



4.0 TRUCK ORIGIN AND DESTINATION STUDY

One of the most important issues of the Northern Colorado Truck Mobility/State Highway (SH) 14 Relocation Study was to clearly establish the number of through trucks using the existing route. To address this issue, a truck origin and destination study was conducted. The intent of the study was to determine the proportion and number of through truck trips that could be accommodated by either a non-route based strategy or an alternate route. Through trucks are classified as trucks that use the SH 14/US 287 route to access I-80 in Laramie or I-25 east of the City of Fort Collins with no business stops in the City of Fort Collins or northern Larimer County. This summary outlines the methodology used, validation efforts, and the results obtained. A final technical memorandum, *Truck Origin and Destination Study* (see Appendix C), has been prepared to describe these elements in more detail.

4.1 SUMMARY OF PAST STUDIES

The issue of truck travel in the City of Fort Collins has been debated and analyzed for more than 30 years. During this timeframe, numerous transportation studies have been completed to address truck travel in and around the City. Several of these studies specifically focus on trucking operations, while other studies investigate truck travel in part of a broader, overall transportation context.

Truck travel data has been collected and analyzed as part of several recent studies. Results from these past quantitative efforts provide points of comparison for the current origin and destination effort. The following information summarizes the results from those past studies that include data collection and analysis focused on truck travel. Detailed documentation of these studies is not available; as a result, the following descriptions were developed based on review of summary materials and discussions with key figures associated with these efforts. The results of these studies had no impact on the results of the truck origin and destination study conducted as part of this study. They were only used as a reference.

4.1.1. Western Highway Institute Assessment (1999)

The Western Highway Institute (WHI) conducted an assessment of truck volumes along SH 14 and US 287 in January 1999. To conduct this assessment, WHI relied on past Colorado Department of Transportation (CDOT) traffic surveys and recent industry surveys. Based on their review of the survey data, WHI determined that commercial vehicle traffic along SH 14 and US 287 generally falls into three categories. These categories include “Local” traffic, “Regional” traffic, and “Through” traffic. The following information summarizes WHI’s findings related to each traffic category:

- **Local.** Commercial vehicles that fall into this category are those that provide local pick-up and delivery of services to homes and businesses within the City. WHI estimated that 33 percent of all commercial vehicles within the corridor are local trips.
- **Regional.** For the purposes of their study, WHI defined “regional” as the area encompassed by Larimer, Weld, Boulder, and Grand Counties in Colorado, and Laramie and Albany Counties in Wyoming. Trucks that fall into this category are those that provide services within this particular region. According to WHI, 50 percent of all commercial vehicles within the corridor are regional trips.

- **Through.** Through trips are defined as those that both originate and terminate outside of the region described above. WHI estimated that 17 percent of all commercial vehicles within the corridor are through trips.

4.1.2. 24-Hour Highway Truck Survey – Maurice L. Albertson, PH.D, P.E. (1999)

(Note: This survey was a volunteer effort by a group of citizens under the lead of Dr. Maurice Albertson.) A group of approximately 60 volunteers were assembled to collect truck counts at six locations in and around the City of Fort Collins. Counts and multiple traffic movements for both commercial trucks and buses were collected continuously over a 24-hour period at the Port of Entry (POE) along I-25, northbound I-25 at SH 14, southbound I-25 at SH 14, the intersection of Jefferson Street/College Avenue, and Ted's Place (intersection of US 287/SH 14). Surveyors recorded number of axles, type of carrier, color, and name (if possible). The number of passenger vehicles were recorded at certain locations. The survey was conducted on May 11 and 12, 1999. Numerical results and general conclusions from this survey are as follows:

SH 14 (west of I-25) Total Truck Count

- Westbound: = 1,165 (645 – 5 axle and larger; 520 – 4 axle and smaller)
- Eastbound: = 896 (568 – 5 axle and larger; 328 – 4 axle and smaller)

Intersection of Jefferson Street & College Avenue Total Truck Count

- Westbound to northbound turn: = 639
- Southbound to eastbound turn: = 620

Intersection of SH 14 & US 287 (Ted's Place) Total Truck Count

- 1,207 (specific count locations were not provided)

Highway 14 (west of US 287) Total Truck Count

- 62 (combined eastbound and westbound travel)

Estimate of Through Trips

- This study concluded that approximately 1,200 trucks would utilize a northern bypass route on a daily basis. This study did not account for trucks that had destinations along the Mulberry Corridor, it was bound by SH 14 at Ted's Place and the Jefferson Street and College Avenue intersection.

