010 and February 2011. ETC Institute was contracted by TxDOT to conduct the commercial vehicle surveys for the study area, with technical assistance from the Texas Transportation Institute (TTI). Prior to these surveys, a pilot study was carried out which consisted of 25 commercial vehicles. A target number of 300 commercial vehicles (150 cargo vehicles and 150 service vehicles) was established for the Abilene study area (ETC Institute 2011).

The survey sample was randomly selected from a listing of all business individuals, companies, and public agencies that own, operate, or lease commercial vehicles within the study area. This list was generated from the Texas Workforce Commission (TWC) employer that was provided by TxDOT in random order. Selected businesses were contacted and requested to participate in the survey. Those who agreed to participate were provided survey packets and instructions on how the survey forms should be filled out. The drivers of the commercial vehicles were asked to keep a 24-hour diary of the locations of all trips made by each vehicle.

As Table 1 shows, 441 businesses were contacted during the recruitment process. Contacts were tracked based on the following three categories:

- Agreed to Participate - The company or individual operated qualifying vehicles making trips within the study area, agreed to participate, and complete and return the survey materials.
- Refused to Participate - The company or individual operated qualifying vehicles making trips within the study area but refused to participate in the survey.
- Not Participating - The company or individual did not operate a qualifying vehicle making trips within the study area; or the company or individual did operate a qualifying vehicle that did not make trips within the study area.

**Table 1. Survey Participation Rates.**

Category	Contact Calls	
	Number	Percent of Total
Agreed to Participate	186	42.2
Refused to Participate	160	36.3
Not participating	95	21.5
<b>Total</b>	<b>441</b>	<b>100.0</b>

Source: 2010-2011 Commercial Vehicle Survey – Final Summary Report. ETC Institute.

Approximately 136 companies participated in the Abilene commercial vehicle survey, from which a total of 336 commercial vehicle surveys were obtained (ETC Institute). Data editing and review processes were performed by TTI to ensure that the survey data collected were complete and followed the guidelines set forth in TxDOT’s bid specification for the project. A data check program was also utilized to examine the accuracy of geocoding of locations and logic of survey responses. The majority of data errors were expected to be corrected prior to final data submittals by the contractor (ETC Institute). However, it was not unusual to find errors during actual data processing and analysis. In this study, survey responses with irreconcilable data were not included in the survey analysis. Also, inconsistent trip records were dropped from the survey analysis.

The results presented in this technical summary are therefore based on data from 317 surveyed commercial vehicles.

## **SURVEY RESULTS**

### **Vehicle Characteristics**

This section presents the characteristics of registered trucks and surveyed commercial vehicles to provide an overview of the type and condition of commercial vehicles operating within the Abilene study area. Information on registered trucks includes the number of diesel-fueled, gasoline-fueled and propane-fueled trucks by gross vehicle weight and by model year.

Information on surveyed commercial vehicles includes the vehicle's make, model and year, odometer reading, gross vehicle weight, vehicle classification, and fuel use.

*Registered Commercial Vehicles*

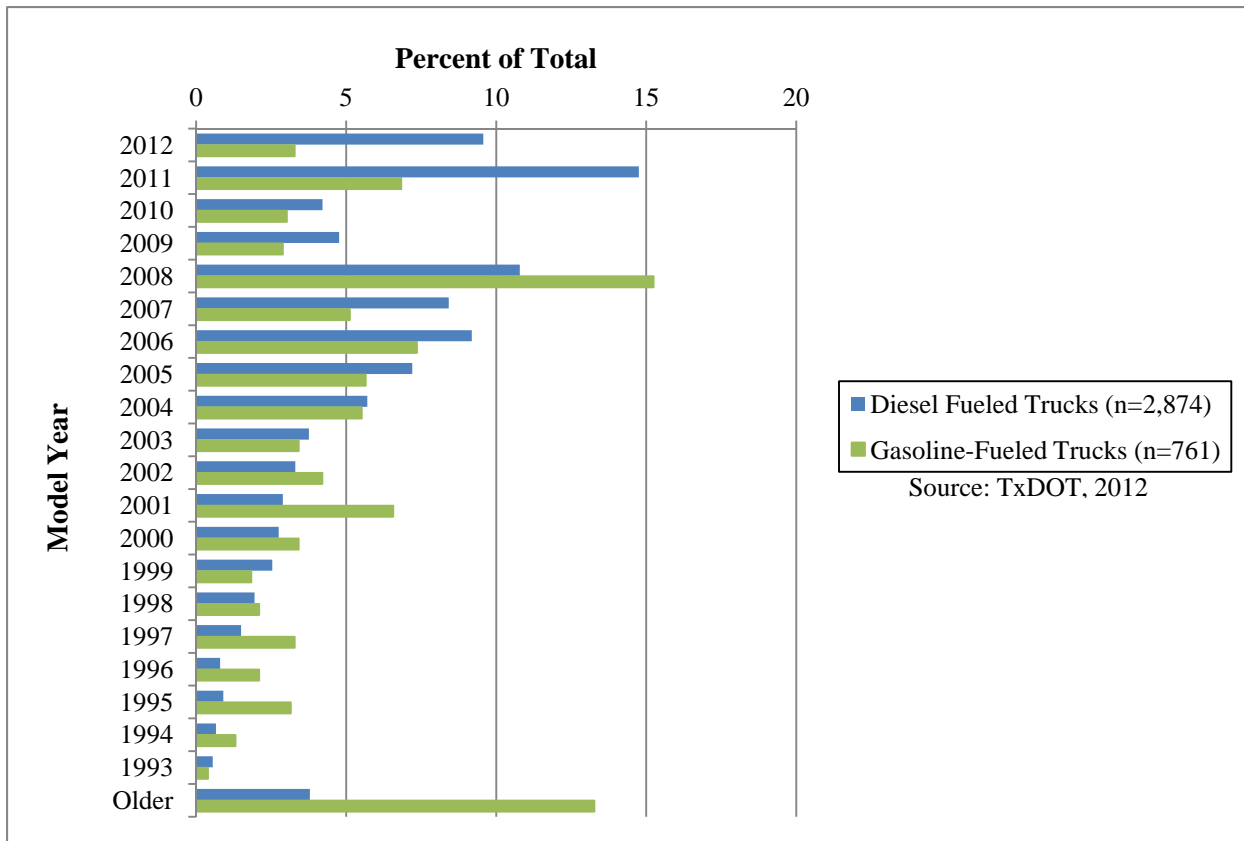
Based on TxDOT's vehicle registration data, there were nearly 3,650 trucks registered in the Abilene study area in 2012. Table 2 shows the distribution of registered diesel trucks and gasoline trucks by gross vehicle weight. Over 79 percent of all trucks registered in the Abilene study area are diesel-fueled vehicles. Sixty-five percent of all registered trucks had a gross vehicle weight of less than 10,000 pounds.

**Table 2. Gross Vehicle Weight of Registered Trucks in Abilene Study Area.**

Gross Vehicle Weight	Diesel Trucks		Gasoline Trucks		Total	
	Number of Vehicles	% of Diesel Trucks	Number of Vehicles	% of Gasoline Trucks	Number of Vehicles	% of Total Trucks
< 10000	1,906	66.3	464	61.0	2,370	65.2
> 10000	278	9.7	185	24.3	463	12.7
> 14000	71	2.5	37	4.9	108	3.0
> 16000	79	2.7	17	2.2	96	2.6
> 19500	179	6.2	33	4.3	212	5.8
> 26000	128	4.5	14	1.8	142	3.9
> 33000	208	7.2	9	1.2	217	6.0
> 60000	27	0.9	2	0.3	29	0.8
<b>Total</b>	<b>2,876</b>	<b>100.0</b>	<b>761</b>	<b>100.0</b>	<b>3,637</b>	<b>100.0</b>

Source: TxDOT 2012

Figure 2 shows the distribution of registered diesel trucks and gasoline trucks by model year. There were two hybrid vehicles present in the raw data and they were not included in summary tables involving fuel type. Registered gasoline trucks were older relative to the diesel trucks. The majority of the diesel trucks (78 percent) were less than 10-years-old, which was notably more than the 58 percent of gasoline trucks within that age range. Less than 4 percent of the nearly 2,900 registered diesel trucks were 20-years-old or older, while 13 percent of registered gasoline trucks were 20-years-old or older.



**Figure 2. Model Year of Registered Trucks in the Abilene Study Area.**

*Surveyed Commercial Vehicles*

Commercial vehicles that participated in the Abilene commercial vehicle survey were distinguished based on the ten classification types listed in Table 3. These were further categorized by commercial type as either major cargo/freight transport or local service vehicles, simply referred to in this report as cargo vehicles and service vehicles, respectively.

Cargo vehicles were defined as vehicles mainly used to transport cargo or freight which were typically bulk goods, materials, and cargo in large quantities for wholesale distribution. Service vehicles were defined as vehicles mainly used to perform services such as those used by building contractors, plumbers, electricians, cable and telephone services/repairs, and delivery vans/vehicles used by local retailers. These also included company fleet vehicles or fleets and maintenance vehicles of public agencies such as TxDOT, city, county, or school district.

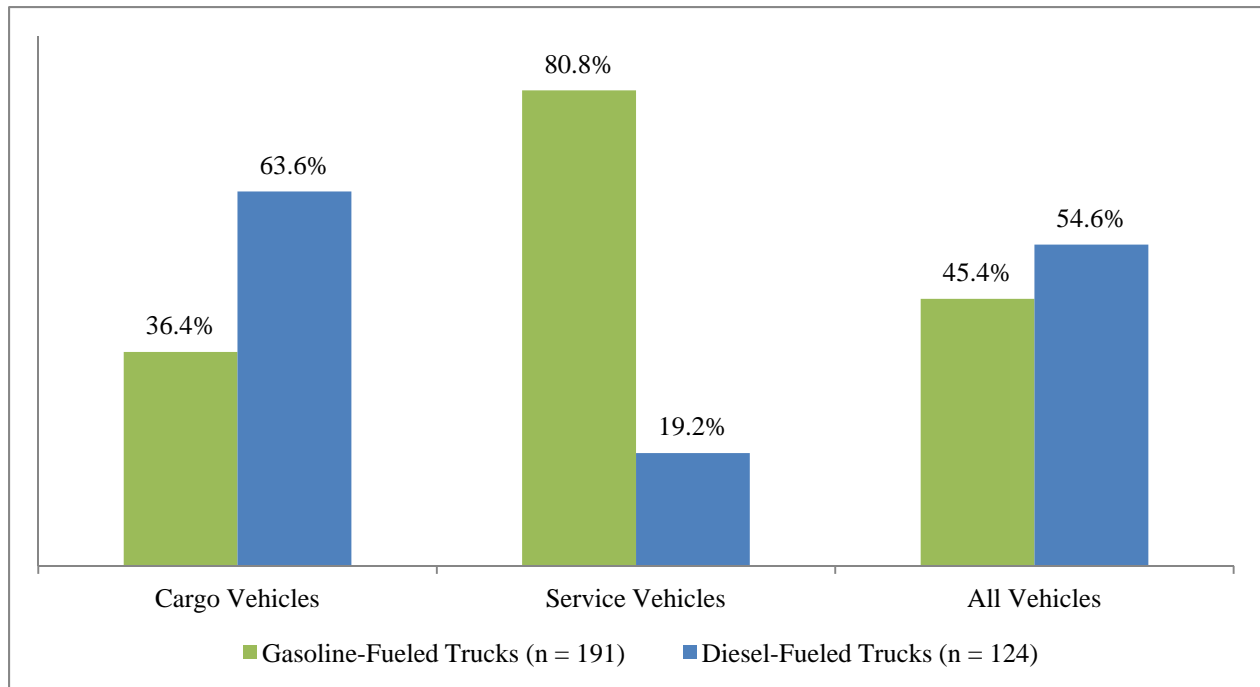
Table 3 shows the distribution of surveyed vehicles by vehicle classification type and commercial type. Out of the total 317 vehicles surveyed, 145 were cargo vehicles and 172 were service vehicles. Among cargo vehicles, approximately 35 percent were semi-tractor/trailers combinations, 26 percent were pick-up trucks, 18 percent were single unit 2-axle trucks (6-wheelers), and 8 percent were vans. Among service vehicles, approximately 52 percent were pick-up trucks, 16 percent were passenger cars, and 15 percent were vans.

**Table 3. Vehicle Classification Type of Surveyed Commercial Vehicles.**

Vehicle Classification	Cargo Vehicles		Service Vehicles		Total Vehicles	
	Number of Vehicles	Percent of Cargo	Number of Vehicles	Percent of Service	Number of Vehicles	Percent of Total
Passenger Car	3	2.1	28	16.3	31	9.8
Pickup Truck	38	26.2	90	52.3	128	40.4
Van (passenger or mini)	12	8.3	26	15.1	38	12.0
Sport Utility Vehicle	0	0.0	17	9.9	17	5.4
Single Unit 2-axle (6 wheels)	26	17.9	10	5.8	36	11.4
Single Unit 3-axle (10 wheels)	11	7.6	1	0.6	12	3.8
Single Unit 4-axle (14 wheels)	5	3.4	0	0.0	5	1.6
Semi (tractor-trailer)	50	34.5	0	0.0	50	15.8
Other	0	0.0	0	0.0	0	0.0
<b>Total</b>	<b>145</b>	<b>100.0</b>	<b>172</b>	<b>100.0</b>	<b>317</b>	<b>100.0</b>

Figure 3 shows the distribution of surveyed vehicles by fuel type. Approximately 55 percent of the surveyed vehicles used diesel and 45 percent used unleaded gasoline. Among cargo vehicles, 64 percent used diesel and 36 percent used gasoline. Among service vehicles, 81 percent used gasoline and 19 percent used diesel.