Previous study efforts have also considered travel through and around the City of Fort Collins although some projects did not focus solely on through truck travel. A report titled *History of Fort Collins Truck Route and Bypass Planning Efforts, 1966 to Present* (see Appendix A) summarizes the recommendations of these studies.

4.2 STUDY METHODOLOGY

In developing the study methodology, the study team worked closely with members of the trucking industry. Based on those discussions, a methodology was developed consisting of two types of data collection efforts. These data collection efforts included a license plate and vehicle description survey and traffic volume classification counts.

4.2.1. License Plate and Vehicle Description Survey

The license plate and vehicle description survey was conducted at six locations in the study area. These locations are listed below and shown in Figure 4.1.

- Port of Entry on I-25
- SH 14 west of I-25
- Jefferson Street/Riverside Avenue
- US 287 east of Laporte Bypass
- US 287 at the Forks at Livermore
- County Road (CR) 70 (Owl Canyon Road) west of I-25

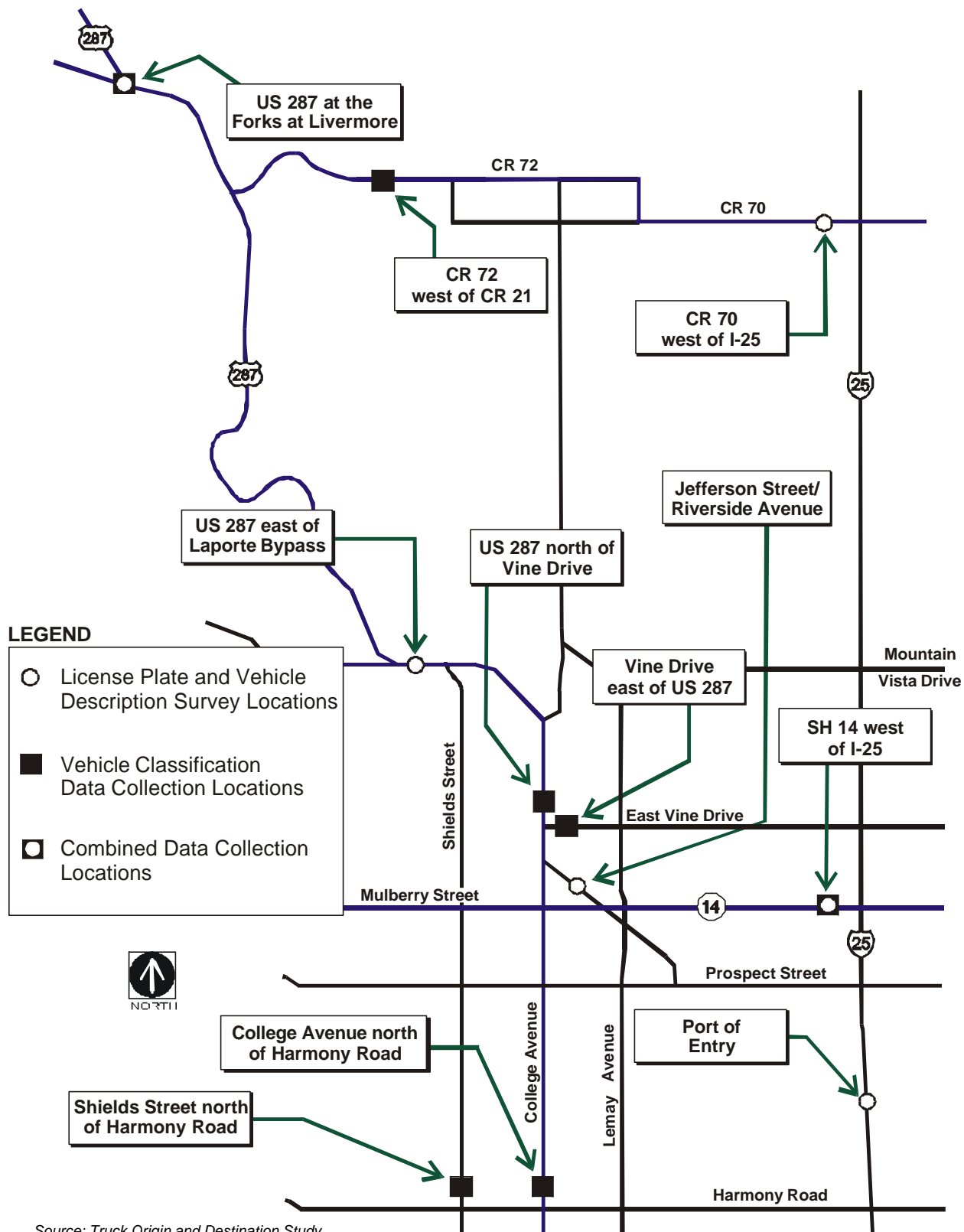
License plate information was collected at each location for trucks with three or more axles and did not record local delivery trucks and buses. The recording was conducted from early morning (7:00 a.m.) to late afternoon (5:00 p.m.). Surveyors were given two breaks during the day. A survey was also conducted between 7:00 p.m. and 1:00 a.m., with one surveyor break in that time period. Since it was difficult to read license plates during late evening and early morning hours due to poor lighting, only basic identifying information such as truck color and number of axles was recorded.