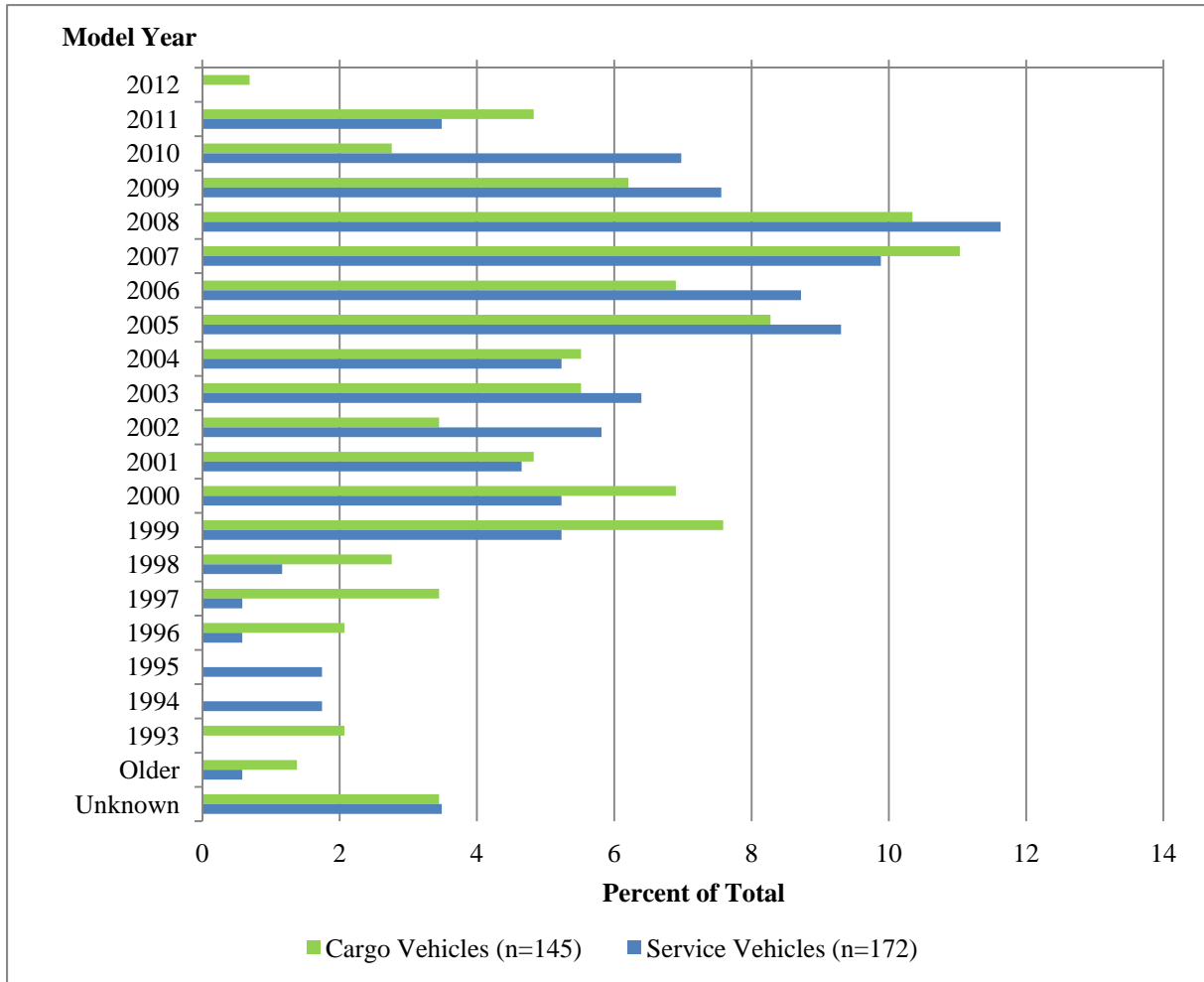
**Figure 3. Type of Fuel Used by Surveyed Commercial Vehicles.**

Table 4 shows the distribution of surveyed vehicles by gross vehicle weight. The survey included commercial vehicles with gross vehicle weight of less than 10,000 pounds. Approximately 94 percent of the service vehicles belonged to this category, while approximately 53 percent of the cargo vehicles weighed more than 19,500 pounds.

**Table 4. Gross Vehicle Weight.**

Gross Vehicle Weight (lbs.)	Cargo		Service		Total	
	Number of Vehicles	% of Cargo Vehicles	Number of Vehicles	% of Service Vehicles	Number of Vehicles	% of Total Vehicles
< 10,000	60	41.4	162	94.2	222	70.0
> 10,000	6	4.1	3	1.7	9	2.8
> 14,000	0	0.0	0	0.0	0	0.0
> 16,000	2	1.4	1	0.6	3	0.9
> 19,500	8	5.5	1	0.6	9	2.8
> 26,000	16	11.0	3	1.7	19	6.0
> 33,000	31	21.4	2	1.2	33	10.4
> 60,000	22	15.2	0	0.0	22	6.9
<b>Total</b>	<b>145</b>	<b>100.0</b>	<b>172</b>	<b>100.0</b>	<b>317</b>	<b>100.0</b>

Figure 4 shows the distribution of surveyed vehicles by model year. Approximately 62 percent of cargo vehicles and 69 percent of service vehicles were less than 10-years-old. The average age for cargo vehicles was 8.2 years, while the average age for service vehicles was 7.3 years (assuming a base year of 2012).



**Figure 4. Vehicle Model Year.**

Table 5 shows the average vehicle mileage by model year based on reported odometer readings from 303 surveyed vehicles at the beginning of their survey travel day. Cargo vehicles reported higher average odometer readings of nearly 191,000 miles compared to nearly 105,000 miles for service vehicles. The average odometer reading for all vehicles was approximately 144,700 miles.

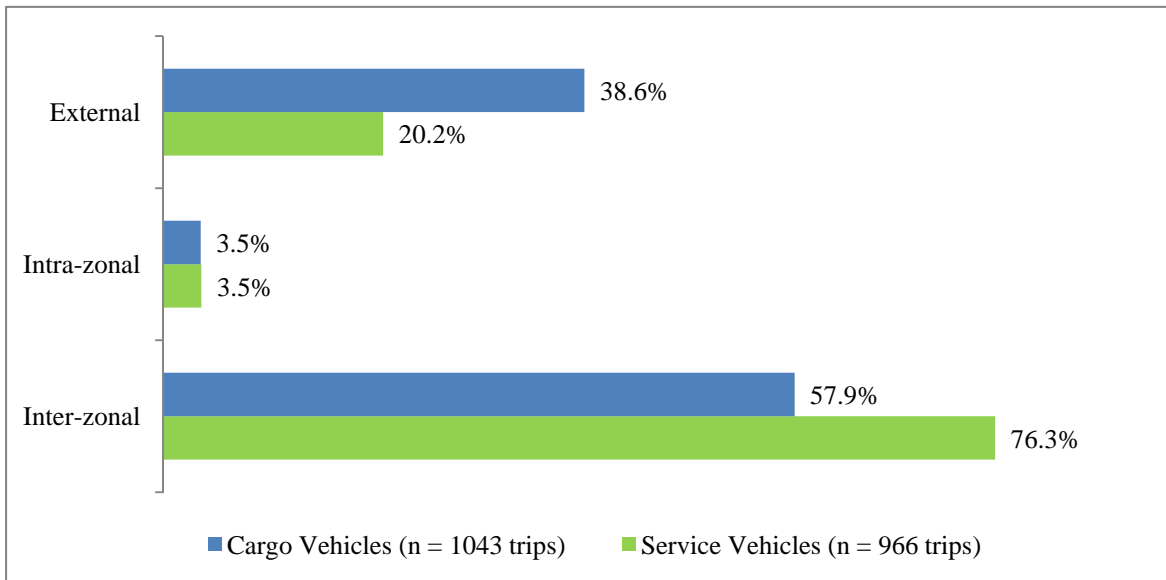
**Table 5. Average of Reported Odometer Readings by Model Year.**

Model Year	Cargo Vehicles		Service Vehicles		Total Vehicles	
	Number of Vehicles	Avg. Odometer Reading	Number of Vehicles	Avg. Odometer Reading	Number of Vehicles	Avg. Odometer Reading
2012	1	3,574	0	0	1	3,574
2011	7	46,316	6	12,629	13	30,768
2010	4	48,904	11	15,216	15	24,199
2009	9	75,194	11	40,725	20	56,236
2008	15	120,658	19	80,676	34	98,315
2007	16	158,803	17	92,220	33	124,503
2006	9	179,278	15	100,059	24	129,767
2005	12	192,751	16	82,448	28	129,720
2004	8	185,650	9	116,358	17	148,966
2003	8	232,430	11	164,960	19	193,368
2002	5	149,776	9	175,556	14	166,349
2001	7	197,986	8	177,761	15	187,199
2000	10	142,813	8	127,682	18	136,088
1999	11	213,456	9	166,625	20	192,382
1998	3	356,030	2	155,361	5	275,762
1997	5	453,744	1	191,696	6	410,069
1996	3	279,191	1	232,072	4	267,411
1995	0	0	3	163,335	3	163,335
1994	0	0	3	152,490	3	152,490
1993	3	747,801	0	0	3	747,801
Older	2	434,622	1	73,251	3	314,165
Unknown	3	298,585	2	86,894	5	213,909
<b>Total</b>	<b>141</b>	<b>190,892</b>	<b>162</b>	<b>104,480</b>	<b>303</b>	<b>144,691</b>

**Trip Frequency**

The surveyed vehicles generated a total of 2,009 trips, of which 1,411 were internal trips and 598 were external trips. Internal trips were defined as those trips made within the Abilene area. These trips were further distinguished by travel within or between zones. Inter-zonal trips were those trips made from one zone to another, while intra-zonal trips were made within the same zone. External trips were those trips made outside of the study area.

Figure 5 shows the distribution of inter-zonal, intra-zonal and external trips, while the breakdown of these trips is provided in Table 6. Cargo vehicles generated 1,043 trips, of which approximately 58 percent were inter-zonal trips, four percent were intra-zonal trips, and 38 percent were external trips. Service vehicles generated 966 trips, of which 76 percent were inter-zonal trips, four percent were intra-zonal trips, and 20 percent were external trips.

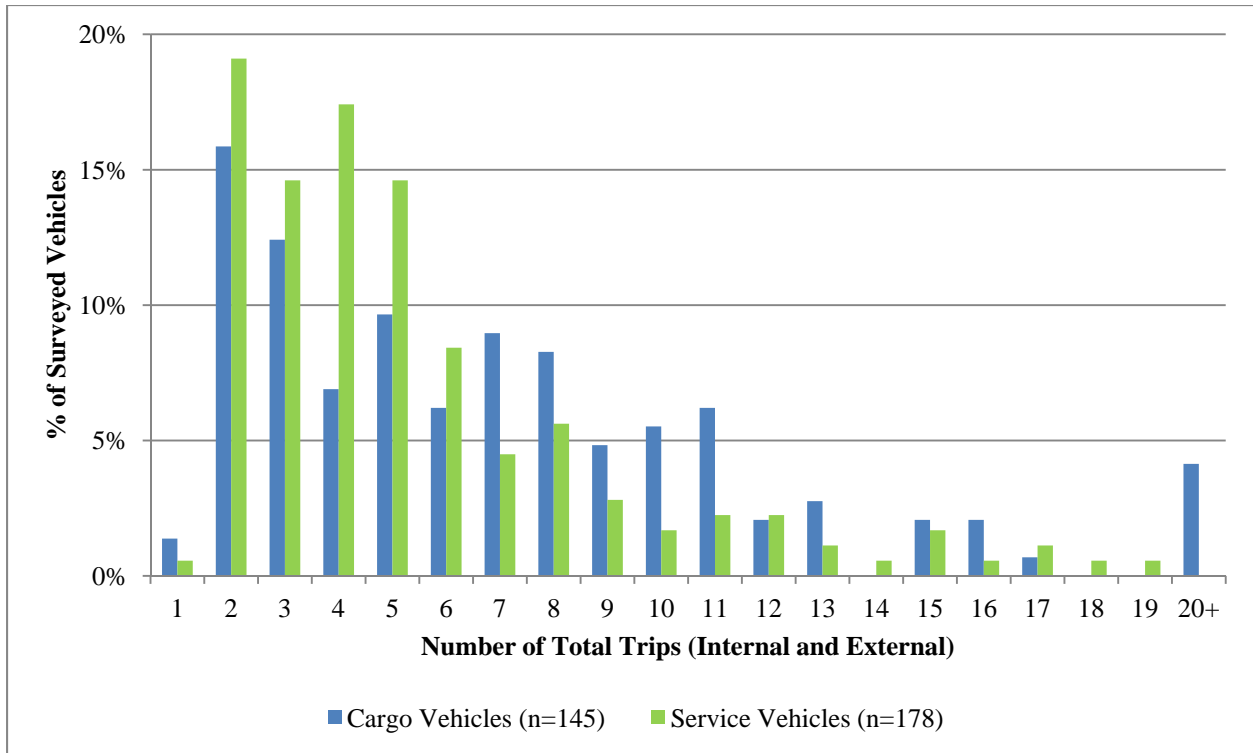


**Figure 5. Inter-Zonal, Intra-Zonal, and External Trips.**

**Table 6. Total Internal and External Trips.**

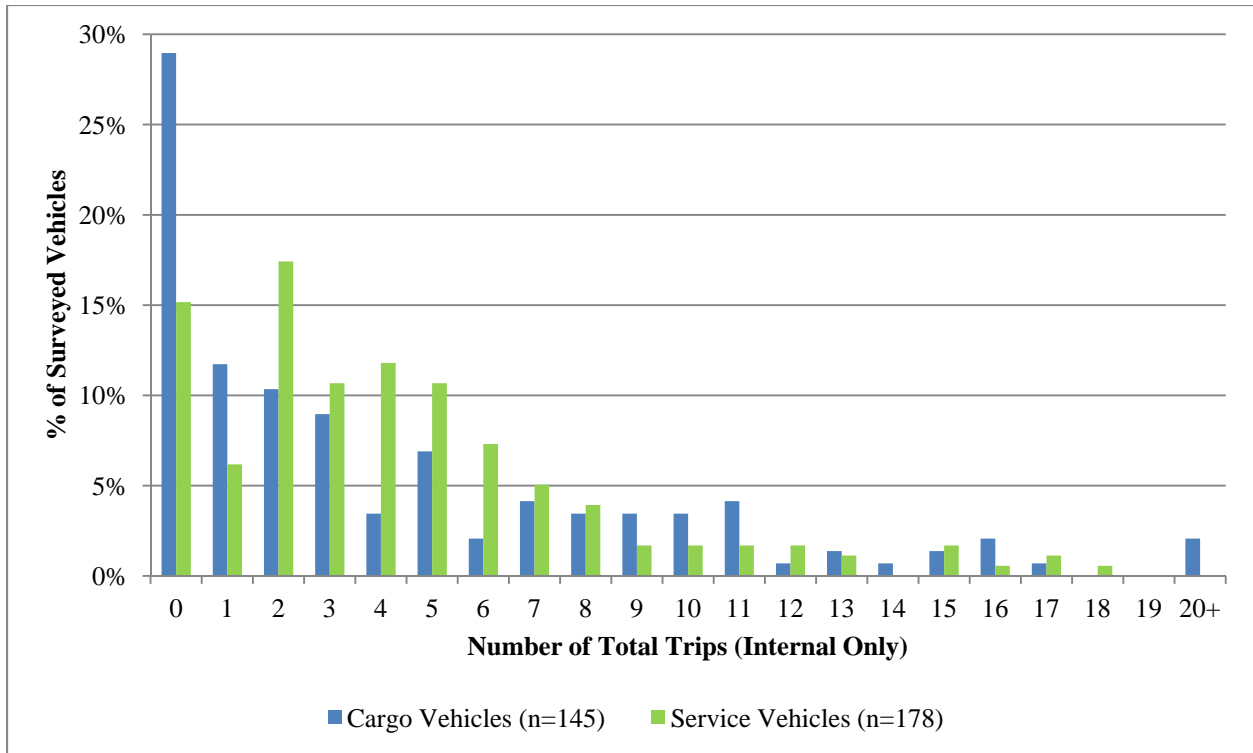
Vehicle Type Trip Type	Cargo Vehicles		Service Vehicles		Total Vehicles	
	Number	% of Total	Number	% of Total	Number	% of Total
Inter-zonal	604	57.9	737	76.3	1,341	66.7
Intra-zonal	36	3.5	34	3.5	70	3.5
<b>Total Internal</b>	<b>640</b>	<b>61.4</b>	<b>771</b>	<b>79.8</b>	<b>1,411</b>	<b>70.2</b>
External	403	38.6	195	20.2	598	29.8
<b>Total</b>	<b>1,043</b>	<b>100.0</b>	<b>966</b>	<b>100.0</b>	<b>2,009</b>	<b>100.0</b>

Figure 6 shows the distribution of total trips (internal and external trips) which varied from one trip to 30 trips per cargo vehicle and from one trip to 19 trips per service vehicle on their survey day. The average number of total trips per day was 7.2 trips for cargo vehicles and 5.4 trips for service vehicles.



**Figure 6. Total Trips per Vehicle.**

Figure 7 shows the distribution of internal trips only. Approximately 12 percent of cargo vehicles made one internal trip per day, while only six percent of service vehicle reported making one internal trip per day. Roughly 29 percent of cargo vehicles did not make any internal trips; while only 15 percent of service vehicles did not make any internal trips. The average number of internal trips per day was 4.4 trips for cargo vehicles and 4.3 trips for service vehicles.



**Figure 7. Total Internal Trips per Vehicle.**

### Trip Characteristics

Information on travel purpose and the type of land use activity where these trips occurred are important in estimating commercial vehicle trip patterns. The analysis of trips presented in this section is based solely on internal trips and does not include external trips.

Table 7 shows the distribution of internal trips by land use type at trip destinations. Approximately 48 percent of the trips made by cargo vehicles occurred at retail locations, followed by 10 percent to warehouses, and nine percent to industrial/manufacturing locations. For service vehicles, over 26 percent of the trips took place at residential sites, followed by 18 percent at locations classified as retail/shopping, and 18 percent at office locations.

**Table 7. Distribution of Internal Trips by Land Use Type at Trip Destinations.**

Land Use	Cargo		Service	
	Number	Percent of Cargo	Number	Percent of Service
Office Building (Non-government)	42	6.6	135	17.5
Retail/Shopping	309	48.3	142	18.4
Industrial/Manufacturing	58	9.1	28	3.6
Medical/Hospital	18	2.8	27	3.5
Education (< 12th grade)	4	0.6	50	6.5
Education (College, Trade)	2	0.3	1	0.1
Government Office/Building	10	1.6	42	5.4
Residential	57	8.9	205	26.6
Airport	14	2.2	2	0.3
Intermodal Facility	0	0.0	0	0.0
Warehouse	63	9.8	34	4.4
Distribution Center	17	2.7	12	1.6
Construction Site	5	0.8	27	3.5
Other	41	6.4	66	8.6
Refused/Unknown	0	0.0	0	0.0
<b>Total Trips</b>	<b>640</b>	<b>100.0</b>	<b>771</b>	<b>100.0</b>

Table 8 shows the distribution of internal trips by trip purposes at trip destinations. Approximately 43 percent of the cargo vehicle internal trips were delivery, 24 percent were base, and 14 percent were classified as pick-up & delivery. For trips made by service vehicles, approximately 35 percent were classified as base, 27 percent were classified as service, and 17 percent were sales trip purposes.

**Table 8. Trip Purposes at Destination Locations.**

Trip Purpose	Cargo		Service	
	Number	Percent of Cargo	Number	Percent of Service
Base	156	24.4	266	34.5
Maintenance	16	2.5	28	3.6
Driver Needs	22	3.4	77	10.0
Delivery	273	42.7	0	0.0
Pick-up	75	11.7	0	0.0
Pick-up & Delivery	87	13.6	1	0.1
Gov't	0	0.0	17	2.2
Service	1	0.2	209	27.1
Sales	10	1.6	133	17.3
Other	0	0.0	40	5.2
<b>Total Trips</b>	<b>640</b>	<b>100.0</b>	<b>771</b>	<b>100.0</b>

### Cargo Characteristics

Information on the type of cargo being delivered or picked up at each stop, the weight of cargo, and the type of land use where the cargo trip occurred was collected in the Abilene commercial vehicle survey to examine the movement of commodities within and outside of the study area. The analyses presented in this section are for both internal and external trips made by surveyed cargo vehicles only, and do not include the trips made by service vehicles. The types of cargo in the survey were based on 22 classification types listed in Table 9.

The analysis of cargo trip data examined the types of cargo being transported at trip destinations, the trip purpose and land use activity at each stop, and the estimated net weight of the cargo being picked up and/or delivered for each trip. Several inconsistencies were observed during the processing and analysis of cargo trip data. There were some trips with full or partial cargo loads that did not report cargo weights but actually reported the type of cargo being transported. There were some trips that indicated delivery trip purpose but did not report any cargo weights at drop-off.



**Table 9. Cargo Classification Types.**

Cargo Type	Cargo Descriptions
1. Farm Products	Livestock, fertilizer, dirt, landscaping, etc.
2. Forest Products	Trees, sod, etc.
3. Marine Products	Fresh fish, seafood, etc.
4. Metals and Minerals	Crude petroleum, natural gas, propane, metals, gypsum, ores, etc.
5. Food, Health, and Beauty Products	Assorted food products, cosmetics, etc.
6. Tobacco Products	Cigarettes, cigars, and chewing tobacco
7. Textiles	Clothing, linens, etc.
8. Wood Products	Lumber, paper, cardboard, wood pulp, etc.
9. Printed Matter	Newspapers, magazines, books, etc.
10. Chemical Products	Soaps, paints, household or industrial chemicals, etc.
11. Refined Petroleum or Coal Products	Gasoline, etc.
12. Rubber, Plastic, and Styrofoam Products	Finished products of rubber, plastic, or Styrofoam
13. Clay, Concrete, Glass, or Stone	Finished products of clay, concrete, glass, or stone
14. Manufactured Goods/Equip.	Miscellaneous products (machinery, appliances, furniture, etc.)
15. Wastes	Waste products including scrap and recyclable materials
16. Miscellaneous Shipments	U.S. mail, U.P.S., Federal Express, and other mixed cargo
17. Hazardous Materials	Hazardous chemicals and substances
18. Transportation	Automobiles and other transport vehicles
19. Unclassified Cargo	Cargo not falling within one of the above categories
20. Driver Refused to Answer	Driver refused to answer
21. Unknown to Driver	Unknown to driver
22. Empty	Empty (including empty shipping containers)

Table 10 shows the distribution of trips by cargo type. Approximately 49 percent of the total cargo vehicle trips were transporting a cargo type unknown to the driver, followed by 11 percent transporting food, health, and beauty products, and about nine percent transporting manufactured goods/equipment. Approximately nine percent of cargo trips were empty shipping containers.

**Table 10. Distribution of Trips by Cargo Type at Destinations.**

<b>Cargo Type</b>	<b>Number of Trips</b>	<b>% of Total</b>
Farm Products	0	0.0
Forest Products	1	0.1
Marine Products	0	0.0
Metals and Minerals	25	2.4
Food, Health, and Beauty Products	113	10.8
Tobacco Products	0	0.0
Textiles	34	3.3
Wood Products	14	1.3
Printed Matter	14	1.3
Chemical Products	0	0.0
Refined Petroleum or Coal Products	19	1.8
Rubber, Plastic, and Styrofoam Products	1	0.1
Clay, Concrete, Glass, or Stone	23	2.2
Manufactured Goods/Equipment.	91	8.7
Wastes	0	0.0
Miscellaneous Shipments	2	0.2
Hazardous Materials	11	1.1
Transportation	7	0.7
Unclassified/Other Cargo	78	7.5
Driver Refused to Answer	0	0.0
Unknown to Driver	514	49.3
<b>Total Trips with Cargo</b>	<b>947</b>	<b>90.8</b>
Empty	96	9.2
<b>Total Cargo Vehicle Trips</b>	<b>1,043</b>	<b>100.0</b>

The commodity grouping scheme used by TxDOT in its Texas Statewide Analysis Model (SAM) was used to simplify the cargo types into ten commodity groups. The type of place option in the survey was categorized into seven land use categories. Table 11 shows the equivalency between SAM commodity groups and cargo classifications from the survey, while Table 12 shows the land use categories and their corresponding equivalents in the type of place options from the survey. Those items in italics did not have equivalents but were added or grouped together so as not to exclude any trips in the analysis.

**Table 11. Equivalency between SAM Commodity Groups and Survey Classifications.**

<b>Commodity Group</b>	<b>Survey Cargo Classification</b>
1. Agriculture	Farm Products, Forest Products, Marine Products
2. Raw Materials	Metals and Minerals, Chemical Products, Refined Petroleum or Coal Products
3. Food	Food, Health and Beauty Products, Tobacco Products
4. Textiles	Textiles, Rubber, Plastic, and Styrofoam Products
5. Wood	Wood Products, Printed Matter
6. Building Materials	Clay, Concrete, Glass or Stone Products
7. Machinery	Manufactured Goods/Equipment
8. Miscellaneous	Wastes, Miscellaneous Shipments
9. Secondary	Unclassified Cargo
10. Hazardous Materials	Hazardous Materials
--- <i>Transportation</i>	<i>Transportation</i>
--- <i>Empty</i>	<i>Empty</i>
--- <i>Unknown</i>	<i>Unknown to Driver/ Driver Refused to Answer</i>

**Table 12. Equivalency between Land Use Category and Survey Type of Place.**

<b>Land Use Category</b>	<b>Type of Place</b>
1. Office	Office Building
2. Retail	Retail/Shopping
3. Industrial	Industrial/Manufacturing
4. Medical	Medical/Hospital
5. Education	Educational (12th grade or less and college, trade, etc.)
6. Government	Government Office/Building
7. Residential	Residential
-- Other	Airport, Inter-modal Facility, Warehouse, Distribution Center, Construction Site, Other
-- Unknown	Land use category not provided, Omitted, Driver refused to answer

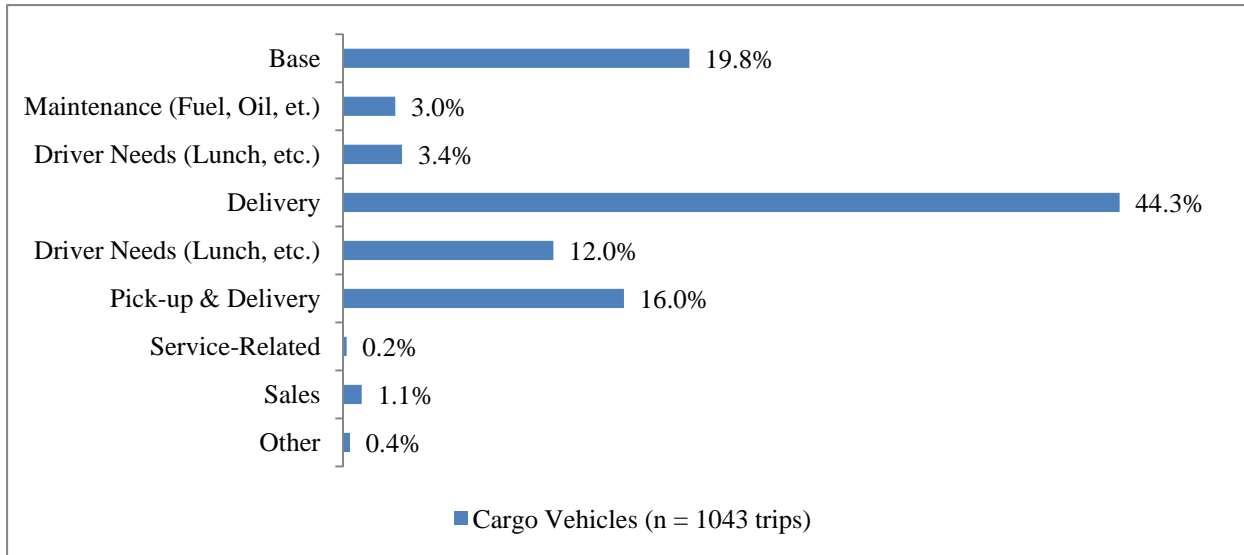
Table 13 shows the distribution of cargo trips by commodity group and land use type at trip destinations. Approximately 48 percent occurred at retail sites, and 13 percent of the trips occurred at industrial sites. Over one-fifth of the trips occurred at “Other” land use types, which

were mainly warehouses, distribution centers and construction sites. By commodity group, nearly half of cargo trips had an unknown commodity group, approximately 11 percent of the trips were transporting food, and about nine percent were transporting machinery. Roughly nine percent were not transporting cargo.