The data was then compiled into a computer database and matched to track license plates through the various survey locations. Travel time data was collected to determine the average travel time between the survey locations at SH 14 west of I-25 and US 287 north at the Forks at Livermore. Trucks that had travel times longer than 45 minutes between the survey locations were assumed to have made a stop in the City of Fort Collins or northern Larimer County, and were therefore not considered through truck trips. The travel time analysis was also extended to 90 minutes as a test, but the results did not vary significantly.

4.2.2. Vehicle Classification Data Collection

The second data collection effort included traffic volume counts providing vehicle classification information throughout the study area. Twenty-four hour vehicle classification data was collected over a 5-day period in November and December 2000 to supplement the license plate and vehicle description data and provide an overall picture of truck traffic along specific corridors.

Figure 4.1
Origin and Destination Study
Data Collection Locations



The vehicle classification data was collected at the following locations (also shown in Figure 4.1):

- SH 14 west of I-25
- US 287 north of Vine Drive
- US 287 at the Forks at Livermore
- CR 72 (Owl Canyon Road) west of CR 21
- Vine Drive east of US 287
- College Avenue (US 287) north of Harmony Road
- Shields Street (CR 17) north of Harmony Road

The vehicle classification data was collected based on the 13 groups typically used in classification studies:

1. Cycles
2. Cars
3. Two-axle, four-tire vehicles (2A-4T)
4. Buses
5. Two-axle, single-unit trucks (2A-SU)
6. Three-axle, single-unit trucks (3A-SU)
7. Four-or more-axle, single-unit trucks (4A-SU)
8. Four-or fewer-axle, single-trailer trucks (4A-ST)
9. Five-axle, single-trailer trucks (5A-ST)
10. Six-or more-axle, single-trailer trucks (6A-ST)
11. Five-or fewer-axle, multi-trailer trucks (5A-MT)
12. Six-axle, multi-trailer trucks (6A-MT)
13. Seven-or more-axle, multi-trailer trucks (7A-MT)

The classifications were then compiled into three general categories: passenger vehicles, larger two-axle vehicles, and multiple-axle vehicles (three or more axles). These categories were then summarized to represent percentages of vehicle types in relation to overall traffic volumes at each of the locations.

4.3 VALIDATION EFFORTS

Several additional factors were considered in the data evaluation. Traffic data tends to fluctuate over the course of the year, with summer months typically experiencing higher volumes and winter months typically experiencing lower volumes. Data collected from CDOT indicates that traffic data collected in November and December should be increased by 2 percent on urban highways (similar to SH 14) and 6 percent on rural highways (similar to US 287 at Owl Canyon) to reflect summer volumes. These factors were applied to the survey and vehicle classification data and are provided in more detail in the technical memorandum in Appendix D. Table 4.1 shows the factored traffic count data and Figure 4.2 shows a graphical representation of the different percentages of traffic in various locations.