**Table 13. Cargo Trips by Commodity Group and Land Use Destinations.**

Commodity Group	Land Use								Total Trips	% of Total
	Office	Retail	Ind'l	Med	Edu	Gov't	Res	Othr		
Agriculture	1	0	0	0	0	0	0	0	<b>1</b>	<b>0.1</b>
Raw Materials	4	23	2	0	0	0	0	15	<b>44</b>	<b>4.2</b>
Food	7	46	5	2	0	0	23	30	<b>113</b>	<b>10.8</b>
Textiles	5	10	4	3	0	0	0	13	<b>35</b>	<b>3.4</b>
Wood	0	8	14	0	0	0	1	5	<b>28</b>	<b>2.7</b>
Building Materials	0	18	0	1	0	0	0	4	<b>23</b>	<b>2.2</b>
Machinery	1	22	26	6	1	4	7	24	<b>91</b>	<b>8.7</b>
Miscellaneous	0	2	0	0	0	0	0	0	<b>2</b>	<b>0.2</b>
Hazardous	0	4	4	0	0	0	0	3	<b>11</b>	<b>1.1</b>
Transportation	1	3	0	0	2	0	0	1	<b>7</b>	<b>0.7</b>
Secondary	9	22	16	0	3	3	12	13	<b>78</b>	<b>7.5</b>
Unknown	29	298	47	12	6	6	25	91	<b>514</b>	<b>49.3</b>
Empty	7	45	12	5	4	1	6	16	<b>96</b>	<b>9.2</b>
<b>Total</b>	<b>64</b>	<b>501</b>	<b>130</b>	<b>29</b>	<b>16</b>	<b>14</b>	<b>74</b>	<b>215</b>	<b>1,043</b>	<b>100.0</b>
<b>Percent of Total</b>	<b>6.1</b>	<b>48.0</b>	<b>12.5</b>	<b>2.8</b>	<b>1.5</b>	<b>1.3</b>	<b>7.1</b>	<b>20.6</b>	<b>100</b>	<b>---</b>

Figure 8 shows the distribution of trips at destination locations by trip purpose, while Table 14 shows a detailed summary of trips by commodity group and trip purpose. Approximately 44 percent of the total cargo vehicle trips were delivery. As previously mentioned, nearly half (49 percent) of the cargo trips were recorded as carrying an unknown commodity group. The trip purpose base made up nearly 20 percent of the total cargo trips. Twelve percent of cargo trip purposes are listed with pick-up as their trip purpose. However, these do not represent the actual portion of trips that picked up cargo because some of the trips coded as “base location” trip purpose were also the pick-up location for cargo.



**Figure 8. Cargo Trip Purposes at the Trip Destinations.**

**Table 14. Cargo Trips by Commodity Group and Trip Purpose at the Trip Destinations.**

Commodity Group	Trip Purpose									Total Trips	% of Total
	Base	Mainten ance	Driver Need	Deliv	Pick- up	Pick-up & Deliv	Serv	Sales	Oth		
Agriculture	1	0	0	0	0	0	0	0	0	1	0.1
Raw Materials	9	2	2	14	4	13	0	0	0	44	4.2
Food	28	3	5	61	3	10	0	3	0	113	10.8
Textiles	8	2	0	22	2	1	0	0	0	35	3.4
Wood	4	3	1	11	8	0	0	0	1	28	2.7
Building Materials	5	0	0	18	0	0	0	0	0	23	2.2
Machinery	22	3	6	28	21	11	0	0	0	91	8.7
Miscellaneous	0	0	0	0	0	2	0	0	0	2	0.2
Hazardous	3	1	0	2	3	2	0	0	0	11	1.1
Transportation	1	0	0	1	1	3	0	1	0	7	0.7
Secondary	11	0	1	15	9	39	0	3	0	78	7.5
Unknown	92	15	18	258	66	56	2	4	3	514	49.3
Empty	22	2	2	32	8	30	0	0	0	96	9.2
<b>Total</b>	<b>206</b>	<b>31</b>	<b>35</b>	<b>462</b>	<b>125</b>	<b>167</b>	<b>2</b>	<b>11</b>	<b>4</b>	<b>1,043</b>	<b>100</b>
<b>Percent of Total</b>	<b>19.8</b>	<b>3.0</b>	<b>3.4</b>	<b>44.3</b>	<b>12.0</b>	<b>16.0</b>	<b>0.2</b>	<b>1.1</b>	<b>0.4</b>	<b>100</b>	<b>---</b>

The analysis of cargo weights by cargo type provides information on the volume and type of commodities being moved from the time the surveyed cargo vehicle left its base location, began its trip, continued making trips until it reached its destination(s), and returned to its base location. The net cargo weight for each trip was estimated based on the cargo weight being picked-up

and/or being dropped-off, consistent with the reported trip purpose for each stop. There were several cases when cargo types were changed between trips (i.e. reported as empty cargo or food type), even if the same cargo was being transported either for delivery or pick-up. The driver of the surveyed cargo vehicle reported a different trip purpose during a particular stop (i.e. driver needs - lunch, etc.), which indicated that no cargo was delivered and/or picked-up but the cargo remained in transit. In such cases, the cargo weight from the trip origin should be the net cargo weight at that particular stop or trip destination with its corresponding cargo type. If a delivery occurred during that particular stop, the cargo weight for that particular drop-off should be deducted from the current weight load, and if cargo was picked-up, the cargo weight should be added to the current weight load, thus resulting in an estimated net cargo weight for that particular trip.

Table 15 shows the distribution of average net cargo weight per trip by commodity group and land use type at destination locations and Table 16 shows the distribution by commodity group and trip purpose. Wood being transported to industrial sites has the highest average net cargo weight. Secondary was transported to all listed land use types except for medical. The transportation commodity group coupled with the trip purpose of delivery had the highest average net cargo weight compared to any other commodity group/trip purpose combination.

**Table 15. Average Net Cargo Weight by Commodity Group and Land Use at Trip Destinations.**

Commodity Group	Land Use							
	Office	Retail	Ind'l	Med	Edu	Gov't	Res	Other
Agriculture	20	0	0	0	0	0	0	0
Raw Materials	839	2,836	1,163	0	0	0	0	6,560
Food	1,913	848	590	250	0	0	1,323	532
Textiles	56	21	14	53	0	0	0	84
Wood	0	5,129	11,897	0	0	0	20	62
Building Materials	0	111	0	0	0	0	0	25
Machinery	0	898	104	67	0	875	236	275
Miscellaneous	0	0	0	0	0	0	0	0
Hazardous	0	6,250	3	0	0	0	0	2,835
Transportation	0	5,333	0	0	0	0	0	0
Secondary	516	761	1,013	0	167	1,867	133	770

**Table 16. Average Net Cargo Weight by Commodity Group and Trip Purpose at Trip Destinations.**

Commodity Group	Trip Purpose						
	Base Location	Maintenance	Driver Needs	Delivery	Pick-up	Pick-up & Delivery	Sales
Agriculture	20	0	0	0	0	0	0
Raw Materials	8,124	7,500	0	607	6,250	3,669	0
Food	508	250	1,225	739	5,072	1,431	2,167
Textiles	39	25	0	63	15	20	0
Wood	3	0	35	7,885	15,142	0	0
Building Materials	20	0	0	111	0	0	0
Machinery	314	0	123	705	249	182	0
Miscellaneous	0	0	0	0	0	0	0
Hazardous	2,835	0	0	3	2	12,500	0
Transportation	0	0	0	16,000	0	0	0
Secondary	618	0	3,000	420	1,600	482	2,000

Table 17 shows the distribution of cargo trips and net cargo weights at trip destinations by commodity group. Overall, the average net cargo weight (excluding trips with empty cargo) per trip was about 658 lbs. Of the classified commodity groups, wood showed the highest average

net cargo weight of over 7,400 lbs. per trip. Food was the most frequently transported of the known commodity groups, with an average net cargo weight of 905 lbs. per trip.

**Table 17. Cargo Trips and Net Cargo Weight by Commodity Group at Trip Destinations.**

Commodity Group	Total Cargo Trips	Total Net Cargo Weight (lbs.)	Number of Trips*	Average Net Cargo Weight (lbs.)*
Agriculture	1	20	1	20
Raw Materials	44	169,319	44	3,848
Food	113	102,239	113	905
Textiles	35	1,796	35	51
Wood	28	207,920	28	7,426
Building Materials	23	2,100	23	91
Machinery	91	34,634	91	381
Miscellaneous	2	0	2	0
Hazardous	11	33,515	11	3,047
Transportation	7	16,000	7	2,286
Secondary	78	55,292	78	709
Unknown	514	0	514	0
Empty	96	0	0	0
<b>Total</b>	<b>1,043</b>	<b>622,835</b>	<b>947</b>	<b>658</b>

\* Excluding trips with empty cargo.

Table 18 shows the number of trips and net cargo weights at trip destinations by land use type. Industrial land use sites showed the highest average net cargo weight of nearly 1,500 lbs per trip, followed by “other” sites, with an average net cargo weight of over 650 lbs per trip and government sites, with an average net cargo weight of roughly 650 lbs per trip.

**Table 18. Cargo Trips and Net Cargo Weights by Land Use at Trip Destinations.**

Land Use	Total Cargo Trips	Total Net Cargo Weight (lbs.)	Number of Trips*	Average Net Cargo Weight (lbs.)*
Office	64	21,687	57	339
Retail	501	225,006	456	449
Industrial	130	190,804	118	1,468
Medical	29	1,060	24	37
Education	16	500	12	31
Government	14	9,100	13	650
Residential	74	33,700	68	455
Other	215	140,978	199	656
<b>Total</b>	<b>1,043</b>	<b>622,835</b>	<b>947</b>	<b>658</b>

\* Excluding trips with empty cargo.



Table 19 shows the distribution of cargo trips and net cargo weights by trip purpose. The service trip purposes had the highest average net weight of 6,250 lbs per trip; however, only two service trips were reported, so this conclusion is based on a relatively small sample size.

**Table 19. Cargo Trips and Net Cargo Weights by Trip Purpose at Trip Destinations.**

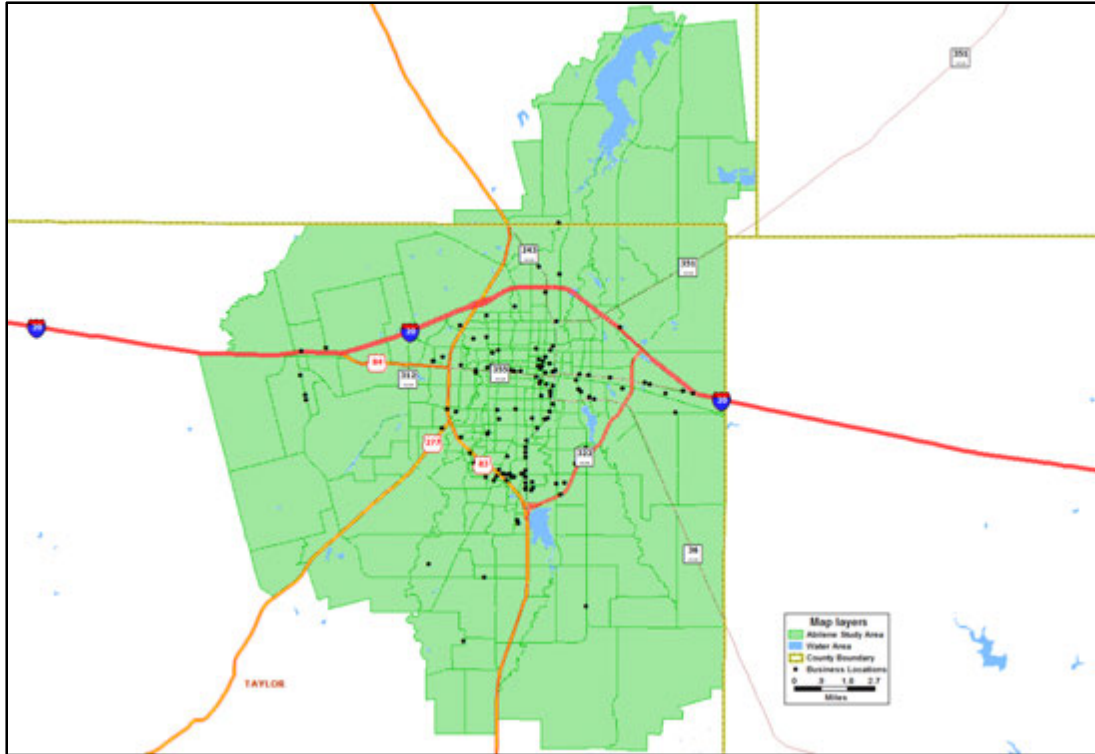
<b>Trip Purpose</b>	<b>Total Cargo Trips</b>	<b>Total Net Cargo Weight (lbs.)</b>	<b>Number of Trips*</b>	<b>Average Net Cargo Weight (lbs.)*</b>
Base	206	110,008	184	598
Maintenance	31	15,800	29	545
Driver Needs	35	9,900	33	300
Delivery	462	185,778	430	432
Pick-up	125	181,025	117	1,547
Pick-up & Delivery	167	107,824	137	787
Government	0	0	0	0
Service	2	12,500	2	6,250
Sales	11	0	11	0
Other	4	0	4	0
<b>Total</b>	<b>1,043</b>	<b>622,835</b>	<b>947</b>	<b>658</b>

\* Excluding trips with empty cargo.

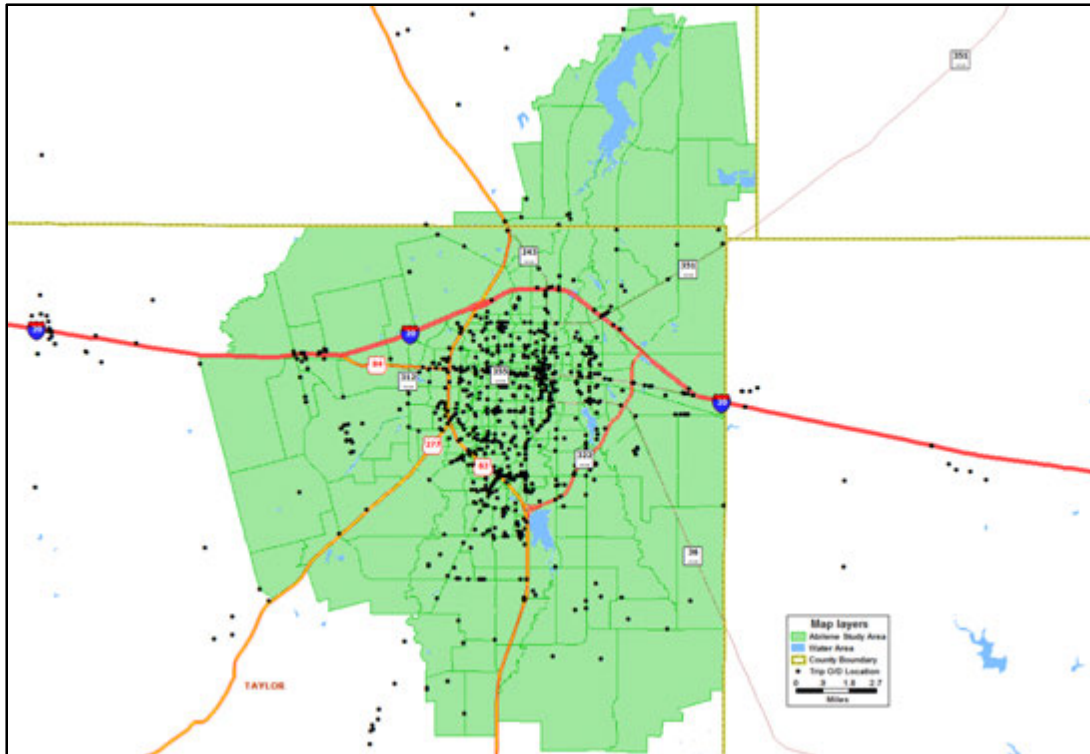
### **Trip Length**

Odometer readings at the beginning and end of the trip are useful in estimating travel distances for external and intra-zonal trips. The Abilene commercial vehicle survey, however, only provided odometer mileage on each vehicle for the beginning of the trip and not for the end of the trip. Because this incomplete information makes odometer readings not particularly useful for trip length measurement in the analysis, network matrices available for the study area were used to estimate trip lengths. The network matrices provide travel distance and time estimates from one zone to all other zones in the Abilene study area. Since each reported trip in the survey was coded with a traffic analysis zone (TAZ) number assigned to the study area, it was then possible to estimate the trip length based on the distance provided in the network matrix.

Figure 9 shows the TAZ boundary and base locations of surveyed vehicles within the Abilene study area, while Figure 10 shows the origin and destination locations of trips made by the surveyed vehicles. Any trip that had at least one trip outside of the Abilene study area was considered an external trip.



**Figure 9. TAZ Boundary and Base Locations of Surveyed Commercial Vehicles.**

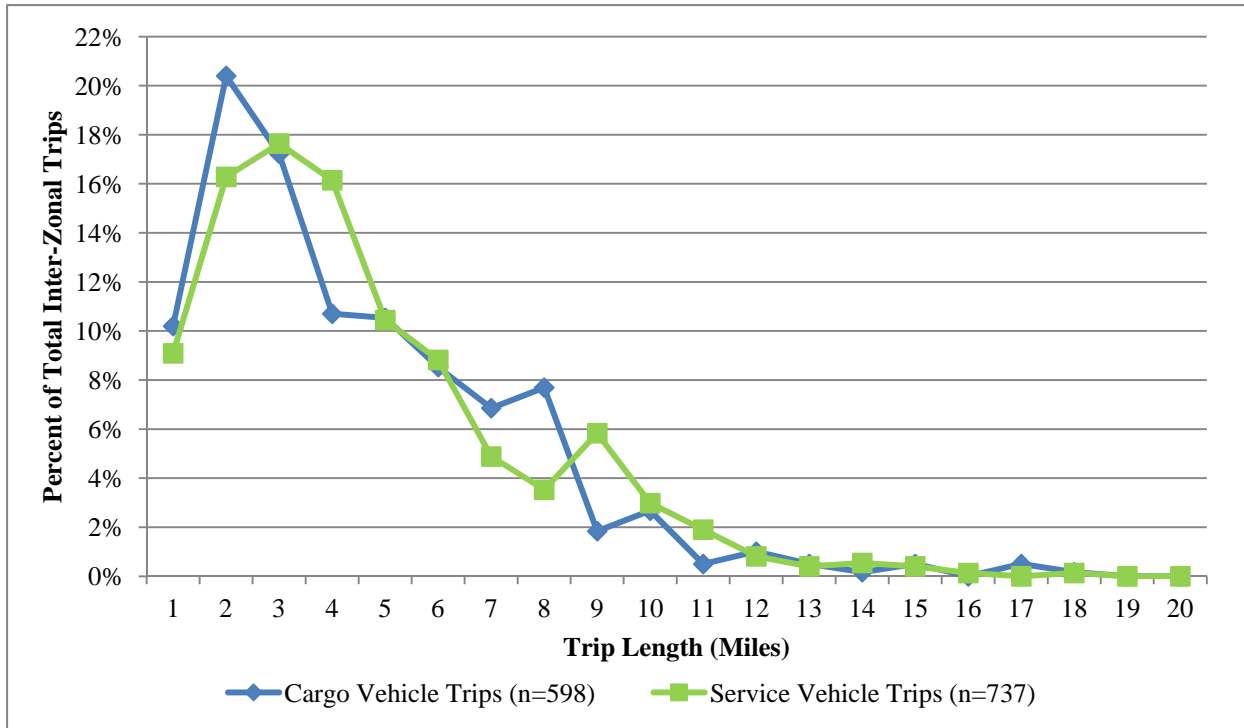


**Figure 10. Trip Origins and Destinations of Surveyed Commercial Vehicles.**

The results presented in this section pertain to trip length characteristics for 1,335 inter-zonal trips only. Table 20 shows the trip length frequency distribution (TLFD), grouped at five-mile intervals, while Table 21 show the ungrouped TLFD. Approximately 69 percent of the cargo vehicles and 70 percent of the service vehicle trips had trip lengths less than five miles. Additionally, 27 percent of the cargo vehicle trips and 26 percent of the service vehicles had trip lengths between six miles and ten miles. The longest trip length reported for both cargo and service trips was 18 miles.

**Table 20. Trip Length Frequency Distribution (Grouped Interval).**

Trip Length (miles)	Cargo		Service		All Vehicles	
	# of Trips	% of Total	# of Trips	% of Total	# of Trips	% of Total
Less than 5	413	69.1	513	69.6	926	69.4
6 to 10	164	27.4	192	26.1	356	26.7
11 to 15	17	2.8	30	4.1	47	3.5
16 to 20	4	0.7	2	0.3	6	0.4
<b>Total</b>	<b>598</b>	<b>100.0</b>	<b>737</b>	<b>100.0</b>	<b>1,335</b>	<b>100.0</b>



**Figure 11. Surveyed Commercial Vehicle Trips TLFDD.**

**Table 21. Trip Length Frequency Distribution (Ungrouped).**

Trip Length (miles)	Cargo Vehicles		Service Vehicles		All Vehicles	
	# of Trips	% of Total	# of Trips	% of Total	# of Trips	% of Total
1	61	10.2	67	9.1	128	9.6
2	122	20.4	120	16.3	242	18.1
3	103	17.2	130	17.6	233	17.5
4	64	10.7	119	16.1	183	13.7
5	63	10.5	77	10.4	140	10.5
6	51	8.5	65	8.8	116	8.7
7	41	6.9	36	4.9	77	5.8
8	46	7.7	26	3.5	72	5.4
9	11	1.8	43	5.8	54	4.0
10	16	2.7	22	3.0	38	2.8
11	3	0.5	14	1.9	17	1.3
12	6	1.0	6	0.8	12	0.9
13	3	0.5	3	0.4	6	0.4
14	1	0.2	4	0.5	5	0.4
15	3	0.5	3	0.4	6	0.4
16	0	0.0	1	0.1	1	0.1
17	3	0.5	0	0.0	3	0.2
18	1	0.2	1	0.1	2	0.1
<b>Total</b>	<b>598</b>	<b>100.0</b>	<b>737</b>	<b>100.0</b>	<b>1,335</b>	<b>100.0</b>

Table 22 shows the average trip length to destinations by land use type for cargo and service vehicle trips. Overall, the average distance per trip traveled by the surveyed vehicles was 4.1 miles, with cargo vehicle trips averaging 3.9 miles and service vehicle trips averaging 4.1 miles. The most number of trips by cargo vehicles occurred at retail land use types, with an average trip length of 3.4 miles, followed by “other” and residential sites with average trip lengths of 4.3 miles and 4.8 miles, respectively. For service vehicles, the highest frequency of trips occurred at residential land use types, with an average trip length of 4.0 miles. Retail, “other”, and office land uses all had a comparable number of trips by service vehicles (140 trips, 135 trips, and 131 trips, respectively), averaging 4.1 miles, 4.4 miles, and 4.3 miles, respectively.

**Table 22. Average Trip Length to Destinations by Land Use Type.**

Land Use	Cargo			Service			All Vehicles		
	Number of Trips	Total Trip Length (miles)	Avg. Trip Length (miles)	Number of Trips	Total Trip Length (miles)	Avg. Trip Length (miles)	Number of Trips	Total Trip Length (miles)	Avg. Trip Length (miles)
Office	41	157	3.8	131	561	4.3	172	718	4.2
Retail	284	953	3.4	140	578	4.1	424	1,531	3.6
Industrial	53	303	5.7	28	159	5.7	81	462	5.7
Medical	18	66	3.7	23	119	5.2	41	185	4.5
Education	6	24	4.0	51	132	2.6	57	156	2.7
Government	9	49	5.4	41	161	3.9	50	210	4.2
Residential	56	270	4.8	188	756	4.0	244	1,026	4.2
Other	131	561	4.3	135	592	4.4	266	1,153	4.3
Unknown	6	0	0.0	0	0	0.0	6	0	0.0
<b>Total</b>	<b>604</b>	<b>2,383</b>	<b>3.9</b>	<b>737</b>	<b>3,058</b>	<b>4.1</b>	<b>1,341</b>	<b>5,442</b>	<b>4.1</b>

Table 23 shows the average trip length to destinations by commodity group for trips made by cargo vehicles only. Approximately half of the trips cited an “unknown” commodity group. Of the known commodity groups, food had the most trips, with an average trip length of 3.8 miles per trip. The commodity group machinery was the next most frequently transported commodity group, with an average trip length of 4.8 miles per trip. The average trip length for vehicles with no cargo (empty) was 4.5 miles.

**Table 23. Average Trip Length to Destinations by Commodity Group.**

Commodity Group	Cargo		
	Number of Trips	Total Trip Length (miles)	Average Trip Length (miles)
Agriculture	0	0	0.0
Raw Materials	25	121	4.8
Food	90	342	3.8
Textiles	17	58	3.4
Wood	4	23	5.8
Building Materials	6	14	2.3
Machinery	57	275	4.8
Miscellaneous	0	0	0.0
Hazardous	8	15	1.9
Transportation	5	18	3.5
Secondary	40	177	4.4
Unknown	301	1,113	3.7
Empty	51	228	4.5
<b>Total</b>	<b>604</b>	<b>2,383</b>	<b>3.9</b>

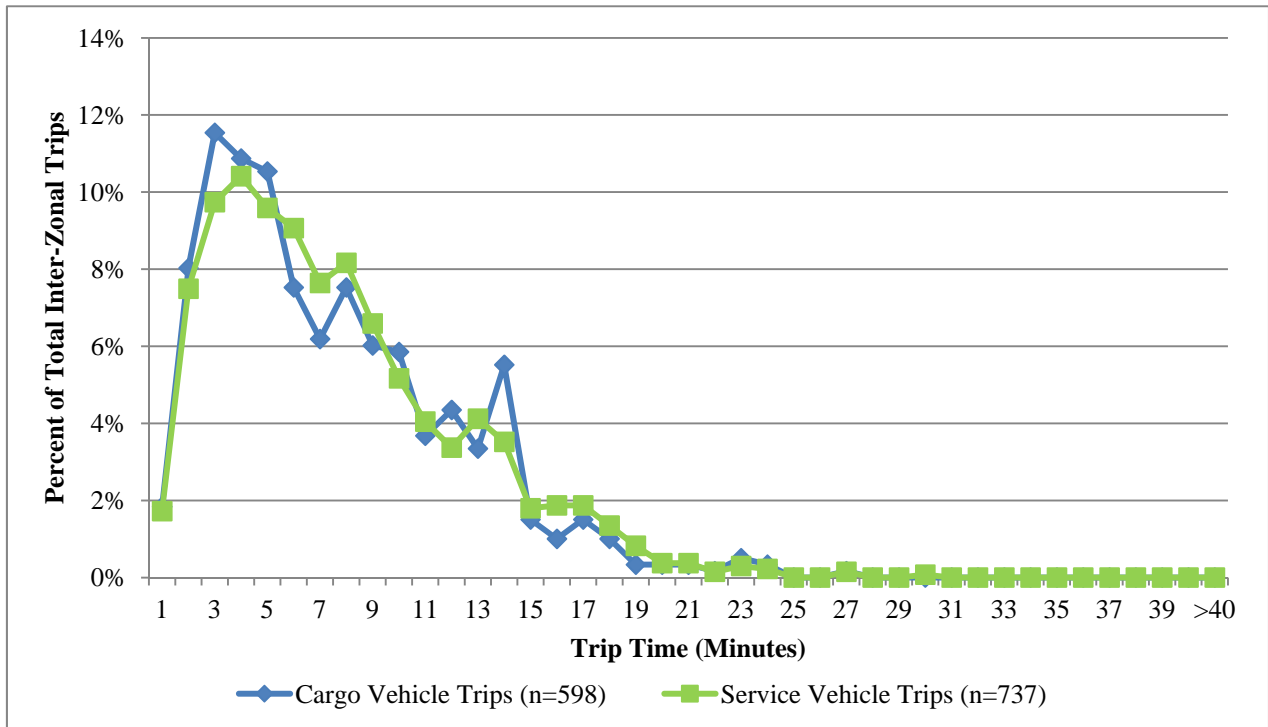
### Travel Time and Speed

The Abilene commercial vehicle survey provided travel logs on the arrival and departure times for each trip made by the surveyed commercial vehicles. The travel logs can be compared with the network travel time matrix table available for the study area. However, some of the reported travel logs had missing departure or arrival times, which rendered them unreliable in generating accurate estimates. Hence, as has been done in the estimation of trip lengths, travel time estimates were generated from the network travel time matrix table available for the Abilene study area, and travel speed estimates were derived from the estimated trip lengths.