Table 4.1
Factored Traffic Count Data (2000)

Location	Passenger Vehicles		Larger Two-Axle Vehicles		Multiple-Axle Vehicles		Total
	Average Weekday Volume	Percent of Total	Average Weekday Volume	Percent of Total	Average Weekday Volume	Percent of Total	
SH 14 west of I-25	20,090	84.1%	2,085	8.7%	1,725	7.2%	23,900
US 287 at the Forks at Livermore	4,195	75.6%	320	5.8%	1,035	18.6%	5,550
US 287 north of Vine Drive	23,740	92.3%	815	3.2%	1,175	4.6%	25,730
CR 72 west of CR 21	480	70.6%	100	14.7%	100	14.7%	680
Vine Drive east of US 287	3,760	89.7%	160	3.8%	270	6.4%	4,190
Shields Street north of Harmony Road	22,260	95.7%	355	1.5%	655	2.8%	23,270
College Avenue north of Harmony Road	33,630	93.2%	755	2.1%	1,695	4.7%	36,080

Source: Truck Origin and Destination Study

Additionally, a capture rate analysis was completed to assess the potential number of trucks that could have been missed during the data collection effort. Results from this analysis indicate at least 87 percent of the trucks on the roadway were included during the survey. This measure only reflects data collected during the survey periods and does not recognize trucks on the roadway that passed through the survey location during non-survey times.

The final step in calibrating the data was determining how much of the data was valid for matching. In order to be matched, the data had to meet several basic criteria, including number of digits recorded, legibility of entries, and duplications. The data set was reviewed and any entries not meeting these criteria were removed. As shown on Table 4.2, the number of invalid license plates did not exceed 19 percent of the overall data collected. In other words, at least 81 percent of the data recorded was usable for matching and an average of 89 percent of the data was valid throughout the study area. To rectify the matching error the invalid data was removed, and the remaining valid data was expanded by 11 percent to return the number of surveyed trucks back to 100 percent.

Table 4.2
Valid License Plates Collected
(Weekday totals)

Location	Total Plates		Valid Plates		Percent Valid	
	North-bound	South-bound	North-bound	South-bound	North-bound	South-bound
Port of Entry on I-25	1,267	1,346	1,166	1,224	92%	91%
SH 14 west of I-25	651	596	529	499	81%	84%
Riverside Avenue	419	422	407	382	97%	91%
US 287 near Vine Street	634	573	553	533	87%	93%
US 287 north of Owl Canyon Road	457	363	385	335	84%	92%
CR 70 (Owl Canyon Road) west of I-25	7	38	7	38	100%	100%
Totals	6,773		6,058		89%	

Source: Truck Origin and Destination Study

4.4 TRUCK ORIGIN AND DESTINATION STUDY RESULTS

The traffic count and license plate and vehicle description matching data collected was validated and analyzed to determine the overall number of trucks on key roadways in the study area as well as the percent of those truck trips that are considered through trucks that would utilize an alternate route or non-route based strategy. In general, the results reflect that about 27 percent of the northwest-bound truck trips from SH 14 and I-25 in the City of Fort Collins to US 287 at the Forks near Livermore are through trips, and about 35 percent of the southeast-bound truck trips from US 287 in Livermore to I-25 at SH 14 are through trips. The remaining truck traffic on surveyed roadways is local or regional in nature.

Based on the elements described above and the related vehicle classification data, an estimate of through truck trips that could be encouraged to use the existing Interstate system or a potential alternate route was determined. This estimate indicates that approximately 560 to 590 existing truck trips are through trips and could be diverted from the existing route. Table 4.3 reflects the percentage of total trucks that are considered through trucks at various locations along the existing SH 14/US 287 route. The table shows that a significant portion of the trucks are local and regional in nature and could not select the Interstate or any of the alternate routes investigated as part of this study as an option for travel. For purposes of the analysis of alternate routes and non-route based strategies, the number of existing through trucks was rounded to 600 through trucks per day.

Table 4.3
Through Trucks as a Percentage of Total Trucks
(Northbound and Southbound Combined)

Roadway Segment	Number of Total Trucks	Number of Through Trucks	% of Through Trucks
US 287 at the Forks at Livermore to US 287 at Laporte Bypass	1,035	600	55%
US 287 at Laporte Bypass to Jefferson Street/ Riverside Avenue	1,175	600	50%
Jefferson Street/Riverside Avenue to Port of Entry on I-25 south of Prospect Street	1,725	600	35%

Source: Truck Origin and Destination Study