Table 24 shows the travel time frequency distribution of inter-zonal trips, grouped at five-mile intervals, while Figure 12 and Table 25 show the ungrouped TLFD. Approximately 43 percent of the trips made by cargo vehicles were less than five minutes, 33 percent were between 6-and-10 minutes, and 18 percent were between 11-and-15 minutes. For service vehicles, approximately 36 percent of the trips were less than five minutes, 40 percent were between 6-and-10 minutes, and 16 percent were between 11-and-15 minutes. The longest duration of travel time for cargo vehicles was 27 minutes, while the longest travel duration for service vehicles was 30 minutes.

**Table 24. Travel Time Frequency Distribution (Grouped Interval).**

Travel Time (minutes)	Cargo		Service		All Vehicles	
	# of Trips	% of Total	# of Trips	% of Total	# of Trips	% of Total
Less than 5	255	42.6	262	35.5	517	38.7
6 to 10	199	33.3	293	39.8	492	36.9
11 to 15	109	18.2	115	15.6	224	16.8
16 to 20	26	4.3	59	8.0	85	6.4
21 to 25	8	1.3	6	0.8	14	1.0
26 to 30	1	0.2	2	0.3	3	0.2
<b>Total</b>	<b>598</b>	<b>100.0</b>	<b>737</b>	<b>100.0</b>	<b>1,335</b>	<b>100.0</b>



**Figure 12. Surveyed Commercial Vehicle Trips Travel Time.**

**Table 25. Travel Time Frequency Distribution (Ungrouped).**

Travel Time (minutes)	Cargo Vehicles		Service Vehicles		All Vehicles	
	# of Trips	% of Total	# of Trips	% of Total	# of Trips	% of Total
1	11	1.8	12	1.6	23	1.7
2	48	8.0	52	7.1	100	7.5
3	69	11.5	61	8.3	130	9.7
4	65	10.9	74	10.0	139	10.4
5	63	10.5	65	8.8	128	9.6
6	45	7.5	76	10.3	121	9.1
7	37	6.2	65	8.8	102	7.6
8	45	7.5	64	8.7	109	8.2
9	36	6.0	52	7.1	88	6.6
10	35	5.9	34	4.6	69	5.2
11	22	3.7	32	4.3	54	4.0
12	26	4.3	19	2.6	45	3.4
13	20	3.3	35	4.7	55	4.1
14	33	5.5	14	1.9	47	3.5
15	9	1.5	15	2.0	24	1.8
16	6	1.0	19	2.6	25	1.9
17	9	1.5	16	2.2	25	1.9
18	6	1.0	12	1.6	18	1.3
19	2	0.3	9	1.2	11	0.8
20	2	0.3	3	0.4	5	0.4
21	2	0.3	3	0.4	5	0.4
22	1	0.2	1	0.1	2	0.1
23	3	0.5	1	0.1	4	0.3
24	2	0.3	1	0.1	3	0.2
25	0	0.0	0	0.0	0	0.0
26	0	0.0	0	0.0	0	0.0
27	1	0.2	1	0.1	2	0.1
28	0	0.0	0	0.0	0	0.0
29	0	0.0	0	0.0	0	0.0
30	0	0.0	1	0.1	1	0.1
<b>Total</b>	<b>598</b>	<b>100.0</b>	<b>737</b>	<b>100.0</b>	<b>1,335</b>	<b>100.0</b>

Table 26 shows the average travel time and speed to destinations by land use for cargo and service vehicles. Overall, the average travel time for all surveyed vehicles was 7.2 minutes, with cargo vehicles averaging 7.0 minutes and service vehicles averaging 7.4 minutes. By land use types, trips made by cargo vehicles to industrial sites have the longest average travel duration of 9.4 minutes, with an average travel speed of 36.4 mph. For service vehicles, trips to industrial sites also had the highest average travel time of 9.5 minutes and an average travel speed of 35.9 mph.



**Table 26. Average Travel Time and Speed to Destinations by Land Use Type.**

Land Use	Cargo			Service			All Vehicles		
	Number of Trips	Avg. Travel Time (min)	Avg. Travel Speed (mph)	Number of Trips	Avg. Travel Time (min)	Avg. Travel Speed (mph)	Number of Trips	Avg. Travel Time (min)	Avg. Travel Speed (mph)
Office	41	7.0	33.0	131	7.5	34.1	172	7.4	33.9
Retail	284	6.0	33.5	140	7.3	33.9	424	6.4	33.7
Industrial	53	9.4	36.4	28	9.5	35.9	81	9.5	36.2
Medical	18	6.5	34.0	23	8.7	35.5	41	7.7	34.9
Education	6	7.6	31.6	51	4.9	31.7	57	5.2	31.7
Government	9	9.3	34.7	41	7.1	33.4	50	7.5	33.7
Residential	56	8.4	34.3	188	7.3	32.9	244	7.6	33.3
Other	131	7.5	34.0	135	7.8	33.6	266	7.7	33.8
Unknown	6	0.0	0.0	0	0.0	0.0	6	0.0	0.0
<b>Total</b>	<b>604</b>	<b>7.0</b>	<b>34.1</b>	<b>737</b>	<b>7.4</b>	<b>33.7</b>	<b>1,341</b>	<b>7.2</b>	<b>33.8</b>

Table 27 shows the average travel time and speed to destinations by commodity group for trips made by cargo vehicles only. Trips transporting wood had the longest average trip duration of 9.2 minutes, with an average travel speed of 38.1 mph. Of the known commodity groups, food had the highest number of trips, with an average travel time of 6.9 minutes and 32.8 mph.

**Table 27. Average Travel Time and Speed to Destinations by Commodity Group.**

Commodity Group	Cargo		
	Number of Trips	Average Travel Time (minutes)	Average Travel Speed (mph)
Agriculture	0	0.0	0.0
Raw Materials	25	8.4	34.4
Food	90	6.9	32.8
Textiles	17	6.2	33.0
Wood	4	9.2	38.1
Building Materials	6	4.3	31.7
Machinery	57	8.1	35.9
Miscellaneous	0	0.0	0.0
Hazardous	8	3.1	35.8
Transportation	5	6.8	30.9
Secondary	40	7.9	33.7
Unknown	301	6.5	34.1
Empty	51	7.9	34.2
<b>Total</b>	<b>604</b>	<b>7.0</b>	<b>34.1</b>

## **Trip Tours**

The analyses of trip tours show the amount of circuitous travel undertaken by commercial vehicles in the study area. Trip tours are defined as a combination (or chaining) of trips in which a vehicle leaves and returns to a common point, typically its base location. However, those cases where a vehicle did not report a base location (i.e., all of the reported trips were non-base) were considered on a case-by-case basis. In cases where the beginning and ending non-base zone were the same, a tour was considered to be made. In a handful of cases where only non-base trips were reported, the trip tour was determined to have an open start or end, with a trip tour happening as well.

To accurately analyze trip tours, external trips had to be included in the analysis. This is done because it is possible for trip tours to begin within the study area, then travel outside the study area, and then end or return to the study area. Therefore, to exclude external trips in the analysis could result in not capturing those trips that occur outside the study area that take place within the trip tour.

There were 2,007 trips observed in the Abilene commercial vehicle survey. Each trip in the survey provided information on whether or not the origin of the trip was the vehicle's base location. This served as the basis for determining if the trip was a base trip or a non-base trip. A base trip was defined as when either trip ends (origin or destination) began or ended at the base location. If neither trip end was at the base location, then the trip was considered as a non-base trip. Such instances were treated separately from those vehicles with at least one trip involving a base, in determining whether the trip tour could be considered "all open," "completely closed," "before a closed tour," or "after a closed tour." Rather than simply labeling such trips as "all open," each case was considered individually. If the trips started or ended at the same zone number, the trips for this vehicle were classified as "completely closed." Similar logic was used in determining if a "trip before the tour" or a "trip after the tour" had occurred.

As Table 28 shows, approximately 62 percent of the total trips generated by cargo vehicles were non-base trips and 38 percent were base trips. For trips made by service vehicles, 44 percent were non-base trips and 56 percent were base trips.

**Table 28. Base and Non-Base Trips.**

Trip Type	Cargo Vehicles		Service Vehicles		All Vehicles	
	Number of Trips	Percent of Total	Number of Trips	Percent of Total	Number of Trips	Percent of Total
Base	399	38.3	544	56.3	943	47.0
Non-Base	642	61.7	422	43.7	1,064	53.0
<b>Total</b>	<b>1,041</b>	<b>100.0</b>	<b>966</b>	<b>100.0</b>	<b>2,007</b>	<b>100.0</b>

Table 29 shows the distribution of trip tours for cargo and service vehicles. There were 462 trip tours generated by 307 vehicles making at least one trip tour. Cargo vehicles made 206 tours and service vehicles produced 256 tours. The number of tours varied from 1-to-8 tours for both cargo and service vehicles. Nearly 70 percent of the cargo and service vehicles made only one trip tour (79 percent and 63 percent, respectively). For those cargo and service vehicles making only one trip tour, they averaged 6.4 trips and 4.1 trips within the tour, respectively. For all vehicles combined, the average number of tours per vehicle was 1.5 and the average number of trips per tour was 4.1.

**Table 29. Trip Tours per Vehicle.**

<b>Cargo Vehicles</b>				
<b>Total Number of Trip Tours</b>	<b>Number of Vehicles</b>	<b>Number of Tours</b>	<b>Number of Trips</b>	<b>Average Trips per Tour</b>
1	112	112	715	6.4
2	12	24	89	3.7
3	9	27	102	3.8
4	6	24	61	2.5
5	1	5	28	5.6
6	1	6	16	2.7
7	0	0	0	0.0
8	1	8	16	2.0
<b>Cargo Total</b>	<b>142</b>	<b>206</b>	<b>1,027</b>	<b>5.0</b>
<b>Service Vehicles</b>				
<b>Total Number of Trip Tours</b>	<b>Number of Vehicles</b>	<b>Number of Tours</b>	<b>Number of Trips</b>	<b>Average Trips per Tour</b>
1	104	104	424	4.1
2	42	84	255	3.0
3	14	42	139	3.3
4	2	8	27	3.4
5	2	10	25	2.5
6	0	0	0	0.0
7	0	0	0	0.0
8	1	8	8	1.0
<b>Service Total</b>	<b>165</b>	<b>256</b>	<b>878</b>	<b>3.4</b>
<b>Grand Total</b>	<b>307</b>	<b>462</b>	<b>1,905</b>	<b>4.1</b>

The analyses of trip tours also involved counting the number of non-base trips, external trips, inter-zonal trips and intra-zonal trips within trip tours to determine the total amount and types of travel that occur during the course of the tour. There were 1,905 trips observed within the total 462 trip tours. For all vehicles, 580 were external trips (30 percent), 1,255 were inter-zonal trips (66 percent), and 70 were intra-zonal trips (4 percent). Table 30 shows the distribution of these trips for cargo and service vehicles.

**Table 30. External, Inter-Zonal and Intra-Zonal Trips within Trip Tours.**

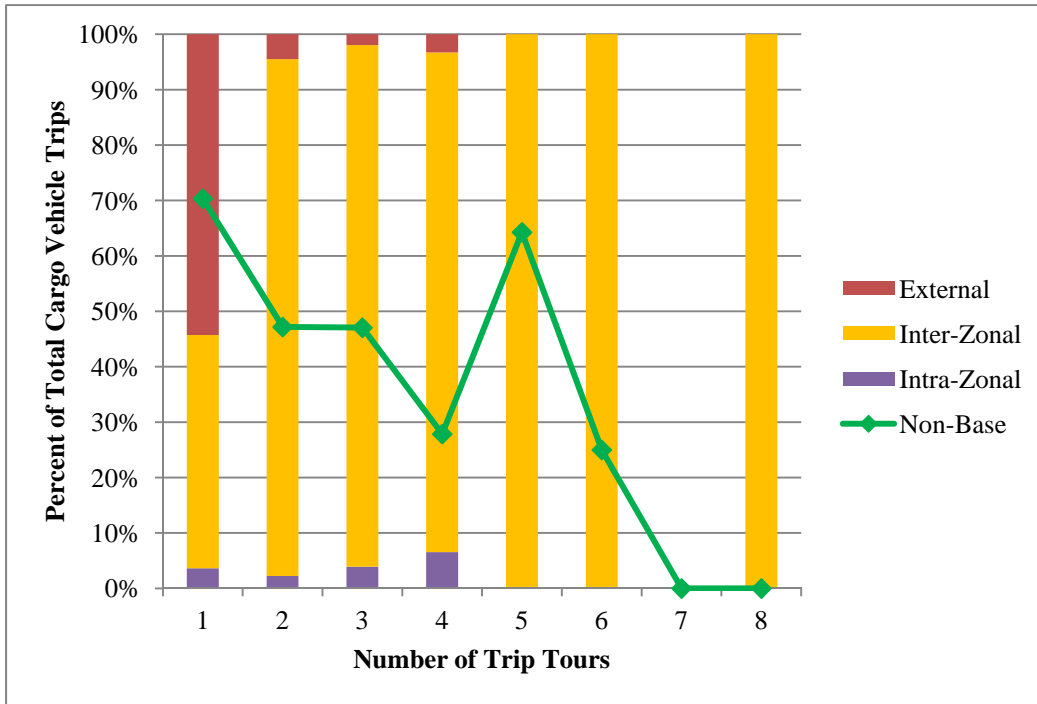
No. of Trip Tours	External		Inter-Zonal		Intra-Zonal		Total Trips	
	Cargo Vehicles	Service Vehicles	Cargo Vehicles	Service Vehicles	Cargo Vehicles	Service Vehicles	Cargo Vehicles	Service Vehicles
1	388	128	301	288	26	8	715	424
2	4	34	83	202	2	19	89	255
3	2	10	96	125	4	4	102	139
4	2	0	55	26	4	1	61	27
5	0	4	28	19	0	2	28	25
6	0	0	16	0	0	0	16	0
7	0	0	0	0	0	0	0	0
8	0	8	16	0	0	0	16	8
<b>Total</b>	<b>396</b>	<b>184</b>	<b>595</b>	<b>660</b>	<b>36</b>	<b>34</b>	<b>1,027</b>	<b>878</b>

Table 31 shows the number of non-base trips within trip tours separately since non-base trips are not mutually exclusive of the other trip types (i.e., a non-base trip may also be an inter-zonal or external trip).

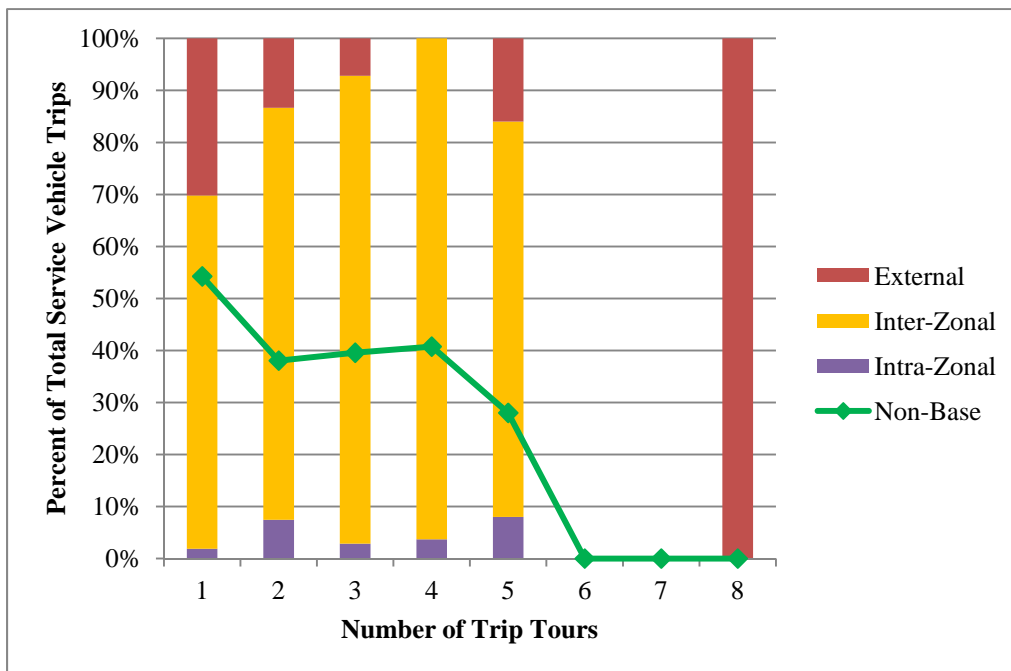
**Table 31. Non-Base Trips within Trip Tours.**

No. of Trip Tours	Non-Base Trips within Trip Tours			Total Trips within Trip Tours					
	Cargo Vehicles	Service Vehicles	All Vehicles	Cargo Vehicles	Percent of Total	Service Vehicles	Percent of Total	All Vehicles	Percent of Total
1	503	230	733	715	69.6	424	48.3	1,139	59.8
2	42	97	139	89	8.7	255	29.0	344	18.1
3	48	55	103	102	9.9	139	15.8	241	12.7
4	17	11	28	61	5.9	27	3.1	88	4.6
5	18	7	25	28	2.7	25	2.9	53	2.8
6	4	0	4	16	1.6	0	0.0	16	0.8
7	0	0	0	0	0.0	0	0.0	0	0.0
8	0	0	0	16	1.6	8	0.9	24	1.3
<b>Total</b>	<b>632</b>	<b>400</b>	<b>1,032</b>	<b>1,027</b>	<b>100.0</b>	<b>878</b>	<b>100.0</b>	<b>1,905</b>	<b>100.0</b>

Figure 13 and Figure 14 show the percentage distribution of non-base trips, external trips, inter-zonal trips, and intra-zonal trips within trip tours for cargo vehicles and service vehicles, respectively.



**Figure 13. Cargo Vehicle Trips within Trip Tours by Trip Type.**



**Figure 14. Service Vehicle Trips within Trip Tours by Trip Type.**

The analyses of trip tours involved counting all the trips that began at the base location until the vehicle returned to its base location. Those trip chains that did not start and/or end at their base location, as well as those that only went to the base one time on the survey day, were considered open tours (except in the case of all non-base trips). In the case of non-base trips, if the trips were determined to contain completely closed tours under the criteria described earlier. They were labeled as completely closed tours. Due to the number of trips that were made in open tours, a review of when these trips occurred was performed. Table 32 provides an overview of when trips that are not part of tours were made relative to trip tours. Nearly 3 percent of the trips made by cargo and service vehicles combined were before the first trip tour or after the last completed trip tour. Roughly 2 percent of the trips made by surveyed vehicles did not have any trip tours (i.e., were only open). A total of 14 vehicles (1 cargo and 13 service) defined to be within an open tour were not associated with any tours.

**Table 32. Summary of Open Tour Trips.**

Trip Type	Cargo		Service		All Vehicles	
	# of Trips	% of Total	# of Trips	% of Total	# of Trips	% of Total
Before start of first tour	2	0.2	25	2.6	27	1.4
After end of last tour	8	0.8	25	2.6	33	1.6
Only Open	4	0.4	38	3.9	42	2.1
Within Closed	1,027	98.6	878	90.9	1,905	94.9
<b>Total</b>	<b>1,041</b>	<b>100.0</b>	<b>966</b>	<b>100.0</b>	<b>2,007</b>	<b>100.0</b>
No Tours	1	NA	13	NA	14	NA

\*Total does not include the “No Tours” category; NA: Not Applicable

### Survey Expansion

The expansion of commercial vehicle survey data is conducted in an indirect manner. In typical travel surveys, an estimate of the population being sampled is known and data are then expanded to represent that population. In the case of commercial vehicle surveys, the population of vehicles operating in the study area is unknown. Vehicle registration data are not considered a viable basis to estimate the number of commercial vehicles in the study area because other vehicles operating in the area may be registered in neighboring counties. However, in the

Abilene commercial vehicle survey analysis, information on registered trucks has been included to show how the survey data compare with existing vehicle registration data.

The methodology currently used to expand commercial vehicle survey data is based on vehicle miles of travel (VMT) estimates from the Highway Performance Monitoring System (HPMS), and vehicle classification counts by functional classification for the study area. In essence, an estimate of the commercial VMT is developed from the HPMS data and is then used to expand the VMT observed from sampled commercial vehicles. HPMS data contain annual average daily traffic (AADT) estimates of the total VMT by functionally classified facilities such as freeways, arterials, collectors, and local roadways. Since AADT includes weekend traffic, a correction factor is applied to the data to obtain average weekday VMT by functional classification. Table 33 provides the adjusted 2011 HPMS VMT estimates for the Abilene study area.

**Table 33. 2011 HPMS Estimates of Weekday VMT in the Abilene Study Area.**

<b>Functional Classification</b>	<b>Total Weekday VMT</b>
Freeway	1,122,381
Arterial	1,849,536
Collector	600,079
Local	223,461
<b>Total</b>	<b>3,795,457</b>

The percentages of commercial and non-commercial vehicles by functional classification were determined by utilizing vehicle classification counts for the Abilene area that were obtained from TxDOT. The percentage of commercial vehicles for internal sites for each functional classification were combined with the corresponding percentage for external sites based on the percentage of regional VMT estimated as external travel.

Table 34 provides the internal, external, and weighted percentages of commercial and non-commercial vehicles by functional classification. The weighted percentages were applied to the HPMS estimated weekday VMT shown in Table 33 to estimate the total commercial and non-commercial VMT. Table 35 shows the estimated VMT for commercial and non-commercial



vehicles. There were no count data for local roadways at external sites, and as a result the percentages obtained at internal locations were utilized for that road classification.

**Table 34. Percentage of Commercial and Non-Commercial Vehicles by Functional Classification.**

Functional Classification	Percent of Commercial Vehicles			Percent of Non-Commercial Vehicles		
	Internal Sites (50%)	External Sites (50%)	Weighted Average	Internal Sites (50%)	External Sites (50%)	Weighted Average
Freeway	23	24	24	77	76	76
Arterial	7	14	10	93	86	90
Collector	8	16	12	92	84	88
Local	8	N/A	8	92	N/A	92

**Table 35. Estimated VMT for Commercial and Non-Commercial Vehicles.**

Functional Classification	Commercial VMT	Non-Commercial VMT	Total VMT
Freeway	262,264	857,118	1,122,381
Arterial	193,741	1,655,795	1,849,536
Collector	72,401	527,677	600,079
Local	17,877	205,584	223,461
<b>Total</b>	<b>549,283</b>	<b>3,246,174</b>	<b>3,795,457</b>

The total commercial VMT of 549,283 miles represents all commercial vehicles that traveled within the Abilene study area. To properly expand the survey data and determine the total internal commercial vehicle trips generated in the study area, external VMT estimates had to be subtracted from the total commercial VMT. The external commercial VMT was estimated to be 115,415 miles. Therefore, the internal commercial VMT estimate was 433,868 miles.

The total internal VMT observed from the commercial vehicle survey was 5,377 miles, of which 2,355 miles were cargo VMT and 3,022 miles were service VMT. This estimate was based on 1,341 inter-zonal trips (604 cargo vehicle trips and 737 service vehicle trips), multiplied by the average trip length (3.9 miles for cargo and 4.1 miles for service vehicles). The total internal commercial VMT (433,868 miles) represented all commercial vehicles and is not distinguished by cargo or service vehicles. Based on the vehicle classification counts conducted in the study area, approximately 43 percent of the commercial vehicles belonged to Class 5 (two-axle six-tire single unit trailers) through Class 13 (seven or more axle multi-trailers) and were assumed as

cargo transport vehicles. Approximately 57 percent of the commercial vehicles belonged to Class 3 (pick-up, van, or two-axle four-tire single unit trailers) and Class 4 (buses) and were assumed as service vehicles. Therefore, to establish the VMT estimates by commercial cargo and service types, it was deemed reasonable to apply these percentages to the total internal commercial VMT. The resulting VMT estimates were 186,563 miles for cargo vehicles and 247,305 miles for service vehicles.

An expansion factor was derived based on the quotient between total internal VMT and observed internal VMT (from the survey) for each commercial vehicle type. The expansion factors (79.20 for cargo vehicles and 81.84 for service vehicles) were then multiplied by the observed number of inter-zonal trips to estimate the total vehicle trips. The resulting inter-zonal trip estimates were approximately 47,837 cargo vehicle trips and 60,318 service vehicle trips. Additionally, 5,634 intra-zonal trips were made, bringing the total number of internal commercial vehicle trips to 113,789. Based on the average number of inter-zonal trips per day of 4.2 trips for cargo vehicles and 4.3 trips for service vehicles, 26,895 commercial vehicles (12,168 cargo vehicles and 14,727 service vehicles) were estimated to be operating within the Abilene study area on a daily basis. This estimate is 7.4 times more than the approximate 3,635 trucks registered in the study area in 2011. Table 36 provides a summary of key results from the Abilene commercial vehicle survey and data expansion.

**Table 36. Key Survey Results and Expanded Trip and VMT Data.**

<b>Indicator</b>	<b>Cargo Vehicles</b>	<b>Service Vehicles</b>	<b>All Vehicles</b>
Sample Size	145	172	317
Total Inter-zonal Trips	604	737	1,341
Total Intra-zonal Trips	36	34	70
Total Internal Trips	640	771	1,411
Total External Trips	403	195	598
Total Internal and External Trips	1,043	966	2,009
Average Total Trips per Vehicle	7.2	5.6	6.3
Average Total Internal Trips per Vehicle*	4.4	4.5	4.45
Average Trip Length	3.9	4.1	4.1
Observed Internal VMT	2,356	3,022	5,377
Total Internal Commercial VMT	186,563	247,305	433,868
Survey Expansion Factor	79.20	81.84	80.69
Total Expanded Inter-Zonal Commercial Vehicle Trips	47,837	60,318	108,155
Total Expanded Intra-Zonal Commercial Vehicle Trips	2,851	2,783	5,634
Total Expanded Commercial Vehicle Trips	50,688	63,101	113,789
Number of Commercial Vehicles Operating on a Daily Basis	12,168	14,726	26,895
Attraction Rate to Households	--	--	0.417

\*Based on internal trips of 317 surveyed commercial vehicles (145 cargo vehicles and 172 service vehicles).

One final calculation was the determination of the commercial vehicle attraction rate to households. In the survey, approximately 19 percent of the trips went to residential land use types. This percentage was applied to the total, expanded commercial vehicle trips within the study area to obtain an estimated 21,128 trips to residential locations. The residential trip estimate was divided by the estimated number of households in the Abilene area (50,724) to obtain an attraction rate of 0.417.

## **SURVEY SUMMARY**

This section provides a summary of vehicle and trip characteristics of 317 commercial vehicles that participated in the 2010-2011 Abilene commercial vehicle survey. Based on the results from the survey, significant differences as well as similarities on travel characteristics were observed between cargo vehicles and service vehicles.

The average vehicle age for cargo vehicles was 8.2 years compared to 7.3 years for service vehicles. The odometer readings reported by cargo vehicles indicated an average mileage of 191,000 miles, which was nearly double the reported average mileage of 105,000 miles by service vehicles. In terms of fuel use, around 64 percent of cargo vehicles used diesel and 36 percent used unleaded gasoline, while 81 percent of service vehicles used unleaded gasoline and 19 percent used diesel.

The analyses of trip characteristics included in-depth examination of trip frequency, trip type, average trip length, trip purpose, and land use activity at trip destinations by commercial vehicle type. Surveyed cargo vehicles made an average of 7.2 total trips per day, compared to 5.4 trips per day for service vehicles. Excluding the trips made outside of the study area (external trips), cargo vehicles produced 4.4 internal trips per day, with average travel distance of 3.9 miles, compared to service vehicles which made 4.3 internal trips per day, with average trip length of 4.1 miles. The average travel time per trip for cargo vehicles was 7.0 minutes and for service vehicles the average travel time per trip was 7.4 minutes.

In terms of trip purpose at trip destinations, approximately 43 percent of the cargo vehicle trips were delivery, 24 percent were base related, and 14 percent were pick-up and delivery. For trips made by service vehicles, approximately 35 percent were service related, 27 percent were service related, and 17 percent were sales related.

In terms of land use activity, approximately 48 percent of the trips made by cargo vehicles occurred at retail locations, followed by 10 percent to warehouses, and nine percent to industrial/manufacturing locations. For service vehicles, over 26 percent of the trips took place at residential sites, followed by 18 percent at locations classified as retail/shopping, and 18 percent at office locations.

The analyses of cargo characteristics were exclusive to trips made by cargo vehicles only and involved examining the types of cargo/commodities being transported at trip destinations, the trip purposes and land use activity at each stop, and the net weight of cargo being picked-up and/or dropped off for each trip. Overall, the average net cargo weight per trip was around 660 pounds. Wood products showed the highest average net cargo weight of around 7,400 pounds per trip, but the most frequently transported commodity was food products with an average net cargo

weight of 905 pounds per trip. The land use “industrial” showed the highest average net cargo weight of around 1,500 pounds per trip, but the retail land use had the most number of trips and an average cargo weight of approximately 450 pounds per trip. Service trip purpose had the highest average net cargo weight of around 6,250 pounds per trip, but it also had the fewest number of trip occurrences (two trips).

The analyses of trip tours involved examining the amount of circuitous travel performed by the commercial vehicles in the study area. It also involved counting the number of non-base trips, external trips, inter-zonal trips, and intra-zonal trips within trip tours to determine the total amount and types of travel that occur during the course of the tour. A total of 462 trip tours were generated by the surveyed vehicles, with cargo vehicles making 206 tours and service vehicles producing 256 tours. The number of trip tours per vehicle varied from one to eight tours for both cargo and service vehicles. The average number of trips tours for all vehicles was 1.5 and the average number of trips per tour was 4.1. Trips made as part of trip tours accounted for 1,905 trips (1,027 trips by cargo vehicles and 878 trips by service vehicles). Within the trip tours, approximately 66 percent were inter-zonal trips, four percent were intra-zonal trips and the remaining 30 percent were external trips. Non-base trips (which were not mutually-exclusive of the other trip types) made up approximately 53 percent of the trips within the tours.

Lastly, the expansion of commercial vehicle survey data were based on vehicle miles of travel (VMT) estimates and vehicle classification counts for the Abilene study area. The commercial VMT estimates represented all commercial vehicles and do not distinguish by cargo and service vehicle types. Therefore, the estimation of VMT and volume of cargo and service vehicles operating within the study area were mainly based on key findings from the survey, such as the total number of internal cargo and service vehicle trips, the average number of trips per cargo and service vehicle, and the average trip lengths per cargo and service vehicle. Based on these findings, approximately 26,900 commercial vehicles (12,200 cargo vehicles and 14,700 service vehicles) were estimated to be operating within the Abilene study area on a daily basis, roughly 7.4 times the volume of trucks registered in the study area in 2011.



## **APPENDIX**





**COMMERCIAL VEHICLE SURVEY  
PART 1: VEHICLE INFORMATION**

(If you have participated in prior surveys, please fill out this form anyway.)

Vehicle ID#: \_\_\_\_\_ Vehicle License # : \_\_\_\_\_

Survey Location (zone): \_\_\_\_\_ SIC Code: \_\_\_\_\_

Travel Day: \_\_\_\_\_  
Month / Day

Company or Name of Owner (name on registration):

\_\_\_\_\_

Address of location where vehicle was based at beginning of travel day:

\_\_\_\_\_

(Street Address or Nearest Intersection)

City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

Type of Place vehicle was based at on beginning of travel day. (SEE BELOW) \_\_\_\_\_

Vehicle Info: Make \_\_\_\_\_ ; Model: \_\_\_\_\_ ; Year: \_\_\_\_\_

- Vehicle Type
- 1)  Cargo / Freight Transport Vehicle
  - 2)  Service Vehicle (vehicle is not used to transport cargo or freight)

- Vehicle Fuel:
- 1)  Unleaded Gas
  - 2)  Diesel
  - 3)  Propane
  - 4)  Hybrid
  - 5)  Other \_\_\_\_\_ (Specify)

Vehicle Classification:

- 1)  Passenger Car
- 2)  Pick-up
- 3)  Van (Cargo or Mini)
- 4)  Sport Utility Vehicle (SUV)
- 9)  Other \_\_\_\_\_
- 5)  Single Unit 2-axle (6 wheels)
- 6)  Single Unit 3-axle (10 wheels)
- 7)  Single Unit 4-axle (14 wheels)
- 8)  Semi (all Tractor-Trailer combinations)

Gross Vehicle Weight: \_\_\_\_\_ pounds

**Beginning Odometer Reading:** \_\_\_\_\_ **Number of Trips Total:** \_\_\_\_\_

Type of Place Codes		
(1) Office Building	(6) Educational (College, Trade, etc.)	(11) Warehouse
(2) Retail / Shopping	(7) Government Office/Building	(12) Distribution Center
(3) Industrial/Manufacturing	(8) Residential	(13) Construction Site
(4) Medical / Hospital	(9) Airport	(14) Other (specify )
(5) Educational (12 <sup>th</sup> grade or less)	(10) Intermodal Facility	(99) Refused/Unknown

**Commercial Vehicle Survey  
PART 2: Travel Log**

**THE PLACE MY TRAVEL BEGAN TODAY WAS:**

Work / Base Location       Other Location (Please describe) \_\_\_\_\_

Type of Place (Specify Type of Place 1-14 or 99, see codes below) \_\_\_\_\_

\_\_\_\_\_  
(Street address or nearest intersection for place travel began)

TRAVEL DATE \_\_\_\_\_ Month / Day

\_\_\_\_\_  
(City, state, zip code)

DEPARTURE TIME: \_\_\_\_\_ a.m./p.m.

**When you left the above location was your vehicle:**  Fully Loaded    Partially Loaded    Empty    Not Applicable (Service Vehicle)

**If loaded, what is the total weight in pounds of the cargo being transported? (Please provide an estimate if unsure of exact weight)** \_\_\_\_\_

**RECORD EVERY PLACE YOU GO, INCLUDING QUICK STOPS**

RECORD the following information about each place		What time did you arrive and depart this location? (record exact times)	Activity What are you doing at this Location (See options below)	What type of place is this? (see options below)	Is this the work / base location for this vehicle?  <input type="checkbox"/> - Yes <input type="checkbox"/> - No	Type of Cargo What is it?	Cargo Weight (in Pounds)
<i>NAME of Place:</i>	<i>Address including city, state, and zip OR Nearest street intersection or Landmark</i>						
PLACE 1		Arrive: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery
		Depart: _____ am/pm					Picked Up
PLACE 2		Arrive: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery
		Depart: _____ am/pm					Picked Up
PLACE 3		Arrive: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery
		Depart: _____ am/pm					Picked Up

ACTIVITY OPTIONS		TYPE OF PLACE OPTIONS		
(1) Base Location / Return to Base Location	(5) Maintenance (fuel, oil, etc.)	(1) Office Building (Non-Government)	(6) Education (college, trade )	(11) Warehouse
(2) Delivery	(6) Driver Needs (lunch, etc.)	(2) Retail / Shopping	(7) Government Office / Building	(12) Distribution Center
(3) Pick-up	(7) Service related business	(3) Industrial/Manufacturing	(8) Residential	(13) Construction Site
(4) Pick-up and Delivery	(8) Other (Please specify)	(4) Medical / Hospital	(9) Airport	(14) Other (specify)
		(5) Education (12 <sup>th</sup> grade or less)	(10) Intermodal Facility	(99) Refused / Unknown

### Commercial Vehicle Survey Travel (continued)

RECORD the following information about each place		What time did you arrive and depart this location?  (record exact times)	Activity What are you doing at this location? (see options below)	What type of place is this? (see options below)	Is this the work / base location for this vehicle?	Type of Cargo What is it?	Cargo Weight (in Pounds)
NAME of Place:	Address including city, state, and zip OR nearest street intersection or Landmark						
PLACE 4		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up
PLACE 5		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up
PLACE 6		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up
PLACE 7		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up
PLACE 8		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up
PLACE 9		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery Picked Up

ACTIVITY OPTIONS		TYPE OF PLACE OPTIONS		
(1) Base Location / Return to Base Location (2) Delivery (3) Pick-up (4) Pick-up and Delivery	(5) Maintenance (fuel, oil, etc.) (6) Driver Needs (lunch, etc.) (7) Service related business (8) Other (Please specify)	(1) Office Building (Non-Government) (2) Retail / Shopping (3) Industrial/Manufacturing (4) Medical / Hospital (5) Education (12 <sup>th</sup> grade or less)	(6) Education (college, trade ) (7) Government Office / Building (8) Residential (9) Airport (10) Intermodal Facility	(11) Warehouse (12) Distribution Center (13) Construction Site (14) Other (specify) (99) Refused / Unknown

### Commercial Vehicle Survey Travel (continued)

RECORD the following information about each place		What time did you arrive and depart this location? (record exact times)	Activity What are you doing at this location? (see options below)	What type of place is this? (see options below)	Is this the work / base location for this vehicle?	Type of Cargo What is it?	Cargo Weight (in Pounds)
NAME of Place:	Address including city, state, and zip OR Nearest street intersection or Landmark						
PLACE 10		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery <hr/> Picked Up
PLACE 11		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery <hr/> Picked Up
PLACE 12		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery <hr/> Picked Up
PLACE 13		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery <hr/> Picked Up
PLACE 14		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		Delivery <hr/> Picked Up

ACTIVITY OPTIONS		TYPE OF PLACE OPTIONS		
(1) Base Location / Return to Base Location (2) Delivery (3) Pick-up (4) Pick-up and Delivery	(5) Maintenance (fuel, oil, etc.) (6) Driver Needs (lunch, etc.) (7) Service related business (8) Other (Please specify)	(1) Office Building (Non-Government) (2) Retail / Shopping (3) Industrial/Manufacturing (4) Medical / Hospital (5) Education (12 <sup>th</sup> grade or less)	(6) Education (college, trade ) (7) Government Office / Building (8) Residential (9) Airport (10) Intermodal Facility	(11) Warehouse (12) Distribution Center (13) Construction Site (14) Other (specify) (99) Refused / Unknown

Record Type 21

### Commercial Vehicle Survey (continued)

VEHICLE LICENSE #: \_\_\_\_\_

	<b>RECORD the following information about each place</b>  <b>NAME of Place:</b> <b>Address including city, state, and zip</b> <span style="margin-left: 150px;"><b>OR</b></span> <b>Nearest street intersection or Landmark</b>	What time did you arrive and depart this location?  (record exact times)	Activity What are you doing at this location? (see options below)	What type of place is this? (see options below)	Is this the work / base location for this vehicle?  <input type="checkbox"/> - Yes <input type="checkbox"/> - No	Type of Cargo What is it?	Cargo Weight (in Pounds)
PLACE 15		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		_____ Delivery _____ Picked Up
PLACE 16		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		_____ Delivery _____ Picked Up
PLACE 17		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		_____ Delivery _____ Picked Up
PLACE 18		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		_____ Delivery _____ Picked Up
PLACE 19		Arrive: _____ am/pm Depart: _____ am/pm			<input type="checkbox"/> - Yes <input type="checkbox"/> - No		_____ Delivery _____ Picked Up

ACTIVITY OPTIONS	TYPE OF PLACE OPTIONS				
(1) Base Location / Return to Base Location (2) Delivery (3) Pick-up (4) Pick-up and Delivery (5) Maintenance (fuel, oil, etc.) (6) Driver Needs (lunch, etc.) (7) Service related business (8) Other (Please specify)	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">                             (1) Office Building (Non-Government)                              (2) Retail / Shopping                              (3) Industrial/Manufacturing                              (4) Medical / Hospital                              (5) Education (12<sup>th</sup> grade or less)                         </td> <td style="width: 50%; border: none;">                             (6) Education (college, trade )                              (7) Government Office / Building                              (8) Residential                              (9) Airport                              (10) Intermodal Facility                         </td> </tr> <tr> <td style="border: none;">                             (11) Warehouse                              (12) Distribution Center                              (13) Construction Site                              (14) Other (specify)                              (99) Refused / Unknown                         </td> <td style="border: none;"></td> </tr> </table>	(1) Office Building (Non-Government) (2) Retail / Shopping (3) Industrial/Manufacturing (4) Medical / Hospital (5) Education (12 <sup>th</sup> grade or less)	(6) Education (college, trade ) (7) Government Office / Building (8) Residential (9) Airport (10) Intermodal Facility	(11) Warehouse (12) Distribution Center (13) Construction Site (14) Other (specify) (99) Refused / Unknown	
(1) Office Building (Non-Government) (2) Retail / Shopping (3) Industrial/Manufacturing (4) Medical / Hospital (5) Education (12 <sup>th</sup> grade or less)	(6) Education (college, trade ) (7) Government Office / Building (8) Residential (9) Airport (10) Intermodal Facility				
(11) Warehouse (12) Distribution Center (13) Construction Site (14) Other (specify) (99) Refused / Unknown					